GEOLOGICAL
SURVEY
OF
CANADA

DEPARTMENT OF ENERGY,
MINES AND RESOURCES

PAPER 69-45

A CATALOGUE OF CANADIAN MINERALS

R. J. Traill

CANADA

GEOLOGICAL SURVEY
OF CANADA

PAPER 69-45

A CATALOGUE OF CANADIAN MINERALS

R. J. Traill

DEPARTMENT OF ENERGY, MINES AND RESOURCES

Available by mail from the Queen's Printer, Ottawa

from the Geological Survey of Canada
601 Booth St., Ottawa

and

Canadian Government bookshops in
HALIFAX - 1735 Barrington Street
MONTREAL - 1182 St. Catherine Street West
OTTAWA - Corner Mackenzie and Rideau
TORONTO - 221 Yonge Street
WINNIPEG - 499 Portage Avenue
VANCOUVER - 657 Granville Street
or through your bookseller

Price: $5.00 Catalogue No.M44-69-45

Price subject to change without notice

Queen's Printer for Canada
Ottawa
1970

A CATALOGUE OF CANADIAN MINERALS

INTRODUCTION

PREVIOUS WORK

Over a century has elapsed since T. Sterry Hunt in Geology of Canada, 1863, presented the first descriptive list of Canadian minerals. Hunt's descriptions, which comprised 76 pages and included some 70 to 80 species were introduced as follows. "It is now proposed to notice in succession the various minerals, which have, up to the present time, been observed in the province. Under each species will be given the most interesting facts in its history, as far as regards its occurrence in Canada, its associations, and its chemical composition. Without attempting to follow a rigidly scientific classification we shall first notice the carbonates, sulphates, phosphates, and fluorides, and then proceed to the silicates; reserving for the last, the metallic ores and combustible minerals".

In 1889, G.C. Hoffmann's "Annotated List of the Minerals Occurring in Canada" appeared in Transactions of the Royal Society of Canada, vol. VII, Sec. III, and was subsequently reprinted in Annual Report of the Geological Survey of Canada for 1889. The latter list, which included some 180 mineral species and an additional 95 varieties, was said to embrace "all such as have, up to date (July 31, 1890), been identified with any degree of certainty, as occurring in Canada". In addition to being an authoritative index as to the knowledge of Canadian mineralogy up to the date of its publication, the list served to indicate the progress that had been made in mineralogical investigations since the earlier report by Hunt. Hoffmann listed the minerals alphabetically, and made no attempt to list all occurrences of each mineral.

A quarter of a century later, in 1915, R.A.A. Johnston attempted to bring together in Geological Survey of Canada Memoir 74 as complete a list as possible of all notable occurrences of minerals so far recorded in Canada. This memoir contained about 360 mineral names in alphabetical order. Under each name a list of localities of occurrence was given for each province and territory. Literature references and the results of chemical analyses were noted where applicable, but descriptions of the occurrences were largely omitted.

During the half century that has elapsed since publication of Johnston's Memoir much has been learned about Canadian minerals and mineral localities and a large part of that knowledge lies buried in the host of publications that now constitute the scientific record. The need to undertake a new revision of the Geological Survey of Canada list of Canadian mineral occurrences became evident by the increasing difficulty encountered in supplying adequate answers to the many enquiries that are received for such information. This need was further emphasized by the National Advisory Committee on Research in the Geological Sciences and the Mineralogical Association of Canada, and accordingly, the Geological Survey of Canada in 1958 instituted a project to update the Canadian mineral record.

PRESENTATION OF THE DATA

In the preparation of the Catalogue of Canadian Minerals, a search of all literature dealing with Canadian minerals was made by students engaged for the summer months. In addition, unpublished data were sought and provided by a number of individual mineralogists, through the co-operation of the Mineralogical Association of Canada, notably M.H. Frohberg, D.H. Gorman, D.F. Hewitt, D.A. Moddle, E.W. Nuffield, Mrs. J.S. Stevenson and R.M. Thompson. It became apparent as the compilation progressed that for many common minerals it would be impractical to attempt to record all reported localities of occurrence. An arbitrary list of common minerals was drawn up and the students were instructed to ignore occurrences of these unless the reference contained either analytical data or some feature likely to be of particular interest, such as distinctive physical properties, unusual associated minerals or mode of occurrence, economic value, or use as a gemstone or decorative stone. Occurrences of hydrocarbons, rocks, coal, petroleum and natural gas were not compiled. Many of those who assisted with the work were untrained mineralogists, and the compilation may therefore have suffered from omission of some data of mineralogical interest. It is hoped that readers will report any such deficiencies to the Geological Survey so that these may be corrected in subsequent supplementary reports.

The minerals are listed in alphabetical order and, for each mineral, the localities of occurrence are subdivided according to province or territory in alphabetical order and in increasing numerical order of the NTS index system. Each entry consists of the NTS number, normally equivalent to a 1:50,000 map sheet reference; a more detailed description of the location; a brief account of the information pertinent to the mineral found at that locality; and a reference to the source of information. Physical and optical properties and detailed mineral descriptions are not given as these are readily obtainable from standard mineralogy textbooks. Chemical analyses, however, have been reported and related to geographic location where possible. X-ray powder diffraction data are listed for each mineral species. Unless otherwise noted, the characteristic lattice spacings are given in angstrom units, and the relative intensities refer to patterns made using copper radiation.

DESCRIPTIONS OF MINERALS AND THEIR OCCURRENCES

ACANTHITE

Ag_2S

Acanthite, the orthorhombic form of Ag_2S, is stable at temperatures below 180° C. Argentite, the cubic form, is stable only at temperatures above 180° C. All occurrences of argentite are therefore valid for acanthite and are so recorded here. Most acanthite probably crystallized originally as argentite and inverted to acanthite on cooling. Pseudomorphs of acanthite after argentite are common. Orthorhombic crystal forms have not been noted in Canadian occurrences. A comparison of X-ray powder diffraction patterns of acanthites from several localities shows that considerable variations exist in unit cell dimensions. The spacings and intensities of the six strongest lines on the X-ray pattern are: 3.07 (8), 2.81 (8), 2.58 (10), 2.44 (10), 2.37 (9), and 2.08 (8) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 E/2 Argentite has been noted in association with silver and gold at the Jewel and other mines in the Greenwood Mining Division (R. Bell, 1902-3: Geol. Surv. Can., Ann. Rept., XV, 127A).

82 E/6 Jet black acanthite, with a brilliant lustre which fades on exposure, occurs as coatings along joints and minor faults and as masses and crystals in vugs at the Highland Bell Mine, Wallace Mountain, near Beaverdell, 23 miles east of Penticton. Chemical analyses by R.M. Williams: crystallized acanthite, S.G. 7.24 ± 0.04, Ag 86.37, Cu 0.23, Fe 0.25, Zn 0.40, Sb trace, S 12.72, total 99.97; massive acanthite, S.G. 7.00-7.21, Ag 86.14, Cu 0.36, Fe 0.21, Zn 0.31, Sb 0.57, S 12.39, total 99.98 (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 32).

82 F/6 Argentite has been found at the Silver King Mine, Toad Mountain, about 5 miles south of Nelson (G.M. Dawson, 1896: Geol. Surv. Can., Ann. Rept., IX, 27A).

82 F/14,
82 K/3 At the Slocan mining camp, argentite is present as a primary mineral associated with argentiferous galena, and has been observed in megascopic amounts in ores from the Capello, Wilmer, Black Grouse, Silver Glance, Boomerang, Howard Fraction and Meteor properties. It is found in considerable masses as a supergene mineral replacing galena at the Hewitt Mine, and as films associated with native silver coating joint fractures at the Molly Hughes, Comstock-Virginia and Republic properties (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 123).

103P/12 Argentite occurs in bluish black vuggy quartz associated with pyrite, galena, sphalerite, pyrargyrite, native silver, chalcopyrite, tetrahedrite, polybasite and argyrodite, at the Dolly Varden Mine, 18 miles from the head of Alice Arm, near the headwaters of the Kitsault River, Skeena mining division (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 545).

Northwest Territories

86 F/12 At the How Group, Camsell River Silver Mines, located on the Camsell River about 20 miles south of Great Bear Lake, argentite occurs in dolomite-quartz gangue associated with galena, chalcopyrite, pyrite, sphalerite, bismuth, argentiferous bismuthinite, silver, tetrahedrite, marcasite and an unidentified cobalt-nickel-arsenic sulphide (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

86 L/1 A rare constituent of the ore at the Eldorado Mine, Great Bear Lake, argentite occurs as inclusions in native silver, and is also associated with tetrahedrite which has been partly replaced by pyrargyrite (Ellis Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 47).

Nova Scotia

21 H/1 Argentite is the source of silver found at the Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton. The deposit is located in the brecciated zone between two faults and is composed of sulphides and sulphates (R. W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Ontario

31 M, 41 P Most of the cobalt-nickel-silver deposits in the Cobalt-Gowganda area contain argentite. It is less common and occurs in smaller quantity than silver. While usually without crystal form, it occasionally occurs as well developed crystals of larger size than those of any other metallic minerals in the veins. Paragenetically, argentite is closely associated with silver, bismuth and dyscrasite, filling fractures in earlier smaltite, niccolite and calcite. Some argentite found as hair-like crystals in vugs and open spaces in the lower, nonproductive workings of the mines appears to be of secondary origin. Occurrences have been reported in the townships of Coleman, South Lorrain, James, Tudhope, Speight, Whitson, Auld, Cane, Casey, Ingram, Harris, Pense, Haultain and Miller (W.G. Miller, 1913: Ont. Bur. Mines, Ann. Rept., vol. 19, pt. II).

The association of argentite and silver is very intimate in specimens from the Cobalt area. Close examination of silver specimens revealed the presence of argentite usually as thin coatings or scales attached to the surface of the silver. Coatings of ruby silver are also common. Minute argentite inclusions in leaf silver were also noted.

A specimen of argentite from the Casey-Cobalt Mine showing good crystal surfaces embedded in cleavable calcite was examined by H.V. Ellsworth. Two distinct habits were noted: (1) simple half octahedrons attached vertically to the argentite mass, the plan of attachment corresponding to the direction of a cube face; and (2) somewhat tabular forms which proved to be combinations of the rhombic dodecahedron, cube, icositetrahedron, trisoctahedron and tetrahexahedron. Chemical analysis of part of the specimen: Ag 86.80, S 13.01, Fe 0.08, SiO_2 0.16, Sb trace, total 100.05.

A specimen of argentite from the O'Brien Mine, having a peculiar iridescent tarnish resembling that of bornite was analyzed in the belief that the tarnish might indicate some variation in composition. It proved to be ordinary argentite. Chemical analysis: Ag 86.91, S 12.86, Sb or As trace, Cu trace, Co trace, insol. trace, total 99.77 (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, pp. 205-8).

Masses of argentite weighing several pounds and crystals ranging in size from 3 to 20 mm were described from the Frontier and Keeley mines, 20 miles southeast of Cobalt in South Lorrain Township. The crystals were commonly frosted, rough, and somewhat rounded. The common forms were cube, octahedron, and combinations of these. Twinning according to the fluorite law was common. The argentite occurred with native silver, stephanite and arsenides of cobalt, nickel and iron in a calcite gangue (T.L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 14).

42 A Argentite is reported with native silver in barite veins on the property of the Premier Langmuir Mining Company in the Township of Langmuir along the south boundary and immediately west of Night Hawk River (W.G. Miller, 1913: Ont. Bur. Mines, Ann. Rept., vol. 19, Pt. II).

52 A/3, 52 A/6, 52 A/7 Argentite has been noted at a number of old silver deposits near the shores of Thunder Bay, Lake Superior. It was reported to be more common than native silver particularly at depth in the ore bodies. The vein-filling material consisted of quartz, barite, calcite, dolomite and fluorite containing a variety of metallic minerals including: sphalerite, galena, pyrite, marcasite, pyrrhotite, chalcopyrite, arsenopyrite, niccolite, domeykite, tetrahedrite, animikite, argentite, silver and bismuth. Other reported minerals include: graphite, erythrite, annabergite, malachite, azurite, witherite, cerargyrite and rhodochrosite. Specific localities mentioned were: Silver Islet off Thunder Cape; Beaver in O'Connor Township; Silver Mountain in Lybster Township; Badger and Porcupine in Gillies Township; Prince's Mine on Spar Island and adjacent mainland; Jarvis and McKellar islands; and Rabbit

Mountain Mine (E.D. Ingall, 1887: Geol. Surv. Can., Ann. Rept., III, H. G.C. Hoffmann, 1889-9: Geol. Surv. Can., Ann. Rept., IV, 20 T. W.G. Miller, 1913: Ont. Bur. Mines, Ann. Rept., vol. 19, Pt. II, 197-210). Chemical analysis of an argentite crystal from Thunder Bay: Ag 86.44, S 13.37, Cu trace, total 99.81, S.G. 7.31 (E.J. Chapman, 1888: Minerals and Geology of Ontario and Quebec, Copp Clark Company, Toronto).

Yukon Territory

105 M/13 Argentite occurs associated with native silver, freibergite and argentiferous galena containing dots and blebs of ruby silvers at the Elsa Mine on the north facing slope of Galena Hill, Mayo District (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

105 M/14 At the Lucky Queen Mine in the Keno Hill-Sourdough Hill area, Mayo District, argentite is associated with native silver and pyrargyrite in ore shoots in which siderite, galena, sphalerite and freibergite are the principal hypogene minerals. For description of the vein system, see: R.W. Boyle (1956): Geol. Surv. Can., Paper 55-30, pp. 19-22.

ACMITE

(See aegirine)

ACTINOLITE

$$Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$$

Actinolite and tremolite constitute a calcium-magnesium-iron series of monoclinic amphiboles in which tremolite is the iron-free end member and actinolite has a significant and variable iron content.

Actinolite is of widespread occurrence in Canada, often formed as a result of contact metamorphism. It is frequently a major constituent of metamorphosed impure limestones and shales, crystalline schists, and greenstones, and is a common gangue mineral in ore deposits. Nephrite jade, consisting of randomly oriented fine fibres of actinolite or tremolite, is valued as a gemstone for its toughness and attractive green colour. Asbestiform actinolite has been mined commercially as a source of asbestos.

British Columbia

92 H, 92 I Jade boulders have been obtained from the gravels of the Fraser River from Chilliwack to as far north as Lytton. Numerous specimens have been collected from Alexander bar, near Chapman, between Lytton and Hope. Jade boulders have also been recovered from the Thompson River, north of Lytton (John Sinkankas, 1959: Gemstones of North America, D. Van Nostrand Company, New York).

92 J Alluvial boulders of good quality jade have been found along the Bridge River from its mouth near Lillooet to Minto Mine about 50 miles upstream. One boulder weighed 800 pounds (John Sinkankas, 1959: Gemstones of North America; D. Van Nostrand Company, New York).

Northwest Territories

86 O/13 Boulders of nephrite have been found in the stream gravels of the Rae River in the Coronation Gulf region (John Sinkankas, 1959: Gemstones of North America, D. Van Nostrand Company, New York).

Ontario

31 C/11 Asbestiform actinolite was mined at intervals from 1883 to 1927 from a large mass about three miles east of the village of Actinolite in Elzevir Township, Hastings County.

31 F/15 Chemical analysis of a light greenish, finely fibrous, massive actinolite from Westmeath Township, Renfrew County: SiO_2 56.70, Al_2O_3 1.62, Fe_2O_3 3.06, FeO 7.19, MnO 0.30, NiO 0.54, MgO 17.20, CaO 10.62, Na_2O 0.64, K_2O 0.24, H_2O (at 100°C) 0.64, H_2O (above 100°C) 2.05, total 100.80, S.G. 2.941 (at 15.5°C) (G.C. Hoffmann, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 15R).

Quebec

21 L/2 Chemical analysis of finely fibrous actinolite which forms large beds of tough greenish rock in the Township of St. Francis (Beauceville), Beauce County: SiO_2 52.30, Al_2O_3 1.30, FeO 6.75, NiO trace, MgO 21.50, CaO 15.00, volatile 3.10, total 99.95 (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada).

The X-ray powder diffraction pattern of actinolite from this locality has four strongest lines with the following spacings and intensities: 8.41 (ms), 3.12 (ms), 2.71 (s) and 1.441 (m) (X-ray Laboratory, Geol. Surv. Can.).

Yukon Territory

115 I Fine specimens of jade were collected from gravel bars in the Yukon River upstream from the junction of the Pelly River (G.M. Dawson, 1887-8: Geol. Surv. Can., Ann. Rept., III, 38 B).

116 B/3 Asbestiform actinolite has been found on the Klondike River about 1 1/2 miles from its junction with the Yukon River (G.C. Hoffmann, 1902: Geol. Surv. Can., Ann. Rept., XV, 432 A).

AEGIRINE

$NaFeSi_2O_6$

Aegirine is a rare soda pyroxene found in alkali rocks such as nepheline syenite, soda granite, soda aplite, and phonolite. Aegirite is a synonym. The name, acmite, is used by some people to characterize the yellow-brown variety. Others have referred to sharply pointed crystals as acmite, and bluntly terminated crystals as aegirine.

British Columbia

104 O/3 Acmite is a constituent of partly-spherulitic rhyolite dykes that are associated with the Glundebery batholith at the southeastern part of the Atsutla Range. It occurs mainly as small equant grains and stout prisms disseminated throughout the spherulites, and is also present as stout radiating fibres in the matrix of the rock. The soda amphibole, riebeckite, is closely associated with aegirine in the spherulites (W.H. Mathews and K.D. Watson, 1953: Am. Mineralogist, 38, 435).

Newfoundland

13 K/5 Aegirine occurs with beryllium mineralization in alkali syenite at Seal Lake, Labrador. Most of the mafic minerals are in clusters, vein-like aggregates, or disseminated microlites. Riebeckite replaces aegirine (E.W. Heinrich and R.W. Deane, 1962: Am. Mineralogist, 47, p. 758).

Ontario

41 I/2 An occurrence of acmite in Bigwood Township, four miles below French River station on the Canadian Pacific Railway, has been described. It occurs in nepheline syenite as radiating tufts and bunches of yellow-green fibres up to one inch long. Chemical analysis by H.C. Rickaby: SiO_2 52.63, Al_2O_3 3.30, TiO_2 0.35, Fe_2O_3 29.72, FeO 0.64, CaO 0.18, MgO 0.69, MnO trace, Na_2O 11.66, K_2O 0.54, H_2O 0.26, total 99.97 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 11).

Quebec

31 H/5, 31 H/12 Acmite is reported to be an important constituent of some of the nepheline syenites near Montreal in Hochelaga County, and Beloeil in Rouville County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 15 T). The three strongest lines on the X-ray powder diffraction pattern of acmite from near Montreal have the following spacings and intensities: 6.5 (4), 2.99 (10) and 2.54 (6) (X-ray Laboratory, Geol. Surv. Can.).

32 I/14 A gneissic nepheline syenite containing up to 10 per cent aegirine outcrops along the Metawishish River (50°51'N; 73°01'W) north of Lac Grenier, about 12 miles east of Lac Albanel. Associated minerals are: potash feldspar, nepheline, cancrinite, biotite and hastingsite. The syenite is partly garnetiferous (J.M. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 14).

AENIGMATITE

$Na_4(Fe, Ti)_{13}Si_{12}O_{42}$

Aenigmatite is a rare silicate mineral described originally as occurring in sodalite syenite at several localities in southern Greenland. The spacings and intensities of the four strongest lines on the X-ray powder diffraction pattern of aenigmatite from Naujakasik, Southern Greenland are: 3.14 (8), 2.70 (8), 2.54 (10) and 2.12 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

104 J/6 Reddish brown crystals up to 2 mm long occur in vugs with amethystine quartz in a light grey sugary latite. The X-ray powder pattern of this mineral agrees well with that of aenigmatite from Pantelleria, Sicily. Specimens were collected from a rock butte in the wide pass at the head of Beatty Creek, about 1/2 mile east of Meszah Peak, Level Mountain, Stikine River area (E.A. Ostinsoe, 1960: Level Mountain, Northwestern British Columbia; U. of B.C. Thesis).

AGATE

(See quartz)

AIKINITE

$CuPbBiS_3$

Ontario

31 M/5 Originally described from the Berezovsk district, Ekaterinburg, Ural Mountains, U.S.S.R. The five strongest lines in the X-ray powder diffraction pattern of aikinite are: 3.67 (10), 3.58 (6), 3.18 (8), 2.88 (7) and 2.58 (5). For details of an X-ray study of aikinite see: M.A. Peacock (1942): Univ. Toronto Stud., Geol. Ser. 47, pp. 63-9.

This rare sulphosalt has been identified by the X-ray powder diffraction method in specimens from the Silanco and Agaunico mines, Cobalt district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

AKERMANITE

$Ca_2MgSi_2O_7$

The five strongest lines on the X-ray powder diffraction pattern of akermanite from the Oka district, Quebec, have the following spacings and intensities: 3.09 (3), 2.87 (10), 2.49 (2), 2.04 (2) and 1.76 (3) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

31 G/9 At the Molybdenum Corporation of America property, Oka district, Two Mountains County, akermanite is a major constituent of the silica deficient rock, okaite, where it is associated with lesser amounts of nepheline, magnetite, biotite, calcite and perovskite. The akermanite is altered in places to fine-grained vesuvianite. The identification was made by X-ray diffraction pattern (R.B. Rowe, 1955: Geol. Surv. Can., Paper 54-22, p. 12).

ALABANDITE

MnS

Alabandite gives a simple cubic X-ray powder diffraction pattern. The spacings and intensities of the four strongest lines are: 2.61 (10), 1.85 (5), 1.51 (2) and 1.168 (2) (X-ray Laboratory: Geol. Surv. Can.).

British Columbia

104 P/4 Albandite has been noted in a vein cutting dolomitized limestone between the headwaters of McDame and Cottonwood Creeks at an elevation 6,000 feet. The vein material is composed chiefly of galena, sphalerite, and magnetite. Pyrrhotite, marcasite, arsenopyrite, dyscrasite, and native antimony are also present. Alabandite occurs as irregular grains up to 4 mm in size, and as what appear to be exsolution laths in sphalerite (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 527).

ALABASTER

(See gypsum)

ALBERTITE

(See hydrocarbons)

ALBITE

$NaAlSi_3O_8$

Albite is a member of the plagioclase, or soda-lime, feldspar series which together with potash feldspar constitute about 60 per cent of the igneous rocks. The plagioclase feldspars vary in composition between the end members $NaAlSi_3O_8$ and $CaAl_2Si_2O_8$. Albite has been defined as that part of the series containing from 90 to 100 per cent of the $NaAlSi_3O_8$ molecule and 0 to 10 per cent $CaAl_2Si_2O_8$. Albite usually contains small amounts and may contain about 15 per cent of the potash feldspar molecule, $KAlSi_3O_8$. There are two structural modifications depending upon the temperature of formation. Low-temperature albite occurs in gneisses and schists and in acid plutonic rocks such as pegmatites, granites and syenites. The less common high-temperature modification occurs as phenocrysts in acidic extrusive rocks. Cleavelandite is a platy variety of albite frequently found in pegmatite veins. Peristerite, an iridescent variety valued as a gemstone, derived its name from the Greek for pigeon, because of the resemblance of its iridescence to the play of colours on the neck feathers of the pigeon.

The spacings and intensities of the four strongest lines on the X-ray powder diffraction patterns of albites are: low-temperature albite, 4.02 (7), 3.79 (4), 3.66 (5) and 3.19 (10); high-temperature albite, 4.03 (7), 3.75 (5), 3.64 (4), 3.21 (10)(X-ray Laboratory, Geol. Surv. Can.).

Manitoba

52 L/5 Cleavelandite, a variety of albite, occurs in the cesium-lithium ore mined at Bernic Lake. (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 19).

52 L/6 Bands of cleavelandite up to one foot thick occur in the Silver Leaf pegmatite in the Winnipeg River area, about one mile southwest of Winnipeg River at a point four miles east of Lamprey Falls. Chemical analysis of a clear white mass containing some glassy quartz; SiO_2 67.76, Al_2O_3 20.61, CaO 0.06, Na_2O 11.14, K_2O 0.13, H_2O 0.10, total 99.80; S.G. 2.626 (V.B. Meen, 1933: Univ. Toronto Stud., Geol. Ser., 35. p. 37).

Nova Scotia

21 A/10 Chemical analysis of albite from a pegmatite first examined in 1903 on the Reeves farm located about 3 miles west of New Ross in Lunenburg County. Analysis by E.W. Todd: SiO_2 67.62, Al_2O_3 20.02, Fe_2O_3 0.05, Na_2O 11.44, K_2O 0.30, CaO 0.32, H_2O 0.16, total 99.91; S.G. 2.603 (by pycnometer) (T.L. Walker and A.L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 46).

Ontario

31 C/7 Attractive specimens of pale red peristerite have been collected from the Burnham pegmatite deposit, conc. X, lot 3, Portland Township, Frontenac County (H.S. Spence, 1930: Am. Mineralogist, 15, p. 436).

31 C/16 Chemical analysis of peristerite from lot 19, conc. IX, Bathurst Township, by T. Sterry Hunt: SiO_2 66.80, Al_2O_3 21.80, K_2O 0.58, Na_2O 7.00, CaO 2.52, MgO 0.20, Fe_2O_3 0.30, volatiles 0.60, total 99.80; S.G. 2.635 (Geol. Surv. Can., Geology of Canada, 1863).

31 D/9 A pegmatite vein which outcrops along the shore of Stoney Lake near the shore of Eel Creek in Burleigh Township, Peterborough County is reported to have contained peristerite (E. Coste, 1887-8: Geol. Surv. Can., Ann. Rept., III, 75 S).

31 E/1 Good specimens of colourless to pale flesh-red to fawn coloured peristerite have been described from pegmatite deposits a few miles east of Wilberforce in the north half of Cardiff Township, Haliburton County (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 17).

31 E/14 A yellowish white cabochon, somewhat less transparent but with more brilliant fire than moonstone from Ceylon, has been cut from peristerite collected near Sundridge in Strong Township, Parry Sound district (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

31 F/4 Chemical analysis of flesh-coloured peristerite from Monteagle Township, probably from a pegmatite in the north half of lot 24, conc. VI: SiO_2 66.16, Al_2O_3 21.38, Fe_2O_3 0.33, FeO 0.09, CaO 1.14, Na_2O 10.43, K_2O 0.64, H_2O 0.13, total 100.30; S.G. 2.637. (V.B. Meen, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 37).

Chemical analyses of iridescent and noniridescent portions of peristerite from Monteagle Township by M.C. Haller: (a) iridescent portion; SiO_2 66.25, Al_2O_3 20.94, Fe_2O_3 0.34, CaO 1.23, Na_2O 9.74, K_2O 1.50, H_2O 0.20, total 100.20; S.G. 2.631; (b) non-iridescent portion; SiO_2 66.72, Al_2O_3 20.98, Fe_2O_3 0.31, CaO 0.81, Na_2O 9.74, K_2O 1.12, H_2O 0.16, total 99.84; S.G. 2.628 (A.L. Parsons, 1930: Am. Mineralogist, 15, p. 93).

31 F/5 Large albite crystals have been found in lot 2, conc. III, Wicklow Township, Hastings County (National Mineral Collection).

31 F/6 Masses of cleavelandite have been found in a beryl-bearing pegmatite in lot 23, conc. XV, Lyndoch Township, Renfrew County (H.S. Spence, 1930: Am. Mineralogist, 15, p. 435).

41 H/16 Fine specimens of peristerite are reported to have been collected from a pit near a small pond north of Caribou Lake, on lot 16, conc. V, McConkey Township, Parry Sound district (Beecher B. Woods, 1958: private communication).

Quebec

21 N/13 Peristerite is reported to be a major constituent of pegmatitic rock on the Brouillard property, ranges II and III, lots 8 and 9, Callieres Township, Charlevoix County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 21).

31 G/11 Good specimens of peristerite have been collected from a pegmatite in range V, lot 20, Buckingham Township, Papineau County (National Mineral Collection).

31 G/12 Coarse peristerite and massive white quartz form the core of a large pegmatite inclusion at the O'Leary-Malartic deposit, range III, lot 25, Wakefield Township, Gatineau County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 47).

31 G/13 Some of the finest gemstone peristerite found in Canada has been obtained at the old Villeneuve Mine, range I, lot 31, (45°50'25"N, 75°35'45"W), Villeneuve Township, Papineau County. Chemical analysis of a clean white cleavage mass containing small amounts of quartz, muscovite and hornblende: SiO_2 65.62, Al_2O_3 21.72, CaO 1.48, Na_2O 10.54, K_2O 0.34, H_2O 0.19, total 99.89; S.G. 2.635. (V.B. Meen, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 37).

32 C/5 Cleavelandite forms part of a zoned dyke containing pollucite at the Valor property, Lacorne Township (R.W. Mulligan, 1961: Geol. Surv. Can., Paper 61-4, p. 4).

ALLANITE

$(Ca, Ce)_2(Al, Fe, Mg)_3Si_3O_{12}(OH)$

Allanite is classed as a member of the epidote group and is characterized by the presence of major amounts of cerium and other rare-earths replacing calcium in the structure. Minor amounts of thorium, uranium, manganese, and magnesium are usually included in its composition; and sodium and beryllium are rarer constituents. The presence of radioactive elements commonly results in a loss of crystal structure and thus, many allanites are metamict. X-ray powder diffraction patterns of allanite show considerable variation in the spacings and intensities of the lines. The A.S.T.M. Index (1960) lists for metamict allanite, three strongest lines at 3.50 (8), 2.96 (10) and 2.67 (8); for nonmetamict allanite 2.92 (9), 2.91 (10) and 2.86 (5).

Although large concentrations of allanite are rare it is, nevertheless, one of the most common radioactive minerals in Canadian rocks. Frequently found in pegmatite and as an accessory mineral in granites, syenites and diorites, allanite also occurs in gneisses, mica and amphibolite schists, metamorphic pyroxenites, and as a contact metamorphic mineral in crystalline limestone. A partial list of occurrences is given below; for additional occurrences in Ontario and Quebec see: E.R. Rose, 1960: Geol. Surv. Can., Paper 59-10.

British Columbia

82 F/11 About 2 1/2 miles above the Lemon Creek bridge, Slocan region (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 45).

92 J/15 In pegmatite, Gem group property, Bridge River camp (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., p. 43).

93 M/4 In pegmatite, Homestake and Victoria properties, Rocher Deboule Mountain, Hazelton camp (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, pp. 41-42).

Ontario

31 D/16 Granite pegmatites: conc. VII, lot 20, Monmouth Township, Haliburton County; concs. XII and XIII, lots 6 to 10, Cardiff Township, Haliburton County (D.F. Hewitt, 1960: private communication).

31 E/1 Syenite pegmatite: conc. XVI, lot 2, Cardiff Township, Haliburton County. Calc-fluorite pegmatite: conc. XX, lots 7 and 8, Cardiff Township, Haliburton County (D.F. Hewitt, 1960: private communication).

31 E/4 Granite pegmatite: conc. IX, lots 4, 9 and 10, Conger Township, Parry Sound district (D.F. Hewitt, 1960: private communication).

31 E/5 Well-developed crystals of allanite, 1/8 to 3/4 inch in diameter, have been described from a pegmatite near Fry Lake, just south of Seguin Falls, conc. B, lots 20 and 21, Monteith Township, Parry Sound district. Chemical analysis by E.W. Todd: SiO_2 31.88, Al_2O_3 16.66, Fe_2O_3 4.91, FeO 9.56, CaO 12.94, MgO 1.03, MnO 0.74, ThO_2 0.44, Ce group oxides 19.58, Y group oxides 1.64, H_2O 1.33, total 100.71; S.G. 3.658 (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, pp. 29-30. H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, pp. 191-2).

31 E/9 Granite pegmatite: conc. IV, lot 14; conc. VI, lot 17; conc. VIII, lot 22; Murchison Township; Nipissing district (D.F. Hewitt, 1960: private communication).

31 E/11 Granite pegmatite: conc. VI, lots 1 to 4; conc. VII, lots 11 and 13; Butt Township, Nipissing district (D.F. Hewitt, 1960: private communication).

31 E/12 Granite pegmatite: conc. I, lot 20, Chapman Township, Parry Sound district (D.F. Hewitt, 1960: private communication).

31 E/13 Pegmatite: concs. V and VI, lot 5, Lount Township, Parry Sound district (J. Satterly, 1955: Ont. Dept. Mines, Ann. Rept.,vol. 64, Pt. VI, p. 43).

31 F/4 Granite pegmatite: conc. XI, lots 16 and 17, Faraday Township, Hastings County; conc. III, lots 27 and 28; conc. VI, lots 20 and 21; conc. VII, lots 11, 18 and 19; conc. XII, lot 6; Monteagle Township; Hastings County (D.F. Hewitt, 1960: private communication).

31 F/6 Sphene and allanite pegmatites are reported as occurring between Strain and Burns lakes in Griffith Township, Renfrew County (E.W. Heinrich, 1959: Can. Mineralogist, 6, pp. 339-47). Granite pegmatites: conc. IV, lot 34, Brudenell Township, conc. XV, lots 23, 25, 30, Lyndoch Township; Renfrew County (D.F. Hewitt, 1960: private communication).

31 F/11 Granite pegmatite: conc. A, lot 13, Hagarty Township, Renfrew County (D.F. Hewitt, 1960: private communication).

31 L/2 Granite pegmatite: conc. IX, lot 20, Calvin Township, Nipissing district (D.F. Hewitt, 1960: private communication).

41 H/16 Granite pegmatite: conc. B, lot 5, Henvey Township, Parry Sound district (D.F. Hewitt, 1960: private communication).

Quebec

21 N/13 In pegmatite, Brouillard property, ranges II and III, lots 8 and 9, Callières Township, Charlevoix County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 21).

31 F/16 In scapolite-diopside rock, Yates Uranium Mines, Huddersfield Township, Pontiac County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 40).

In pyroxenite; range IV, lot 49, Leslie Township (R. Kretz: Que. Dept. Mines, Prelim. Rept., 346).

31 G/12 As large crystals in pegmatite, range III,lot 13, Portland Township, Papineau County. Chemical analysis by E.W. Todd: SiO_2 31.94, Al_2O_3 18.18, Fe_2O_3 3.80, FeO 12.13, CaO 14.76, MgO 0.32, MnO 1.10, ThO_2 0.52, Ce group oxides 13.44, Y group oxides 0.76, H_2O 2.99, total 99.94; S.G. 3.279 (T.L. Walker and

A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 30: H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 244).

31 K/16 Near Mercier dam, Mitchell Township, Gatineau County, streaks of radioactivity up to 200 times background in a region of pyroxenes, granites and syenites were found to be rich in allanite, titanite, zircon and uranothorite (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, pp. 44-5).

31 P/3 Tabular crystals of allanite, some as large as 6x4x1 inches are reported to occur throughout a granite cliff at Lac à Baude, Normand Township, Laviolette County.

Chemical analysis by H.V. Ellsworth: SiO_2 29.90, TiO_2 1.91, Al_2O_3 13.68, Fe_2O_3 4.64, FeO 12.45, CaO 9.46, MgO 1.20, MnO 1.18, K_2O 0.03, Na_2O 0.07, ThO_2 0.41, Ce group oxides 21.15, Y group oxides 1.58, P_2O_5 0.04, H_2O (-110°) 0.13, H_2O (+110°) 0.59, insol. 1.26, total 99.68 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 251).

Saskatchewan

74 O/13 Occurs abundantly in apatite-rich veins in the Nisikkatch and Northwest lakes region, 35 and 40 miles northeast of Uranium City. Analysis of one specimen gave 12.03 per cent total rare-earths, mainly Ce_2O_3 (D.D. Hogarth, 1957: Can. Mineralogist, 6, pp. 140-50).

ALLEMONTITE

AsSb

British Columbia

104 M/8 Allemontite occurs with native antimony and gold in quartz veins at the Engineer Mine, 19 miles southwest of Atlin. The mineral is tin-white on a freshly broken surface and exhibits mammillary structure. Chemical analysis: As 70.08, Sb 28.68, S 0.25, Au 0.05, total 99.06; S.G. 6.05 (T.L. Walker, 1921: Am. Mineralogist 6, p. 97).

Allemontite from the above locality gives an X-ray powder diffraction pattern having the seven strongest lines at 3.58 (4), 2.91 (10), 2.76 (6), 2.13 (5), 2.01 (4), 1.653 (4), and 1.280 (5), in agreement with type material from Allemont, France (X-ray Laboratory, Geol. Surv. Can.).

ALLOPHANE

silica-alumina gel

This amorphous, poorly defined, hydrous aluminium silicate has been reported as occurring at the following localities.

British Columbia

103 P/11 Along cleavage cracks in slates, at the Red Bluff claim, north of Alice Arm, Observatory Inlet (R.G. McConnell, 1911: Geol. Surv. Can., Summ. Rept., p. 49).

Yukon Territory

105 D/11 Pale bluish allophane, filling fissures in andradite, was identified by means of blowpipe and chemical tests in a specimen from the Rabbit-foot claim, on the west side of the Yukon River at Miles Canyon (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, 18 R).

ALMANDINE

$Fe_3Al_2(SiO_4)_3$

The name almandine, or almandite, is applied to the dominantly ferrous iron and aluminium compositional variety of the garnet group. In addition to ferrous iron and aluminium, most almandines contain lesser amounts of calcium, magnesium, manganese, and ferric iron and are thus gradational in chemical composition between pure almandine and the other common compositional varieties of garnet: grossular, pyrope, spessartine, and andradite. Transparent red almandine is valued as a gemstone; translucent varieties are called common garnet.

The almandine variety of garnet is commonly found in schists, particularly mica schists, associated with other metamorphic minerals, such as staurolite, andalusite and kyanite. It occurs less commonly in gneiss, pegmatitic granite, and associated with mica in pegmatite. Garnets, of which almandine is probably the most common variety, are of such widespread distribution throughout Canada that no attempt has been made to list separate occurrences. Because of the analytical difficulties involved in determining the chemical composition of a garnet, only a few analyses of almandine have been published, and most of these are not accompanied by precise locations and descriptions of the occurrences.

The spacings and intensities of the four strongest lines in the X-ray powder pattern of almandine from Cavendish Township, Peterborough County, Ontario are: 2.873 (4), 2.569 (10), 1.599 (4) and 1.540 (5) (L.G. Berry: A.S.T.M. card No. 9-427).

Manitoba

52 L Physical properties of almandine garnets: (1) from the contact metamorphosed andesite, Shatford Lake, n = 1.813, S.G. = 4.21, a = 11.53 Å; (2) from andesite or greywacke, Winnipeg River, n = 1.805, S.G. = 4.125, a = 11.54 Å (C.H. Stockwell, 1927: Am. Mineralogist, 12, p. 343).

63 K/13 Chemical analysis of garnet separated from Kisseynew gneiss, Kisseynew Lake; by A.F. Matheson: SiO_2 39.02, Al_2O_3 21.20, Fe_2O_3 2.27, FeO 27.59, MgO 4.90, CaO 4.60, MnO 2.43, total 102.01 (E.L. Bruce and A.F. Matheson, 1930: Trans. Roy. Soc. Canada, Sect., IV, vol. XXIV, p. 123).

63 N/3 Chemical analyses of garnets: (1) from contact zone, Wiltsey-Henderson claims, north of Sherritt Gordon Mine; by F.T. Jolliffe: SiO_2 38.92, Al_2O_3 23.34, Fe_2O_3 2.53, FeO 25.40, MnO 7.94, CaO 1.62, total 99.75; (2) from basic gneiss, Sherritt Gordon Mine; by A.F. Matheson: SiO_2 38.40, Al_2O_3 21.60, FeO 30.30, MgO 4.90, CaO 4.50, MnO 1.30, total 101.00 (E.L. Bruce and A.F. Matheson, 1930: Trans. Roy. Soc. Canada, Sect. IV, vol. XXIV, p. 123).

Northwest Territories

Specimens of deep red, gem-quality almandine are reported to have been found in southern Baffin Island as early as 1908. The occurrences are not described and the localities are reported vaguely as Albert Harbour, Alert Harbour, and Garnet Island (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 10.John Sinkankas, 1959: Gemstones of North America, D. Van Nostrand Company, New York. A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 19).

Ontario

41 I/9 One of the few properties in Canada from which garnet has been mined is located about one mile northeast of River Valley at latitude 46°36'N, longitude 80°10'W. Garnetiferous schists in this area contain almandine crystals up to six inches in diameter (Mr. Beecher B. Woods, 1959: private communication).

52 P/10 Physical properties of almandine garnets from Miminiska Lake: (1) from arkosic schists, n = 1.805, S.G. = 4.039, a = 11.59 Å; (2) from amphibolite, n = 1.797, S.G. = 4.01, a = 11.61 Å (C.H. Stockwell, 1927: Am. Mineralogist 12, p. 343).

Saskatchewan

63 L/9 Chemical analysis of almandine from biotite schist, Amisk Lake; SiO_2 36.00, Al_2O_3 22.61, Fe_2O_3 2.67, FeO 32.12, MgO 2.19,

CaO 2.36, MnO 1.86, total 100.01. Garnet composition expressed as molecular percentages of end-members: Al 81.5, Py 7.4, Gr 6.5, Sp 4.6.

Physical properties and partial analysis of garnet from garnet-andalusite schist, Amisk Lake: n = 1.805, S.G. = 3.97, FeO = 29.1 per cent, Mn trace. Estimated composition expressed as molecular percentages of end-members: Al 68, Py 15, An 10, Gr 5, Sp 2. (W.L. Wright, 1938: Am. Mineralogist, 23, pp. 437-8).

Yukon Territory

105 G/13 Chemical analysis of almandine found in gravel at Hoole Canyon, Pelly River, by R.A.A. Johnston: SiO_2 37.7, Al_2O_3 21.1, Fe_2O_3 2.4, FeO 31.9, MnO 1.5, MgO 5.1, total 99.7, S.G. 3.991 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 11).

ALTAITE

PbTe

The spacings and intensities of the five strongest lines in the X-ray powder diffraction pattern of altaite are: 3.22 (10), 2.28 (8), 1.854 (3), 1.439 (5), and 1.311 (4) (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

British Columbia

82 E/2 Altaite has been identified, associated with hessite, gold, copper and possibly native tellurium, at the Lakeview claims, on the north side of Long Lake some 13 miles NNE of the mouth of Boundary Creek, Kettle River. Chemical analysis by R.A.A. Johnston (recalculated to 100 per cent): Te 43.01, Pb 54.04, Ag 2.27, Fe 0.68, total 100.00, S.G. 8.081 (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, 11 R).

Also reported to occur, in association with tetradymite, at the Rhoderic Dhu claim in the same mining camp (Ellis Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

82 E/5 An occurrence of altaite, associated with hessite and petzite, at the Hedley Monarch Mine, Olalla, has been confirmed by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

82 G/5 Altaite is reported to have been found in a quartz vein with gold and chalcopyrite at the Payroll claim, Little Nigger Creek, 12 miles southwest of Cranbrook (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, 19 R).

82 K/3 The first recorded identification of altaite in Canada was made by R.A.A. Johnston in a specimen of quartz from a locality about six

miles north of Liddle Creek, a tributary of the Kaslo River (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, 29 R).

92 G/16 Identified by X-ray powder pattern in float of limonitic vein calcite from near Glacier Lake, New Westminster mining division (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

92 O/4 Altaite has been described from the Charlie Group, north of the Tchaikazan River, about five miles southwest of Taseko Lake narrows. It is associated with hessite, gold, and several sulphides (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser. 51, p. 77). This occurrence and a similar one at the Hido Group (Pellaire Mines Ltd.) in the same area, have been confirmed by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

93 E Altaite, hessite, and galena are reported to occur in limonite-stained vuggy quartz veins at the Hebson property, Surel Lake, Tweedsmuir Park (R.M. Thompson, 1950: Am. Mineralogist 35, p. 452).

Manitoba

63 K/11, 63 K/14 Altaite has been identified by X-ray powder pattern as grains in quartz from Copper Lake, The Pas district (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

Ontario

32 D/4, 42 A/1 The Kirkland Lake camp has long been noted for the various telluride minerals that are associated with the gold ores. Of these, altaite is the most common. Altaite has a creamy yellow colour when freshly broken but it takes on a brilliant blue to bluish green tarnish. It occurs in irregular masses ranging in size from minute blebs to seams half an inch wide. Usually associated closely with other tellurides, gold, and sulphides, it also occurs alone in quartz or other gangue minerals. Paragenetically, altaite was one of the latest minerals to be deposited (J.E. Hawley, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V, p. 113.)

Altaite has been identified by X-ray powder pattern in specimens from the following mines in the Kirkland Lake area: Lake Shore, Macassa, Toburn (Tough-Oakes), Kirkland Lake, Wright-Hargreaves, Teck-Hughes, Sylvanite, Kirkland Golden Gate, Bidgood, and Upper Canada (R.M. Thompson, 1949: Am. Mineralogist 34, p. 362).

Chemical analyses of two specimens of altaite from Lake Shore Mine, by H.C. Rickaby: (1) spherical masses associated with coloradoite, Pb 61.26, Cu 0.20, Fe 0.64, Hg trace, Te 36.84, S 0.29, insol. 0.46, total 99.69; (2) associated with chalcopyrite in nests, Pb 57.33, Au + Ag 1.10, Cu 1.60, Fe 1.63, Te 35.66, S 1.95, insol. 0.38, total 99.65 (E.W. Todd, 1928: Ont. Dept. Mines, Ann. Rept., vol. 37, Pt. II, p. 74).

41 I/16 Altaite has been identified by X-ray powder pattern in a specimen from the New Golden Rose Mine, a former gold producer in Afton Township, Timagami area (E.W. Nuffield and D.H. Gorman, 1960: private communication).

41 P/15 At the Ashley Mine in Bannockburn Township altaite is reported to occur with gold and galena in narrow veinlets cutting across pyrite and quartz-carbonate gangue (Ellis Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 27).

42 A/2, 42 A/3 Altaite is reported to occur in quartz stringers cutting basalt at the property of McGill Gold Mines in Hincks Township (H.C. Rickaby, 1931: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. II, pp. 12-19).

42 A/6 Telluride minerals are constituents of the gold ores of the Porcupine camp. Altaite has been reported from the Hollinger and Dome mines (A.G. Burrows, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. II, p. 54). The occurrence at Dome has been confirmed by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 362).

42 D/14 An occurrence of altaite is reported at the Chambers-Ferland Group, near Schreiber (Ellis Thomson, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 39).

52 S.W. Altaite is reported to occur with gold, galena, and pyrite, at the Three Ladies Mine, Lake of the Woods district (Ellis Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 100).

52 B/10 Altaite occurs with hessite in a quartz-calcite gangue at the Ardeen (Moss, Huronian, Shebandowan) Mine in Moss Township. Identification was made by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

52 F/16 At the property of Newlund Mines Limited in Echo Township, altaite has been observed with gold in a quartz vein cutting lavas, about 500 feet east of No. 4 zone (H.S. Armstrong, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. V, p. 35).

52 N/4 Small amounts of altaite occur in the gold ores of the Red Lake area, at the Gold Eagle, Howey, and McKenzie Red Lake mines (H.C. Horwood, 1940: Ont. Dept. Mines, Ann. Rept., vol. 49, Pt. II, pp. 114, 144, 166).

Quebec

31 M/7 Altaite has been identified by X-ray powder pattern in a specimen from the Belleterre Mine, Guillet Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

32 C/3 Altaite occurs disseminated with petzite, wehrlite, and gold in massive white quartz in a specimen from the Bevcourt (Bevcon) Mine in Louvicourt Township. The identification was made by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 362).

32 D/3 At the Horne Mine, Noranda, altaite occurs with petzite and calaverite in coarsely crystalline masses, or intergrown with tellurbismuth. Identification by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 362).

32 D/6 At the Robb-Montbray Mine, about 3 miles northwest of the southeast corner of Montbray Township, altaite occurs in substantial masses, usually intergrown with tellurbismuth. Associated tellurides include petzite, melonite, frohbergite, and montbrayite. Identification by X-ray powder pattern (R.M. Thompson, 1949: Am. Mineralogist 34, p. 362).

Yukon Territory

115 G/6 An occurrence of altaite, associated with hessite, gold, and hedleyite, has been confirmed by X-ray powder pattern, in a specimen from Upper Burwash Creek in the Kluane Lake district (R.M. Thompson, 1949: Am. Mineralogist 34, p. 361).

ALUNITE

$KAl_3(SO_4)_2(OH)_6$

The spacings and intensities of the six strongest lines in the X-ray powder pattern of alunite from Muszay, Hungary are 4.96 (8), 2.99 (10), 2.29 (7), 1.90 (7), 1.74 (5) and 1.51 (5), in close agreement with synthetic material (X-ray Laboratory, Geol. Surv. Can.).

New Brunswick

21 H/10 Alunite is reported to have been found in association with quartz and specularite at New Ireland road, Parish of Alma, in Albert County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, 16 T).

Newfoundland

1 M/16 At Hickey's Pond, 5 miles west of the head of Placentia Bay, alunite occurs with quartz and specularite as a fine-grained constituent of silicified gneissic rock. It is common as euhedral crystals showing rhombohedron and basal pinacoid forms (A.L. Howland, 1940: Am. Mineralogist 25, p. 34.)

ALUNOGEN

$Al_2(SO_4)_3.18H_2O$

British Columbia

82 L/12 Alunogen is reported as thick yellowish white crusts on weathered, pyritiferous, quartzo-feldspathic rocks at Blair Creek, which flows into Bolean Creek southeast of Pillar Lake, Kamloops district (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, 13 R).

83 D/15 Coatings of alunogen on weathered chloritic schists have been noted near the mouth of Grant Brook, a tributary of the Fraser River, southeast of Moose Lake, Cariboo district (J. McEvoy, 1898: Geol. Surv. Can., Ann. Rept., XI, 33 D).

92 I/11 Pale yellowish to white, cellular mammillary crusts occurring near Spatsum, on the east side of the Fraser River, south of Ashcroft, Kamloops district, have been identified as alunogen (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, 24 T).

92 I/12 Alunogen is reported to occur as pale ochre-yellow to white, crystalline, cellular masses in rocks at the mouth of Fountain Creek, which flows into the Fraser River northeast of Lillooet (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, 25 R).

92 I/15 Pale yellowish to white, silky masses on greyish pyritiferous, quartzo-feldspathic rock occurring four miles west of Savona, at the west end of Kamloops Lake, have been identified as alunogen (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, 24 T).

Nova Scotia

21 H/9 Alunogen is reported as crusts on slate at the Scotia Mine, Springhill, Cumberland County. Chemical analysis by Adams: Al_2O_3 13.479, Fe_2O_3 2.888, FeO 0.157, CaO 0.140, MgO 0.138, K_2O 0.087, Na_2O 0.131, SO_3 36.935, H_2O 45.109, insol. 0.235, total 99.299 (G.C. Hoffmann, 1878-79: Geol. Surv. Can., Rept. Prog., 8 H).

The spacings and intensities of the five strongest lines in the X-ray powder pattern of alunogen from Springhill are: 4.41 (10), 3.95 (5), 3.67 (4) 3.02 (4) and 2.49 (3) (X-ray Laboratory: Geol. Surv. Can.).

AMALGAM

(See silver)

AMAZONITE

(See potassium feldspar)

AMBLYGONITE

$(Li, Na)AlPO_4(F, OH)$

Amblygonite is a pegmatite mineral that occurs typically with quartz in the core zones of complex pegmatites which usually contain spodumene, lepidolite, tourmaline and apatite and may contain a wide variety of minerals. The name montebrasite has been given by some authors to the dominantly hydroxyl variety of amblygonite.

Manitoba

52 E/11 Amblygonite has been found at the Lucy No. 1 claim of North American Rare Metals Limited located in the West Hawk Lake district about one-half mile north of the Trans Canada Highway at a point 6.6 miles east of the East Braintree turnoff (R. Mulligan, 1956: Geol. Surv. Can., Paper 57-3, p. 18).

52 L/6 Amblygonite occurs in greyish white masses in the Bear (Silverleaf) pegmatite located about 3 miles southeast from Lamprey Falls on the Winnipeg River. The indices of refraction (nX 1.600, nY 1.611, nZ 1.620) correspond to the variety montebrasite. Chemical analysis by R.J.C. Fabry: Al_2O_3 33.14, K_2O 0.26, Li_2O 8.20, Na_2O 2.96, P_2O_5 48.63, H_2O 5.12, F_2 2.15, less O for F 0.91, total 99.55 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 155).

52 L/6 Amblygonite is a constituent of the complex pegmatite dyke on the Montgary (Chemalloy) property near the west end of Bernic Lake. This dyke is better known for its rich assemblages of spodumene and pollucite. (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 19.)

Irregular masses up to two feet long of white, locally pink-stained amblygonite occur in massive grey quartz in the lowest exposed zone of a complex pegmatite on the Buck claim, about 1,500 feet east of Bernic Lake (R. Mulligan, 1956: Geol. Surv. Can., Paper 57-3, p. 21).

Northwest Territories

85 I/1 Amblygonite and quartz form the core zones of the Moose pegmatite dykes located immediately north of Hearne Channel, Great Slave Lake (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 16).

85 I/1 A series of quartz pods that contain amblygonite and spodumene make up the core of a complex pegmatite on the Best Bet claims (lat. 62°14'N, long. 112°18'W) located northwest of the north-central part of a lake known locally as Drever Lake (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 16).

A group of four zoned pegmatites on the Tan claims, located one and one-half miles east of the southeast corner of Blatchford Lake, carry spodumene and, locally, amblygonite, cassiterite, and columbite-tantalite (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 15).

85 I/7 Amblygonite, beryl, lithiophilite and columbite-tantalite are associated with abundant spodumene in the central zone of a complex pegmatite that outcrops about 5 miles southwest of the north end of Buckham Lake (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 15).

85 I/11 Amblygonite is associated with spodumene, lithiophilite, cassiterite and columbite-tantalite in a group of narrow pegmatites that extend 1,600 feet southeastward from Sproule Lake (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 14).

85 O/14 Large crystals of amblygonite, spodumene and columbite-tantalite occur in a pegmatite seven miles south of Ghost Lake (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 57).

Nova Scotia

21 A/10 White to pale bluish amblygonite occurs in a pegmatitic segregation with durangite, cassiterite, scheelite, wolframite, lepidolite, monazite and beryl at the Reeves farm, 3/8 mile south of a point 3 miles by road west of New Ross, Lunenburg County. Analysis by E.W. Todd: SiO_2 1.08, Al_2O_3 32.92, P_2O_5 46.62, Fe_2O_3 0.31, CaO 2.22, MnO 0.06, K_2O 0.08, Li_2O 7.45, Na_2O 2.53, H_2O 6.38, F_2 1.38, less O for F 0.58, total 100.45, S.G. 2.989 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 255).

The X-ray powder pattern of amblygonite from the New Ross area has three strongest lines at 3.15 (10), 4.64 (9), and 2.96 (7) (X-ray Laboratory: Geol. Surv. Can.).

Ontario

52 H/1 A small amount of amblygonite is reported in drill logs of a pegmatite on the M.N.W. Group property, about one and one half miles west of Cosgrave Lake (R. Mulligan, 1956: Geol. Surv. Can., Paper 57-3, p. 15).

AMETHYST

(See quartz)

ANALCIME

$NaAlSi_2O_6.H_2O$

Analcime is one of the more common minerals of the zeolite Group. The zeolites are hydrated aluminosilicates, chiefly of sodium and calcium, which are capable of undergoing cation exchange and which can lose part or all of their water without change of crystal structure. They are formed in nature late in the sequence of magmatic crystallization and also as secondary minerals by hydrothermal activity or diagenesis. At the 1962 meeting of the International Mineralogical Association, members of the Commission on New Minerals and Mineral Names voted unanimously to recommend to mineralogists that the name analcime be used in preference to analcite.

Alberta

82 G/9 Specimens of analcime have been collected from a railway cut near Blairmore on the Crows Nest branch of the Canadian Pacific Railway (C.W. Knight: Canadian Record of Sciences, IX, No. 5, pp. 265-78).

Analcime has been found in fragments of blairmorite in a 3-foot stratum of tuffaceous breccia, in the valley of the South Fork River.

Bluish red phenocrysts of analcime up to 1 inch in diameter are evenly distributed through a dark olive-green matrix and form half of the rock. The analcime is distinguishable with difficulty from garnet. Large phenocrysts occur in a finely crystalline groundmass of a second generation of analcime, aegirite-augite, nephelite, sanidine, and melanite, which are in turn embedded in an unresolvable matrix. The analcime phenocrysts are faintly pink, homogeneous, and anisotropic. Cubic cleavage is well developed and faint dust-like inclusions are seen along cleavage cracks. Narrow rims of clear analcime border most phenocrysts. Alteration to calcite is frequent. Analysis by M.F. Connor, 1914: SiO_2 54.16, Al_2O_3 22.35, FeO 0.06, Fe_2O_3 0.92, MgO 0.25, CaO 0.60, Na_2O 12.49, K_2O 0.59, H_2O 8.50, TiO_2 0.15, MnO tr., CO_2 0.30, total 100.37 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 378).

British Columbia

82 E/2 Small crystals of analcime are abundantly developed in volcanic rocks north of Midway and Rock Creek in the Similkameen district (R.A. Daly, 1912: Geol. Surv. Can., Mem. 38).

92 I/15 Good specimens of analcime were collected by W.F. Ferrier in 1918 from Criss Creek, one-quarter mile above its junction with Deadman River in the Ashcroft district (National Mineral Collection).

Manitoba

63 N/3 At the Sherritt Gordon Mine, analcime and natrolite occur as encrustations in cavities on the hanging-wall along the contact between the pyrrhotite-pyrite-chalcopyrite-sphalerite ore assemblage and quartz-feldspar gneiss host rock. This occurrence is unusual because of the close association of zeolites with the ore and the absence of any evidence of volcanic activity. The simple trapezohedron (211) is the only form observed on the analcime crystals. Refractive index, 1.486 ± 0.002. Specific gravity, 2.253 (G.M. Brownell, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 19).

New Brunswick

21 P/13 The ore of the Sturgeon River Mines in the Bathurst area contains analcime and jamesonite (X-ray Laboratory: Geol. Surv. Can.).

Nova Scotia

21 A, 21 H Many fine specimens of analcime have been collected along the south shore of the Bay of Fundy from Digby Neck to Cape Blomidon and on the north shore of Minas Channel and Minas Basin. The mineral occurs with other zeolites in veins and cavities in basic volcanic rocks.

Some of the more favourable collecting localities are reported as: Amethyst Cove, Cape Blomidon, Cape d'Or, Digby Gut, Digby Neck, Five Islands, Horseshoe Cove, Martials Cove, McKay Head, Partridge Island, Pinnacle Island, Pinnacle Rock, Swan Creek, Sheffield Vault, Two Islands, Wasson's Bluff and Williamsbrook (E. Gilpin: Nova Scotia Inst. Nat. Sci., V, p. 283. C.W. Willimott, 1882-4: Geol. Surv. Can., Rept. Prog., 27 L. A.R.C. Selwyn, 1890: Geol. Surv. Can., Ann. Rept., V, 55 AA. L.W. Bailey, 1896: Geol. Surv. Can., Ann. Rept., IX, 93 A. G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, 192 A).

The morphology and effects of heating studies of analcime from Nova Scotia are reported by A.L. Parsons. The trapezohedron (211) is the only form observed. Analcime from Cape d'Or shows feeble double refraction; some grains give biaxial interference figures, others are uniaxial with a refractive index of 1.484 ± 0.003. Chemical analysis of analcime crystals from Cape d'Or: SiO_2 56.56, Al_2O_3 21.99, Fe_2O_3 0.05, CaO 0.39, Na_2O 12.58, K_2O 0.25, H_2O 8.47, total 100.29, S.G. 2.227-2.239 (A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 32).

The X-ray powder pattern of analcime from Cumberland County, Nova Scotia, has four strongest lines with the following spacings and intensities: 5.61 (8), 3.43 (10), 2.93 (7) and 1.75 (5) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

41 N/12, 41 N/13 Analcime is reported to occur, associated with native copper, in amygdaloidal lavas on Michipicoten Island (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 481).

42 E/10, 42 E/11 Dull white crystals with well-developed icositetrahedral form occur in contact zones between diabase and greenstone in the area between Longlac and Jellicoe. Chemical analysis by K. McNeill: SiO_2 50.98, Na_2O 10.42, Al_2O_3 23.2, CaO 2.10, MgO 1.16, H_2O 7.45, total 95.31 (A.G. Burrows, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 246).

52 H/8 Crystals of analcime, associated with pectolite and prehnite, have been found filling crevices in olivine diabase. One broken crystal measured one and one-half inches in diameter. The diabase is exposed in rock cuts along the railway between Orient Bay and Fairclough (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 19).

Quebec

31 H/5, 31 H/11 Analcime and natrolite have been found in dykes cutting Trenton limestone near Montreal, Hochelaga County. Chemical analysis by Harrington: Geol. Surv. Can., Rept. Prog. 1877-78: SiO_2 53.59, Al_2O_3 23.33, Fe_2O_3 trace, CaO 0.64, MgO trace, Na_2O 14.54, H_2O 8.47, total 100.27, S.G. 2.255 (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 17 T).

ANATASE

TiO_2

Anatase, rutile and brookite are three polymorphic modifications of TiO_2 that occur as minerals. Anatase, also known as octahedrite, is found frequently as a fine-grained alteration product of titanium-bearing minerals. Leucoxene is a very fine grained alteration product consisting of anatase and/or rutile. The X-ray powder pattern of anatase from the Oka district, Quebec, has six strongest lines with the following spacings and intensities: 3.52 (10), 2.38 (4), 1.89 (5), 1.70 (4), 1.66 (4) and 1.48 (3) (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

11 F/4 Anatase is reported to occur in small, but fine crystals in quartz at Sherbrooke, Guysborough County (Henry How, 1868: Mineralogy of Nova Scotia, p. 209).

Ontario

31 D/16 Brown anatase occurs as grains in magnetite which is exposed in trenches cut in leucogranite and granite pegmatite in lot 9, conc. XVI, Chandos Township (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 170).

41 H/15 An interesting occurrence of anatase as an alteration product of titanite is reported from a pegmatite dyke in lot 5, conc. B, Henvey Township, Parry Sound district. The altered titanite occurs as masses of coarse crystals weighing several pounds intimately associated with uraninite and thucholite in oligoclase zones. The titanite crystals are completely altered to a clay-like material having an inner cellular structure of siliceous material upon which is deposited many small, black, lustrous crystals of anatase (F.T. Pough, 1934: Am. Mineralogist, 19, pp. 599-602).

41 J/7 Fine-grained anatase is a constituent of the radioactive conglomerates in the Blind River area. It occurs most frequently as a creamy-white alteration product of brannerite and also as separate dark brown grains (R.J. Traill, 1954: Can. Mining J., 75, pp. 63-8).

Saskatchewan

74 A/11 A small hand specimen of radioactive material from the Eldorado pegmatite dyke near Middle Foster Lake was found to consist of about 60 per cent of a mixture of black rutile with a metallic lustre and dull black anatase, and 40 per cent light brown, metamict brannerite. The brannerite gave an anatase X-ray powder pattern when unheated and a brannerite pattern when heated at 800° C for 5 minutes in vacuum (X-ray Laboratory: Geol. Surv. Can., 1955).

ANDALUSITE

Al_2SiO_5

The compound Al_2SiO_5 occurs in nature as three polymorphic modifications, namely, andalusite, kyanite and sillimanite. Andalusite usually occurs as nearly square prismatic crystals. Chiastolite is a variety containing regular arrangements of carbonaceous inclusions in the interior of the crystal, commonly in the shape of a cross. Andalusite is a typically metamorphic mineral occurring in schists and slates. Common mineral associates are kyanite, sillimanite, mica, garnet and cordierite.

British Columbia

82 F/ The dark grey to purplish fine-grained argillaceous quartzites outcropping northeast of Dear Park contain andalusite (H.W. Little, 1960: Geol. Surv. Can., Mem. 308, p. 47).

82 L/6 Chiastolite is reported to be a prominent constituent of a black schist that outcrops on hills west of Armstrong (A.R.C. Selwyn, 1892-3: Geol. Surv. Can., Ann. Rept.,VI, 7 A).

New Brunswick

21 G/3, 21 G/6 Large crystals of andalusite have been found in Charlotte County at St. Stephen, and at Moores Mills in the parish of St. James (L.W. Bailey and G.F. Matthew, 1870-1: Geol. Surv. Can., Rept. Prog.).

Newfoundland

2 D/16 Andalusite porphyroblasts are partly developed in the metasediments at a granite contact along the highway a mile north of the bridge at the east end of Gander Lake (S.E. Jenness, 1963: Geol. Surv. Can., Mem. 327, p. 81).

Northwest Territories

85 H/11 At Outpost Islands in the east arm of Great Slave Lake, andalusite occurs in a conformable series of sandy and argillaceous sediments cut by a few basic dykes and later quartz-mica-andalusite pegmatites. It is present in greatest quantity in a conglomeratic andalusite schist. Mauve, pink, and brown andalusite crystals up to four inches long and one and one-half inches in cross-section occur as aggregates in the pegmatites. Chemical analysis by H.V. Ellsworth: SiO_2 36.58, Al_2O_3 60.16, Fe_2O_3 1.82, MnO $<$0.01, TiO_2 0.05, CaO 0.22, MgO 0.16, Na_2O 0.03, K_2O 0.22, H_2O^+ 0.86, H_2O^- 0.08, total 100.18, S.G. 3.139 (J.E. Hawley, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 53. H.V. Ellsworth and F. Jolliffe, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, pp. 74-6).

85 M/12 Andalusite is found with cordierite in metamorphosed greywacke and slates of the Yellowknife Group, Basler Lake (1963: J. Geol., vol. 71, No. 5, p. 644).

85 P Andalusite having a glassy appearance and slightly pink colour occurs in a quartz-andalusite pegmatite about 55 miles north-northeast of Yellowknife Bay. Chemical analysis by H.V. Ellsworth: SiO_2 38.86, Al_2O_3 61.46, Fe_2O_3 0.60, MnO $<$0.01, TiO_2 0.04, CaO 0.20, MgO 0.22, H_2O^+ 0.64, H_2O^- 0.08, total 100.10, S.G. 3.137. Spectrograms of this specimen showed strong gallium lines (H.V. Ellsworth and F. Jolliffe, 1936-7: Univ. Toronto Stud., Geol. Ser., 40, p. 74).

Nova Scotia

11 D/12, 11 D/15 Andalusite is reported to occur in Halifax County at Geizer's Hill, west of Halifax, and at Beaver Dam, near Sheet Harbour (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 16).

11 F/4 Specimens of andalusite have been obtained from the Crow's Nest Mine, near St. Mary's in Guysborough County. The X-ray powder pattern shows five strongest lines with the following spacings and intensities: 5.55 (8), 4.52 (10), 2.77 (9), 2.17 (8) and 1.486 (9) (X-ray Laboratory: Geol. Surv. Can.).

20 O/16 Andalusite is reported to occur inland from Yarmouth and Pubnico in Yarmouth County (L.W. Bailey, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 12 Q).

20 P/11, 20 P/12, 20 P/14 Pale pink prismatic crystals of andalusite have been found in Shelburne County at Red Head, and Goose Neck Point near Port Latour (L.W. Bailey, 1896: Geol. Surv. Can., Ann. Rept., IX, 58 M, 148 M), and at Shelburne Harbour (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 16).

20 P/15 Masses of andalusite crystals occur in mica schists along the Broad River, about one and one-half miles from its mouth (L.W. Bailey, 1896: Geol. Surv. Can., Ann. Rept., IX, 52 M).

21 H/1 Poikilitic, subhedral to anhedral andalusite crystals are common in a siliceous gneiss at the contact of a granite with slate along the Gaspereau River (D.G. Crosby; 1962: Geol. Surv. Can., Mem. 325, p. 30).

Ontario

42 A/9 Numerous large prisms and almost square crystals of chiastolite have been noted in thin sections of a green metamorphosed rock occurring in Beattie Township, lot 5, conc. V (P.E. Hopkins, 1915: Ont. Dept. Mines, Ann. Rept., vol. 24, Pt. IV, p. 175).

52 N/4 Andalusite occurs as grains up to 3 mm in diameter as an essential constituent of the so-called 'paint rock', a highly metamorphosed sediment making up 'Cochenour Point' at the Cochenour-Willans Mine (M.H. Frohberg, 1960: private communication).

Quebec

21 E/4, 21 E/5, 21 E/6 Andalusite is reported to have formed as a product of contact metamorphism in slates cut by granite dykes in Barnston, Hatley and Stanstead Townships, in Stanstead County; Compton, Eaton and Hampden Townships in Compton County; and in Marston Township, Frontenac County (R.W. Ells, 1886: Geol. Surv. Can., Ann. Rept., II, 11 J – 37 J).

21 E/14 Andalusite is reported to occur at St. Samuel de Gayhurst, Frontenac County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 65), and as small flesh-red prisms in micaceous slates at Lake St. Francis, Frontenac county (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 17 T).

Yukon

105 M/13 Andalusite porphyroblasts largely altered to pseudomorphous mica have been found in a pebble from White Channel cut on the east side of Clear Creek, opposite Gauvin's Cabin, Barlow (X-ray Laboratory, Geol. Surv. Can.).

ANDESINE

$NaAlSi_3O_8$-$CaAl_2Si_2O_8$

Andesine is an intermediate member of the plagioclase feldspar minerals which are the most common rock-forming minerals in the Earth's crust. It has been defined as that part of the series containing from 70 to 50 per cent of the $NaAlSi_3O_8$ molecule and 30 to 50 per cent of the $CaAl_2Si_2O_8$ molecule.

Quebec

21 L/14 Chemical analyses of reddish andesine which occurs in large cleavable masses with hypersthene and ilmenite at Chateau Richer, Montmorency County: (I) SiO_2 59.55, Al_2O_3 25.62, Fe_2O_3 0.75, CaO 7.73, MgO trace, K_2O 0.96, Na_2O 5.09, H_2O 0.45, total 100.15, S.G. 2.66-2.67; (II) SiO_2 59.80, Al_2O_3 25.39, Fe_2O_3 0.60, CaO 7.78, MgO 0.11, K_2O 1.00, Na_2O 5.14, total 99.82, S.G. 2.66-2.67 (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 478).

21 M/2 Chemical analysis of pale lavender-blue vitreous andesine found as large cleavable masses in a boulder at St. Joachim, Montmorency County: SiO_2 57.55, Al_2O_3 + Fe_2O_3 27.10, CaO 8.73, K_2O 0.79, Na_2O 5.38, H_2O 0.20, total 99.75, S.G. 2.68-2.69 (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 478).

31 G/8 Chemical analysis of specimen of lavender blue to sapphire blue andesine from near Lachute, Argenteuil County: SiO_2 58.15, Al_2O_3 26.09, Fe_2O_3 0.50, CaO 7.78, MgO 0.16, K_2O 1.21, Na_2O 5.55, H_2O 0.45, total 99.89, S.G. 2.687 (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 478).

ANDORITE

$AgPbSb_3S_6$

British Columbia

93 N/11 This rare sulphosalt is reported to occur at a property (Kay Group) located on the hillside on the west side of the pass from Kwanika Creek to Silver Creek, twenty miles east of Takla Landing, Takla Lake, in the Omineca mining division. The andorite occurs in a vein associated with stibnite, jamesonite, arsenopyrite, sphalerite, pyrite, freibergite, native silver, quartz and calcite. Chemical analysis by R.N. Williams: Pb 20.89, Ag 9.18, Cu 1.45, Fe 2.51, Zn 0.50, As 0.76, Sb 41.07, S 21.83, insol. 1.83, total 100.02; S.G. 5.23 ± 0.04 (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 72).

The X-ray powder pattern of andorite from Oruru, Bolivia, has four strongest lines with the following spacings and intensities: 3.44 (4), 3.29 (10), 2.89 (8), 2.76 (4) (E.W. Nuffield, 1945: Trans. Roy. Soc., Canada, 39, Ser. 3, Sec. 4, p. 41).

ANDRADITE

$Ca_3Fe_2(SiO_4)_3$

The name andradite is applied to the dominantly calcium-iron members of the garnet group of minerals. Most andradites contain lesser amounts of aluminium, ferrous iron, manganese and magnesium, and are gradational in composition between pure andradite and one or more of the other compositional varieties of garnet: grossular, pyrope, almandine and spessartine. Schorlomite is a highly titaniferous variety of andradite. Andradite has been found in nepheline syenite, serpentine, chloritic schist, pegmatite and crystalline limestone.

British Columbia

82 N/1 Schorlomite occurs in some of the coarsely crystalline ijolites in the Ice River area, associated with nephelite, aegirine, titanite and calcite. Specimens have been collected near the head of Moose Creek valley and on the ridge to the west of Garnet Mountain. Chemical analysis by F.G. Wait: SiO_2 25.77, TiO_2 10.83, Al_2O_3 3.21, Fe_2O_3 18.59, CaO 31.76, TiO 8.23, MnO 0.76, MgO 1.22, total 100.37, S.G. 3.802. Other varieties of garnet including black andradite (nontitaniferous), grossular, almandine and possibly spessartine have been reported from the same area (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, pp. 12-13R; J.A. Allan, 1914: Geol. Surv. Can., Mem. 55, pp. 176-7).

A portion of the ground sample of schorlomite that was analyzed by Wait gives a typical garnet-type X-ray powder pattern. The unit cell edge is 12.160 ± 0.005 Å (X-ray Laboratory; Geol. Surv. Can.).

92 F/10 Brilliant crystals of andradite, measuring up to five inches in diameter are found in the Marble Bay Mine on Texada Island. The mineral is commonly found embedded in sulphides in the ore zones. Chemical analysis of andradite crystal: SiO_2 37.00, TiO_2 0.14, Al_2O_3 8.68, Fe_2O_3 16.62, FeO 1.08, MgO 0.76, CaO 34.58, MnO 0.74, Na_2O 0.33, K_2O 0.16, H_2O 0.24, P_2O_5 trace, total 100.33; S.G. 3.78. Large masses of buff coloured grossular have been found developed in the host rocks away from the ore zone (T.L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 7).

92 I/12 Chemical analysis by F.G. Wait of a massive, finely-columnar andradite found near Foster Bar on the Fraser River about 23 miles north of Lytton: SiO_2 34.52, Al_2O_3 4.09, Fe_2O_3 25.82, FeO 2.66, MnO 0.94, CaO 31.49, MgO 0.59, H_2O at 100°C 0.03, total 100.14; S.G. 3.706 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 16 R).

The unit cell edge of a portion of the specimen analyzed by Wait is 11.981 ± 0.005 Å (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 C/13 Good crystal specimens are reported from lots 6, 7, conc. XIII, Tudor Township, Hastings County (R.A.A. Johnston: 1915, Geol. Surv. Can., Mem. 74, p. 17).

31 D/15 Chemical analysis by B.J. Harrington of black andradite from the Paxton iron mine, lot 5, concs. V and VI, Lutterworth Township, Haliburton County: SiO_2 35.68, Al_2O_3 5.88, Fe_2O_3 23.70, FeO 3.65, MnO 0.81, CaO 29.64, MgO 0.35, H_2O 0.28, total 99.99; S.G. 3.813 (B.J. Harrington: Canadian Record of Sciences, VI, p. 480).

31 F/4 Andradite is associated with nepheline syenites in Dungannon Township, Hastings County. Chemical analysis by B.J. Harrington: SiO_2 36.604, Al_2O_3 9.771, TiO_2 1.078, Fe_2O_3 15.996, FeO 3.852, MnO 1.301, CaO 29.306, MgO 1.384, H_2O 0.285, total 99.577; S.G. 3.739 (B.J. Harrington: Canadian Record of Sciences, VI, p. 480).

At the MacDonald Mine, lots 18 and 19, conc. VII, Monteagle Township, Hastings County, a garnet identified as andradite occurs as rounded masses and rough crystals near the walls of the dyke. The garnet is radioactive, has a specific gravity of 3.73, refractive index of more than 1.80, and contains 1.14 per cent total rare earths (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 208).

Quebec

21 L/3 Pale green crystals of garnet are reported to occur embedded in a kaolin-like matrix at West Thetford Mines. Small diopside crystals are embedded in the garnet and also occur as separate grains in the clay. The most common garnet form is the trisoctahedron (332). A chemical analysis made by W.F. Green gave the following composition: SiO_2 36.66, TiO_2 0.10, Al_2O_3 4.18, Fe_2O_3 24.86, CaO 33.89, MgO 0.25, MnO 0.20. This corresponds to 78.74 per cent andradite, 18.45 per cent grossularite, and 2.91 per cent diopside (A.L. Parsons, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 33).

31 F/16 Chemical analysis of black andradite from Cawood Township, Pontiac County, by F.G. Wait: SiO_2 36.09, Al_2O_3 12.69, Fe_2O_3 12.33, FeO 3.30, MnO 0.48, CaO 34.46, MgO 0.94, H_2O at 100° 0.04, total 100.33; S.G. 3.690 (G.C. Hoffmann, 1892-3: Geol. Surv. Can., Ann. Rept., VI, p. 16 R).

The unit cell edge of a portion of the original specimen analyzed by Wait is 11.914 $\pm$ 0.005 Å (X-ray Laboratory: Geol. Surv. Can.).

31 G/8 Anhedral grains of a black zirconium bearing variety of andradite occur with calcite, nepheline, and biotite at the Oka property of Quebec Columbium Ltd. The grains are up to 5 mm in diameter and have the following composition: CaO 42, SiO_2 32, Fe_2O_3 14, TiO_2 5, MnO 2.6, Al_2O_3 3.8, MgO 1.0, ZrO_2 3.7, total 104 (E.H. Nickel, 1960: Can. Mineralogist, 6, pp. 549-550).

ANGLESITE

$PbSO_4$

British Columbia

82 F/14 Anglesite occurs sparingly in the zones of oxidation of lead ores in the Slocan area. The first occurrence to be noted in Canada was as small, colourless, translucent crystals coating a specimen of galena from the Wellington Mine, two and one-half miles northeast of Bear Lake. Other properties at which anglesite has been reported include: Beaver, Mammoth, Rainbow, Payne, Queen Bess, Hope and Reco (G.C. Hoffmann, 1892-3: Geol. Surv. Can., Ann. Rept., IV, pp. 27-8 R; R.A.A. Johnston, 1910: Geol. Surv. Can., Summ. Rept., p. 260; C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173).

New Brunswick

21 O/8 Anglesite occurs on the property of Heathe Steele in Northumberland County (A.L. McAllister, 1959: Bull. Can. Inst. Mining Met., N.B. Mines Br. reproduction).

21 P/5 Anglesite is present in the ore of the Brunswick No. 6 Mine, Bathurst (X-ray Laboratory: Geol. Surv. Can.).

Yukon

105 M/13, 105 M/14 Anglesite is the most abundant of the secondary lead minerals and has a widespread occurrence in the oxidized parts of silver-lead-zinc deposits in the Keno Hill-Galena Hill area (R.W. Boyle, 1956: Geol. Surv. Can., Paper 55-30, p. 51).

X-ray powder patterns of anglesite from the Keno Hill-Galena Hill area have constant d-spacings but show considerable variation in intensities. The five strongest lines have the following spacings and average intensities: 4.26 (9), 3.33 (6), 3.00 (10), 2.07 (7), 2.03 (5) (X-ray Laboratory; Geol. Surv. Can.).

ANHYDRITE

$CaSO_4$

Anhydrite is an important sedimentary rock-forming mineral and occurs with gypsum in salt deposits. It also occurs, less-commonly, as a gangue mineral in metalliferous veins and filling amygdules and cavities in lava flows.

Alberta

Anhydrite is probably associated with massive gypsum beds which outcrop in the following localities: (a) in Wood Buffalo National Park, along the banks of the Peace River between Peace Point and Little Rapids; (b) along the banks of the Slave and Salt rivers, north and west of Fort Fitzgerald; (c) in Jasper Park north of Brûlé Lake.

74 D/11 Beds of anhydrite and gypsum were encountered in wells drilled near McMurray at depths of 400 to 500 feet (J.A. Allan, 1929: Bull. Can. Inst. Mining Met. 206, p. 77).

82 J/7 Anhydrite is associated with cryptocrystalline limestone in the Mount Head map-area (R.J.W. Douglas, 1958: Geol. Surv. Can., Mem. 291, p. 33).

British Columbia

82 L/5 Lenticular masses of anhydrite occur in the Falkland (Salmon River) gypsum deposits. Chemical analysis of bluish, translucent, vitreous anhydrite, by R.A. Rogers: CaO 37.65, MgO 0.22, Fe_2O_3 0.20, Al_2O_3 0.07, SO_3 53.81, CO_2 0.69, H_2O 4.02, insol. 3.00, pyrite 0.47, total 100.13 (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br. Publ., No. 732).

92 G/11 At the Britannia property on Howe Sound, anhydrite is one of the most abundant and widespread of the non-metallic minerals within the Britannia shear zone. It does not occur as a gangue mineral in the sulphide veins, but in a separate group of veins. One vein in the Victoria Mine is about 5 feet wide, and is essentially pure anhydrite (H.T. James, 1929: Geol. Surv. Can., Mem. 158).

Manitoba

62 G/9 A borehole sunk at Rothwell encountered a 62-foot bed of gypsum and anhydrite at a depth of 960 feet below the surface (R.C. Wallace, 1927: The Non-Metallic Mineral Resources of Manitoba: Industrial Development Board of Manitoba, p. 41).

62 J/10 A zone of pale-blue vitreous anhydrite about four feet thick occurs between layers of gypsum at the Amaranth gypsum deposit (G.M. Brownell, 1931: Trans. Can. Inst. Mining Met. pp. 274-94).

62 O/10 Anhydrite occurs abundantly in the Gypsumville district associated with large deposits of gypsum. Chemical analysis of bluish white, semi-translucent, vitreous anhydrite, by R.A. Rogers: CaO 38.84, MgO 0.03, Fe_2O_3 0.04, Al_2O_3 0.04, SO_3 56.03, CO_2 0.05, H_2O 4.57, insol. 0.28, total 99.88 (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br., Publ. 732).

New Brunswick

21 H/15 Anhydrite is associated with gypsum deposits in Albert County near Hillsborough. Extensive cliffs of anhydrite occur on the south side of Wilson Brook, several miles south of Hillsborough. Chemical analyses by R.A. Rogers: I. bluish grey, opaque, earthy anhydrite from property of Albert Manufacturing Company, CaO 40.21, MgO 0.04, Fe_2O_3 0.04, Al_2O_3 0.08, SO_3 57.31, CO_2 0.47, H_2O 1.35, insol. 0.46, total 99.96; II. bluish grey, translucent, vitreous anhydrite from property of Albert Manufacturing Company, CaO 40.68, MgO 0.03, Fe_2O_3 0.06, Al_2O_3 0.08, SO_3 58.27, CO_2 0.31, H_2O 0.06, insol. 0.44, total 99.93; III. bluish white, earthy anhydrite from Wilson Brook, CaO 39.77, MgO 0.03, Fe_2O_3 0.05, Al_2O_3 0.05, SO_3 55.65, CO_2 0.97, H_2O 3.30, insol. 0.26, total 100.08 (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br. Publ., 732).

Newfoundland

11 O/14
12 B/2
12 B/3
12 B/7 Large massive gypsum deposits outcrop at numerous places in the area southeast of St. George's Bay between St. George's and Searston. Most of these deposits contain anhydrite (R.K. Collings, 1959: Can. Dept. Mines, Mines Br. Info. Circ., 114, p. 8).

Nova Scotia

11 E/3 Outcrops of anhydrite and gypsum occur along the west bank of the Shubenacadie River between South Maitland and Urbania. Chemical analysis of greyish white, earthy anhydrite by R.A. Rogers: CaO 37.32, MgO 0.18, Fe_2O_3 0.04, Al_2O_3 0.02, SO_3 53.18, H_2O 8.55, insol. 0.40, total 99.69 (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br. Publ., 732).

11 E/4 Chemical analyses of anhydrite that outcrops near Latties Brook: I. from high face near cave east of Burton on Andrew Hayes property, CaO 39.60, MgO trace, SO_3 55.20, CO_2 0.78, H_2O 4.05, total 99.63; II. from the Geary property east of Burton on the railway, CaO 38.80, SO_3 53.40, H_2O 8.05, insol. 0.40, total 100.65 (W.F. Jennison, 1911: Can. Dept., Mines, Mines Br. Rept. No. 84, pp. 68-9).

11 E/4
21 A/16
21 H/1 An area underlain by gypsum and anhydrite extends over 150 square miles between the Avon River, a few miles southwest of Windsor, and South Maitland. It is not possible to list all occurrences of anhydrite in this district and only a few representative ones will be mentioned.

Anhydrite occurs in irregular patches on the 'Meadows' property of the Canadian Gypsum Company at Windsor. Chemical analysis of a representative sample, by R.A. Rogers: CaO 38.07, MgO 0.16, Fe_2O_3 0.06, Al_2O_3 0.08, SO_3 54.08, CO_2 0.62, H_2O 6.30, insol. 0.46, total 99.83.

Good exposures of anhydrite are reported along the west shore of the Avon River at Mount Denison, and on the Scott estate and Hannah property.

Prominent cliffs of gypsum and anhydrite are exposed on the south side of the St. Croix River above the St. Croix bridge and an almost continuous series of outcrops extends from here to Newport Station.

At Noel to the east of Walton, anhydrite occurs in round spire-like pinnacles protruding through the gypsum (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br. Publ. 732).

11 E/6 Numerous outcrops of anhydrite and gypsum occur in the area drained by the Shubenacadie River. Chemical analyses of two anhydrite samples from the farm of Leonard Carter near Brookfield, by W.F. Jennison: I. CaO 38.20, MgO 1.06, SO_3 53.80, CO_2 1.17, H_2O 5.16, insol. 0.10, total 99.49; II. CaO 39.88, SO_3 51.28, CO_2 1.80, H_2O 7.16, total 100.12. At Beaver Brook, 8 miles southeast of Truro, and also on the west side of the Shubenacadie River opposite Eagles Nest Point, beds of gypsum have an anticlinical structure with a core of anhydrite. Chemical analysis of this anhydrite, by W.F Jennison: CaO 38.40, Fe_2O_3

and Al_2O_3 1.60, SO_3 54.44, H_2O 5.76, insol. 0.60, total 100.80 (L.H. Cole and R.A. Rogers, 1933, Anhydrite in Canada: Can. Dept. Mines, Mines Br. Publ. 732).

11 E/7 Gypsum occurrences in the vicinity of Bridgeville contain abundant anhydrite (L.H. Cole and R.A. Rogers, 1933, Anhydrite in Canada: Can. Dept. Mines, Mines Br. Publ. 732).

11 F/10, 11 F/11 Irregular patches of anhydrite occur in gypsum beds that outcrop on the north shore of Madame Island to the south of Lennox passage. The most prominent outcrops are about one mile back from the shore.

Cliffs of anhydrite from 30 to 60 feet high occur near Port Hastings on the east side of the road running from Port Hastings to Hawkesbury. Chemical analysis of anhydrite from this locality, by W.F. Jennison: CaO 40.48, SO_3 55.48, H_2O 3.90, insol. 0.44, total 100.30 (L.H. Cole and R.A. Rogers, 1933, Anhydrite in Canada: Can. Dept. Mines, Mines Br. Publ. 732).

11 F/15, 11 K/2 The Washabuck peninsula between St. Patrick's Channel and Bras d'Or Lake is noted for numerous outcrops of anhydrite.

Chemical analysis of a sample of anhydrite from Lieutenant Pond, a few miles north of Iona, by W.F. Jennison: CaO 40.16, SO_3 55.60, H_2O 4.52, insol. 0.13, total 100.41.

Chemical analyses of two specimens of anhydrite from quarries at Ottawa Brook, by R.A. Rogers: I. CaO 39.09, MgO 0.49, Fe_2O_3 0.06, Al_2O_3 0.06, SO_3 54.45, CO_2 1.07, H_2O 4.44, insol. 0.42, total 100.08; II. CaO 40.94, MgO 0.23, Fe_2O_3 0.04, Al_2O_3 0.08, SO_3 57.48, CO_2 0.31, H_2O 0.53, insol. 0.32, total 99.93.

Large cliffs composed largely of anhydrite are exposed along the banks of the Washabuck River and along the road from the Washabuck River to Little Narrows, at Nineveh, and Cain Mountain. Chemical analysis of a specimen from Cain Mountain by R.A. Rogers: CaO 39.96, MgO 0.10, Fe_2O_3 0.06, Al_2O_3 0.02, SO_3 54.65, CO_2 1.14, H_2O 2.85, insol. 0.80, total 99.58 (L.H. Cole and R.A. Rogers, 1933, Anhydrite in Canada: Can. Dept. Mines, Mines Br. Publ. 732).

11 K/2 Many outcrops of anhydrite occur between Baddeck Bay and Big Harbour.

Chemical analysis of a specimen taken from a large cliff exposed on the west bank of Bevis Creek about 3 miles west of Ross Ferry, by R.A. Rogers: CaO 37.68, MgO 0.16, Fe_2O_3 0.06, Al_2O_3 0.02, SO_3 52.68, CO_2 0.49, H_2O 8.02, insol. 0.44, total 99.55.

Chemical analysis of anhydrite from the property of J.H. McLeod at the head of Baddeck Bay, by R.A. Rogers: CaO 40.10, MgO

0.10, Fe_2O_3 0.04, Al_2O_3 0.04, SO_3 52.97, CO_2 1.89, H_2O 3.90, insol. 0.26, total 99.30 (L.H. Cole and R.A. Rogers, 1933: Can. Dept. Mines, Mines Br. Publ. 732).

11 K/7 Chemical analysis of anhydrite from a quarry at Goose Cove, St. Ann's Harbour, by W.F. Jennison: CaO 42.80, SO_3 56.16, H_2O 0.73, insol. 0.80, total 100.49 (W.F. Jennison, 1911: Can. Dept. Mines, Mines Br. Rept. 84).

11 K/9 Considerable anhydrite is encountered in the lower workings of a quarry on the north side of Ingonish Harbour (L.H. Cole and R.A. Rogers: Can. Dept. Mines, Mines Br. Publ. 732).

11 K/15, 11 K/16 Occasional patches of anhydrite are exposed in gypsum beds at Aspy Bay, on the east shore of Cape Breton. Some of the anhydrite contains crude petroleum as shown in the following chemical analysis by W.F. Jennison: CaO 41.30, SO_3 57.91, H_2O 0.82, insol. 0.07, bitumen 0.08, total 100.18 (W.F. Jennison, 1911: Can. Dept. Mines, Mines Br. Rept. 84).

Ontario

30 M/4 Lens-like deposits of anhydrite and gypsum are associated with limestone and dolomite in the Salina Group rocks south of Hamilton. These deposits are mined underground at Hagersville and Caledonia (R.K. Collings, 1959: Can. Dept. Mines, Mines Br. Info. Circ., 114, p. 11). The X-ray powder pattern of anhydrite from the Salina Group has the following spacings and intensities for the six strongest lines: 3.51 (10), 2.86 (5), 2.33 (3), 2.21 (4), 1.87 (3), 1.65 (3) (X-ray Laboratory, Geol. Surv. Can.).

31 C/16 A specimen of massive purple anhydrite in the National Mineral Collection is reported to have been collected at McLaren's phosphate mine, lot 4, conc. VIII, North Burgess Township, Lanark County.

42 A/6 Veins of anhydrite occur in the quartz-ankerite zone at the McIntyre Mine in the Porcupine gold camp (G.B. Langford and E.G. Hancox, 1936: Econ. Geol., 31, pp. 600-9).

Quebec

31 F/10 Pale violet to colourless anhydrite mixed with carbonate, and deep mauve, coarsely crystalline anhydrite have been encountered in a deep drillhole cutting Grenville limestone at Calumet Mines Limited, Calumet Island (F. Fitz Osborne, 1941: Univ. Toronto Stud., Geol. Ser., 46).

31 H/12 Anhydrite has been identified as a constituent of alkaline gabbro rocks taken from a tunnel at Mount Royal (F. Fitz Osborne, 1941: Univ. Toronto Stud., Geol. Ser., 46).

ANIMIKITE

This name, from Animikie-Thunder, was given by Wurtz (Eng. and Mining J., 27, 1879) to a supposed silver antimonide mineral occurring in the silver ore at Silver Islet, Thunder Bay district, Ontario. The material is now believed to have been a mixture of antimonian silver and dyscrasite.

ANKERITE

$Ca(Fe,Mg)(CO_3)_2$

The problem of nomenclature for minerals of the dolomite group is complicated by the fact that iron and manganese may substitute for both calcium and magnesium in the dolomite structure. The pure calcium-iron end member of the group, $CaFe(CO_3)_2$, is known in nature and all ankerite contains a considerable amount of magnesium. Palache, Berman and Frondel in Dana's System of Mineralogy, Seventh Edition, arbitrarily divide the dolomite group at Mg: Fe=1:1; material with Mg>Fe is referred to as dolomite and material with Fe>Mg is referred to as ankerite. According to this system a great many specimens previously called ankerite would be called ferroan dolomite. Many mineralogists prefer to extend the range of composition of ankerite to include material having a $FeCO_3$ content of more than 10 per cent (Mg:Fe <5:1) thereby including most of the material that weathers characteristically dark brown to reddish brown and that, in the past, has been commonly referred to as ankerite. Most of the ankerite of Canadian deposits would be classified as ferroan dolomite according to Dana's System.

British Columbia

92 H/7 Ankerite is the main cementing material in breccia zones containing ore minerals at lead-zinc deposits on the north side of Whipsaw Creek, about 12 miles from its junction with the Similkameen River (H.M.A. Rice, 1947: Geol. Surv. Can., Mem. 243).

92 I/E 1/2 Ankerite occurs abundantly as an alteration product of lavas, tuffs and breccias at many of the ore deposits in the Nicola map-area. These deposits include: Corona Group on Swakum Mountain, nine miles north of Nicola; Mercury Group, fifteen miles south of Savona on the Merritt highway about one mile east of Tunkwa Lake; North Line and South Line claims on the south side of Kamloops Lake about three miles by road east of Savona; Charbonneau property, about one-quarter mile east of Savona; Davis property (Sand T Group) on the southern slope of Mount Uren, about one mile east of Savona Station on the Canadian National Railway; MacMercury Group on Criss Creek about two miles above its mouth on Deadman River; and on the lower western slope of Hardie Mountain, about four miles by road from Copper Creek station (W.F. Cockfield, 1948: Geol. Surv. Can., Mem. 249).

104 N/12 Ankerite occurs as a gangue mineral in shear zones at the Atlin-Ruffner silver-lead deposit near Crater Creek, a small tributary of Fourth of July Creek (J.D. Aitken, 1959: Geol. Surv. Can., Mem. 307, p. 71).

Northwest Territories

34 C Lenticular masses of ankerite enclosed in thick beds of chert are reported to occur on the Nastapoka Islands, off the east coast of Hudson Bay (A.P. Low, 1900: Geol. Surv. Can., Ann. Rept. XIII, 9 and 30 DD).

Nova Scotia

11 E/5 Large masses of ankerite, altered in part to limonite iron ore, occur on the south flank of the Cobequid Mountains, near Londonderry in Colchester County. Ankerite was quarried by early operators of the iron mines and used as a flux in blast furnaces (L.J. Weeks, 1948: Geol. Surv. Can., Mem. 245).

Chemical analyses of ankerite from Londonderry as reported by R.A.A. Johnston (Geol. Surv. Can., Mem. 74, p. 21); I, II, III by Louis (Nova Scotia Inst. Nat. Sci., V, 47-50, 1879-82); IV average of a number of analyses by Louis; V by Dawson; VI, VII by Jackson; VIII by How (A.R.C. Selwyn: Geol. Surv. Can., Ann. Rept., 1872-3, p. 27):

	I	II	III	IV
$CaCO_3$	53.64	49.32	54.96	53.75
$FeCO_3$	23.29	23.11	21.92	22.70
$MnCO_3$	0.77	0.68	1.29	0.80
$MgCO_3$	21.48	26.29	21.42	22.75
Fe_2O_3	tr		1.05	
Insol.	0.57	0.12	0.19	
Total	99.75	99.52	100.83	100.00

	V	VI	VII	VIII
$CaCO_3$	54.0	43.80	49.20	51.61
$FeCO_3$	23.2	23.45	20.30	19.59
$MnCO_3$		0.80		
$MgCO_3$	22.0	30.80	30.20	28.67
Insol.	0.5	0.10		0.13
Total	99.7	98.95	99.70	100.00

11 E/7 Veins of ankerite are reported to occur in slates at Glencoe Brook, Pictou County (H. Fletcher, 1890-1: Geol. Surv. Can., Ann. Rept., V, 101 P).

21 H/8 Veins of ankerite are reported to occur in slates and sandstone at Clarke's Head and Crane Point in Cumberland County (H. Fletcher, 1890-1: Geol. Surv. Can., Ann. Rept., V, 101 P).

Ontario

41 J/5 Ankerite is associated with chalcopyrite in quartz veins at the Rock Lake Mine, 14 miles north of the village of Bruce Mines (E.D. Ingall, 1902: Geol. Surv. Can., Ann. Rept. XV, 251 A).

42 A/6 Ankerite occurs in the gold-bearing veins and in the wall rocks at the Porcupine camp. Chemical analyses of ankerite from Curts vein, West Dome Mine: I. $CaCO_3$ 50.63, $MgCO_3$ 29.57, $FeCO_3$ 14.15, insol. 1.73, total 96.08; II. $CaCO_3$ 51.28, $MgCO_3$ 29.82, $FeCO_3$ 14.70, total 95.80 (A.G. Burrows, 1912: Ont. Dept. Mines, Ann. Rept., vol. 21 Pt. I).

Quebec

23 J/10 The X-ray powder pattern of ankerite from Schefferville, Quebec, has the following spacings and intensities for the five strongest lines: 2.90 (10), 2.201 (3), 2.022 (2), 1.816 (3), 1.798 (4). The c_o dimension calculated from the 0009 reflection is 16.18 Å, corresponding to an FeO content of about 12 per cent (X-ray Laboratory, Geol. Surv. Can.).

24 C/14 Masses of ankerite occur with thin beds of jaspery magnetite in cherty limestone on the banks of the Koksoak River (Kaniapiskau River) immediately below Shale Chute, a few miles below Cambrian Lake, Ungava district (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, 18 R).

32 D/6 Ankerite is a common mineral in ore deposits in the Noranda district where it occurs in veins and shear zones and cementing breccia (M.E. Wilson, 1941: Geol. Surv. Can., Mem. 229).

ANNABERGITE

$Ni_3(AsO_4)_2 . 8H_2O$

Ontario

31 C/13 Annabergite is reported to have been observed as a stain on quartzite containing some arsenopyrite at lot 1, conc. I, Limerick Township, Hastings County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 21).

31 M
41 P
Many of the ore veins in the Cobalt-Gowganda district contain annabergite formed as an alteration product of cobalt-nickel arsenides (W.G. Miller, 1910: Ont. Bur. Mines, Ann. Rept., vol. 19, Pt. II, p. 19).

The X-ray pattern of annabergite from the Cobalt district has three strongest lines with spacings and intensities of: 6.61 (10), 3.19 (7), 2.98 (7) (X-ray Laboratory, Geol. Surv. Can.).

41 I/6 A specimen of gersdorffite from the Gersdorffite Mine, lot 12, conc. III, Denison Township, Sudbury district, is reported to have been coated with botryoidal, globular and mammillary crusts of annabergite. The annabergite may have formed during storage of the specimen in a mineral cabinet for several years (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, 103-4 H).

52 A/6 Annabergite has been noted on specimens of ore from the Silver Islet Mine, off Thunder Cape, Lake Superior (E.D. Ingall, 1887-8: Geol. Surv. Can., Ann. Rept., III, 28 H).

ANTHOPHYLLITE

$$(Mg, Fe)_7(Si, Al)_8O_{22}(OH)_2$$

Anthophyllite is an orthorhombic member of the amphibole group. It occurs in metamorphic rocks that have high magnesia and alumina and low lime contents. Cordierite is a common associate. The name gedrite is applied to aluminian anthophyllite.

Manitoba

63 N/2 A band of anthophyllite-rich rock has been traced from east to west through the Batty Lake map-area. Two chemical analyses were made by R.J.C. Fabry (1949). Grey-green bladed crystals from Star Lake; SiO_2 44.03, Al_2O_3 19.06, FeO 19.77, CaO 1.30, MgO 15.20, TiO_2 0.47, total 99.83. Brownish pink bladed crystals from north of the lake, two miles north of the west end of Batty Lake; SiO_2 45.32, Al_2O_3 22.74, FeO 14.15, CaO1.11, MgO16.90, TiO_2 0.25, total 100.47 (D.S. Robertson, 1953: Geol. Surv. Can., Mem. 271, p. 19).

Newfoundland

23 G/2 Anthophyllite has been found in the Wabush, Labrador, iron-formation in two places: in the Smallwood Mine, with specularite, quartz, and a small amount of talc; and in Wabush deposits nos., 6 and 7 associated with quartz, magnetite, specularite, and mangano-cummingtonite. Fibrous varieties of anthophyllite occur as lenticular bands parallel to the regional foliation (K.L. Chakraborty, 1963: Can. Mineralogist, 7, p. 738).

Ontario

31 E/1 Gedrite is an abundant constituent of amphibolite which occurs as a narrow belt along the north shore of Fishtail Lake, lot 11, conc. IX, Harcourt Township. The anthophyllite occurs with garnet, cordierite, and lesser amounts of quartz, biotite, rutile, magnetite and ilmenite. Chemical analysis of carefully purified sample, by Evans: SiO_2 44.32, Al_2O_3 16.04, Fe_2O_3 2.80, FeO 16.88, MnO 0.09, CaO 0.77, MgO 15.95, H_2O 1.31, K_2O and Na_2O 1.86, total 100.02 (H.N. Evans and J.A. Bancroft, 1908: Am. J. Sci., Ser. 4, XXV, pp. 509-512).

Quebec

12 L/14 A meta-gabbro mass composed mainly of coarse actinolite contains gedrite, some chlorite and a little epidote. The mass outcrops as a prominent topographic feature along the banks of Romaine-Est River, upstream for two and one-half miles from a point one-half mile north of the mouth of the Metivier River (J.A. Retty, 1944: Que. Dept. Mines, Geol. Rept., No. 19, p. 17).

31 I/16 Anthophyllite is an abundant constituent of the ore zone at the Tetreault Mine, Montauban-les-mines, Portneuf County. The association cordierite-anthophyllite is a characteristic feature of that part of the ore zone that occurs in sillimanite-garnet gneiss (J.J. O'Neill and F. Fitz Osborne, 1938: Que. Dept. Mines, Prelim. Rept., 138, p. 18).

Yukon Territory

115 O/9 A hand specimen of anthophyllite submitted to the X-ray Laboratory, Geol. Surv. Can., is reported to have been found on Australia Mountain, about 16 miles east of Granville. The X-ray powder pattern has four strongest lines with the following spacings and intensities: 3.22 (7), 3.05 (10), 2.57 (4) and 1.51 (5).

ANTHRAXOLITE

(see hydrocarbons)

ANTIGORITE

(see serpentine)

ANTIMONY

Sb

British Columbia

92 I/15 At Criss Creek, one-half mile from the road along Deadman River and about twelve miles north of Savona, Kamloops Lake, native

antimony occurs as small droplets (0.2 to 1.0 mm) within native arsenic associated with colloform dolomite in a breccia-type vein (J.S. Stevenson, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 88).

92 O/4 Native antimony, associated with pyrite and hessite, is a minor constituent of the ore at Pellaire Mines, located on Falls River about five miles southwest of Taseko Lake (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 83).

104 P/4 Scattered grains of native antimony occur in a vein composed chiefly of galena, sphalerite and magnetite. The vein cuts dolomitized limestone at the Contact Group located between the head waters of McDame and Cottonwood Creeks at an elevation of 6,000 feet (R.M. Thompson, 1954: Am. Mineralogist 39, p. 527).

New Brunswick

21 G/14 Native antimony, sometimes in large masses, occurs with stibnite and kermesite in quartz veins at a deposit near George Lake, Prince William parish, York County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 19 T).

Northwest Territories

85 J/8 Native antimony believed to be of hypogene origin occurs as small grains within massive stibnite in the gold ores of the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist 38, p. 520).

Nova Scotia

11 E/4 A small amount of native antimony occurs with stibnite and kermesite in quartz veins at the West Gore antimony mine in Hants County (A.R.C. Selwyn, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 58 A).

Ontario

31 C/12 Chemical analysis of native antimony, found in small amounts at the Dufferin iron mine, lot 18, conc. I, Madoc Township, Hastings County, by R.A.A. Johnston: Sb 99.89, As 0.02, Fe trace, total 99.91 (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, 13 R).

42 E/10 Native antimony occurs as tiny blebs and patches within stibnite and berthierite in gold ores at Talmora Longlac Mines in Errington Township (E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VI, p. 57).

Quebec

21 E/13 Lamellar to fine granular native antimony is reported to occur with stibnite, kermesite and valentinite in schists along a diabase-serpentine contact at an old mine on lot 28, range I, South Ham Township, Wolfe County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 876, and H.C. Cooke, 1937: Geol. Surv. Can., Mem. 211, p. 153).

Native antimony from South Ham Township gives an X-ray diffraction pattern having four strongest lines with the following d-spacings and intensities: 3.10 (10), 2.24 (5), 2.15 (4), 1.77 (3) (X-ray Laboratory, Geol. Surv. Can.).

APATITE

$Ca_5(PO_4)_3(F, Cl, OH)$

Apatites contain varying amounts of fluorine, chlorine and hydroxyl and the names fluorapatite, chlorapatite and hydroxyl-apatite have been given to varieties rich in one of these constituents. Some apatites also contain several per cent of carbon dioxide. Substitutional solid solution between calcium and many other elements is common in apatites; strontium, manganese, cerium group rare earths, and uranium are the most common elements involved.

McConnell (Am. Mineralogist 38, p. 1, 1938) has studied variations in axial dimensions corresponding to changes in composition of different members of the apatite group. A specimen of mangan-apatite is found to have $a_o = 9.33$, $c_o = 6.80$, $c/_a = 0.729$, whereas the fluor-apatite from Faraday Township, Hastings County (31 E/1), analyzed by Dadson, has $a_o = 9.36$, $c_o = 6.88$, $c/_a = 0.735$. The powder pattern of the latter apatite shows strongest lines at 2.80 (10), 2.77 (4), 2.70 (6) and 1.838 (6).

Manitoba

52 L/6 Indigo-blue to prussian-blue manganiferous apatite occurs in irregular aggregates up to fist size and as distinct crystals of short prismatic habit up to 1 cm. in diameter along the footwall contact of the main pollucite body at the Montgary property, Chemalloy Minerals Limited, near the west end of Bernic Lake (M.H. Frohberg, 1960: private communication).

Ontario

Apatite is of common occurrence in the Grenville rocks of eastern Ontario and adjoining Quebec where it was mined at the turn of the last century as a major world source of phosphate. It occurs in calcite masses and veins and is associated with various amounts of pyroxene, mica, hornblende, scapolite, titanite, zircon, fluorite, microcline and spinel. Well-developed crystals, often very large, in various shades of green and brown are common. Many fine specimens of apatite crystals, associated with crystals of diopside and phlogopite, in a matrix of salmon-orange calcite have been collected in this region. No attempt has been made to list all occurrences of apatite, instead, a representative list of localities taken from Johnston (Geol. Surv. Can., Mem. 74, pp. 35-6, 1915) is given here.

	COUNTY	TOWNSHIP	CONCESSION - LOT
31 C/7	Frontenac	Bedford	II - 4
31 C/8			IV - 6
31 C/9			VII - 7, 32, 33, 34
31 C/10			VIII - 28
31 C/15			XII - 3
			XIII - 4, 6
			XVII - 1
		Hinchinbrooke	I - 29, 30
		Loughborough	VII - 2
			VIII - 11, 12, 14, 16
			IX - 4, 10, 11, 12, 13, 15, 17
			X - 7, 8, 10, 13, 19, 24
			XI - 8, 9, 10, 15
			XII - 19, 22, 24
			XIII - 24, 25
		Oso	I - 6
			V - 1, 2
			VI - 14
			VIII - 4
		Storrington	XV - 8, 23
31 D/16	Haliburton	Cardiff	XII - 8
31 E/1			XIV - 22
31 E/2			XVI - 8
			XXII - 7
		Dudley	III - 4
		Dysart	I - 28
			V - 11
		Harcourt	XI - 21
		Monmouth	X - 3
			XI - 12, 13, 14, 15, 17
31 F/14	Hastings	Monteagle	VI - 26
31 C/15	Lanark	Bathurst	VIII - 10
31 C/16			IX - 8, 20

	COUNTY	TOWNSHIP	CONCESSION - LOT
31 C/15 31 C/16	Lanark	North Burgess	III - 15, 16 IV - 11 V - 4, 7, 8, 9, 10, 16, 18, 19, 20, 21 VI - 13, 14, 15, 16, 18, 19 VII - 5, 6 VIII - 1, 2, 3, 4, 5, 6 IX - 5
		North Elmsley	VI - 30 VIII - 24, 25, 26, 27
		South Sherbrooke	VII - 11
31 C/9	Leeds	South Crosby	VI - 12 VII - 15
		North Crosby	II - 19 III - 20 IX - 29 X - 21
31 D/16	Peterborough	Anstruther	XVII - 39
31 F/6 31 F/10	Renfrew	Sebastopol	VII - 32 X - 27, 28, X - 31 XI - 31 XII - 32
		Ross	I - 7 VI - 13 IX - 7

31 C/7 Chemical analysis of massive, compact apatite with dull lustre and dull red colour from conc. X, lot 10, Loughborough Township, Frontenac County: CaO 48.475, Ca 4.168, MgO 0.158, Fe_2O_3 0.905, Al_2O_3 0.835, P_2O_5 40.868, F 3.731, Cl 0.428, CO_2 0.105, insol. 1.150, total 100.823; S.G. 3.1641 (G.C. Hoffmann, 1877-8: Geol. Surv. Can., Rept. Prog., 6 H).

31 C/8 Chemical analysis of apatite from conc. VI, lot 14, Storrington Township, Frontenac County: massive, compact, dull lustre, greyish to reddish white with reddish brown bands: CaO 47.828, Ca 3.732, MgO 0.151, Fe_2O_3 0.151, Al_2O_3 0.609, P_2O_5 40.373, F 3.311, Cl 0.438, CO_2 0.026, insol. 3.890, total 100.509; S.G. 3.1593 (G.C. Hoffmann, 1877-8: Geol. Surv. Can., Rept. Prog., 3 H).

31 C/15, 31 C/16 Study of apatite crystal from South Sherbrooke Township, Lanark County. Colour deep green. Lustre vitreous. Transparent only in thin splinters. Forms present include first and second order

prisms and first order pyramids. Indices of refraction: E = 1.628, O = 1.635 ± 0.001, S.G. 3.165. Clayey material and a little hematite are present as impurities. Chemical analysis: CaO 55.38, MnO 0.04, Fe_2O_3 0.51, Al_2O_3 0.23, Na_2O 0.16, K_2O 0.12, P_2O_5 41.05, F 2.35, Cl 0.48, CO_2 0.22, H_2O 0.13, insol. 0.35, total (101.02) less O for F (1.09) 99.93 (A.S. Dadson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 55).

31 C/16 Chemical analysis of apatite from conc. III, lot 16, North Burgess Township, Lanark County; massive, lustre subvitreous, colour dull red. S.G. 3.1603: CaO 46.327, Ca 4.258, MgO 0.548, Fe_2O_3 1.290, Al_2O 1.190, P_2O_5 39.046, F 3.791, Cl 0.476, CO_2 0.096, insol. 3.490, total 100.512 (G.C. Hoffmann, 1877-8: Geol. Surv. Can., Rept. Prog., 4 H).

Study of apatite crystal from Elmsley Township, Lanark County. Colour emerald green. Lustre vitreous. Transparent only in thin splinters. Indices of refraction: E = 1.637, O = 1.642 ± 0.001, S.G. 3.167. Crystal forms present include first order prism and one pyramidal termination. Chemical analysis: CaO 55.25, MnO 0.01, Fe_2O_3 0.36, Al_2O_3 0.35, P_2O_5 41.12, F 3.31, Cl 0.88, CO_2 0.33, H_2O 0.11, insol. 0.27, total (101.99) less O for F (1.58) 100.41 (A.S. Dadson 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 56).

31 E/1 Bluish green apatite crystals from conc. XV, lot 35, Monmouth Township, Haliburton County have been cut and polished as gemstones. The apatite is said to cut well en cabochon but is rather brittle (A.L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 46).

Asparagus-green apatite crystals up to eighteen inches long and five inches in diameter occur in nepheline syenite in conc. XV, lot 32, Faraday Township, Hastings County. Associated minerals include crystals of biotite and plagioclase and irregular masses of fluorite, magnetite and pyrite. The crystals exhibit the forms c (0001), m $(10\bar{1}0)$, and x $(10\bar{1}1)$ and many are doubly terminated. Chemical analysis by H.C. Rickaby: CaO 55.10, MgO 0.23, MnO 0.12, FeO 0.36, Al_2O_3 0.12, P_2O_5 41.24, F 3.65, CO_2 0.73, insol. 0.22, total (101.77) less O for F (1.54) 100.23 (T.L. Walker, and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 22).

Study of apatite crystal from Faraday Township, Hastings County. Colour asparagus green. Lustre vitreous. Clear and transparent except where fractures are filled with dull rust-coloured material. Indices of refraction: E = 1.630, O = 1.634 ± 0.001, S.G. 3.176. Chemical analysis: CaO 55.16, MnO 0.12, FeO 0.14, Fe_2O_3 0.63, Al_2O_3 0.24, P_2O_5 41.30, F 3.67, Cl 0.09, CO_2 0.50, H_2O 0.01, insol. 0.28, total (102.14) less O for F (1.56) 100.58. The CO_2 found on analysis is believed due to finely disseminated calcite (A.S. Dadson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 53).

31 F/11 Study of apatite crystals from Eganville, Renfrew County. Colour dull reddish brown. Forms present include first order prisms and pyramids and base. The crystals have numerous inclusions of hematite which are responsible for the reddish colour. Indices of refraction: E = 1.630, 0.634 ± 0.001, S.G. 3.197. Chemical analysis: CaO 53.96, MnO 0.01, MgO 0.10, Fe_2O_3 1.28, Al_2O_3 0.98, P_2O_5 39.70, F 3.40, Cl 0.11, CO_2 0.47, H_2O 0.23, insol. 1.16, total (101.40) less 0 for F (1.45) 99.95 (A.S. Dadson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 52).

Quebec

Many occurrences of apatite have been found in Grenville rocks in the counties of Gatineau, Papineau and Pontiac. The following list is taken largely from R.A.A. Johnston (Geol. Surv. Can., Mem. 74, p. 26, 1915).

	COUNTY	TOWNSHIP	RANGE and LOT
31 G/5 31 G/12	Gatineau	Hull	VII - 18, 19 X - 15, 17 XI - 9, 14 XII - 9, 10, 14 XIII - 1 XIV - 10 XV - 12 XVI - 13, 14, 15, 16
31 G/12	Gatineau	Wakefield	I - 12, 17 II - 17, 18 V - 22, 23, 24 IX - 30
31 G/11 31 G/12 31 G/13	Papineau	Bowman	IV - 1, 2, 3, 4
		Buckingham	XI - 26 XII - 17, 18, 19, 26
		Portland	VIII - 9
		Templeton	VII - 3, 4, 5, 6, 7 IX - 16 X - 7, 9, 10 XI - 6, 7, 8, 9, 10, 11 XII - 2, 8 XIII - 6, 7, 22
31 G/11 31 G/12 31 G/13		Villeneuve	I - 31
31 F/15	Pontiac	Huddersfield	IV - 20 V - 20

21 L/3 Colourless tabular crystals of apatite up to 1 cm in diameter and not more than 2 millimetres thick have been found in drusy quartz boulders used for construction of a stone fence about five miles northwest of Black Lake, near the road leading to St. Ferdinand de Halifax. Colourless quartz crystals are superimposed upon the transparent apatite plates, which rest on massive white quartz (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull. 27, pp. 81-2).

31 G/11 The old Grant Mine, range XII, lot 18, Buckingham Township has yielded one of the largest apatite crystals in the world. This crystal which weighs 550 pounds and measures 62 1/2 inches in circumference is housed in Ottawa in the National Mineral Collection.

Chemical analysis of massive, fine granular, greyish green apatite from the Grant Mine: CaO 44.198, Ca 3.062, MgO 0.422, Fe_2O_3 0.120, Al_2O_3 1.979, P_2O_5 34.032, F 2.855, Cl 0.101, CO_2 2.848, insol. 2.050, Fe + S 8.877, total 100.544, S.G. 3.2441.

Chemical analysis of massive, vitreous, pale greenish grey apatite from the Grant Mine: CaO 49.161, Ca 3.803, MgO 0.158, Fe_2O_3 0.125, Al_2O_3 0.705, P_2O_5 41.080, F 3.474, Cl 0.260, CO_2 0.370, insol. 0.370, total 99.506, S.G. 3.1493 (G.C. Hoffmann, 1877-8: Geol. Surv. Can., Rept. Prog., 4-7 H).

31 G/12 Chemical analysis of massive, granular, greenish white apatite from range I, lot 6, Portland Township: CaO 49.041, Ca 3.603, MgO 0.205, Fe_2O_3 0.083, Al_2O_3 0.267, P_2O_5 40.518, F 3.377, Cl 0.086, CO_2 0.855, insol. 1.630, total 99.665, S.G. 3.1676.

Chemical analysis of massive, lamellar, vitreous, bright sea-green apatite from range VII, lot 7, Portland Township: CaO 49.335, Ca 4.195, MgO 0.180, Fe_2O_3 0.094, Al_2O_3 0.566, P_2O_5 41.139, F 3.863, Cl 0.229, CO_2 0.223, insol. 0.060, total 99.884, S.G. 3.1884.

Chemical analysis of massive, waxy, pale greenish white apatite from range XII, lot 12, Templeton Township: CaO 49.102, Ca 3.763, MgO 0.620, Fe_2O_3 0.125, Al_2O_3 0.565, P_2O_5 40.812, F 3.554, Cl 0.040, CO_2 0.518, insol. 0.630, total 99.729, S.G. 3.1750 (G.C. Hoffmann, 1877-8: Geol. Surv. Can., Rept. Prog., 5-6-8 H).

A vitreous, light sea-green apatite crystal from Battle Lake, Templeton Township, has indices of refraction, E = 1.629, O = 1.634 $\pm$ 0.001; S.G. 3.174. Chemical analysis: CaO 55.48, MgO 0.26, Fe_2O_3 0.58, Al_2O_3 0.36, Na_2O 0.18, K_2O 0.22, P_2O_5 40.31, F 3.47, Cl 0.30, CO_2 0.14, H_2O 0.11, insol. 0.42, total (101.83) less O for F (1.52) 100.31 (A.S. Dadson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 54).

31 G/12 Chemical analyses of apatite from Templeton Township by Carnot (1896): I. outer portion of crystal, CaO 52.90, MgO trace, FeO 1.20, Fe_2O_3 0.30, P_2O_5 41.64, F 1.17, Cl 0.42, CO_2 2.31, insol. 0.37, total 100.31; II. inner portion of crystal, CaO 52.90, MgO trace, FeO 1.30, Fe_2O_3 0.22, P_2O_5 41.50, F 1.26, Cl 0.37, CO_2 2.30, insol. 0.30, total 100.15 (Bull. Soc. Min. France, XIX, p. 43).

Saskatchewan

74 O/13 Radioactive apatite-rich veins occur in the Nisikkatch and Northwest Lakes region, 35 to 40 miles northeast of Uranium City. Orange, red, brown and green apatite is associated with allanite, thorite and monazite. Chemical analysis of brown apatite by Mines Branch, Ottawa, gave 4.48 per cent total rare earths and 0.40 per cent thoria. The cerium group rare earths predominate in the red and brown apatite; yttrium group rare earths predominate in the orange and green apatite (D.D. Hogarth, 1957: Can. Mineralogist, 6, pp. 140-50).

APOPHYLLITE

$KCa_4Si_8O_{20}(F, OH).8H_2O$

Apophyllite is a relatively uncommon mineral which is found most often in association with zeolites. Like the zeolites it has a high content of water, but structurally it is more closely akin to the micas.

British Columbia

82 F/4 Apophyllite is reported to be one of the most common minerals that occur as crystals in vugs and fissures in the gold-copper-silver mines of the Rossland camp, West Kootenay district. The mineral occurs in cube-like forms, also as elongate prisms with pyramidal terminations, and as flat tabular crystals. The colour varies from colourless to pink. The X-ray powder pattern of pink, well-crystallized apophyllite from the Le Roi Mine has five strongest lines with the following spacings and intensities: 4.53 (6), 3.91 (5), 3.57 (5), 2.97 (8) and 2.49 (10) (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

21 A/NW
21 H/SE Many fine specimens of apophyllite have been collected along the shores of Minas Channel and the south shore of the Bay of Fundy in Annapolis, Cumberland and King's counties. The mineral occurs as easily cleavable masses and rosette-like crystal aggregates in cavities and fissures in basalt. Localities that have yielded specimens include: Ile Haute, Cape d'Or, Partridge

21 A/NW 21 H/SE Island, Amethyst Cove, Hall Harbour, Scott Bay, Chute Cave, Hampton, Margaretville, Port George, and Bennett Brook. A. L. Parsons (Univ. Toronto Stud., Geol. Ser. 14, p. 39, 1922) has studied the morphology of crystals from this area, and reports the following chemical analysis of apophyllite from Ste. Croix River: SiO_2 52.02, Al_2O_3 1.02, Fe_2O_3 0.07, CaO 24.74, Na_2O 0.70, K_2O 4.28, MgO 0.05, H_2O 16.23, F 1.88, total (100.99) less 0 for F (0.79) 100.20.

Ontario

52 A/3 Apophyllite is reported to occur in foliated masses or plates associated with calcite at the Prince's Mine on Spar Island, Thunder Bay district (G. C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 20 T).

Quebec

21 L/3 Large crystals of apophyllite, intimately associated with pectolite occur in a granite or aplite rock in the serpentine deposits at Thetford Mines (A. L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 55).

ARAGONITE

$CaCO_3$

Aragonite is polymorphous with calcite. It is isostructural with witherite, strontianite and cerussite, three carbonates of metals having atomic radii greater than that of calcium. The calcite structure is the stable one for calcium and ions of smaller atomic radii. Aragonite is formed in low-temperature environments and it may invert to calcite at normal temperatures in the presence of water.

British Columbia

82 E/6 A large specimen of white acicular aragonite in the National Mineral Collection was collected at Penticton. The five strongest lines in the X-ray powder pattern are: 3.395 (10), 3.27 (5), 2.70 (6), 2.33 (5) and 1.978 (6) (X-ray Laboratory, Geol. Surv. Can.).

82 F/3 A large body of aragonite is reported to occur one mile north of the south fork of Salmon River, on the south slope of 'Staghorn Mountain' (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 29).

82 F/14 Aragonite is reported to have been found lining a large vug or cavity over No. 3 level, Standard Mine, Slocan camp (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 29).

82 F/14 Also reported as large groups of radiating, acicular, colourless crystals and as compact masses filling fissures at the Wonderful Mine, Slocan camp (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 130).

82 K/11 Fine specimens showing masses of radiating translucent crystals of aragonite have been collected near the head of Gainer Creek which flows into Lardeau Creek, east of Ferguson Creek and about 10 miles northeast of Trout Lake, in the West Kootenay district (R. Bell, 1902-3: Geol. Surv. Can., Ann. Rept., XV, 51 AA).

93 A/6 Aragonite has been observed filling amygdaloidal cavities in dark greenish grey basalt along the Horsefly River, which flows into Horsefly Bay, Quesnel Lake (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, 13 R).

Newfoundland

12 B/10 Aragonite is associated with barite and celestite at Port au Port (G.C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 55).

Nova Scotia

11 E/5 Aragonite has been reported to occur in fissures and cavities in ankerite, and implanted on barite and calcite at Londonderry, Colchester County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 21 T).

Ontario

31 M Aragonite has been noted at the O'Brien Mine, Coleman Township, and other mines in the Cobalt district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 29).

52 A Aragonite has been observed in the trap rocks in the Thunder Bay district north of Lake Superior (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 21 T).

Quebec

21 E/14 Aragonite occurs in druses as thin-bladed individuals and radiating groups, associated with vesuvianite, diopside, garnet and chlorite at the Montreal Chrome Pit, about three-quarters of a mile east of the south end of Little Lake St. Francis in Coleraine Township, Megantic County (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull. 27, pp. 25-6).

ARGENTITE

(See acanthite)

ARGYRODITE

Ag_8GeS_6

103 P/12 This rare sulpho-germanate mineral has been identified in specimens from the Dolly Varden Mine, located about 17 miles north of Alice Arm near the head of the Kitsault River. The mineral occurs in small amounts with acanthite in veinlets and fissures. It is closely associated with pyrite and has not been observed in areas of massive acanthite away from pyritized quartz. Galena, chalcopyrite, sphalerite, tetrahedrite, polybasite, pyrargyrite and native silver are also present in the specimens (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 545). The spacings and intensities of the six strongest lines on the X-ray powder pattern of argyrodite are: 3.14 (3), 3.02 (10) 2.66 (4), 2.44 (3), 2.03 (3), 1.863 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 122).

ARGYROPYRITE

Ag, Fe sulphide

Ontario

31 M Argyropyrite is reported to occur with stromeyerite and native silver in a specimen collected at the Foster Mine, Cobalt district (R.A.A. Johnston, 1907: Geol. Surv. Can., Sum. Rept., p. 96). No data is given to substantiate the reported occurrence. Argyropyrite is of doubtful validity as a mineral species.

ARQUERITE

(See silver)

ARSENIC

As

British Columbia

82 F/11 Native arsenic occurs in large nodules associated with arsenopyrite and pyrrhotite at Eight Mile Creek, which flows north into the west arm of Kootenay Lake about eight miles northeast of Nelson (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, 14 R).

92 B/12 Native arsenic has been reported in small veins outcropping along the Koksilah River which flows northeast into Cowichan Bay, Victoria district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 31).

92 F/2 A specimen of native arsenic in the National Mineral Collection is listed as having been collected at Port Alberni on Vancouver Island.

92 I/15 Colloform masses of native arsenic and dolomite form the matrix of a vein breccia that cuts carbonatized argillaceous sediments at Criss Creek, one-half mile from Deadman River road, north of the west end of Kamloops Lake (J.S. Stevenson, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 83).

92 O/1 Veins containing native arsenic have been found on Watson Bar Creek, about seven miles from its junction with the Fraser River (G.C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, 9 T).

103 B/6 An occurrence of native arsenic has been reported on Alder Island, 52°27'N, 131°19'W, north of Burnaby Island, Queen Charlotte Islands (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 31).

Ontario

41 I/6 Crystalline native arsenic has been noted at the Long Lake gold mine, near the south end of Long Lake and one and three-quarter miles west of Wavy Lake, Sudbury district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 31).

52 A/7 Native arsenic has been identified from Edward Island in Lake Superior about thirty miles east of Fort William (W.F. Ferrier: Canadian Record of Sciences, IV, p. 472). The X-ray powder pattern of arsenic from Edward Island has four strongest lines with the following spacings and intensities: 3.53 (3), 2.78 (10), 2.05 (5) and 1.88 (5) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

31 H/12 Fist-size specimens of native arsenic were found in nepheline syenite on the northwest flank of Mount Royal at the Corporation Quarry, Outremont (Montreal). Chemical analysis by N.N. Evans: As 98.14, Sb 1.65, S 0.16, insol. 0.15, total 100.10; S.G. 5.73-5.75 (N.N. Evans, 1903: Am. J. Sci., Ser. 4; and F.D. Adams, 1901: Geol. Surv. Can., Ann. Rept., XIV, 23 O).

ARSENOLITE

As_2O_3

British Columbia

92 O/1 Arsenolite occurs as a white coating on native arsenic from Watson Bar Creek, about seven miles from its junction with the Fraser River (G.C. Hoffmann, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 30 R). The X-ray powder pattern of arsenolite from Watson Bar Creek shows seven strongest lines having the following spacings and intensities: 6.37 (8), 3.20 (10), 2.77 (5), 2.54 (6), 1.96 (5), 1.67 (5) and 1.55 (5) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 C/12 Arsenolite occurs as an alteration product of arsenopyrite at the Deloro Mine, lot 9, conc. VIII, Marmora Township, Hastings County (W.G. Miller, 1902: Ont. Bur. Mines, Ann. Rept., vol. 11, p. 195).

31 M Arsenolite has been noted in silver-bearing veins in the Cobalt camp (G.C. Hoffmann, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 30 R).

ARSENOPYRITE

FeAsS

Arsenopyrite, also known as mispickel, is the most abundant arsenic-bearing mineral and is found widely distributed throughout Canada in varying environments. It is a common mineral in gold-bearing quartz veins, nickel-silver-cobalt, and lead-zinc-silver veins, and high temperature tin-tungsten veins. Danaite is a name given to cobaltian arsenopyrite. Known occurrences of arsenopyrite are too numerous to list here, and only a few localities that have yielded good specimens are mentioned.

British Columbia

82 F/4 Good specimens of cobaltian arsenopyrite have been obtained from the Josie and Evening Star mines near Rossland. Chemical analysis by Johnston: As 46.41, S 19.21, Fe 28.91, Co 2.97, insol. 3.86, total 101.36. S.G. 6.166. Analysis recalculated to 100 per cent after deducting siliceous impurities: As 47.60, S 19.70, Fe 29.65, Co 3.05 (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 13 R). The X-ray powder pattern of cobaltian arsenopyrite from the Evening Star Mine shows five strongest lines having the following spacings and intensities: 3.65 (4), 2.67 (7), 2.42 (10), 1.82 (8) and 1.63 (5) (X-ray Laboratory, Geol. Surv. Can.).

92 J/15 Danaite, bearing 1 to 6 per cent cobalt, occurs on the Gem Group, about 25 miles northwest of the main Bridge River camp. It is found in pegmatite lenses near the contact of the Coast Range batholith. Associated minerals are allanite, molybdenite, and uraninite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 43).

Manitoba

63 K/16 Good crystals of arsenopyrite have been found in mica schist at the Minto claim near Snow Lake in the Herb Lake district (National Mineral Collection).

Northwest Territories

85 J/8 Most of the gold mined at Yellowknife is believed to occur as submicroscopic inclusions and possibly in solid solution in arsenopyrite. Fine blebs of native gold have been found around the grain boundaries and in fractures of arsenopyrite (R.C. Tait, 1961: Bull. Can. Inst. Mining Met., vol. 54, No. 588, p. 302).

Nova Scotia

11 F/5 Well-formed crystals of arsenopyrite up to 1/2 inch in cross-section have been found in fine-grained mica schist near Guysborough (National Mineral Collection).

Ontario

31 C/12 Many fine specimens of arsenopyrite have been collected at the Deloro Mine, lot 9, conc. VIII, and Gawley Mine, lot 19, conc. IX, in Marmora Township, Hastings County.

31 M/5 Massive, silver-white to steel-grey danaite was found forming a vein up to 6 feet wide at the 400-foot level of the O'Brien Mine at Cobalt. It was originally thought to be smaltite but was found to contain only 3.5 per cent Co. It has been studied using X-ray
31 M/5 (by M.A. Peacock), polished section, and chemical analysis (M.H. Frohberg, 1960: private communication).

41 I/6 Massive arsenopyrite occurs in a deposit worked for nickeliferous pyrrhotite in lot 6, conc. III, Graham Township, Sudbury district. Chemical analysis by Johnston: As 40.16, S 17.92, Fe 31.69, Co 3.89, Ni 0.88, Sb 0.57, Au trace, insol. 4.77, total 99.88; S.G. 5.988. Analysis recalculated to 100 per cent after deducting siliceous impurities: As 42.22, S 18.84, Fe 33.32, Co 4.09, Ni 0.93, Sb 0.60 (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 19 R).

Specimens of danaite have been obtained from a locality in Graham Township, conc. IV, lot 4, in the Algoma district (National Mineral Collection).

Quebec

31 F/10 Danaite occurs in Pontiac County, Calumet Township, range IX, lot 12 (National Mineral Collection).

ASBESTOS

(See serpentine, actinolite, anthophyllite, crocidolite)

ASHTONITE

(See mordenite)

AUGITE

$Ca(Mg, Fe, Al)(Al, Si)_2O_6$

Augite is the most abundant variety of pyroxene occurring in igneous rocks. It is especially common in basic and ultrabasic rocks such as diabase, gabbro, basalt and andesite. The X-ray powder pattern has five strongest lines with the following spacings and intensities: 2.99 (10), 1.62 (10), 1.43 (10), 1.08 (10), 1.07 (10) (A.S.T.M. card 3-0623).

Ontario

41 P Augite is the chief ferromagnesian mineral of diabase in the Gowganda mining division, Timiskaming district. It is faint reddish brown in transmitted light and shows no crystal outlines except in incomplete crystallized basaltic rock types. By decomposition it changes to a hornblende with strong blue-green pleochroic coloration. Chemical analysis by M.F. Connor (1913): SiO_2 48.00, Al_2O_3 4.31, Fe_2O_3 3.06, FeO 17.34, MgO 9.82, CaO 14.84, Na_2O 0.91, K_2O 0.15, H_2O^+ 1.00, H_2O^- 0.07, TiO_2 0.91, total 100.40 (100.41) (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 347).

Quebec

31 H/11 Chemical analysis of a crystal of augite from olivine dolerite comprising a large part of Mont St. Bruno, Chambly Township: SiO_2 49.40, Al_2O_3 6.70, Fe_2O_3 7.83, CaO 21.88, MgO 13.06, Na_2O 0.74, volatile 0.50, total 100.11; S.G. 3.341 (T. Sterry Hunt, 1858: Geol. Surv. Can., Rept. Prog., p. 183).

AUROSTIBITE

$AuSb_2$

This mineral was described for the first time in 1952 from two localities in Canada. In polished section the mineral resembles galena but has a slight pinkish tinge. It has a pyrite-type crystal structure with $a = 6.646 \pm 0.003$ kX. The specific gravity is 9.91 (calculated), 9.98 (measured on synthetic material). The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.32 (5), 2.98 (4), 2.71 (3), 2.35 (4), 2.01 (10) (A.R. Graham and S. Kaiman, 1952: Am. Mineralogist, 37, p. 461).

Northwest Territories

85 J/9 Aurostibite occurs at the Giant Yellowknife Mine in dolomitic carbonate and quartz with gold, freibergite, stibnite, jamesonite, chalcostibite, bournonite, arsenopyrite, pyrite, chalcopyrite and sphalerite.

Ontario

32 D/4 At the Chesterville Mine, Larder Lake area, aurostibite occurs in quartz with gold, galena, tennantite, chalcopyrite, sphalerite, arsenopyrite, gersdorffite and pyrite.

AWARUITE

(See nickel-iron)

AXINITE

$Ca_2(Mn, Fe)Al_2BSi_4O_{15}OH$

British Columbia

92 H/8 Axinite is found as fine brown crystals and crystalline masses at the contact between monzonite and sedimentary rocks on the western slope of Nickel Plate Mountain, north of the junction of Hedley Creek and the Similkameen River. Chemical analysis by Johnston: SiO_2 42.18, B_2O_3 5.22, Al_2O_3 18.12, Fe_2O_3 0.98, FeO 7.20, MnO 3.89, ZnO 0.09, CaO 19.91, MgO 1.43, H_2O 0.35, total 99.37; S.G. 3.296 (R.A.A. Johnston, 1910: Geol. Surv. Can., Summ. Rept., p. 259).

Ontario

31 C/5 Axinite occurs in joints and thin seams in dark hornblende schist near a contact with granite gneiss at the extreme southeastern lot in Marmora Township, Hastings County. The mineral has a brilliant lustre when fresh but becomes dull purplish grey on exposure. It occurs as crystals as large as one and one-half inches in diameter, but with poor crystal forms. Chemical analysis by E.W. Todd: SiO_2 41.46, Al_2O_3 19.94, Fe_2O_3 0.96, FeO 4.56, MnO 5.44, CaO 19.57, MgO 1.99, H_2O 1.61, B_2O_3 4.88, total 100.41; S.G. 3.221 (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser.,16, p. 31).

42 A/6 Axinite has been found in vein quartz and calcite at the Moneta gold mine near Timmins. Chemical analysis by E.W. Todd: SiO_2 42.34, Al_2O_3 19.68, Fe_2O_3 1.90, FeO 5.28, MnO 3.38, CaO 20.27, MgO 1.24, H_2O 1.23, B_2O_3 5.16, total 100.48; S.G. 3.274 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser. 20, p. 20).

Quebec

31 M/3 Grey crystalline aggregates and scattered crystals of axinite in a quartz-calcite vein cutting diabase are reported to occur in lot 7, range VI, N, Fabre Township, Timiskaming district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 37).

33 N/11 Axinite is reported to occur at Manitounuck Sound on the east shore of Hudson Bay (G.M. Dawson, 1899: Geol. Surv. Can., Ann. Rept., XII, 193 A).

33 N/15 An occurrence of axinite, associated with epidote, in calcite and quartz is reported about one and one-half miles south of Little Whale River on the east side of Hudson Bay (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

Yukon Territory

115 P/10 Axinite is reported to occur at May Creek, in the McQuesten River valley. The X-ray powder pattern of the above mineral has four strongest lines at the following spacings and intensities: 3.44 (8), 3.14 (6), 2.79 (10) and 1.99 (4) (X-ray Laboratory, Geol. Surv. Can.).

AZURITE

$Cu_3(CO_3)_2(OH)_2$

Very few good specimens of azurite have been found in Canada. It usually occurs with malachite as a stain or light incrustation on copper minerals or copper-bearing rocks. The X-ray powder pattern of azurite shows four strongest lines having the following spacings and intensities: 5.13 (8), 3.67 (6), 3.53 (10) and 2.52 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 E/2 King Solomon Mine, near Greenwood (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, 20 R).

82 F/6 Eureka Mine, Nelson area (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 37).

82 F/14 Kaslo River, Ainsworth mining division (A.R.C. Selwyn, 1892-3: Geol. Surv. Can., Ann. Rept., VI, 77 A).

82 G/12 Near Fort Steele (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 37).

104 P/3 Azurite and malachite occur with chalcopyrite, pyrite, and hematite in two deposits in the McDame map-area, 1 1/2 miles south of the mouth of Nizi Creek on the east side of the trail along Four Mile River; 2 miles north of McDame. Both deposits are in greenstone (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 113).

New Brunswick

21 G/1 Azurite is found on Frenchman Creek in Saint John County (W.L. Goodwin, 1938: Geology and Minerals of New Brunswick, 1st. Edition, Industrial and Educational Pub. Co., Gardenvale, Que.).

21 H/4 At Beveridge County in Saint John County, in a shear zone (F.J. Alcock, 1938: Geol. Surv. Can., Mem. 216).

21 H/10 At Little Ridge and Midway in Albert County, in sandstone and conglomerate (W.J. Wright, 1951: New Brunswick, Mines Br., Paper 51-2 P).

21 H/15 Near Dorchester, Westmorland County (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, 284 A).

Nova Scotia

21 H/1 Azurite is one of the supergene minerals at the Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton (R.W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Ontario

32 D/4 Morrissette Township (D.G.H. Wright, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 62).

41 P/5 Azurite has been noted at a prospect on the south side of a narrow peninsula near the outlet of Clam Lake, Chester Township; also at the Lawrence Group showings on the east side of Mesomikenda Lake in the northeast corner of Chester Township (H.C. Laird, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, pp. 27, 33).

41 P/9 Conc. II, lot 10, and conc. III, lots 10 and 11 in Bryce Township (W.W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. IV, p. 35).

52 A/3 Batchewanung Bay and Spar Island, Thunder Bay district, Lake Superior (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

52 F/15 Dryden gold-mining area (Ellis Thomson, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 180).

Quebec

21 L/12 At the Black River Mine, St. Flavien, Lotbiniere County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

31 H/10 Prince of Wales Mine, Upton, Bagot County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

Yukon Territory

105 D/11 Whitehorse copper belt, near the town of Whitehorse (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 377).

BADDECKITE

(See muscovite)

BARITE

$BaSO_4$

Barite is of widespread occurrence in Canada and has been mined since about 1866. The first production is reported to have come from Bass River, near Five Islands, Colchester County, Nova Scotia. Barite occurs in vein or bedding replacement deposits in many types and ages of host rock but is most commonly found replacing limestone of Paleozoic and Precambrian age. The minerals usually associated with barite are: quartz, calcite, fluorite, dolomite, siderite, celestite, galena, sphalerite and chalcopyrite. Although calcium, strontium and lead may substitute for barium in the lattice, an examination of 54 X-ray powder patterns of barite on file at the G.S.C. shows no marked differences in d-spacings. The spacings and intensities of the four strongest lines on the barite pattern are at 3.43 (8), 3.30 (6), 3.10 (8) and 2.11 (10) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 E/1 A specimen of barite from the Rock Candy Mine, located about 15 miles north of Grand Forks is in the National Mineral Collection.

82 F/14 The Ottawa Mine, Calumet, Hekla and Myrtle claims, Slocan City mining division, have yielded barite (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 38).

82 G/4 Barite from Phillips Creek, near Roosville, near the International Boundary east of the Kootenay River, is represented in the National Mineral Collection.

82 G/6 The National Mineral Collection includes barite from near Elko.

82 K/2 The orebodies at the Mineral King Mine, 28 miles southwest of Invermere consist essentially of galena and sphalerite in a predominantly barite gangue. Barite was produced from this deposit in 1959 and shipped to Rosalind, Alberta, for grinding and bagging (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 40).

82 K/8 During 1959, barite was mined by open-pit methods from a vein on the Harrobee claim, about 10 miles west of Invermere (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 41).

82 K/16 A barite deposit located four miles by road west of Brisco siding has been worked annually on a seasonal basis since 1945. The main barite zone is more than 40 feet wide and 800 feet long, and occupies a fault zone in dolomitic limestone (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 39).

The tailings pond at the abandoned Giant Mine, located seven miles west of Spillimacheen contains an estimated 800,000 tons of material containing 40 per cent barite (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 42).

82 M/4 Barite, associated with galena, occurs in a bedded rock at Adams Lake (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, 21 A).

82 N/2 A barite vein deposit, located six miles by road southwest of Parson, has been mined annually on a seasonal basis since 1941 (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 38).

92 B/13 Tyre and Mount Sicker copper mines, northwest of Duncan, contain barite (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 38).

93 A/6 Barite is associated with lignite along the Horsefly River (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, 99 A).

94 K/10 Exploration work has been carried out on a barite deposit near mileage 397 on the Alaska Highway (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 42).

94 M/8 A large witherite-fluorite-barite deposit occurs near mileage 498 on the Alaska Highway (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 43).

104 P/3 Barite with sparsely disseminated galena was noted along the north bank of Dease River, south of Atan Lake, McDame map-area (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

Manitoba

62 P/7 Barite occurs in veins in serpentine on Pipestone Island, Lake Winnipeg (J.B. Tyrrell, 1898: Geol. Surv. Can., Ann. Rept., XI, 54 G).

New Brunswick

21 B/15 Small veins containing barite have been noted at the northern head of Grand Manon Island, Charlotte County (L.W. Bailey, 1897: Geol. Surv. Can., Ann. Rept., X, 125 M).

21 G/2 Barite occurs on Frye Island in Charlotte County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st. Edition, Industrial and Educational Pub. Co., Gardenvale, Que.).

21 H/5 Barite occurs associated with manganese at Quaco Head, in Saint John County (New Brunswick Mines Br. files).

21 H/10 The gangue material at the Teahan Prospect at the junction of Kierstead and Bartlet Brooks on the head waters of Upper Salmon River, includes barite, quartz, and calcite. Ore minerals not in sufficient quantity for economical mining, include pyrite, chalcopyrite, tennantite, sphalerite and galena (A.J. Smith, 1962: Geol. Surv. Can., Paper 62-22, p. 11).

21 H/11 Barite occurs associated with manganese at Markhamville in Kings County (New Brunswick Mines Br., files).

21 I/2 Barite occurs in sulphide-bearing veins in shale at Gouldville in Westmoreland County (W. L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st. Edition, Industrial and Educational Pub. Co., Gardenvale, Que.).

21 J/4 Barite is associated with galena in a vein at Woodstock in Carleton County (P.W. Richardson, 1959: New Brunswick Mines Br., files).

21 J/10 Barite occurs as nodules in slate on Lower Birch Island in York County (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

21 O/16 Barite occurs associated with sulphides on the Jacquet River, in Restigouche County (New Brunswick Mines Br., files).

Newfoundland

1 M/10 Small amounts of barite occur at Cape Mille and on the west side of English Harbour East (D.A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 55).

12 A/15 The zinc-lead-copper ore at the Buchans Mine on the northwest shore of Red Indian Lake contains about 30 per cent barite gangue. An estimated 170,000 tons of barite enters the tailings pond at this mine each year (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 44).

12 B/10 Barite and celestite are associated with calcite, aragonite, galena and pyrite at Portau Port (G.C. Riley, 1963: Geol. Surv. Can., Mem. 303, p. 55).

Northwest Territories

75 L/7 A barite-calcite vein having a maximum width of 50 feet outcrops for a distance of 200 feet, about 4 miles southwest of Snowdrift (F.Q. Barnes, 1951: Geol. Surv. Can., Paper 51-6, p. 29).

Nova Scotia

11 E/3 A barite deposit near Middle Stewiacke, Colchester County was mined in the late 1890's (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 44).

11 E/5 Fine specimens of barite crystals have been found in veins in slates exposed along the Bass and East rivers, Colchester County (H. Fletcher, 1890-1: Geol. Surv. Can., Ann. Rept. V, 192 P).

11 E/5 White, pink and flesh-coloured barite crystals have been noted in ankerite veins near Londonderry (H. Louis: Nova Scotia Inst. Nat. Sci., V, pp. 47-57).

11 E/6 Barite occurs abundantly in a brecciated zone between rocks of the Horton and Windsor groups at the Brookfield deposit about 12 miles south of Truro, Colchester County (I.M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 70).

11 E/12 Crystalline aggregates of barite occur in conglomerate at Atkinson, Cumberland County (R. Bell, 1902-3: Geol. Surv. Can., Ann. Rept., XV, 166 AA).

11 E/15
11 F/10
11 F/14
11 F/15
R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 39, reports the following barite occurrences: Hodson, five miles east of John River, Pictou County; L'Archeveque, Richmond County; Judique, near Cap Rouge, Inverness County; and Loch Lomond, Richmond County.

11 K/3 Large reserves of barite are known to occur in veins at the Campbell-MacMillan, Trout Brook, Johnson, McDougal, McKinnon and other deposits in the Lake Ainslie district, Inverness County, Cape Breton Island (J.S. Ross, 1960: Can. Dept. Mines, Mines Br. Info. Circ., 126, p. 44).

21 H/1 The Magnet Cove Barium Corporation Mine and Quarry is located about 2 1/2 miles southwest of Walton. The primary minerals in the deposit are barite, galena, sphalerite, pyrite, tennantite, proustite, chalcopyrite, argentite, gersdorffite, hematite, siderite, dolomite, calcite and chlorite. The majority of the barite is fine grained, often with a microcrystalline sugary texture. It is pink, red or cream in colour; banded or mottled in appearance, and contains inclusions of bitumen and/or petroleum (R.W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

21 H/7
21 H/8
21 H/9
R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 39, reports the following barite occurrences: Two Islands, Cumberland County; Five Islands, Colchester County; and on the south bank of Black Brook, near Springhill, Cumberland County.

Ontario

31 C/6 Concession XII, lot 13, Huntington Township, Hastings County (specimen in National Mineral Collection).

31 C/7 Barite occurs with anthraxolite in veins in conc. IV, lots 16 and 17, and conc. V, lots 15 and 16, Kingston Township, Frontenac County (R. Bell, 1901: Geol. Surv. Can., Ann. Rept., XIV, 181 A).

31 C/8 Dog Lake, Storrington Township, Frontenac County (E.D. Ingall, 1900: Geol. Surv. Can., Ann. Rept., XIII, 138 A).

31 C/9 Concession X, lot 24, Bastard Township, Leeds County (G.M. Dawson, 1900: Geol. Surv. Can., Ann. Rept., XIII, 138 A).

31 C/10 Barite veins in crystalline limestone have been reported in conc. VI, lot 16, Bedford Township and conc. I, lot 1, Hinchinbrooke Township, Frontenac County (W.D. Harding, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. VI, p. 41).

31 C/11 Concession IV, lot 1 and conc. X, lot 9, Madoc Township, Hastings County (specimens in the National Mineral Collection).

31 C/12 Concession VI, lot 15, Madoc Township, Hastings County (E.D. Ingall, 1897: Geol. Surv. Can., Ann. Rept., X, 136 S).

31 C/15 Barite veins occur in crystalline limestone in conc. I, lot 25, and conc. VI, lot 16, Oso Township, Frontenac County (W.D. Harding, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. 6, pp. 40-1).

31 C/16 Barite veins are reported in conc. VIII, lot 2; conc. IX, lot 4; and conc. X, lot 20; North Burgess Township, Lanark County. A small amount of barite was produced from the latter deposit in the early 1920's (W.R. Rogers, 1922: Ont. Dept. Mines, Ann. Rept., vol. 32, Pt. I, p. 21).

31 D/8 Dummer and Galway Townships, Peterborough County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

31 D/10 Summerville Township, Victoria County (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22 T).

31 F/1 Concession IV, Ramsay Township, Lanark County (W.G. Miller, 1900: Ont. Dept. Mines, Ann. Rept., p. 195).

31 F/2 Concession I, lot 22, Lavant Township, Lanark County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 39).

31 F/8 Massive and coarsely crystalline barite occurs in Trenton limestone in conc. VII, lot 27, Huntley Township, Carleton County (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, 19 R).

31 F/8 Concession XI, lot 3, Pakenham Township, Lanark County (A.R.C. Selwyn, 1886: Geol. Surv. Can., Ann. Rept., II, 59A).

31 F/9 Strontian barite (barytocelestite) is reported from the Kingdon lead mine at Galetta. A chemical analysis gave 81.5 per cent $BaSO_4$, 18.5 per cent $SrSO_4$ (E.L. Bruce and M. Light, 1927: Am. Mineralogist 12, p. 396).

31 G/5 Concession IV, lot 21, March Township, Carleton County (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, 19R).

31 L/5 Red crystals of barite are reported from Iron Island in Lake Nipissing (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 23 T).

41 P/9 Barite is fairly abundant near Elk Lake, Timiskaming district (W.W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. 4, p. 19).

41 P/15 Two barite veins, five and six feet wide, separated by a band of quartzite occur near Yarrow Lake, Yarrow Township, Timiskaming district (A.G. Burrows, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 238).

Barite has been reported in veins occupying post-ore faults at the Lake Shore and Wright-Hargreaves Mine, Kirkland Lake district (J.E. Hawley, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V, p. 122).

42 A/1 A barite vein occurs in a red syenite at the Biederman deposit on the west shore of Browning Lake in the northern part of Cairo Township, Matachewan area (A.G. Burrows, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 237).

42 A/6 Barite has been mined at the Premier Langmuir Mine on Night Hawk River about 15 miles southeast of South Porcupine (L. Smith, et al., 1945: Ont. Dept. Mines, Ann. Rept., vol. 54, Pt.II, p. 2).

42 B/1 A barite vein occurs in sheared pegmatite at the Ravena deposit, near Tionaga in Penhorwood Township (T.L. Gledhill, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. VI, pp. 15-17).

42 D/13 McKay's Harbour, Rossport Station, Thunder Bay district (specimen in National Mineral Collection).

42 D/14 A narrow barite-fluorite vein assaying 2 ounces of silver per ton was found in a fault at the 90-foot falls near the mouth of Black River. Small veins of barite were also noticed in porphyritic hornblende-biotite granite near mileage seven on the railway between Selim and Horn siding (P.E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. IV, pp. 7-8).

52 A/3 Barite veins occur on Jarvis, McKellar and Pie Islands in the Thunder Bay district, Lake Superior (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22-3 T).

52 A/6 Barite is abundant in many veins in Neebing Township (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 22-3 T).

Quebec

22 A/3 Barite has been noted at Port Daniel and along the streams flowing into the Gaspé Basin, Bonaventure County (R.W. Ells, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 115 R).

31 G/11 A barite vein, six to fourteen inches wide, is reported to occur at range IV, lot 21, Buckingham Township, Papineau County (E.D. Ingall, 1897: Geol. Surv. Can., Ann. Rept., X, 135 S).

31 G/12 In Hull Township, Gatineau County: range X, lot 7; range XI, lot 3; and range XII, lot 4 (R.W. Ells, 1899: Geol. Surv. Can., Ann. Rept., XII, 43 G and 135 J); also range XII, lot 2 (specimen in National Mineral Collection).

In Templeton Township, Papineau County: range VI, lots 11 and 28 (B.J. Harrington, 1873-4: Geol. Surv. Can., Rept. Prog., p. 220); range XI, lot 10, Blackburn Mine, North of Perkins Mills (K.K. Landes, 1938: Am. Mineralogist 23, p. 372); range XII, lot 12 (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 66-7 T).

BARYLITE

$BaBe_2Si_2O_7$

Newfoundland

13 K/5 Barylite is associated with lenticular bodies of alkali syenite intruding Precambrian rocks at Seal Lake, Labrador. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 3.35 (vs), 2.93 (ms) and 2.45 (ms) (E.W. Heinrich and R.W. Deane, 1962: Am. Mineralogist 47, p. 758).

BARYTOCALCITE

$CaBa(CO_3)_2$

British Columbia

94 M/8 Barytocalcite has been identified by X-ray powder pattern as a major constituent in a specimen of drill core from a deposit north of the Alaska Highway at about mile 498. The five strongest lines in the X-ray powder pattern are: 4.33 (5), 4.00 (6), 3.12 (10), 2.37 (4) and 2.00 (5) (X-ray Laboratory, Geol. Surv. Can.).

BASSANITE

$CaSO_4 . 1/2\ H_2O$

The name bassanite appears to have priority over soluble anhydrite, hemi-hydrate of gypsum, and vibertite. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 5.98 (9), 2.98 (10), 2.78 (10) and 1.84 (9) (A.S.T.M. X-ray data card 2-0675).

Nova Scotia

21 H/16 Bassanite is reported to be an abundant constituent in the upper 1000 feet of well borings drilled at Nappan, Cumberland County (N.R. Goodman, 1957: Geology of Canadian Industrial Mineral Deposits, special publication of the C.I.M.M., p. 111).

BASTNAESITE

$(La, Ce)FCO_3$

British Columbia

82 F/13
82 F/14 Small amounts of bastnaesite have been identified in granodiorite augen gneiss near the mouth of Gwillim Creek. The four strongest lines in the X-ray powder pattern have the following spacings and intensities: 3.54 (10) 2.85 (10), 2.04 (8) and 1.88 (6) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 D/16
31 E/1 Bastnaesite has been identified (X-ray Laboratory, Geol. Surv. Can.) in mineral specimens from the following localities in the Bancroft area. (1) Blue Rock Cerium Mines Limited property in lots 18, 19, 20, concs. V, VI, Monmouth Township, Haliburton County. (2) Centre Lake property, Bicroft Uranium Mines Limited, lots 26, 27, conc. XI, Cardiff Township, Haliburton

31 D/16 31 E/1 County. (3) Croft property, Bicroft Uranium Mines Limited, at the intersection of Cardiff, Herschell and Faraday Townships, Haliburton and Hastings counties. (4) Lot 9, conc. XVI Chandos Township, Peterborough County.

BECQUERLITE

near $7UO_3.11H_2O$

Saskatchewan

74 N/10 Becquerlite occurs as bright orange-coloured crusts surrounding areas of yellow-green uranopilite on surfaces of massive hematite-pitchblende intergrowths. The mineral has been identified at two deposits in the Beaverlodge area, Lake Athabasca (S. C. Robinson, 1955: Geol. Surv. Can., Bull. 31, p. 71). The X-ray powder pattern of becquerlite from the Bolger showing has four strongest lines at 7.51 (10), 3.74 (5), 3.54 (7) and 3.19 (8) (X-ray Laboratory, Geol. Surv. Can.).

BERTHIERITE

$FeSb_2S_4$

British Columbia

103 P/14 Slender needles of berthierite have been identified in a specimen of quartz vein from Kitsault Lake, 20 miles north of Alice Arm at the headwaters of the Kitsault River (R.M. Thompson, 1951: Am. Mineralogist 36, p. 504).

New Brunswick

21 G/14 Berthierite is reported to have been found at the old antimony mine north of Lake George, in Prince William parish (G.C. Hoffmann, 1888-9: Geol. Surv. Can., Ann. Rept., IV, 23 T).

Northwest Territories

85 J/8 Berthierite occurs mainly with abundant pyrite or arsenopyrite in gold deposits of the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist 38, p. 516). The X-ray powder pattern of berthierite from Yellowknife has four strongest lines at 3.66 (9), 2.62 (10), 1.89 (7) and 1.76 (6) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

42 E/10 Ellis Thompson has identified berthierite in two polished sections of ores from the Little Long Lac Mine and Talmora Mine in Errington Township. The mineral is closely associated with arsenopyrite and stibnite (E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60,Pt. VI, p. 57).

52 N/4 At the Cochenour Willans Mine, Dome Township, berthierite occurs in massive steel-grey aggregates up to the size of a fist. It is closely associated with stibnite near the fringe of high-grade ore shoots. Other associated minerals include jamesonite, tetrahedrite, pyrite, pyrrhotite, arsenopyrite and gold. The berthierite has been identified by X-ray powder pattern by E.W. Nuffield and R.M. Thompson (M.H. Frohberg, 1960: private communication).

BERYL

$Be_3Al_2(SiO_3)_6$

Beryl is the most common beryllium mineral. It occurs in granite pegmatites, high-temperature and pegmatitic quartz veins, and as disseminations in granite. In pegmatite, beryl is usually concentrated with quartz and muscovite, although in well-zoned lithium-bearing pegmatites it is mostly found outside the lithium and quartz-rich core zones. Cleavelandite and tourmaline are commonly associated, and topaz may occur under similar conditions. Beryl is found with molybdenite in the Priessac-Lacorne district, Quebec, and with wolframite at the Burnt Hill Mine in New Brunswick. The occurrences listed below, unless otherwise noted, are taken from Geol. Surv. Can., Paper 60-21: Beryllium Occurrences in Canada, by R. Mulligan (1960). The X-ray powder pattern of beryl from Bernic Lake, Manitoba, has five strongest lines at 7.96 (9), 4.62 (6), 3.25 (10), 3.02 (6) and 2.87 (10) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F/7 Beryl was found as large blue-green crystals, associated with garnet, magnetite and tourmaline in a pegmatite dyke just south of Midge Creek about one mile from Kootenay Lake.

82 F/9 Small crystals and larger irregular masses of whitish beryl occur in a pegmatite exposed along the road to the Boy Scout property, which is about three miles south of St. Mary Lake. Beryl is reported to have been found also on Angus Creek. Minerals associated with beryl in the pegmatite include muscovite, tourmaline and galena.

82 F/16 Blue-green beryl occurs locally with tourmaline in pegmatites along the borders of the White Creek batholith. One particular locality is west of peak 9,010 on the ridge between the sources of White and Skookumchuck creeks.

A few crystals of pale glossy beryl have been found in pegmatite dykes cutting Aldridge quartzite and dioritic intrusions north of the first west fork of Burnt Creek, a tributary of Skookumchuck Creek, and also north of Burnt Creek about two miles farther upstream.

82 L/16 Beryl is reported to occur in a pegmatite dyke at the lower edge of the great snowfield on the northeast side of Mount Begbie, about eight miles south of Revelstoke. It is associated with black, and a little red and green tourmaline, garnet and lepidolite.

82 N/4 Pegmatites containing beryl have been found on the Snowflake trail a short distance from the railway. The trail follows Woolsey (Silver) Creek about two miles west of Albert Canyon.

83 D/14 Beryl has been identified at the Bonanza mica mine, on Mica Mountain about seven miles south of Tete Jaune Cache. Topaz has also been reported from this locality.

94 C/7 Pale bluish green beryl has been found in a pegmatite dyke in the Butler Range, west of Findlay River. Pegmatites are particularly abundant in the area five to ten miles south of Fort Grahame.

94 D/8 Beryl crystals have been observed in a block of pegmatite in a moraine near the source of Dortatelle Creek.

104 O/13 Small bluish green crystals and irregular masses of beryl are reported to occur in granitic dykes in the Jennings River area at latitude 59°59'30"N, longitude 131°36'W.

104 P/7 Pegmatites composed of feldspar, quartz, muscovite, tourmaline, garnet and minor beryl occur at the heads of three westerly flowing creeks, known locally as Moosehorn, Camp and Mica creeks, about 3 1/2 miles northwest of the highest peak (7,300 feet) in the Horseranch Range.

Manitoba

52 E/11 On the Lucy and Artdon claims, located one-half mile north of the Trans-Canada Highway at a point 6.6 miles east of the East Braintree turnoff, beryl is reported to have been found in pegmatite dykes, where it is associated with spodumene and abundant tourmaline.

52 L/6 At the Montgary property near the west end of Bernic Lake, white beryl is sparsely scattered through the outermost zones of a

52 L/6 complex pegmatite dyke. The dyke is noted for rich concentrations of pollucite and spodumene.

At the Buck and Coe claims at the east end of Bernic Lake, beryl occurs as a minor component of zoned lithium-bearing pegmatite dykes.

A number of pegmatite bodies near the east end of Shatford Lake contain beryl. Associated minerals include muscovite, lithium muscovite, topaz, monazite, columbite-tantalite, euxenite and gadolinite.

Several claims in the vicinity of Greer Lake, south of Winnipeg River, have been examined for beryllium. At the Huron claim, yellow-green beryl crystals up to 18 inches across are exposed in the sides of a pit. Columbite-tantalite, cleavelandite, quartz, tourmaline and mica are also present. Rich pockets of beryl are reported to have been found on the Grace claim; other occurrences are reported on the Clare No. 1, Captain, and Top of the World claims.

Crystals of milky white, and greenish to colourless transparent beryl have been found in a zoned pegmatite dyke on the Bear (Silverleaf, Bob) claim located three miles south of east from Lamprey Falls on the Winnipeg River. Chemical analysis of the greenish beryl: SiO_2 65.83, Al_2O_3 19.01, BeO 12.74, Fe_2O_3 0.49, CaO 0.84, MgO 0.08, Na_2O 0.43, H_2O 0.08, total 99.50 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 156).

Silver Leaf Mining Syndicate, lot 17, range 16, township 16, Oiseau River map-area, Manitoba. Chemical analysis of beryl by R.J.C. Fabry (1928): SiO_2 64.59, Al_2O_3 22.98, Fe_2O_3 0.21, FeO 0.11, MgO 0.23, CaO 0.41, Na_2O 1.08, K_2O 0.33, H_2O 0.22, TiO_2 nil, P_2O_5 nil, MnO 0.02, Li_2O 0.14, BeO 10.06, total 100.38. Note: K_2O includes R_2O, Cs_2O (J.A. Maxwell, et al., 1965: Geol. Surv. Can., Bull. 115, p. 345).

52 L/11 Beryl is a minor constituent of spodumene-bearing pegmatites that occur around Cat Lake at latitude 50°37'N, longitude 95°27'W.

63 J/13 Beryl was found in the outer zones of three pegmatite dykes north of a small lake about 2 1/2 miles southeast of Crowduck Bay, Wekusko Lake. A few crystals of golden beryl are reported to have been found in a trench half a mile west of the narrows of Crowduck Bay.

63 K/3 In the Birch Portage area, 40 miles west of Flin Flon, a series of beryl-bearing pegmatite dykes occur. Many of the beryl crystals are euhedral, the largest measuring 10 inches by 4 inches; the average size being 1/4 inch to 1/2 inch. The pale green to white crystals occur with pink to white feldspar and white to smoky

63 K/3 quartz, and trace amounts of biotite, garnet, titaniferous magnetite and monazite. In the wider dykes, the beryl appears to be confined to the centres (R.L. Cheesman, 1963: Precambrian, vol. 36, No. 3, p. 20).

New Brunswick

21 J/2 Small crystals of beryl, associated with tourmaline and a little molybdenite, occur in pegmatite stringers cutting granite on a ridge about 1 1/2 miles west of Zealand Station.

21 J/10 Beryl occurs with topaz, wolframite, molybdenite, minor cassiterite and a variety of sulphide and other minerals in a high-temperature quartz vein at the Burnt Hill Mine, on the south side of Southwest Miramichi River near Burnt Hill Brook.

21 P/12 Beryl occurs as small crystals disseminated in granite, northwest of Pabineau Lake about 10 miles southwest of Bathurst. The beryl is associated with molybdenite. In one trench beryl was found as sheaves of crystals 1/4 inch across and 3 inches long.

Newfoundland

11 B/9 A pegmatite body at a sharp bend in the highway south of Oxback Pond is reported to contain beryl as an accessory mineral with tourmaline, zircon, uraninite and magnetite.

Northwest Territories

75 N/12
75 N/15 Beryl has been reported as a minor constituent in pegmatite at latitude 63°44'N, longitude 109°55'W, Reid Lake; and at latitude 63°59'N, longitude 108°32'W, Aylmer Lake area.

76 O/9 A pegmatite at latitude 64°44'N, longitude 110°19'W, northwest of Paul Lake, contains minor beryl.

85 I/1 More than one ton of beryl crystals have been stockpiled at the Moose No. 2 dyke, the easternmost of two pegmatite bodies located just north of Hearne Channel, Great Slave Lake. The beryl occurs as white irregular crystals and masses chiefly in cleavelandite-quartz-muscovite intermediate zones and is commonly associated with spodumene. Scattered beryl crystals have also been noted in the Moose No. 1 dyke about 4,800 feet west of No. 2.

On the Tan claims, latitude 62°12'N, longitude 112°22'W, four pegmatite bodies are grouped around a small lake just west of 'Johnson' Lake, about 1 1/2 miles east of the southeast corner of Blatchford Lake. One of these dykes contains fine beryl crystals distributed around the margin of a pod of quartz.

85 I/1 Creamy white beryl is scattered throughout a cleavelandite-quartz-muscovite zone in a large pegmatite dyke which has been quarried on the Best Bet property. The property lies just north-west of the north-central part of a lake about three miles long that is known locally as Drever Lake, at latitude 62°14'N, longitude 112°18'W.

85 I/7 A few crystals of beryl, associated with some spodumene and columbite-tantalite, were found in a zoned pegmatite dyke on the north shore of Buckham Lake at latitude 62°20'N, longitude 112°40'W. The pegmatite dyke occurs on claims which have been known variously as Lit 1 and 2, Lita 5 and 6, and 'Campbell pegmatites'.

Beryl, amblygonite, lithiophilite and tantalite-columbite occur in a zone rich in spodumene in a pegmatite dyke about five miles southwest of the north end of Buckham Lake, at latitude 62°18'N, longitude 112°46'W. The property has been known variously as Lit 3, 'McDonald pegmatite', Ramona Group, and Lita 1 to 4.

85 I/8 Numerous beryl crystals occur with coarse spodumene, cleave-landite and quartz in a zoned pegmatite dyke, one of several large dykes that are located less than half a mile east of the east arm of 'Tanco Lake', southeast of François Lake at latitude 62°26'N, longitude 112°11'W.

85 I/11 Minor amounts of beryl have been noted in a zone of narrow peg-matite dykes extending some 1,600 feet southeastward from Sproule Lake, latitude 62°44'N, longitude 113°29'W. Other min-erals present include spodumene, amblygonite, lithiophilite, cassiterite and tantalite-columbite.

Beryl occurs in numerous dykes in the area between Ross and Redout Lakes. The best concentrations and largest crystals occur in well-zoned pegmatites that contain a core of quartz and perthite.

85 I/12 A.W. Jolliffe reports occurrences of beryl in 56 out of 100 peg-matite within an area of 10 square miles located about two to four miles north of Prelude Lake. The dykes are reported to be dis-tinctly zoned. Tourmaline and some tantalite-columbite are pres-ent but lithium minerals are generally absent.

85 I/13 Beryl has been noted by A.W. Jolliffe in 32 out of nearly 50 peg-matite dykes examined in the area around Blaisdell Lake. Most of these pegmatites carry tourmaline but no appreciable amounts of lithium minerals.

Several beryl and spodumene-bearing pegmatites occur north of Blaisdell Lake at latitude 62°50'N, longitude 113°34'W, immedi-ately southwest of 'Schist Lake'.

85 J/9 A pegmatite dyke just east of Bighill Lake contains beryl crystals associated with cleavelandite, quartz and abundant muscovite. Six occurrences of beryl are reported around the south end of a large granite mass east of Prosperous Lake.

Nova Scotia

20 P/14 Beryl is present, along with smaller amounts of tourmaline and molybdenite, in parts of a high-temperature quartz vein that has been exposed by trenching about one-half mile east of a point 3 miles by road north of Jordan Falls, Shelburne County.

20 P/15 Beryl has been found in pegmatites at several localities along a 17-mile strip of coast-line from Sandy Cove to Western Head, Queens County. The occurrences are in granite near its contact with quartzites and schists of the Meguma series. Some of the best showings are on the west shore of the southern part of Mouton Island; other occurrences are at Sandy Cove, Hunts Point, Wharf, Western Head, and in boulders at Summerville Beach.

21 A/10 Beryl was one of a large variety of minerals found in the early 1900's in a small pegmatite at Reeves Farm, about half a mile south of a point three miles by road west of New Ross, Lunenburg County.

Ontario

31 E/14 Beryl crystals having an aquamarine colour are reported to have been found with pink feldspar, quartz and muscovite, in a pegmatite dyke in conc. IV, lot 6, Paxton Township (private communication: G. Brown, Kearney, Ontario).

31 F/6 Beryl has been recovered and stockpiled at two pegmatite occurrences in conc. XV, Lyndoch Township – one on lot 23, and one on lots 30 and 31. The beryl is associated mainly with cleavelandite, quartz and reddish perthite. Columbite, euxenite, cyrtolite and monazite have also been found in these workings. Chemical analysis of beryl crystals from lot 23, by H. C. Rickaby: SiO_2 64.40, Al_2O_3 18.08, Fe_2O_3 0.97, BeO 14.38, CaO 0.18, MgO 0.33, MnO 0.04, K_2O 0.18, Li_2O 0.18, Na_2O 0.35, H_2O 1.08, total 100.17; S.G. 2.726 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 229) (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 12, also 1932, vol. 32, p. 23; and 1934, vol. 36, p. 19).

31 L/2
31 L/7 Beryl occurs in a pegmatite dyke just south of the road on conc. IV, lot 13, Calvin Township. Beryl has also been reported to be present in a dyke about a mile northwest of Eau Claire Station, and at the old Purdy Mica Mine about 3 miles north of Eau Claire Station, in Mattawan Township.

41 H/15 A few specimens of massive greenish blue beryl and several smaller crystals were found by H.V. Ellsworth (1932): at the Besner feldspar mine on lot 5, conc. B, Henvey Township.

42 L/10 Pegmatites near Saga Lake (latitude 50°41'N, longitude 86°52'W) are reported to contain small amounts of beryl.

52 B/13 Translucent yellow-green crystals of beryl two inches long were found in a pegmatite dyke at Turtle Lake, latitude 48°57'N, longitude 91°58'W.

52 F/13 Beryl was found in noteworthy amounts in two places on the east shore of Medicine Lake in Tustin Township, about 35 miles east of Kenora. A length of about 1,000 feet has been stripped and a number of trenches blasted out.

52 F/15 Small green crystals of beryl have been found in samples of pegmatite from lots 17, concs. VII and VIII, about 10 miles east of Dryden in Zealand Township. Beryl has also been reported in pegmatites northwest of Ghost Lake, about three miles farther northeast.

52 H/1 At the M.N.W. property, about 1 1/2 miles west of Cosgrave Lake, scattered white beryl crystals occur in the cleavelandite-quartz-muscovite zone of a pegmatite dyke. Beryl has also been found at the Swanson property in the same area.

52 I/10 Numerous quartz veins and granite and pegmatite dykes containing minor amounts of beryl outcrop in the vicinity of Linklater Lake.

52 L/7 A few small crystals of beryl have been noted in a pegmatite dyke on the east shore of the English River two miles northwest of Separation Rapids, and in a small dyke three miles west of Oneman Lake.

Quebec

21 L/7 Beryl-bearing pegmatites have been reported at the following localities in Drucourt and Johan Beetz Townships: on an island off the point on the southeast side of the entrance to Quetachow Bay; on a small island near the west side of the bay at the mouth of Watshishow River; and on the tip of a long point forming the east side of the same bay.

21 M/9 A few crystals of beryl are reported to have been found at a pegmatite worked for mica prior to 1908 at Lac Pied des Monts, about 17 miles northwest of La Malbaie, Charlevoix County.

22 C/5 Large beryl crystals were found in a pegmatite dyke in block G, north of Point aux Sauvages, Bergeronnes Township.

22 D/6 Two small beryl crystals were found in a pegmatite stringer on lot 1, range II, Kenogami Township, Chicoutimi County.

22 D/7 Beryl is reported to have been found on the dump of the Lac Xavier mica in Harvey Township, Chicoutimi County.

22 D/12 A pegmatite worked for mica prior to 1923 on lot 13, range V, Taché Township, Chicoutimi County, is reported to have contained some beryl and topaz.

31 G/13 The Villeneuve Mine, on lot 31, range I, Villeneuve Township, Papineau County, is a large pegmatite body that has been worked extensively for mica. Beryl is reported to have been found in the dyke.

31 J/12 Beryl is reported to have been found in a pegmatite dyke at the north end of Lac des Iles, about seven miles by road southwest of Mont Laurier, on lot 25, range IV, Robertson Township, Labelle County.

31 J/16 One crystal of beryl is reported to have been found at the Maisonneuve pegmatite, located about 10 miles northwest of St. Michel des Saints on lots 1 and 2, range II, Maisonneuve Township, Berthier County.

31 M/10 A massive pegmatite body near the northeast corner of Lac Expanse (Lac Simard) in Delbreuil Township, Temiskaming County contains abundant crystals of green beryl. The crystals occur as clusters and as single individuals in feldspar, quartz and micropegmatite and are closely associated with muscovite. Cleavelandite and spodumene are minor constituents.

31 M/15, 31 M/16, 31 N/13, 31 N/14 Scattered crystals of beryl have been found in pegmatites at the following localities: (1) a small island in Mourier Lake, Desroberts Township; (2) 1 1/2 miles east of Mourier Lake in range VIII, Desroberts Township; (3) a small island just south of Carriere Bay in range IX, Jourdan Township; (4) range IX, Chabert Township; (5) Rapide 7 road east of Ferguson Lake, Beraud Township; (6) lot 1, ranges IX and X, Darlens Township; (7) lot 40, range V, Basserode Township; (8) west of Grand Lake Victoria, Granet Township.

32 C/5 Beryl occurs in pegmatite bodies that are related to the Preissac-Lacorne batholith at a number of localities in Lacorne Township. Deep blue-green beryl is particularly abundant at the Lacorne molybdenite mine, in the southwest corner of the township, and has been recovered from a picking belt. The Massberyl property, in the southern part of range VIII, has been reported to be the most promising beryl property in the region. Beryl is also fairly abundant at the Valor property, in the southern part of lot 22, range VIII.

32 D/2 In Montanier Township, scattered crystals of pale green beryl occur in a spodumene-bearing pegmatite on the Rapid 11 road at about latitude 48°06'N, longitude 78°30'W. Pegmatites in Bellecombe Township are reported to carry some spodumene, beryl and molybdenite.

32 D/8 Beryl is associated with molybdenite and bismuthinite at the old Height of Land molybdenite mine on lot 22, range X, about one mile north of Preissac village. Phenacite has also been found at this locality.

32 L/6 About a dozen pale green crystals of beryl were observed in a pegmatite mass surrounded by hornblende schist on the east shore of the Harricana River at about latitude 50°20'N, longitude 79°00'W (J.W. Remick, 1960: private communication).

Yukon Territory

105 B/6 Scattered pale-green crystals of beryl have been observed in a pegmatite segregation in granitic rocks of the Cassiar batholith at about latitude 60°22'30"N, longitude 131°20'W.

BERZELIANITE

Cu_2Se

Saskatchewan

74 N/10 This rare copper selenide has been identified by X-ray diffraction pattern in specimens collected at the Eagle Group showings and Martin Lake Mine in the Lake Athabasca uranium camp. The berzelianite is present in minor amounts and occurs as rounded grains in umangite (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31, p. 55). The X-ray powder pattern has three strongest lines with the following spacings and intensities: 3.32 (8), 2.03 (10) and 1.72 (5) (X-ray Laboratory, Geol. Surv. Can.).

BETA-

(Minerals with the prefix beta are entered following the main mineral name).

BETAFITE

(See pyrochlore)

BEUDANTITE

$PbFe_3AsO_4SO_4(OH)_6$

New Brunswick

21 P Beudantite has been identified by X-ray diffraction as a constituent of gossans in the Bathurst-Newcastle area. Associated minerals include: pyrite, goethite, gypsum, melanterite and jarosite (X-ray Laboratory, Geol. Surv. Can.)

Yukon Territory

105 M/14 Beudantite is a common constituent of oxidized ore zones in the Keno Hill-Sourdough Hill-Galena Hill area where it occurs as yellowish to greenish coatings on, and fills fractures in, hypogene galena, freibergite and arsenopyrite. Identification has been made by X-ray diffraction in specimens from the following mining properties: Comstock, Hector-Calumet, Helen Fraction, Klondyke vein, MacLeod vein (Galkeno Mine), Mount Haldane (Little Big Horn Creek), Silver Basin Mine and Yukeno Mine (R.W. Boyle, 1955; 1957: Geol. Surv. Can., Papers 55-30, 57-1). The X-ray powder pattern has six strongest lines at 5.93 (9), 3.66 (7), 3.07 (10), 2.25 (6), 1.98 (6) and 1.83 (5) (X-ray Laboratory, Geol. Surv. Can.).

106 D/4 Beudantite has been found as a coating on arsenopyrite in heavy mineral concentrates from a placer at Dublin Gulch (X-ray Laboratory, Geol. Surv. Can.).

BINDHEIMITE

$Pb_2Sb_2O_6(O, OH)$

Yukon Territory

105 M/14 Bindheimite occurs as a yellow to yellowish green alteration product of hypogene minerals in oxidized ore zones in the Keno Hill-Sourdough Hill-Galena Hill area. Its occurrence at the following properties has been confirmed by X-ray powder pattern: Calumet-Hector, Comstock, Arctic and Mastiff, Dragon, and lower adit northwest of the Tin Can vein (R.W. Boyle, 1955: Geol. Surv. Can., Papers 55-30 and 57-1). The X-ray powder pattern has four strongest lines at 3.02 (10), 2.61 (5), 1.85 (7) and 1.58 (6) (X-ray Laboratory, Geol. Surv. Can.).

BIOTITE

$K(Mg, Fe)_3(AlSi_3O_{10})(OH)_2$

Biotite is a very common rock-forming mineral and, as such, its occurrences in Canada are too numerous to record in this publication. It is present in many igneous rocks, particularly those of intermediate to acidic composition, and is a common constituent of metamorphic rocks especially schists, gneisses and hornfels. The spacings and intensities of the strongest lines on the X-ray powder pattern of biotite are: 10.1 (10), 3.37 (10), 2.66 (8), 2.45 (8), 2.18 (8), 2.00 (8), 1.67 (8) and 1.54 (8) (A.S.T.M. card 2-0045).

Quebec

21 M/9 Biotite from Mine de Pied des Monts in the Murray Bay district exhibits pleochroic haloes along major and minor cleavage planes in such a way as to suggest that the nuclei were formed after the crystallization and rupture of the mica. The biotite can be cleaved into exceptionally thin sheets (D.E. Kerr-Lawson, 1927, 1928: Univ. Toronto Stud., Geol. Ser., No. 24, p. 54; and No. 27, p. 15).

31 H/14 Brown, pleochroic biotite forming euhedral pseudohexagonal crystals is found in the bed of the Achigan River downstream from the dam at L'Epiphanie. It is concentrated in the lower six inches of the Utica Shale where it overlies the Trenton limestone and is the first known authigenic occurrence of the mineral in that formation. The crystals average 0.4 millimetre in diameter and 0.1 millimetres thick and contain black carbonaceous inclusions (Mrs. J.S. Stevenson: private communication).

BISMITE

Bi_2O_3

A secondary mineral formed by oxidation of native bismuth and bismuth minerals. Four polymorphs of artificial Bi_2O_3 are known. The name bismite is given to the monoclinic polymorph, α-Bi_2O_3. The X-ray powder pattern of synthetic bismite has four strongest lines at 3.31 (3), 3.25 (10), 2.71 (4) and 2.69 (4) (A.S.T.M. card 14-699).

Ontario

31 F/6 Bismite has been found in Lyndoch Township, Renfrew County, conc. XV, lot 23, where its presence has been attributed to the alteration of bismuthinite (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, 14 R).

BISMUTH

Bi

British Columbia

92 H/8 At the Oregon property, about 3 miles east of Hedley (Osoyoos mining division) bismuth is found with massive garnet, hedenbergite, wollastonite, calcite, minor quartz, and sparsely disseminated sulphides and tellurides. Bismuth, molybdenite and gold are closely associated with hedleyite and joseite while bornite, chalcopyrite, cobaltite and safflorite occur apart and are locally abundant (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

104 M/9 Bismuth occurs at the Engineer Mine in the Atlin mining division associated with calaverite, gold and pyrite (E. Thomsom, 1936-37: Univ. Toronto Stud., Geol. Ser., No. 40, p. 97).

104 P/4 Small amounts of bismuth have been found in the McDame area about two miles northeast of the junction of Bass Creek and Cottonwood River. The bismuth occurs in a dense black skarn zone on the southwest slope of Needlepoint Mountain at the 5,000-foot level. Fluorite, magnetite, chlorite, quartz, carbonate and danalite are abundant (R.M. Thompson, 1957: Can. Mineralogist, 6, p. 69).

New Brunswick

21 G/2 At Letite (Oliver Lode) native bismuth occurs with gold and with copper minerals in quartz veins (New Brunswick Mines Br., files).

21 G/7 Bismuth is associated with tin-zinc deposits in rhyolite at Mount Pleasant, Charlotte County (R.A.A. Ruitenberg, 1963: Univ. New Brunswick, M.Sc. Thesis).

21 G/8 At Square Lake, Queens County, native bismuth and bismutite occur with wolframite and molybdenite (W.J. Wright, 1940: New Brunswick, Mines Br., Paper 40-3).

21 O/8 Native bismuth, bismutite and bismuthinite are minor constituents associated with the copper, lead and zinc deposits as at Heath Steele, Northumberland County (A.L. McAllister 1959: Can. Inst. Mining Met., New Brunswick Mines Br. reproduction).

Northwest Territories

75 L/5 Native bismuth has been identified in samples obtained from the Nix claim on the north shore of Sachowia Lake, north of the east arm of Great Slave Lake. Identification was made from X-ray powder patterns at the X-ray Laboratory, Geol. Surv. Can.

85 I/14 Bismuth occurs near Allan Lake, about fifty miles northeast of Yellowknife, in veins composed predominantly of quartz and containing less than one per cent metallic minerals. Arsenopyrite, chalcopyrite, sphalerite, gold, and tellurbismuth are found in the vicinity of the native bismuth (H.V. Warren and R.M. Thompson, 1949: Am. Mineralogist, 34, p. 458).

86 F/12 Specimens containing native bismuth have been found on the property of Camsell River Silver Mines (How Group) on the Camsell River, about twenty miles to the south of Great Bear Lake. They consist of a dolomite-quartz gangue with disseminated galena, chalcopyrite, pyrite, bismuth, and silver-bearing bismuthinite. Associated with these minerals are sphalerite, chalcopyrite, tetrahedrite (in traces), silver, argentite, matildite, marcasite, and minute zoned crystals of an undetermined iron-cobalt-nickel-arsenic sulphide (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

86 K/4 Native bismuth has been observed in two sections at the Eldorado Mine on Great Bear Lake. It occurs in vein-like forms associated with zoned crystals of skutterudite and with minor amounts of interbanded chloanthite and smaltite. The bismuth was formed after the skutterudite and quartz. Carbonate and minor amounts of chloritic mica are the gangue minerals (Ellis Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 47).

Nova Scotia

11 K/7 At Wagamatcook, Inverness County, native bismuth was found as water worn nuggets from the size of a wheat grain to that of a pigeon's egg (H. How, 1868: Mineralogy of Nova Scotia, p. 63).

Ontario

31 C/12 Small quantities of native bismuth have been noted in association with bismuthinite in a quartzose vein in Tudor Township, Hastings County, conc. III, lot 34 (H.G. Vennor, 1866-69: Geol. Surv. Can., Rept. Prog., p. 171).

31 M/5 The Drummond Mine in Ontario's Timiskaming district is known to contain native bismuth (National Mineral Collection).

Specimens containing native bismuth have been found in Coleman Township in the Timiskaming district near Cobalt. Analysis of native bismuth by Burrows: Bi 99.20, Co distinct trace, Ni trace, FeO 0.40, Ag trace, Sb none, total 99.60 (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14, Pt. II, p. 22).

The Foster, Nipissing and O'Brien mines in the Cobalt area of the Timiskaming district all contain native bismuth (R.A.A. Johnston, 1907: Geol. Surv. Can., Summ. Rept., p. 97).

32 D/4 Bismuth occurs at the Peerless property, McElroy Township, with galena, copper, pyrite, sphalerite, pyrrhotite and cosalite in a rock composed predominantly of calcite but containing quartz and fragments of greenstone as well (A.G. Burrows and P.E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 17).

32 D/4 A calcite-quartz brecciated greenstone rock in the southwestern part of McElroy Township contains bismuth (E.M. Abraham, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. VI, p. 51).

41 I/6 In the Sudbury ores, native bismuth is confined almost entirely to ores rich in galena and pyrrhotite, or with parkerite and bornite, as at the Frood Mine (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 41).

41 J/11 Bismuth occurs in quartz veins in the southeast quarter of conc. IV, lot 1, Otter Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 42).

41 J/12 Native bismuth was discovered by Chapman in some rolled pieces of quartz near Echo Lake in the Algoma district (G.C. Hoffmann: Geol. Surv. Can., Ann. Rept., IV, p. 237).

41 P/9 Bismuth has been identified in dark grey carbonate rock from James Township, conc. I, lot 2 (northeast quarter, south half). It occurs as scattered masses and is associated with bismuthinite (D.A. Moddle, private communication).

41 P/10 Native silver and native bismuth have been found together in the Gowganda area in a vein on the Silver Bullion property at the northeast end of Leroy Lake (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 34).

Quebec

23 B/14 Native bismuth is associated with bismuthinite, cobaltite, safflorite-lollingite and arsenopyrite at the Quebec Cobalt property, 52°50'N, 67°15'W, in the Mount Wright area. Identification was made by the X-ray powder diffraction method in the X-ray Laboratory, Geol. Surv. Can. The spacings and intensities of the five strongest lines in the X-ray pattern are 3.28 (10), 2.37 (5), 2.27 (6), 1.867 (3) and 1.444 (3).

31 M, 31 N An occurrence of bismuth has been reported on the property of the St. Maurice mining syndicate in Temiskaming County, Quebec (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 42).

32 D/12 Bismuth is present in the Height of Land Mine in the Abitibi district of western Quebec (M.E. Wilson, 1910: Geol. Surv. Can., Summ. Rept., p. 207).

Yukon

106 D/4 Bismuth occurs at Dublin Gulch, 64°03'N, 135°50'W, in the Mayo mining district as a minor constituent in a gold placer deposit (X-ray Laboratory, Geol. Surv. Can.).

115 P/9 Small, rounded, yellow, oxide-coated nuggets of native bismuth exhibiting the characteristic pink tinge on a freshly broken surface were found among the heavy minerals recovered from a placer on Highet Creek in the Mayo district (R.M. Thompson, 1950: Am. Mineralogist,35, p. 451).

115 P/16 Yellow oxide-coated nuggets up to 10 millimetres in diameter occur in a placer on Haggart Creek in the Mayo district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 451).

BISMUTHINITE

Bi_2S_3

Bismuthinite and native bismuth are the main ore minerals of bismuth. Although widely distributed in nature they rarely occur as large deposits.

British Columbia

82 E/3 Massive pyrite, pyrrhotite and arsenopyrite; accessory chalcopyrite, magnetite, tetrahedrite and gold; and minor bismuthinite comprise the ore at the Dividend Lakeview Mine, two miles south of Osoyoos (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 451).

82 E/2 Bismuthinite occurs in association with magnetite, chalcopyrite, pyrite and other minerals on the Bluebell, Summit Camp and Kettle River properties in the Greenwood mining division (R. Bell, 1902-3: Geol. Surv. Can., Ann. Rept., XV, p. 106 A).

82 F/4 Bismuth sulphide occurs in impregnations near pulaskite dykes at the Giant and Jumbo mines in the Rossland area. It forms in particles or aggregates up to two inches in diameter. Visible gold is frequently found with it (C.W. Drysdale: Geol. Surv. Can., Mem. 77, p. 77).

82 G/12 Specimens of bismuthinite in quartz have been obtained from the St. Mary's River near Cranbrook (National Mineral Collection).

82 L/14 Long prismatic crystals of bismuthinite were found in quartz on the north side of Little Shuswap Lake in the Kamloops mining division (G.M. Dawson 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 161 R).

93 L/11 Poorly formed, flattened prisms of bismuthinite are associated with bismuth tellurides and electrum (Au 85.72, Ag 14.28) in quartz at Hudson Bay Mountain near Smithers. They are from 1/2 to 1 inch long by 1/8 to 1/4 inch wide, have perfect cleavage, and a specific gravity of 6.77 ± 0.03 (H.V. Warren and P. Davis, 1940: Univ. Toronto Stud., Geol. Ser., 40, p. 107).

104 P/4 Quartz veins in porphyritic granite north of Cassiar contain bismuthinite, molybdenite and scheelite (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 109).

Manitoba

52 L/6 Bismuthinite was identified in a specimen from No. 1 subdrift, south, Chemalloy Minerals property at Bernic Lake (X-ray Laboratory, Geol. Surv. Can.).

New Brunswick

21 G/7 Bismuthinite is associated with tin-zinc deposits in rhyolite at Mount Pleasant, Charlotte County (A.A. Ruitenberg, 1963: Univ. New Brunswick, M.Sc. Thesis).

21 O/8 Native bismuth, bismutite and bismuthinite are minor constituents associated with the copper, lead and zinc deposits, as at Heath Steele, Northumberland County (A.L. McAllister, 1959: Can. Inst. Mining Met., New Brunswick Mines Br. reproduction).

Northwest Territories

86 F/12 Specimens from the property of Camsell River Silver Mines consist of a dolomite-quartz gangue with disseminated galena, chalcopyrite, pyrite, bismuth, and bismuthinite which carries silver. The bismuthinite is usually in contact with bismuth and occurs only in small amounts. Associated minerals are sphalerite, chalcopyrite and traces of tetrahedrite, silver, argentite, matildite, marcasite and minute zoned crystals of an undetermined iron-cobalt-nickel-arsenic sulphide. The specimens were taken from the How Group on Camsell River about twenty miles south of Great Bear Lake (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

Ontario

31 C/12 Bismuthinite has been noted in Tudor Township, Hastings County, on conc. III, lot 34, and conc. IV, lot 34 (G.M. Dawson, 1895, 1897: Geol. Surv. Can., Ann. Rept., VIII, p. 119 A; X, p. 118 A).

31 C/14 Specimens containing bismuthinite have been collected in Frontenac County; Barrie Township, conc. X, lot 13 (National Mineral Collection).

31 C/14, 31 F/3	Bismuthinite has been found in Clarendon Township, lot 33, southwest range, and in Miller Township in a lot north of Buckshot Lake (R.W. Ells: Geol. Surv. Can., Ann. Rept., XIV, 75 J).
31 F/6	Bismuthinite and beryl form lamellar masses in a coarse granite vein on conc. XV, lot 23, Lyndoch Township (G.C. Hoffmann: Geol. Surv. Can., Ann. Rept., VIII, 14 R).
31 F/15	Bismuthinite has been found in an opening on a quartz vein a half mile north of Swamp Creek in the Dalhousie area of Clarendon Township (B.L. Smith, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VII, p. 39).
31 M/4	Bismuthinite is found in veins with quartz, calcite, cobaltite and arsenopyrite on a claim (H.R. 616) northeast of Lorrain Lake in the Matabitchuan area (E.W. Todd, 1925: Ont. Dept. Mines, Ann. Rept., vol. 34, Pt. III, p. 31).
32 D/4	Needle-like crystals of bismuthinite have been observed in a quartz veinlet at Bennett-Pacaud Mines, in Pacaud Township, conc. VI, lot 1, north half (K.D. Lawton, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. V, p. 47) (A.G. Burrows and P.E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 15).
41 P/9	A shiny, grey, cleavable mineral associated with native bismuth in grey carbonate rock was found in James Township on conc. I, lot 2, northeast quarter, south half. It was identified as bismuthinite by the Provincial Assay Laboratory using X-ray diffraction methods (D.A. Moddle: private communication).
42 L/4	Quartz veins and adjoining schists in the Kowkash area are well mineralized with pyrite and pyrrhotite. On the Knapp-Hendricks claim, south of the Tashota gravel pit, molybdenite, graphite, and bismuthinite occur in small quantities (P.E. Hopkins, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 222)
52 C/10	Bismuthinite occurs in a vein at the Mikado Mine in the Rainy River district. It is associated with quartz, pyrite, chalcopyrite, molybdenite, malachite and free gold. The mine is on the south shore of Bag Bay, Shoal Lake, about 35 miles from Kenora (A.L. Parsons, 1911: Ont. Bur. Mines, Ann. Rept., vol. 20, Pt. I, p. 164).
52 F/10	A vein occurring on claims K. 665 and H.W. 443 in the Dryden area contains tellurides, bismuthinite, and small amounts of gold (Ellis Thomson, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 186).

52 F/16 Bismuthinite is a rare accessory in a muscovite-granite pegmatite in Echo Township in the district of Kenora. It occurs as prismatic crystals up to an inch long and one sixteenth of an inch across and contains minor impurities of lead, copper, and antimony. Specimens were obtained for analysis from conc. V, lot 8, northeast quarter, south half. The identification was done by the Provincial Assay Laboratory using X-ray diffraction and spectrographic analysis (J. Satterly, 1960: Ont. Dept. Mines, Ann. Rept., vol. 69, Pt. VI).

Quebec

22 D/6 Tourmaline, spessartite, and bismuthinite occur in foliated masses in a perthite-quartz-muscovite rock on lot 21 of the north range of Jonquiere Township, Chicoutimi County. An analysis by Johnston of bismuthinite from this occurrence is as follows: S 18.46, Bi 79.28, Pb 1.68, Cu 0.48, Fe 0.74, total 100.64; specific gravity 6.781 (G.C. Hoffmann, 1892: Geol. Surv. Can., Ann. Rept., VI, pp. 19, 20 R).

An X-ray powder pattern of this specimen has the following five strongest lines: 3.57 (10), 3.12 (8), 2.81 (3), 1.95 (4) and 1.737 (3) (X-ray Laboratory, Geol. Surv. Can.).

23 B/14 Bismuthinite occurs with native bismuth, lollingite-safflorite, cobaltite, and arsenopyrite at the Quebec Cobalt property, 52°50'N, 67°15' W, in the Mount Wright area. Identification was by the X-ray powder diffraction method (X-ray Laboratory, Geol. Surv. Can.).

32 C/5, 32 D/1 Molybdenite bearing quartz pegmatites in Malartic and Lacorne townships of Abitibi County contain considerable amounts of bismuthinite (H.S. Spence, 1930: Am. Mineralogist, 15, p. 438).

32 C/5 Pegmatites in the Fiedmont area of Abitibi County have quartz cores enclosed in spodumene-rich rock containing sugary albite, spessartite, columbite-tantalite, microlite, bismuthinite, molybdenite, betafite and powellite (E.W. Heinrich and A.A. Levinson, 1958: Am. Mineralogist, 38, p. 35).

32 D/8 A bismuthinite occurrence has been found in Preissac Township, Abitibi County, on the property of the St. Maurice mining syndicate (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 43).

32 D/8 Bismuthinite occurs with molybdenite in pegmatite in Lamotte Township, range II, lots 3-6, Abitibi County (National Mineral Collection), donated by H. Mayrand, 1929).

32 D/8 Bismuthinite is associated with molybdenite in Preissac Township on the property of the Height of Land Mining Co. and on Indian Peninsula, Kewagama Lake (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 43).

Yukon

115 I/3 Samples of white quartz taken from a vein on the Divided Mineral claim at the head of the Klaza River near Carmacks contained sparse amounts of a massive grey metallic mineral which has been identified as bismuthinite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 451).

BISMUTITE

$(BiO)_2CO_3$

Ontario

31 C/12 Bismutite and other bismuth minerals have been observed on conc. III, lot 34, and conc. IV, lot 34, of Tudor Township, Hastings County (H.G. Vennor, 1866-69: Geol. Surv. Can., Rept. Prog., p. 171).

31 F/6 Bismutite is reported to occur in Renfrew County on conc. XV, lot 23, of Lyndoch Township (H.S. Spence, 1930: Am. Mineralogist, 15, p. 438).

Yukon

106 D/4 Bismutite was found associated with a specimen of bismuth from a gold placer at Dublin Gulch, 64°03'N, 135°50'W, in the Mayo mining district. It was identified by X-ray diffraction in the X-ray Laboratory of the Geol. Surv. Can. The six strongest lines in the bismutite X-ray powder pattern have the following spacings and intensities: 6.87 (4), 3.72 (5), 2.95 (10), 2.74 (5), 1.75 (4) and 1.62 (4).

BLENDE

(See sphalerite)

BORNITE

Cu_5FeS_4

This common ore mineral of copper can often be distinguished by the characteristic iridescent purplish tarnish responsible for its popular name, 'peacock ore'. It was named for the German mineralogist Von Born and has been found in dykes, basic intrusives, contact metamorphic deposits, quartz veins, and pegmatites.

Alberta

82 O/4, 82 O/11 — Bornite has been found at two localities in the Red Deer district; at Copper Mountain, near Bow River (G.M. Dawson, 1885: Geol. Surv. Can., Ann. Rept., I, p. 136 B); and at the head of Panther Creek, Rocky Mountain park (G.M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 165 A).

British Columbia

82 E — Specimens of massive bornite have been collected from the Main Kettle River area (National Mineral Collection).

82 E/2 — Specimens showing chalcopyrite surrounded by a zone of bornite have been collected from the Big Copper claim at the head of Copper Creek in the Boundary Creek district (R. Bell, 1902: Geol. Surv. Can., Ann. Rept., XV, p. 126 A).

82 F/6 — In the Silver King Mine on Toad Mountain the ore consists mainly of argentiferous bornite with chalcopyrite, pyrite, tetrahedrite, argentite, sphalerite, galena and stromeyerite (G.M. Dawson, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 27 A).

82 N/4 — High grade bornite ore specimens have been taken from the Silver Box Mine near Illecillewaet in the Revelstoke mining division (E.D. Ingall, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 167 S).

92 E/8 — Massive bornite occurs at the Indian Chief Mine (National Mineral Collection) and at the Dewdney claims, near Sidney Inlet on the west coast of Vancouver Island (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 46).

92 F/4 — Bornite has been reported at Deer Creek, at the head of Tofino Inlet, Clayoquot mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 46).

92 F/9, 92 F/15 — Bornite is an important ore mineral at the Copper Queen (Van-Anda) Mine on Texada Island (E.D. Ingall, 1897: Geol. Surv. Can., Ann. Rept., X, p. 62 S) and at the Marble Bay Mine, where it occurs both in masses and disseminated. Chemical analysis of bornite from Marble Bay: Cu 63.24, Fe 11.75, S 24.34, insol. 0.35, total 99.68; S.G. 5.165 (T.L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 6).

92 G/11 — Veins cutting granitic rocks at the head of Salmon Arm of Jervis Inlet and between that inlet and Howe Sound, contain bornite (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 102 R).

92 K/15 Occurrences of bornite have been noted along the Homathco River at the head of Bute Inlet, Nanaimo mining division (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 152 R).

93 L/11, 93 L/14 Bornite occurs on the property of the Whiteheader Group on Hudson Bay Mountain, and also near Telkwa, in the Omineca mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 47).

93 M/16 Bornite occurs on Thorkelson's claims, Driftwood River, in the Omineca mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 47).

103 B/12 Granular bornite occurs at the Last Chance Mine in the Queen Charlotte Islands (National Mineral Collection).

103 I/9 The mineral association at the M. and K. Copper property on Legate Creek consists of an intimate mixture of bornite, galena, and chalcopyrite. These minerals occur as solid masses in the basins of drag folds in a series of Jurassic lavas and tuffaceous sediments. Covellite occurs as narrow veinlets cutting all other minerals (W.L. Uglow, 1922: Am. Mineralogist, 7, p. 1).

Bornite specimens exhibiting almost perfect octahedral cleavage and with surfaces up to 2 centimetres in diameter, have been found at an auriferous copper prospect near Usk. Chalcocite occurs along the cleavage planes of the bornite. Chemical analysis by A.C. Wheatly: Cu 67.51, Fe 8.49, S 24.88, total 100.88; S.G. 5.28 (T.L. Walker, 1921: Am. Mineralogist, 6, p. 3).

104 G/14 Pockets of bornite occur in granitic dykes cutting diorite on Nine-Mile Creek, about nine miles above Telegraph Creek in the Stikine mining division (G.M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 55 A).

New Brunswick

21 G/2 Veins containing bornite occur in schist on Hardwood Island, Charlotte County (L.W. Bailey, 1864: Can. Naturalist, 1, pp. 81-97).

Pyrite and pyrrhotite are associated with bornite in a fault zone at Wheal Louisana in Charlotte County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick 1st. Edition. Industrial and Educational Pub. Co., Gardenvale, Quebec).

21 G/7 The copper minerals, bornite, chalcopyrite, chalcocite and covellite are found in the tin deposits at Mount Pleasant in Charlotte County (A.A. Ruitenberg, 1963: M.Sc. Thesis, Univ. New Brunswick).

21 H/6 Bornite and chalcocite occur in a fault zone at Martin Head in Saint John County (L.W. Bailey, 1897: Trans. Roy. Soc. Can., Sec. 4, vol. 14, pp. 107-116).

21 H/10 Quartz-carbonate veins carrying bornite, chalcopyrite, and chalcocite have been found at Alma (West) in Albert County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st. Edition. Industrial and Educational Pub. Co., Gardenvale, Que.).

21 H/11 Bornite occurs in quartz veins with chalcopyrite, chalcocite, pyrrhotite and pyrite at Mile Brook and Roman Wolfe in Albert County. It has also been reported at Goose Creek in Saint John County (New Brunswick Mines Br., files).

Quartz veins carrying bornite, chalcocite and chalcopyrite occur at the Vernon Mine in Saint John County (G.S. MacKenzie, 1945: New Brunswick Mines Br., Paper 45-1).

21 J/16 Bornite is found with chalcopyrite and pyrite in quartzite and schist on the Little Southwest Miramichi River, Northumberland County (E.W. Shaw, 1936: Geol. Surv. Can., Mem. 197).

21 O/3 The volcanic rocks on Blue Mountain, Victoria County, contain showings of copper minerals, notably bornite and chalcopyrite (New Brunswick Mines Br., files).

21 P/13 Bornite is found near Patapat Brook in Restigouche County (H.R. Greiner, 1960: New Brunswick Mines Br., P.M. 60-2); also at Henry Brook in diorite, and at Green Point in andesite, Gloucester County (New Brunswick Mines Br., files).

Northwest Territories

86 K/6 Copper minerals occur in a giant quartz vein at MacAlpine Channel, north shore of Hunter Bay, eastern end of Great Bear Lake. Minerals present include bornite, chalcopyrite, pyrite, hematite and carbonate (M. Feniak, 1949: Geol. Surv. Can., Paper 49-19, p. 13).

Nova Scotia

11 F/6, 11 F/11, 11 F/12, 11 F/13 The following occurrences of bornite were noted by R.A.A. Johnston, 1915, in Geol. Surv. Can., Mem. 74, p. 47.

(1) On the Canso road near its junction with the Whitehaven road, Guysborough County.
(2) Campbell point, St. George channel, Richmond County.
(3) Upper South River, Antigonish County.
(4) Polson Lake, near Lochaber, Antigonish County.

Ontario

31 M/8 Many of the silver deposits of the Cobalt camp contain bornite; examples are the Silver Queen and Foster mines in Coleman Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 47).

41 J/4, 41 J/5 Copper deposits in the Bruce Mines district are of the fissure vein type and consist of chalcopyrite and bornite in a gangue of quartz intermixed with ankerite. The old Bruce Mine was first worked in 1846. Other notable deposits are: the Rock Lake Mine, 14 miles north of Bruce Mines village, and the Cameron or Stobie Mine, 2 1/2 miles northeast of Desbarats station on the Canadian Pacific line. The X-ray powder pattern of bornite from Bruce Mines shows the following five strongest lines: 3.29 (3), 3.05 (4), 2.73 (4), 2.50 (2) and 1.933 (10) (X-ray Laboratory, Geol. Surv. Can.) (R. Bell, 1902: Geol. Surv. Can., Ann. Rept., XV, pp. 246-52).

41 K/15 A specimen of bornite was obtained from the Sand Bay or Pancake Bay properties of the Copper Creek Mining Company on Lake Superior in the Thunder Bay district (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 124 A).

41 P/9 Several showings of copper minerals have been reported in Tudhope Township. These include covellite and bornite in conc. IV, lot 12, and chalcopyrite, bornite and malachite in narrow veins in conc. V, lot 11, and conc. VI, lot 12 (W.W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. IV, pp. 29-41).

41 P/10 Veins containing bornite, chalcopyrite and pyrite have been found on claims RSC 135 and 136 in Nicol Township, Gowganda district (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 34).

41 P/12 Two occurrences of bornite have been noted in Chester Township; with azurite on the east shore of Mesomikenda Lake; and with visible gold, tetradymite, covellite and malachite in a 14-inch quartz vein near Clam Lake (H.C. Laird, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, pp. 27, 33).

41 P/15 A calcite vein containing bornite, native silver and smaltite is reported to occur in diabase on the Bishop claim (L. 0305) in Morel Township, Gowganda district (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 44).

Quebec

Bornite occurs with chalcocite, chalcopyrite and pyrite at many localities in the eastern townships of Quebec. The following list of localities is taken from: R.A.A. Johnston, 1915: Geol. Surv. Can., Mem 74, p. 48.

NTS	Range	Lot	Township	County
21 E/13	XIV	11	Chester	Arthabaska
			Craig Road Range	Arthabaska
	IV	28	Ham	Wolfe
21 L/4	III	10	Halifax	Megantic
21 L/6	IX	9, 10, 11	Leeds	Megantic
31 H/2	V	5	Brome	Brome
	VIII	18, 19	Brome	Brome
	X	8, 9	Sutton	Brome
31 H/8	XIII	3	Orford	Sherbrooke
	IV	9	Stukely	Shefford
	VI	21	Stukely	Shefford
	VII	21	Stukely	Shefford
	II	28, 29	Brompton	Richmond
31 H/9	XII	25	Cleveland	Richmond
	I	8	Melbourne	Richmond
	II	2, 6	Melbourne	Richmond
	IV	2	Melbourne	Richmond
	VII	21	Durham	Drummond
31 H/10	III	31, 32	Acton	Bagot
	VI	29	Acton	Bagot
31 H/16	X	14	Wickham	Drummond

Yukon

105 D Most of the copper deposits in the Whitehorse area are of the contact metamorphic type. The deposits of the Whitehorse copper belt, which extends along the valley of the Yukon River, lie near the contact between granitic rocks and limestones. Bornite and chalcopyrite are the chief ore minerals and these occur most commonly in garnet-diopside-tremolite skarn; they also occur in magnetite-rich skarn at the Arctic Chief Mine. Specular hematite is abundant in the ore of the Pueblo Mine. J.O. Wheeler, 1961, in Geol. Surv. Can., Mem. 312, pp. 137-142, describes the following properties.

105 D/1 Bornite, chalcopyrite, specularite and hematite are disseminated throughout a rock along a contact between serpentinized dunite and limestone, north of Jubilee Mountain.

105 D/3 Lenses of massive chalcopyrite, bornite and specularite have been exposed on the Fleming Group property located on the northeast spur of Carbon Hill.

105 D/11 The Arctic Chief property is at an elevation of 3,012 feet above sea-level at the head of McIntyre Creek. It is accessible by a rough road 3 miles long from mile 9134 on the Alaska Highway.

105 D/11 The Grafter property lies about a mile north of the Arctic Chief and is accessible by the same rough road.

The Best Chance property is about 1,000 feet east-northeast of the Grafter. It has large surface showings of magnetite.

The War Eagle showing is located in the valley of Porter Creek near the northern end of the copper belt, at an elevation of 2,660 feet above sea-level. It is accessible from Whitehorse - about six miles along a good road.

The Copper King showing, located on the east bank of McIntyre Creek about 4 miles northwest of Whitehorse, was the first claim recorded in the copper belt. Magnetite, molybdenite and some free gold are associated in the ore.

105 D/14 The Anaconda claim is situated west of Porter Creek at the northern end of the copper belt.

BOULANGERITE

$Pb_5Sb_4S_{11}$

Boulangerite is a lead grey sulphosalt of lead and antimony. It tends to occur in veins formed at low or moderate temperatures. Boulangerite is difficult to distinguish from other sulphosalts of similar composition and reported occurrences must be viewed with suspicion unless the identification is confirmed by X-ray methods.

British Columbia

82 E/1 Specimens of fibrous boulangerite in quartz were collected from the Red Paddy property, near the headwaters of the Kettle River in the Greenwood mining division. A spectrographic analysis of the boulangerite indicated the presence of essential Pb and Sb, and also traces of Fe, As, Sn, Cu, Ag, Bi, and Au. The specific gravity of the mineral was found to be 6.12 (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 80).

The mineralization on the Kismet Group situated on the north side of Trap Creek, a tributary of the Kettle River, consists of galena, pyrite and boulangerite in quartz. The average specific gravity of the boulangerite was found to be 6.0, and spectrographic analysis indicated the presence of Pb, Sb and traces of Ag, Fe, Bi, Te, Sn, As, Mn, Cd, Zn, Ti and Cu (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 81).

82 E/2 Boulangerite of fibrous habit occurs associated with quartz, galena and sphalerite in a quartz vein on the Amandy property, on the south slope of Roderic Dhu Mountain, northwest of Jewel Lake in the Greenwood mining district. The identification of the mineral as boulangerite was confirmed by X-ray powder pattern. Spectrographic analysis showed essential Pb, Sb, and traces of Cu, Ag, As, Zn, Fe. The specific gravity was found to be 6.02 (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 80).

82 E/15 Galena, sphalerite, pyrite, chalcopyrite, silver minerals and boulangerite have been reported from a locality at the headwaters of the Granby River and Rendell Creek in the Vernon mining division. A sample containing quartz and boulangerite was obtained from the Lightning Peak Group in this area and submitted for analysis. The boulangerite was of fibrous habit, had a specific gravity of 6.08 and was shown, by spectrographic analysis, to contain traces of Cu, Ag, Sn, Bi, Te, Au, Mn, V and Ti in addition to the main constituents.

Chemical analysis by J.R. Williams and Son: Pb 55.40, Fe 0.25, Sb 25.50, As 0.24, S 18.50, Se was detected, total 99.89 (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 80).

82 F/4 Samples from the property of Rossland Mines Ltd., situated a mile and a half south of Rossland, consisted of massive sulphides and sulphosalts including pyrite, arsenopyrite, pyrrhotite, sphalerite, galena, and boulangerite. Minor amounts of tetrahedrite, chalcopyrite and gold were also present. Boulangerite formed radiating or interlocking fibrous crystals (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

The mineralization on the Richmond-Lily May claims, located south of Rossland on the Dewdney trail, consists of galena, pyrite, pyrrhotite, sphalerite, and occasionally boulangerite, in a quartz gangue. The average specific gravity of the boulangerite is 6.02. Spectrographic analysis has indicated the presence of traces of Fe, Sn, Cu, As, Zn, Cd, Ti, and Mn as well as the essential Sb and Pb. An X-ray powder photograph was obtained from the mineral confirming its identity as boulangerite (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 81).

82 F/13 A specimen from the Great Britain property on Sable Creek in the Lardeau mining division, consists of a fine-grained compact mass of a feathery looking metallic mineral. Upon examination, it was found to give the combined X-ray diffraction patterns of galena and boulangerite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 451).

82 G/12 Boulangerite is erratically distributed throughout the Sullivan Mine, near Kimberley. It is associated with galena, sphalerite, pyrrhotite, pyrite, arsenopyrite, and quartz. It is occasionally found in vugs forming hair-like crystals up to 2 centimetres long. These are flexible and have one cleavage parallel to their elongation. The average specific gravity of 30 fragments is 6.18. Chemical analysis by J.R. Williams and Son gives the following composition: Pb 55.35, Fe 0.51, Sb 24.95, As 0.71, S 18.40, total 99.92. Spectrographic analysis indicated traces of Ag, Cu, Sn, As, Cd, Mn, V and Ti (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 79).

82 K/1 Sulphide wedges and lenses at the Silver Key Group, at the head of the east fork of Doctor Creek, twenty-five miles west of Canal Flats, are composed of galena, pyrite, chalcopyrite, sphalerite and antimonial sulphide. Boulangerite may be intimately mixed with galena and it may occur as needles in quartzite or as the lining in vugs (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 504).

82 K/13 On the Big Five claim group at the extreme head of Ferguson Creek, Lardeau mining division, boulangerite of specific gravity 6.05 is associated with tetrahedrite, galena and sphalerite. A spectrographic analysis of the fibrous mineral shows essential Sb and Pb as well as traces of Cu, Ag, Sn, As and Fe. Boulangerite was conclusively identified by X-ray powder photograph (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 81).

82 L/16 A specimen from the Mastodon property near Revelstoke was found to consist of a narrow band of fibrous boulangerite with galena and sphalerite (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 504).

92 H/8 Fibrous boulangerite occurs with arsenopyrite, pyrite, sphalerite and quartz at a locality 3 miles west of Hedley in the Osoyoos mining division (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 84).

93 L/15 Boulangerite, intimately intergrown with barite occurs in the Omineca mining division at the Lamarr Mine, near the head of Driftwood Creek, 19 miles east of Smithers. The X-ray photograph showed a weak boulangerite pattern with extra unidentified lines. Spectrographic analysis indicated Pb, Sb, Ba, and traces of Ag, Cu, As, Fe, Zn, V and Ti. The specific gravity was 5.83 (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 80).

Boulangerite is locally abundant and associated with sphalerite, galena, tetrahedrite, pyrite and chalcopyrite in a quartz gangue on the Babine Bonanza (or Cronin) property located near the head of Cronin Creek, thirty-two miles from Telkwa. Chemical

93 L/15 analysis, by J.R. Williams and Son: Pb 55.45, Ag 0.06, Fe 0.13, Sb 25.40, As 0.36, S 18.45, total 99.85; S.G. 6.08 (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 79).

93 M/3 A sample consisting of massive galena, sphalerite and very fine grained boulangerite was obtained from the Sunrise Group in the Omineca mining division. The group is situated on the north slope of Nine Mile Mountain, eight miles northeast of New Hazelton. The specific gravity of boulangerite was found to be 6.00-6.06 and a spectrographic analysis showed traces of Cu, As, Ag, and Zn (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 84).

104 K/12 About three miles from Tulsequah, on the Erickson-Ashby property (Atlin mining division) there is an occurrence of massive sulphides consisting of galena, pyrite, sphalerite, pyrrhotite, arsenopyrite, tetrahedrite and fibrous masses of silvery grey boulangerite. The property is at the north end of Erickson Mountain (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 451).

A sample consisting of pyrite, sphalerite, boulangerite, chalcopyrite and quartz was obtained from the Hidding Creek Group located at about the 4,000 foot level on the west slope of Mount Lester Jones in the Taku River area (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 85).

Manitoba

63 I/7 Polished sections of specimens from Eskamanish River, northeast of Lake Winnipeg contain massive aggregates of sphalerite enclosing short veins and blebs of galena and boulangerite. Larger areas of galena and boulangerite sometimes contain inclusions of tetrahedrite. Marcasite, pyrrhotite and chalcopyrite are also present in varying amounts, the latter occurring as small inclusions in a quartz gangue (Ellis Thomson, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 103).

Ontario

31 C/15 Boulangerite is reported to occur in Clarendon Township, conc. I, lot 34 (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

32 C/6 Boulangerite is disseminated in quartz and sphalerite and forms narrow massive veinlets up to 1/4 inch wide in a sericite schist on the property of the Alaska Development and Mineral Co., on lot 6, range VI, Montgay Township. In polished sections, it appears as aggregates averaging 1/4 inch in diameter with distinct polarization colours of light and dark grey. The specific gravity of a

32 C/6 sample from this locality was 5.6. Chemical analysis by Gould: Pb 54.7, Sb 30.4, S 15.1, total 100.2. Later samples from the same occurrence were found to contain plagionite and jamesonite. Associated minerals are tetrahedrite, chalcopyrite, arsenopyrite, pyrite, silver and gold (J.E. Hawley, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 25).

Yukon

105 M/14 Fibrous boulangerite occurs with sphalerite, galena, freibergite, siderite, quartz, pyrite, cerussite and oxides of iron and manganese on the Arctic Group property, Galena Hill, 27 miles northwest of Mayo. The specific gravity of the mineral was found to be 5.80, a low value (H.V. Warren and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 81).

The X-ray laboratory of the Geol. Surv. Can., has identified boulangerite as a constituent of several mineral specimens from the Keno Hill, Sourdough Hill, and Galena Hill areas of the Mayo mining district. The specimens were from the Arctic and Mastiff prospect; the Dragon Shaft; the Sadie Friendship Mine and a shaft north of Charity Gulch in number 6 vein (R.W. Boyle, 1955, 1957: Geol. Surv. Can., Papers 55-30, 57-1).

106 D/4 Boulangerite has been identified by X-ray diffraction patterns as a minor constituent in gold placer deposits at Dublin Gulch, 64°03'N, 135°50'W, in the Mayo mining district. The X-ray powder pattern of the Dublin Gulch mineral has four strongest lines at 3.72 (10), 3.00 (4), 2.81 (9), 1.860 (3) (X-ray Laboratory, Geol. Surv. Can.).

BOURNONITE

$CuPbSbS_3$

Bournonite occurs typically in moderate temperature hydrothermal veins where it may be associated with galena, tetrahedrite, sphalerite, chalcopyrite, siderite and quartz. It crystallizes in the orthorhombic system and may contain up to three per cent As. It alters to antimony oxides, cerussite, malachite or azurite. The four strongest lines of the powder pattern are: 3.90 (8), 2.74 (10), 2.59 (5) and 1.765 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Amer., Mem. 85, p. 133).

British Columbia

82 F/10 An occurrence of bournonite with galena and quartz is reported on the Chicago property on La France Creek in the Nelson mining division (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 84).

82 F/14 Minute masses of bournonite occur in the galena ore of the Surprise and McAllister mines at the Slocan mining camp (C.E. Cairnes: Geol. Surv. Can., Mem. 173, p. 123).

82 K/8 Bournonite was identified in a polished section made from a specimen from the Mineral King Mine. It occurs as masses in sugary barite and is associated with sphalerite, galena, pyrite and tetrahedrite. The mine is located 27 miles west of Athalmer between Toby and Jumbo Creeks at latitude 50°N, longitude 116°W (R.M. Thompson, 1960: private communication).

82 M/1 Specimens of white quartz from the property of Allco Silver Mines Ltd., have been found to contain bournonite as thin selvages on tetrahedrite and galena. The property is located at the head of Silver Creek, 20 miles northwest of Revelstoke (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

At the Mastodon claims in the Revelstoke mining division, bournonite occurs in a small quartz vein with sphalerite, calcite, tetrahedrite, meneghinite, galena, covellite, chalcocite, gold and probably arsenopyrite. The claims are located twenty miles by road, north of Revelstoke, and 7 miles by trail up La Forme Creek on the east side of the Columbia River (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 51, p. 73).

94 C/13 A sample collected from a vuggy quartz vein in the Ingenika Group quartzite on the northeast side of Pelly Creek, contains disseminated grains of a black metallic mineral which gave the X-ray pattern of bournonite. The occurrence is located about five miles northwest of Pelly Lake in the Cassiar district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

Northwest Territories

85 J/8 Drill cores from the Akaitcho property near Yellowknife contain bournonite apparently replacing tetrahedrite. Pyrite, arsenopyrite, gold, calcite, and quartz are associated minerals (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 84).

Ontario

31 C/12 Bournonite occurs on lot 18 of conc. VIII, Marmora Township, Hastings County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 66 T).

Conc. V, lot 17, Madoc Township, Hastings County contains an occurrence of bournonite with quartz (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 34 R).

31 F/2 In Darling Township, Lanark County, bournonite has been found on lots 21 and 22, conc. IV, and on lot 22, conc. III (G.C. Hoffman, 1889: Geol. Surv. Can., Ann. Rept., IV, 66 T).

31 F/7 Bournonite, pyrite and dolomite occur together in Bagot Township, conc. XII, lot 14, Renfrew County (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 13 R).

42 E/10 Irregular veinlets and blebs of bournonite have been found associated with chalcopyrite and quartz in the Little Long Lac Mine (A.S. Armstrong, 1944: Am. Mineralogist, 29, p. 314).

Yukon

115 I/3 A specimen from the Brown McDade property near Pony Creek, 35 miles west of Carmacks, was found to contain pyrite, arsenopyrite, bournonite, stibnite, sphalerite and quartz (H.V. Warren, 1948: Univ. Toronto Stud., Geol. Ser., 52, p. 84).

BRANNERITE

UTi_2O_6

This rare radioactive mineral first became of economic value as an ore mineral of uranium with the development of the Blind River uranium camp. Prior to its discovery at Blind River, brannerite had been reported from only four localities in the world. At Blind River it occurs in association with an assemblage of heavy minerals in pyritized conglomerate; elsewhere it has been found in pegmatites, high-temperature quartz veins and gneiss. The mineral usually contains important amounts of thorium and rare earths in substitution for uranium.

Ontario

31 C/16 Small amounts of brannerite were found in a tremolite zone in metamorphic gneiss in South Sherbrooke Township, conc. C, lot 18, in Lanark County. The occurrence is north of Christie Lake and on the east side of a rock cut on the C.P.R. railway line. The mineral was identified by X-ray diffraction patterns of heated material. A chemical analysis by D.A. Moddle of the Ont. Dept. Mines indicated 42.7 per cent U_3O_8. A quantitative spectrographic analysis by Moddle gave the following results U, Ti >10; Ca, Fe, Y, Si, 0.5-5.0; Th, Pb, 0.1-1.0; Yb, 0.05-0.5; Ce, Nb, trace (D.A. Moddle, 1957: Can. Mineralogist, 6, pp. 155-157).

41 J/2 Brannerite and uraninite are the main ore minerals of uranium in the radioactive conglomerate of the Blind River region. Identification of brannerite in these rocks was first made by E.W. Nuffield, who subsequently synthesized the material and reported its crystallography. The mineral is metamict and commonly gives an anatase X-ray pattern. The X-ray powder pattern of heated brannerite is characterized by the six strongest lines: 4.77 (8), 3.43 (10), 3.33 (6), 2.46 (4), 2.281 (6) and 1.903 (4) (X-ray Laboratory, Geol. Surv. Can.). Spectrographic

41 J/2 analysis by W.H. Champ: U, Ti, 10-100; Th, Si, Yb, Y, 1-10; Fe, Mn, Al 0.1-1; B, Mg, Pb, Ca, Ba, Sc trace (E.W. Nuffield, 1954: Am. Mineralogist, 39, p. 520. R.J. Traill, 1954: Can. Mining J., 75, p. 64. J.E. Patchett and E.W. Nuffield, 1960: Can. Mineralogist, 6, p. 483).

Saskatchewan

74 A/11 Brannerite has been identified as a constituent of a pegmatite dyke known as the Eldorado dyke on Middle Foster Lake. The mineral has a light brown colour and dull lustre and is closely associated with metallic black rutile and dull black anatase. Identification was by X-ray diffraction pattern after heating for five minutes in vacuo at about 900° C. The specimen was about the size of a walnut and contained about 40 per cent brannerite. This is the first known occurrence of brannerite in a Canadian pegmatite (X-ray Laboratory, Geol. Surv. Can., 1955).

BRAUNITE

$$Mn^{++}Mn_6^{+++}SiO_{12}$$

Commonly associated with other manganese oxides, braunite is a potential ore mineral of manganese. It frequently occurs as a weathering product of psilomelane, pyrolusite, and other manganese minerals.

British Columbia

82 E/5 A bedded deposit of manganiferous chert on the Iron King prospect near Olalla Creek is traversed by a network of minute veins containing rhodonite. These merge laterally into zones of hard black braunite containing small masses of chert and rhodonite. The braunite appears to be an alteration product of rhodonite and is cut by tiny stringers of rhodochrosite and quartz (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 504).

93 N/6 A vein of braunite and psilomelane cuts the Permian limestone about a mile west of the south end of Indata Lake. It has been traced for sixty feet and varies in width from a few inches to two feet (J.E. Armstrong, 1942: Geol. Surv. Can., Paper 42-11, p. 11).

New Brunswick

21 H/11 The Markhamville Mine at latitude 45°37'N, longitude 65°27'W, King's County, operated from 1862 to 1893 and was the province's largest producer of manganese. The manganese minerals which include braunite, hausmannite, psilomelane, manganite and pyrolusite occur as lenses, nodules, veins and masses, generally

21 H/11 conformable with the bedding of the Windsor limestone in which they occur (A. Y. Smith, 1963: Geol. Surv. Can., Paper 62-22, p. 18).

21 J/4 Braunite and hausmannite are the main constituents of the Plymouth ore body which lies mainly on the south side of the Meduxnekeag River, about five miles west-northwest of Woodstock. This deposit is of interest for the occurrence there of the rare mineral sursassite (E. W. Heinrich, 1962: Can. Mineralogist, 7, p. 294).

Prince Edward Island

11 L/6 A specimen of braunite in the National Mineral Collection is reported to have been found on the west shore of the Wheatley River, Queens County. The X-ray diffraction pattern shows five strongest lines at 2.71 (10), 2.34 (2), 2.14 (2), 1.66 (7), and 1.414 (4) (X-ray Laboratory, Geol. Surv. Can.).

BREITHAUPTITE

NiSb

Breithauptite occurs in veins often associated with cobalt and silver minerals and niccolite. It is isostructural with the latter but may be distinguished from it by its darker violet red colour.

The X-ray powder pattern of breithauptite from Cobalt, Ont., is characterized by the following five strongest lines: 2.84 (10), 2.06 (7), 1.965 (7), 1.533 (3) and 1.074 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am. Mem. 85, p. 62).

Ontario

31 M/2 Breithauptite has been found in the O'Brien Mine, Coleman Township, in the district of Timiskaming (R.A.A. Johnston, 1907: Geol. Surv. Can., Summ. Rept., p. 97).

41 P/10 Purplish copper-coloured breithauptite occurs as rounded arborescent patches varying from about an eighth of an inch to an inch in diameter on the Hudson Bay Mines property in the Cobalt area. The breithauptite-bearing areas are always enclosed by narrow bands of pale niccolite which is itself fringed by cobaltite. An analysis is as follows: Ni 32.09, Co 0.59, Fe 0.04, Sb 66.62, As 0.58, S nil; total 99.92 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 209).

BREUNNERITE

(See magnesite)

BRITHOLITE-ABUKUMALITE

$(Na, Ca, Ce, Y)_5(P, Si)_3(OHF)$

Quebec

31 G/8 Chemical analysis of britholite from Oka, by J.G. Sen Gupta and G.R. Lachance: SiO_2 12.28, Al_2O_3 0.47, Fe_2O_3 0.14, R.E. Oxides 33.43 (CeO_2 15.0, Nd_2O_3 8.0, La_2O_3 5.6) CaO 28.84, MgO 0.20, Na_2O 0.21, ThO_2 5.62, TiO_2 0.09, P_2O_5 16.96, H_2O 0.54, F 2.10, total 100.80, less O≡F = 99.98. The X-ray powder pattern of the analyzed material has five strongest lines at 3.47 (6), 2.80 (10), 2.71 (5), 1.94 (3), and 1.84 (3) (X-ray Laboratory, Geol. Surv. Can.).

31 K/14 A mineral found in Ville Dieu Township about one third of a mile east of the widening of the Kipawa River known as Sheffield Lake (latitude 46°46'N, longitude 78°27'W) was examined by the Ont. Dept. Mines and found to have an apatite type X-ray diffraction pattern and cell dimensions corresponding to those of a britholite specimen from the Royal Ontario Museum. A qualitative spectrographic analysis showed the following to be major constituents: Ca, Ce, La, Y, Si, P, Th (D.A. Moddle: private communication).

BROCHANTITE

$Cu_4SO_4(OH)_6$

British Columbia

92 K/3 Brochantite is associated with abundant malachite and volborthite as weathering products of a chalcocite-bearing interlava sedimentary rock which outcrops west of Menzies Bay on Vancouver Island and north of Gowland Harbour on Quadra Island (J.L. Jambor, 1960: Am. Mineralogist, 44, p. 1308). The three strongest lines on the X-ray powder pattern of brochantite are: 3.90 (8), 2.68 (5) and 2.52 (10) (ASTM card 13-398).

BRONZITE

(See enstatite)

BRUCITE

$Mg(OH)_2$

Brucite is an ore mineral of magnesium. It is most commonly found in crystalline limestone and is associated with dolomite, magnesite, chromite, and serpentine minerals. The name nemalite has been used for ferroan brucite.

Nova Scotia

11 N/2 The Meat Cove zinc deposit is located on the headwaters of French Creek, 2 miles southwest of the settlement of Meat Cove, on the northern tip of Cape Breton Island. Brucite occurs in marble as round blebs or spheroids 0.1 to 3 mm in diameter which are semi-transparent to opaque. The colour varies from grey to almost grey-black (W.M. Tupper, 1963: Can. Mineralogist, 7, p. 796).

Ontario

31 L/6
31 L/7 The Aluminum Company of Canada Ltd., holds what has been estimated as up to a million tons of ore grading from 11 to 23 per cent brucite on conc. A, Olrig Township (W.D. Harding, 1944: Ont. Dept. Mines, vol. 53, Pt. VI, p. 43).

An equigranular rock made up of calcite, dolomite, and brucite forms a series of low weathered outcrops on conc. IX, lot 28, Calvin Township. These cover an area about 500 feet wide and 900 feet long just north of the highway (H.C. Cooke, 1938: Geol. Surv. Can., unpublished File 21-C-10, p. 1).

32 C/12 Granular brucite is present in the crystalline limestones underlying much of Hinchenbrooke Township. It is exposed on conc. X, lot 5; conc. XI, lot 4; conc. XII, lots 3, 4, 5 and 6 (W.D. Harding, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. VI, pp. 44-5).

Quebec

21 E/13 Brucite is present in the Martin-Bennett chrome pit in Ireland Township, Megantic County. Specimens collected from this locality by E. Poitevin are in the National Mineral Collection. Two unusual modes of occurrence of brucite have been found in the Johns-Manville Mine at Asbestos: long parallel fibres with peridotite in a crushed zone; and a central zone of brucite dividing a vein of cross fibre asbestos. A chemical analysis of brucite from Asbestos by Gonyer is as follows: Fe_2O_3 1.95, FeO 9.57, MgO 60.33, H_2O 28.60, total 100.45 (H. Berman and C.D. West, 1932: Am. Mineralogist, 17, p. 313).

21 E/13 The fibrous iron-bearing variety of brucite (nemalite) occurs in the Asbestos district of Quebec. It has a lower birefringence than iron-free brucite. Chemical analysis by Gonyer: Fe_2O_3 1.95, FeO 9.57, MgO 60.33, H_2O 28.60, total 100.45 (J.D.H. Donnay, 1945: Univ. Toronto Stud., Geol. Ser., 49, p. 5).

31 F/10 The white crystalline limestones of the Calumet Island area contain brucite both as small aggregates amounting to 25 or 30 per cent of the rock and as concentrations along joints. On range II, lot 3 to 9 in Calumet Township, brucite occurs as lenticles following the structural trend, and coarse aggregates of the hydroxide mineral appear in a rock cut on the road leading from the island to the town of Campbells Bay (F.F. Osborne, 1939: Que. Dept. Mines, Prelim. Rept., 139, pp. 13, 14).

31 G/12 Occurrences of brucite in limestones have been noted in Wakefield Township, range I, lots 5, 6, and 7; and range III, lots 6 and 7; Masham Township, range I, lot 6, and range III, lot 7; and Hull Township, range XV, lots 22 and 23, and range XIV, lots 23 and 24 (F.F. Osborne, 1939: Que. Dept. Mines, Prelim. Rept., 139, pp. 7-11). The X-ray powder pattern of brucite from Wakefield has five strongest lines at 4.77 (9), 2.37 (10), 1.80 (7), 1.576 (4) and 1.375 (3) (X-ray Laboratory, Geol. Surv. Can.).

BUETSCHLIITE

$$3K_2CO_3.2CaCO_3.6H_2O$$

Ontario

31 C/6 This rare mineral has been identified from the trunk of a partially burned hickory tree near Deseronto. The four strongest lines in the X-ray powder pattern are: 2.866 (10), 2.690 (7), 2.069 (6) and 1.694 (5). It is associated with fairchildite ($K_2CO_3.CaCO_3$) (K.R. Dawson and Ann Sabina, 1958: Can. Mineralogist, 6, p. 290).

BYTOWNITE

$$NaAlSi_3O_8-CaAl_2Si_2O_8$$

Bytownite is a member of the plagioclase feldspar series. Its range in composition is limited by definition to between 10 and 30 per cent of the albite molecule ($NaAlSi_3O_8$) and 70 to 90 per cent of the anorthite molecule ($CaAl_2Si_2O_8$). Although the feldspar group of minerals are the most abundant minerals in the earth's crust, bytownite is relatively rare. It has been found in basic igneous rocks.

The name was given to a greenish white mineral found in a boulder near Bytown, now Ottawa. The name was later applied by Tschermak to include all feldspars within the range of composition Ab_{10-30} An_{70-90}. The original bytownite specimen was later shown to be a mixture of anorthite and other minerals.

Ontario

42 C/8 Colourless bytownite of composition Ab:An = 1:3 (approx.) has been found at the northwest end of Dog Lake, a mile and a half southeast of Lochalsh. The feldspar occurs as a primary constituent of a gabbro-wehrlite with olivine, augite, biotite, pigeonite, chromite, magnetite and apatite (M.H. Frohberg, 1944: Am. Mineralogist, 29, p. 302).

Quebec

31 H/7 Anorthite is reported to occur at Yamaska Mountain near Abbotsford in Rouville County as a constituent of yamaskite, a rock composed of pyroxenem hornblende, ilmenite, and feldspar, and lesser amounts of biotite, titanite, and spinel. The amount of feldspar varies from small amounts of irregular grains to abundant idiomorphic crystals (G.A. Young, 1904: Geol. Surv. Can., Ann. Rept., XVI, 31-32 H).

Chemical analysis of feldspar from Yamaska Mountain, by T. Sterry Hunt: SiO_2 46.90, Al_2O_3 31.10, Fe_2O_3 1.35, CaO 16.07, MgO 0.65, K_2O 0.58, Na_2O 1.77, H_2O 1.00, total 99.42: S.G. 2.756-2.763 (T. Sterry Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 479). The above analysis converted to atomic proportions does not agree with the feldspar formula. If Fe and Mg are assumed to be due to admixed pyroxene and corresponding atomic proportions of Fe, Mg, Ca, Si, and O are deducted, the remaining atomic proportions yield the formula $(Ca_{.78}Na_{.18}K_{.04})(Al_{.46}Si_{.54})_4O_8$ which falls within the bytownite range of composition.

The composition of the feldspar in a specimen of yamaskite believed to be similar to that studied by Hunt has been determined by X-ray diffraction and fusion techniques. Values of An_{82-88} were obtained by the X-ray method and An_{80} by the fusion method. The Yamaska 'anorthite' is thus shown to be bytownite (X-ray Laboratory, Geol. Surv. Can.).

31 I/16 Bytownite, wilsonite, cordierite, and scapolite occur in Montauban Township on range I, lots 33 to 41 and 312 to 322 and, range II, lots 38 to 41, in association with a sulphide body (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 30).

CACHOLONG

(See opal)

CACOXENITE

$Fe_4(PO_4)_3(OH)_3.12H_2O$

Ontario

31 B/12 Cacoxenite crystals have been described by B.J. Harrington as beautiful little yellow tufts on the walls of cavities in calcite. The calcite is associated with a pyrite deposit near Brockville in Elizabethtown Township, conc. II, lot 19 (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 25 T).

The X-ray powder pattern of cacoxenite has the following strongest lines: 6.86 (6), 4.82 (8), 4.17 (5), 3.18 (9), 2.79 (10). Intensities are variable because of preferred orientation effects (X-ray Laboratory, Geol. Surv. Can.).

CALAVERITE

$AuTe_2$

Calaverite is essentially a ditelluride of gold, but may contain subordinate amounts of silver. It is found in gold-bearing hydrothermal vein deposits associated with other telluride minerals and native gold that normally crystallize late in the paragenetic sequence.

The seven strongest lines in the X-ray powder diffraction pattern have the following spacings and intensities: 3.02 (10), 2.93 (3), 2.20 (4), 2.09 (8), 1.758 (3), 1.689 (3) and 1.506 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85,p. 112).

British Columbia

93 L/14 At Glacier Gulch, 6 miles west of Smithers, calaverite occurs as a subordinate mineral with tetradymite in a white rock which also contains sericite, carbonates, and kaolin. It is also associated with matildite, sphalerite and chalcopyrite (G.M. Pratt, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 55).

104 M/8 Calaverite occurs with gold, bismuth, and pyrite at the Engineer Mine in the Atlin mining division (Ellis Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

Ontario

31 M/13 Calaverite has been identified, by X-ray diffraction, with chalcopyrite, pyrite, and sphalerite in a polished section of a specimen from Miller Independence Mines at Boston Creek, Pacaud Township. It occurs as bladed lath-like crystals, stout or slender

prisms, or in a massive to indistinctly crystalline form (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 348).

The mineral has also been identified from the Boston-McRae Mine where it is the chief telluride present (Ellis Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 97).

32 D/4 In the Kirkland Lake area, calaverite occurs as small compact masses, and disseminations in quartz, calcite, or altered porphyry, in association with other tellurides, sulphides, and free gold. It has been noted at the following mines: Wright-Hargreaves, Macassa, Toburn, Bidgood, Kirkland Golden Gate, Upper Canada, and Lake Shore. Chemical analysis by Rickaby of calaverite from Lake Shore gave the following results: Au 39.36, Ag 0.30, Pb 5.20, Cu 0.24, Fe 0.33, Te 54.32, S 0.12, insol. 0.24, total 100.11. An analysis of calaverite with minor altaite, pyrite, and chalcopyrite, from the Wright-Hargreaves Mine is as follows: Au 38.55, Ag 0.22, Pb 6.49, Cu trace, Fe 0.70, Te 52.70, S 0.55, insol. 0.60, total 99.81 (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 348).

42 A/1 Calaverite has been reported in the Teck-Hughes and Sylvanite mines at Kirkland Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 349).

42 A/1 Coarse, readily recognized grains of calaverite were found in No. 3 vein of the Tough-Oakes Mine near Kirkland Lake. An assay of the telluride from this occurrence yielded 40.6 per cent gold (A.G. Burrows, 1923: Ont. Dept. Mines, Ann. Rept., vol. 32, Pt. IV, p. 24, revised edition).

42 A/9 Calaverite associated with tetradymite, gold, and pyrite occurs at Painkiller Lake, Beatty Township (Ellis Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 98).

52 E/9 Small blebs and short veins of calaverite occur in quartz and carbonate gangue at Bigstone Bay, Lake of the Woods. Tetradymite, petzite, pyrite, gold, chalcopyrite, and hessite are associated minerals (Ellis Thomson, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 48).

Quebec

32 C/4 Specimens taken from the Louvicourt Goldfields Mine in Louvicourt Township were composed of tourmalinized quartz, with free gold and small areas of calaverite and tarnished tellurbismuth in close association with calcite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 348).

32 C/4 A specimen of white quartz from the Lamaque Mine in Bourlamaque Township contained small plates of tellurbismuth

32 C/4 and massive calaverite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 348).

32 D/1 Grains of calaverite about one millimetre in diameter occur in massive milky quartz at Canadian Malartic Gold Mines in Fournier Township, Quebec (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 348).

32 D/6 Several pieces of greenstone taken from the Horne Mine at Noranda contained calaverite, altaite, and petzite in coarsely crystalline masses or intergrown with tellurbismuth (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 349).

CALCIOSAMARSKITE

Columbate of rare earth elements

Ontario

31 F/4 Calciosamarskite is the name given to what was believed to be a lime-rich variety of samarskite from the Woodcox Mine, in lot 17, conc. VII, of Monteagle Township. It occurs in a pegmatite dyke with hatchettolite (pyrochlore) and cyrtolite. A chemical analysis by H.V. Ellsworth is as follows: SiO_2 2.39, TiO_2 2.50, Al_2O_3 0.16, Fe_2O_3 7.67, BeO 0.26, FeO 0.21, CaO 7.56, MgO 0.02, MnO 0.04, ZrO_2 0.02, SnO_2 1.49, Ta_2O_5 2.54, Cb_2O_5 43.32, PbO 0.44, UO_2 9.00,UO_3 1.67, ThO_2 3.34 $(Ce, La, Di)_2O_3$ 1.68 $(Yt, Er)_2O_3$ 11.38, H_2O (-110°) 0.40, H_2O (+110°) 3.24, total 99.33. S.G. 4.738 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 258).

X-ray powder patterns of ignited calciosamarskite do not resemble those of samarskite but are similar to yttrotantalite (Dana, 7th edition, vol. I, p. 772).

41 H/1 A black radioactive mineral occurs with uraninite in a dyke on lots 9 and 10, conc. IX, Conger Township, Parry Sound district. It resembles the calciosamarskite from Monteagle Township in Hastings County and has, therefore, been given that name. Analysis by H.V. Ellsworth: SiO_2 1.92, TiO_2 1.43, Al_2O_3 0.65, BeO 0.49, FeO + Fe_2O_3 (as Fe_2O_3) 3.01, CaO 4.76, MgO 0.14, MnO 0.23, ZrO_2 0.24, SnO_2 0.48, Ta_2O_5 4.86, Cb_2O_5 43.50, PbO 0.38, U_3O_8 13.38, ThO_2 2.16 $(Ce, La, Di)_2O_3$ 4.04, $(Y, Er)_2O_3$ 10.71, H_2O^- 0.68, H_2O^+ 5.76, total 98.82, S.G. 4.485 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 258).

CALCITE

$CaCO_3$

Calcite, the most stable form of calcium carbonate is one of the commonest of minerals. It is an important rock-forming mineral in rocks of sedimentary origin and their metamorphic equivalents, where it may be the dominant and almost pure constituent as in limestone, chalk and marble, or occur in lesser amounts as a cementing material in other rocks. Calcite is a widespread alteration product of igneous rocks, particularly basic varieties, and is a common constituent of hydrothermal mineral deposits. It also occurs as a product of magmatic crystallization. Calcite is deposited from meteoric lime-bearing carbonated waters in a variety of forms including: stalactites and stalagmites in limestone caves; travertine and calc-sinter from springs and streams; and petrifying material preserving animal and plant remains.

Varietal names for calcite, based mainly on variations of crystal habit include: dog-tooth spar, nail head spar, Iceland spar, satin spar, lublinite, argentine and aphrite. Massive and cryptocrystalline calcite is known variously as limestone, marble, chalk, lithographic stone, pisolite, Egyptian and Oriental alabaster, Mexican onyx, calc-sinter, travertine, calc-tufa, rock-milk and rock-meal. Compositional varieties found by substitution of other divalent cations for calcium include: manganoan, ferroan, magnesian, zincian, cobaltian, plumbian, barian, and strontian calcite.

The X-ray powder pattern of pure $CaCO_3$ has five strong lines at 3.035 (10), 2.285 (2), 2.095 (2), 1.913 (2) and 1.875 (2) (A.S.T.M. card 5-0586).

A few of the many Canadian localities that have yielded interesting specimens of calcite in its various forms are noted below.

British Columbia

82 F/15
82 K/2
Marble suitable for ornamental purposes is quarried at two places near Kootenay Lake: at the Canadian Marble and Granite Works property near Marblehead (8 miles north of Lardeau), and at a quarry on the south fork of Kaslo Creek, 5 miles from Kaslo. The marble is of the mottled blue variety (W.A. Parks, 1917: Can. Dept. Mines, Mines Br. Publ., No. 452, vol. 5, pp. 128-29, 138-39).

92 F/9
92 F/10
92 F/15
Delicate pink, red to chocolate brown and greenish coloured crinoidal marble occurs at the Malaspina Quarries Company property located at lot 339, group 1, on a ridge west of Anderson Bay near the southern tip of Texada Island. Nootka Quarries Limited, on lot 26, 100 feet above sea level and about 900 feet from the head of Anderson Bay, produces a pink and white marble.

92 F/9
92 F/10
92 F/15 Outcrops of a pure white to greyish and bluish marble are found in the northern part of Texada Island, in an area extending from the northern tip southward for a distance of 6 miles, in the Davis Bay and Crescent Bay areas. At one time, a quarry was operating in the southwestern corner of Blubber Bay (W.A. Parks, 1917: Can. Dept. Mines, Mines Br. Publ., No. 452, vol. 5, pp. 150-162).

94 A/4 A large deposit of travertine formed from springs is reported to occur near Hudson Hope in the Peace River mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 50).

New Brunswick

21 G/8 A band of serpentine marble, about 50 feet wide, occurs in a crystalline limestone exposure along Burpee Avenue in the city of Saint John. The marble is the verde-antique variety consisting of coarse-grained white, bluish, and greyish calcite irregularly mingled with greenish and yellowish serpentine (W.A. Parks, 1914: Can. Dept. Mines, Mines Br. Publ., No. 203, p. 164).

21 H/11 Large rhombohedrons of calcite fill crevices in the conglomerates at Goose Creek near Martin Head (L.W. Bailey, 1870-71: Geol. Surv. Can., Rept. Prog., p. 237).

21 P/13 Good crystals of calcite have been collected at Chapel Point in Gloucester County (National Mineral Collection).

Northwest Territories

27 C A beautiful marble composed of white and light rose or orange coloured crystalline limestone is reported to occur "in an inland zone west of a line connecting the heads of Sam, Clyde and McBeth fiords to the edge of the Barnes ice cap". The limestone is interbedded with diopside, chrondrodite, and phlogopite in the 200-foot-wide formation. The limestone is exposed along the valleys of the Clyde River and the Sam Fiord River (E.H. Kranck, 1951: Can. Inst. Mining Met., Bull., vol. 44, No. 474, pp. 682-3).

Nova Scotia

11 E/5 Dog-tooth spar is found associated with pyrolusite and manganite in the Faulkner manganese mine southwest of Minasville (L.J. Weeks, 1948: Geol. Surv. Can., Mem. 245, pp. 68-69).

11 E/6 Dolomitic shell limestone (coquina-type) occurs in a deposit about 3 miles west of Hilden. The limestone is composed almost entirely of shells replaced by black crystalline limestone and cemented with the same material. Crystals of red calcite and of dolomite coat the cavities between and inside the shells

11 E/6 (M.F. Goudge, 1934: Can. Dept. Mines, Mines Br. Publ., No. 742, pp. 44-45) (I.M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 100).

11 E/13 Reddish brown calcium limestone concretions occur in a red shaly matrix at a limestone quarry on Dewar's Hill, 3 miles southwest of Pugwash. Crystals of calcite and dolomite line vugs in the limestone of the quarry (M.F. Goudge, 1934: Can. Dept. Mines, Mines Br. Publ., No. 742, pp. 51-55).

11 F/15 Beautiful marbles occur at a locality near Eskasoni, on the west side of East Bay on Bras d'Or Lake (W.A. Parks, 1914: Can. Dept. Mines, Mines Br. Publ., No. 203, pp. 183-185).

11 K/1 Two types of marble are found at the quarry at Scotch Lake, west of the Scotch Lake village. One is a fine-grained white matrix with pink and green clouds and veins; the other a medium-grained white marble with dots of yellow serpentine (W.A. Parks, 1914: Can. Dept. Mines, Mines Br. Publ., No. 203, pp. 181-182).

11 K/8 Pure white, blue and white clouded, and salmon variegated marbles are among those found at the Marble Mountain limestone quarry, located at Marble Mountain village, near the shore of the West Bay of Bras d'Or Lake (T.D. Guernsey, 1927): Geol. Surv. Can., Summ. Rept., Pt. C, pp. 77-79).

11 L/2 Calcareous tufa deposited on moss has been found at a spring near Upper Stewiacke, in Colchester County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 228).

21 A/16 Black calcite, the result of its content of manganese, occurs at the manganese mines south of Dean Chapter Lake, about 7 miles north of New Ross (G. Hanson, 1932: Geol. Surv. Can., Econ. Geol. Ser., 12, pp. 53-62).

21 H/1 Fluorescent calcite is found in the rock exposed along the shores of Minas Basin from Chenerie to Walton. The calcite occurs as crystals in carboniferous conglomerate and as fine-grained matrix cementing pebbles in the conglomerate. It fluoresces a brilliant hot pink (R.W. Boyle, private communication).

21 H/8 Calcite crystals associated with analcite occur in geodes at Wasson's Bluff, Cumberland County (A.T. McKinnon, 1916: National Mineral Collection).

Ontario

30 M/3 Fine specimens of dog-tooth spar have been collected at Niagara Falls in Welland County (National Mineral Collection).

31 C/6 Clear to smoky grey, pink, and red aggregates of calcite scalenohedrons (individual crystals up to 1 inch long) occupy vugs and

31 C/6 fissures in the Henderson and Conley talc mines (Canada Talc Industries Limited). These mines are near the north shore of Moira Lake in Huntingdon Township, Hastings County (P. Sandomirsky, 1954: M.A. Thesis, Univ. Western Ont.) (M.E. Wilson, 1926: Geol. Surv. Can., Econ. Geol. Ser., No. 2, pp. 78-87).

31 C/7 Calcite crystals, vugs lined with small amethyst crystals, and banded calcite with hematite are exposed at a road cut on the east side of Highway No. 38, 1 mile south of Verona, Portland Township, Frontenac County. The banded calcite-hematite specimens are reported to fluoresce (B.B. Woods and L.B. Woods: Min. Coll. Eastern Ont., pp. 5-6).

31 C/10 A.L. Parsons has described an unusual occurrence in Godfrey Township in which a small crystal of calcite has been nearly enclosed by the lower part of a large pyramidal crystal giving the impression of twinning (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 23).

31 C/11 A beautiful black marble composed of alternating dark and lighter bands occurs in a quarry in the southeast end of the village of Madoc, in Madoc Township, Hastings County. The quarry is on the north side of the road leading to the talc mines, 700 yards from the turnoff on Highway No. 7 (F.F. Osborne, 1930: Ont. Dept. Mines, Ann. Rept., vol. 39, Pt. VI, pp. 53-54).

31 C/15 Cream-coloured crystals of calcite having diameters of up to 8 inches occur at the Marhill calcite quarry located about 2 miles west of Robertsville, Palmerston Township, Frontenac County. Some of the crystals have a violet tinge. The calcite vein cuts pink granite gneiss (B.L. Smith, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VII, p. 42).

31 C/16 The Silver Queen Mine located on lot 13, conc. V, North Burgess Township, contains crystalline limestone in which are found phlogopite, diopside, wollastonite, pyrite, garnet, tremolite, marcasite, pyrrhotite and graphite. The limestone is unusual on account of its blue colour and its property of releasing hydrogen sulphide when crushed. The limestone pit is 250 feet from the mica pits (H.S. de Schmidt, 1912: Can. Dept. Mines, Mines Br. Publ., No. 118, pp. 167-68, 253-54).

31 D/16 Orange calcite is found in crystalline limestone at a roadcut on Highway No. 121 about 3/4 mile north of Tory Hill (D.D. Hogarth: private communication).

31 F/4 In the Stewart marble quarry, located in lots 29 and 30, conc. X, Dungannon Township, Hastings County, several varieties of dolomite marble are found. Among them are light blue, medium-grained, siliceous dolomite veined with white; brownish pink, fine-grained, banded marble; pale, clouded green, fine-grained

31 F/4 marble with siliceous streaks, containing feathery rosettes of green tremolite; serpentinous, green, fine-grained dolomite ('Imperial Green' Marble); and pink calcium marble. The marbles occur as bands which adjoin each other in the quarry.

Four varieties of marble are found at the Barker marble quarry on lots 41 and 42, Hastings Road. They are: 'Laurentian No. 10' marble consisting of greyish white and greenish white dolomite fragments cemented by chocolate brown micaceous material; calcium marble in pink to red shades with irregular black and pale green veins; 'Laurentian No. 14' marble composed of green and brown brecciated dolomite traversed by narrow white calcite veins; siliceous, fine-grained, banded brownish dolomite.

'Laurentian Buff' marble, a fine-grained buff dolomite veined and clouded with dark brown micaceous bands is exposed in a small quarry on the top of a cliff, 200 yards northwest of the Barker (main) quarry on lots 41 and 42, Hastings Road (D. F. Hewitt and W. James, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. VIII, pp. 55-56).

Coarsely crystalline, salmon pink calcite with ellsworthite is found on lot 18, conc. VII of Monteagle Township. The colour is believed due to the presence of manganese and possibly ferrous iron. An analysis by E.W. Todd gave the following composition: CaO 55.43, CO_2 43.86, FeO 0.28, MnO 0.21, SiO_2 0.03, H_2O 0.10, total 99.91 (T.L. Taylor and A.L. Parsons: Univ. Toronto Stud., Geol. Ser., 16, p. 18).

Calcite in the form of clear honey yellow crystals measuring up to 5 inches across has been found at the Faraday Uranium Mines Ltd., property on lots 16-18, conc. XI, in Faraday Township, Hastings County. Some of the crystals contain inclusions of chalcopyrite and tiny crystals of pyrite, and hematite. Hematite in botryoidal form often coats these crystals (D. F. Hewitt, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. III, pp. 70-75).

Good terminated crystals of calcite occur in a road cut on Highway No. 62, 3.3 miles north of Bancroft in Dungannon Township, Hastings County (D. F. Hewitt, P.A. Peach, and L. Moyd, 1953: Geol. Soc. Am. and Geol. Assoc. Can., Ann. Meeting, Guide to Field Trip No. 1, p. 16).

Massive blue calcite is found in a skarn zone exposed by a pit on a hillside above the road, 200 yards north of Highway No. 500, on the east side of Egan Chute on the York River, in lot 12, conc. XII, Dungannon Township, Hastings County.

Pink calcite in crystalline limestone occurs at a deposit 2 miles from Birds Creek on the side of a cliff overlooking McFall Lake, Herschel Township, Hastings County, on its north side (V.B. Meen

31 F/4 and D.H. Gorman, 1953: Geol. Soc. Am. and Geol. Assoc. Can., Ann. Meeting, Guide to Field Trip No. 2, p. 20).

31 F/6 A vein of coarse salmon orange calcite is located in a deposit near the northern shore of Turner's Island in Lake Clear, Sebastopol Township, Renfrew County. Scapolite, hornblende, and pyroxene are found in this vein (G.F. Kunz, 1890: Gems and Precious Stones of North America, pp. 259-260).

31 F/15 Iceland spar has been found at Dalhousie Lake in Lanark County (National Mineral Collection).

31 L/7 Pale blue coarse-grained calcite, siliceous, pale green dolomite, and a rock composed of mainly quartz crystals is associated with the dolomite in an outcrop on the south side of Highway 17, at a point 1/3 mile east of the bridge over Pimisi Bay, near Rutherglen (M.F. Goudge, 1938: Can. Dept. Mines, Mines Br. Publ., No. 781, pp. 130-132).

40 J/3 Dog-tooth spar has been found with celestite in the rocks in the bed of the Detroit River at Amherstburg in Essex County (G.C. Hoffmann, 1904: Geol. Surv. Can., Ann. Rept., XVI, pp. 347-348 A).

52 A/4 Pink and white calcite are found at the Hidden Treasure Mine, on the south half of lot 16, conc. IV, Pearson Township, along with pale brown barite crystals (T.L. Tanton, 1931: Geol. Surv. Can., Mem. 167, p. 140).

52 A/6 Iceland spar is found in the Neepatyre Mine, located on lots 24 and 25, conc. V, north of the Kaministikwia River in Neebing Township (T.L. Tanton, 1931: Geol. Surv. Can., Mem. 167, p. 144).

52 A/7 Calcite crystals of two generations occur near Thunder Cape, Lake Superior. The earlier crystals tend to be tabular and badly etched while the later ones are well formed though usually with a frosted surface. The interiors are unusually transparent and colourless and their suitability for optical use has been considered (A.L. Parsons, 1920: Univ. Toronto Stud., Geol. Ser., 12, p. 51).

Pink laumontite and calcite, some of which is of the Iceland spar variety, are found in a composite vein cutting basic lava on Porphyry Island, in Lake Superior. This vein, which strikes parallel to a diabase dyke to the north of it, is exposed on the eastern shore of the north part of the island (T.L. Tanton, 1931: Geol. Surv. Can., Mem. 167, p. 187).

Quebec

21 L/3 Dog-tooth calcite crystals occur in vugs in altered leucocratic rocks in association with thomsonite crystals at the King, Beaver, and Bennett-Martin mines (property of Asbestos Corp., Ltd.) and at the Johnson Mine (property of Johnson's Co. Ltd.). These mines are all located at Thetford Mines, Thetford Township, Megantic County (A. Sabina, private communication).

31 F/10 Sky blue calcite crystals have been reported from Calumet Falls in Litchfield Township, Pontiac County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 51).

31 F/15 Salmon pink calcite is found to occur with apatite and diopside crystals and purple fluorite in a skarn zone at the property of Yates Uranium Mines Ltd. This property is located north of Otter Lake, in lots 19 and 20, range IV, and lots 16 and 17, range V, Huddersfield Township, Pontiac County. Pink calcite containing stilbite and heulandite has been found in a pit about 3/4 of a mile by road west of the camp (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, pp. 39-41).

31 G/9 Fetid calcite occurs with tourmaline in lot 10 range XI, Chatham Township, Argenteuil County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 51).

31 G/11 Fibrous calcite occurs at an apatite-mica deposit on lot 8, range IX, in Templeton Township, Papineau County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 51).

Pink calcite, mica, and green apatite occur in the Wallingford mica mine, on the north slope of a ridge in lot 16, range VIII, Templeton Township, Papineau County, southwest of Perkins Mills; at the Goldring Mine, lot 17, range IX, Templeton Township; and at the Victoria Mine, 2 1/2 miles northwest of Perkins Mills (H.S. de Schmidt, 1912: Can. Dept. Mines, Mines Br. Publ., No. 118, pp. 70-78, 276-295).

31 G/12 The Nellie and Blanche Mine, located in Hull Township, lot 10, range II, 2 miles southwest of Cantley village, contains salmon-coloured calcite with apatite, scapolite, diopside, and actinolite, in a pyroxenite dyke (D.D. Hogarth, 1962: Can. Field Nat., vol. 76, No. 1, p. 31).

Pink calcite occurs in the Lake Girard Mine on the south shore of Lac Girard, lot 24, range II, Wakefield Township, Gatineau County (D.D. Hogarth, private communication).

31 H/3 Grey, pink, and green marbles occur at the quarry of Missisquoi-Lautz Co. Ltd., 3/4 mile north of the village of Philipsburg, on Missisquoi Bay of Lake Champlain, Missisquoi County. The grey marble is mottled, traversed by dark green irregular lines, and

31 H/3 blotched with yellow-green. The 'Emeraldo' variety is a grey marble with a high proportion of yellowish green to deep sea green patches. The 'vert Rose' variety consists of a white and green matrix with mottled white and rose-coloured clouds up to 2 inches in diameter (W.A. Parks, 1914: Can. Dept. Mines, Mines Br. Publ., 279, pp. 212-225).

31 H/8 Several varieties of marble are mined at the quarry of Dominion Marble Co., among them dark and light 'Jaune royal', dark and light 'Rose royal', 'vert royal', 'violetta', 'Royal veined white' and 'Royal Dominion blue'. The quarry is located 1 1/4 miles north of the village of South Stukely, Stukely Township, Shefford County.

Fine-grained red and green marble are found at the quarry of the Orford Marble Co., on the east side of Bowker Lake, Orford Township, Sherbrooke County. The red variety is traversed by white calcite veinlets. Crystals of green calcite occur in the crystalline limestone (W.A. Parks, 1914: Can. Dept. Mines, Mines Br. Publ., 279, pp. 203-211).

Iceland spar occurs on lot 6, range XII of Orford Township, Sherbrooke County (National Mineral Collection).

31 K/1 Pale salmon pink calcite is found in the Father Quay Mine, 6 miles northeast of Gracefield, lot 6, range A, Wright Township, Gatineau County.

Pink calcite is found with apatite and mica at the Chaibee Mine, lot 6, range A, Wright Township, Gatineau County (H.S. de Schmidt, 1912: Can. Dept. Mines, Mines Br. Publ., 118, pp. 123-124, 296).

CALEDONITE

$$Cu_2Pb_5(SO_4)_3CO_3(OH)_6$$

British Columbia

82 F/3 Caledonite occurs sparingly with linarite in greenish blue druses on the Beaver claim group at Beaver Mountain in the Slocan district (Unknown, 1921: Univ. Toronto Stud. Geol. Ser., 12, p. 69).

The strongest lines in the X-ray pattern of caledonite are listed in the A.S.T.M. Index as 4.60 (8), 3.09 (8), and 1.85 (10). A specimen from Theban Maricopa County, Arizona gives strong lines at 4.71 (10), 3.16 (9), 3.04 (4), 2.77 (4) and 1.87 (4), in poor agreement with the A.S.T.M. data. Further work is required on this species (X-ray Laboratory, Geol. Surv. Can.).

82 N/1 Caledonite has been reported from the Ice and Beaverfoot rivers in the Golden mining division (J.A. Allan, 1910: Geol. Surv. Can., Summm. Rept., p. 139).

CAMSELLITE

(See szajbelyite)

CANCRINITE

near $Na_3CaAl_3Si_3O_{12}CO_3$

The exact formula for cancrinite, an aluminium silicate and carbonate of sodium and calcium, is indefinite. It may contain potassium, sulphate and chlorine in addition to the elements noted above.

Ontario

31 C/12 Fine amber yellow cancrinite occurs in Methuen Township in the quarries of the American Nepheline Corporation. X-ray study of a fragment gave unit cell constants a = 12.60, c = 5.12. Chemical analysis by R. Phoenix: SiO_2 33.98, Al_2O_3 29.11, Na_2O 18.69, K_2O 0.64, CaO 4.80, CO_2 7.00, SO_3 1.37, Cl 0.42, H_2O^+ 4.34, H_2O^- 0.23, total 100.58 less 0 for Cl_2 0.10 = 100.48; S.G. 2.420, 2.423 (R. Phoenix and E.W. Nuffield, 1949: Am. Mineralogist, 34, p. 452).

31 F/4 Cancrinite occurs as an alteration product of nepheline in the nepheline-bearing rocks of Dungannon Township near Egan Chute. It is found as an opaque white zone surrounding crystals of nepheline and is in turn surrounded by zones of fine-grained pink and green material, respectively (L. Moyd, 1949: Am. Mineralogist, 34, p. 747).

Irregular veins of cancrinite from one to four inches wide cut nepheline in a quarry near Bancroft. Chemical analysis by V.B. Meen: SiO_2 35.38, Al_2O_3 28.42, CaO 11.66, Na_2O 9.82, K_2O 1.23, CO_2 6.18, H_2O^+ 6.39, H_2O^- 0.60, Cl 0.08, SO_3 0.19, total 99.95; S.G. 2.476 (V.B. Meen, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 35).

41 I/2 Cancrinite forms yellow masses in the central portions of pegmatite dykes in Bigwood Township. The dykes occur in a north-south belt about 5 miles long and 1/4 mile wide with its south end exposed along the French River. Associated minerals are: sodalite, plagioclase, microcline, apatite, magnetite, lepidomelane, molybdenite, and pyrrhotite. Chemical analysis by H.C. Rickaby: SiO_2 36.24, CO_2 5.61, Al_2O_3 28.78, Fe_2O_3 0.36, CaO 4.83, MgO 0.26, MnO 0.04, Na_2O 18.63, K_2O 0.73, H_2O 4.64, Cl trace, total 100.12; S.G. = 2.425. It is said to have possibilities

41 I/2 as a gemstone (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 8) (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 19).

Cancrinite from the French River area gives an X-ray powder pattern with four strongest lines at 6.29 (5), 4.65 (10), 3.65 (6) and 3.22 (9) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

31 H/6 Cancrinite occurs in Beloeil Township, Rouville County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 26 T) (B.J. Harrington, 1882-83: Trans. Royal Soc. Canada, vol. I, sec. III, p. 81).

31 H/12 The nepheline syenites at Montreal contain some cancrinite (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 26 T).

31 I/14 Thin sections made from specimens obtained from the Metawishish River in the Albanel area contain up to 5 per cent cancrinite. It occurs as poikilitic intergrowths with nepheline and as grains interstitial to the feldspars. Associated minerals are orthoclase, albite, and biotite (James Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 14).

CARNELIAN

(See quartz)

CARNOTITE

$K_2(UO_2)_2(VO_4)_2 \cdot 3H_2O$

British Columbia

92 K/3, 92 K/6 While examining copper deposits in the vicinity of Gowland Harbour, Quadra Island, Mr. Crowe-Swords of Vancouver noticed a soft greenish yellow material occurring in small fissures in the rocks. The material was subsequently identified as carnotite at the University of British Columbia. Chemical analyses: I, by Archibald, Univ. British Columbia: SiO_2 17.54, U_3O_8 27.70, V_2O_3 19.00, Fe_2O_3 22.00, CaO 4.5, Na_2O 2.2, K_2O 3.2, H_2O 5.0, total 101.14; II, by Mines Br., Ottawa: SiO_2 10.6, U_3O_8 28.9, V_2O_3 21.1, Fe_2O_3 2.9, H_2O 4.9, total 68.4. Carnotite has also been reported on the surface and in fractures of amygdaloidal flows of the Valdes formation northwest of the north end of Gowland Harbour (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 139).

92 K/3, 92 K/6 Identification of the material as carnotite appears to have been based on colour and apparent high content of uranium and vanadium. The chemical analyses, however, do not correspond with carnotite and, lacking confirmation by X-ray diffraction, the identification must be viewed with suspicion. Subsequent study of the area by J. L. Jambor (M.Sc. Thesis; Univ. British Columbia, 1960) has shown that vanadium-bearing minerals are abundant, but no radioactive minerals were found and no significant amounts of uranium are present in the rocks of the area. The above evidence suggests that the reported occurrences of carnotite on Quadra Island are not valid.

CARROLLITE

$CuCo_2S$

Quebec

32 C/4 Carrollite was identified by X-ray powder pattern in a sample from Siscoe Gold Mines (E. W. Nuffield and D.H. Gorman, 1960: private communication).

The X-ray powder pattern of carrollite has five strongest lines at 2.86 (10), 2.35 (5), 1.825 (6), 1.674 (8) and 0.994 (5) (L. G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 77).

CASSITERITE

SnO_2

Cassiterite is the most important ore mineral of tin. It occurs in high-temperature veins, pegmatites, and contact-metamorphic deposits. Probably its most important occurrence, however, is in placer deposits derived from areas of granitic rocks.

British Columbia

104 N/11 Ruby Creek, 17 miles east of Atlin has cut a deep narrow canyon through a basalt flow exposing buried stream gravels in which cassiterite is found as a placer mineral. Other minerals identified in the black sand are: wolframite, magnetite, zircon, brookite, gold, copper, bismuth, ilmenite, rutile, chalcopyrite, pyrite, pyrope, quartz, feldspar, biotite, muscovite, chrysotile, amalgam, and mercury. The cassiterite is believed to have originated in the ultrabasic rocks in the upper reaches of the creek (T. L. Gledhill, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 40).

Manitoba

52 L/6 A few grains and lumps of cassiterite have been found on the Bear mineral claim, 3 miles southeast of Lamprey Falls on the Winnipeg River (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 157).

52 L/6 Cassiterite occurs in a pegmatite dyke with quartz, albite, tourmaline, biotite and mica in the Shatford-Ryerson Lake area of Manitoba. The dyke follows the contact of a basalt and a garnetiferous band lying between the basalt and a silicified rock. It is located on a small reef near the east end of Shatford Lake (J.F. Davies, 1957: Manitoba Mines Br., 56-1, p. 16).

New Brunswick

21 G/7 The largest concentration of tin in the province is at Mount Pleasant, Charlotte County, where cassiterite and stannite occur with sulphides of Cu, Zn, Pb, Mo, Bi and W in acidic volcanic rocks (A.A. Ruitenberg, 1963: M.Sc. Thesis, Univ. New Brunswick). Cassiterite has also been found at Kedron Brook in quartz veins, with associated sphalerite, pyrite, pyrrhotite, galena and chalcopyrite (W.M. Tupper, 1959: New Brunswick Mines Br., P.M. 59-2).

21 J/10 Quartz veins carrying cassiterite, topaz, molybdenite, wolframite, chalcopyrite, pyrrhotite, pyrite, arsenopyrite and fluorite have been found at Burnt Hill Brook, York County (W.J. Wright, 1940: New Brunswick Mines Br., Paper 40-2).

21 P/5 Cassiterite and stannite are minor constituents of the massive sulphide ore bodies in the Bathurst mining camp, notably at Brunswick No. 6 and No. 12 and Portage River (A.L. McAllister, 1959: New Brunswick Mines Br., reproduction of Can. Inst. Mining Met., Bull.).

Northwest Territories

85 I/1 The Tan claims are located on four zoned pegmatite dykes grouped around a small lake about 1/2 mile east of the southeast corner of Blatchford Lake. The dykes carry spodumene, amblygonite, cassiterite and tantalite-columbite (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 15).

85 I/11 Noteworthy amounts of cassiterite have been reported in pegmatites that extend for a distance of some 1,600 feet southeast of Sproule Lake. Other minerals present include beryl, spodumene, amblygonite, lithiophilite and tantalite-columbite (R. Mulligan, 1960: Geol. Surv. Can., Paper 60-21, p. 14).

Nova Scotia

11 D/15 Cassiterite has been reported to occur in sand at Tangier in Halifax County.

11 F/4 It has also been noted at Country Harbour in Guysborough County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 53).

21 A/9 Small quantities of cassiterite have been found in pegmatite veins in Lunenburg County near Lake Ramsay, and elsewhere in the parish of New Ross (E.R. Faribault, 1907: Geol. Surv. Can., Summ. Rept., pp. 80, 81).

Ontario

41 I/6 Minute crystals of cassiterite have been noted with sperrylite in the Vermillion Mine in Denison Township, conc. IV, lots 5 and 6, in the Sudbury district (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 26 T).

Quebec

31 G/11
31 G/14 Microscopic grains of cassiterite have been observed with rutile in samples taken from the more micaceous portions of the gneiss in the graphite area of Buckingham Township, ranges VII and VIII, lots 18 to 28 (A. Osann, 1899: Geol. Surv. Can., Ann. Rept., XII, 72-0).

Yukon

106 D/4 Cassiterite has been found west of Haggart Creek, a tributary of the McQuesten River, in the Mayo mining district (R. M. Thompson, 1945: Econ. Geol., 40, p. 142-147).

The mineral also occurs in abundance in the gold placers of the Dublin Gulch area in the Mayo mining district. The X-ray powder pattern of cassiterite from Dublin Gulch has five strongest lines at spacings of 3.35 (8), 2.65 (9), 1.76 (10), 1.41 (4) and 0.780 (5) (X-ray Laboratory, Geol. Surv. Can.).

115 J/15 Pebbles of cassiterite have been noted in Canadian Creek (National Mineral Collection).

116 B/3 Irregularly shaped pebbles of cassiterite have been found in the auriferous gravels of Bonanza and Hunker Creeks and from claim 26 on Last Chance Creek (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., XII, p. 16 R).

CELADONITE

near $KMg_3Fe_3Si_9O_{25}(OH)_2 . 9H_2O$

Northwest Territories

87 H/2 Celadonite occurs as bluish green earthy coatings in amygdules and on the surface of specimens of amygdaloidal basalt from the Minto River canyon, 71°15'N, 113°30'W, on Victoria Island (Collector: R. L. Christie). Identification was made by X-ray powder pattern. A similar specimen from Axel Heiberg Island was also proved to contain celadonite. The X-ray powder photograph of the mineral from Victoria Island shows seven strongest lines with the following spacings: 4.52 (8), 3.95 (4), 3.33 (6), 3.08 (4), 2.59 (10), 2.40 (5) and 1.510 (7) (X-ray Laboratory, Geol. Surv. Can.).

CELESTITE

$SrSO_4$

Newfoundland

12 B/10 Crystalline aggregates of celestite occur with barite, calcite, and aragonite at Gillanis Cove, about 1/2 mile west of Aguathuna. At the settlement of Boswarlos, 1/2 mile southwest of the mouth of Hoopers Brook, celestite occurs as:

(a) intergrowths of blue granular celestite in an aragonite groundmass,

(b) large lenticles of friable, coarsely crystalline, blue celestite in a buff muddy limestone,

(c) large rounded crystal masses of celestite with sugary white or pink massive barite,

(d) intergrowths of finely crystallized celestite and barite,

(e) filling vugs and cavities, and,

(f) as veinlets in thinly bedded limestone.

(Helgi Johnson, 1954: Geol. Surv. Can., Bull. 27, p. 13).

Nova Scotia

11 K/1 A bluish grey, granular, massive variety of celestite has been observed in a bed, one foot thick, in the carboniferous limestone, on the right bank of the Sydney River, about a mile and a half above Sydney Bridge, Cape Breton County (G. C. Hoffmann, 1892: Geol. Surv. Can., Ann. Rept., VI, p. 25 R).

Ontario

30 M/12 Celestite occurs at the Fleming quarry on lot 26, conc. X, Esquesing Township, Halton County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 53).

30 M/13 A red variety of celestite occurs in cavities in dolomite at Credit Forks, Caledon Township, Peel County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 26 T).

31 C/1 The Trenton limestone near Kingston contains white, translucent, foliated masses of celestite (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 26 T).

31 C/6 North of the town of Belleville, in the Madoc area, tabular crystals and fibrous aggregates of celestite up to several feet in diameter occur in veins. Fluorite is associated with the celestite (W.M. Fairbairn, 1929: Am. Mineralogist, 14, p. 286).

31 C/7 Well formed crystals of celestite are found as segregations or nodular masses in the Paleozoic limestones in the vicinity of Verona, and at the Frontenac lead mine north of Kingston (W.M. Fairbairn, 1929: Am. Mineralogist, 14, p. 286).

31 C/9 Celestite, associated with calcite and galena occurs in abundance on lot 2, conc. VIII, Lansdowne Township, Leeds County. Chemical analysis by Johnston: SO_3 43.51, SrO 56.31, BaO trace, CaO 0.11, total 99.93; S.G. 3.958 (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 9-10 R).

The X-ray powder pattern of celestite from Lansdowne Township has five strongest lines at 3.30 (9), 2.97 (10), 2.73 (5), 2.045 (7) and 2.002 (7) (X-ray Laboratory, Geol. Surv. Can.).

An occurrence of celestite has been reported at Lyndhurst on the Brockville-Westport branch of the Canadian National railway (W.M. Fairbairn, 1929: Am. Mineralogist, 14, p. 286).

31 C/10 Celestite has been found in lot 5, conc. XII, of Loughborough Township in Frontenac County (R.L. Broadbent, 1907: National Mineral Collection).

31 F/4 The X-ray Laboratory of the Geol. Surv. Can., has identified celestite from the property of Faraday Uranium Mines Ltd., in Hastings County, Faraday Township, conc. XI, lots 16 and 17.

31 F/7 Slab-like masses of celestite enclosed in brown dolomite occur on the Kingston-Pembroke branch of the Canadian Pacific railway near Calabogie. The strontium sulphate is believed to have been deposited from ascending solutions related to intrusions of diabase (W.M. Fairbairn, 1929: Am. Mineralogist, 14, p. 286).

31 F/7 A milk white, columnar variety of celestite occurs in lot 7, conc. X, Bagot Township, Renfrew County. Chemical analysis by Johnston: SO_3 42.09, SrO 48.30, BaO 9.44, CaO trace, total 99.83; S.G. 3.944 (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 9 R).

Chemical analysis by E.A. Thomson, $SrSO_4$ 78.50, $BaSO_4$ 18.61, $CaSO_4$ 0.73, total 97.84 (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, p. 111).

31 F/8 Specimens of celestite from a vein in Fitzroy Township, lot 21, conc. VI, have been analyzed in the chemical laboratory of the Mines Branch, Ottawa. The results are as follows: $SrSO_4$ 93.00, $CaCO_3$ 1.30, Fe and Al oxides 0.85, total 95.15 (M.E. Wilson, 1924: Geol. Surv. Can., Mem. 136, p. 115).

31 G/10 An occurrence of celestite has been reported at Hawksbury, West Hawksbury Township, Prescott County (G.M. Dawson, 1900: Geol. Surv. Can., Ann. Rept., XIII, 174 A).

40 J/3 Crystals and crystal aggregates of celestite were recovered from an excavation in the bed of the Detroit River at Amherstburg in Essex County (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 347 A, 348 A).

41 G/15
41 H/12 White to bluish translucent, radiating, columnar masses of celestite are known to occur in the Manitoulin district on the east side of Manitowaning Bay and in the neighbourhood of Cape Robert, Bayard Island and Drummond Island (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 19 R).

42 A/1 Celestite occurs as clusters of fine radiating needles in vugs in quartz veins at the Lake Shore Mine near Kirkland Lake (J.E. Hawley, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V, p. 122).

CENOSITE

(See kainosite)

CENTRALLASSITE

(See gyrolite)

CERIANITE

CeO_2

A rare mineral, isostructural with uraninite and thorianite, described for the first time and named by A.R. Graham in 1955.

Ontario

41 O/14 The mineral was observed as tiny, translucent, dark greenish amber octahedrons in a suite of minerals concentrated from a sample of carbonate rock taken from a nephelinized hybrid gneiss on the claims of the Dominion Gulf Company in Lackner Township, Sudbury mining division. Spectrochemical analysis on a 2 mg sample of handpicked crystals by W.O. Taylor: CeO_2 80 ± 20, ThO_2 5.1 ± .05, Nb_2O_5 1.8 ± 0.2, La_2O_3 1.5 ± 0.2, Y_2O_3 1.2 ± 0.2, Yb_2O_3 1.1 ± 0.1, Ta_2O_5 0.6 ± 0.05, ZrO_2 0.6 ± 0.05, U_3O_8 N.D. Cell edge 5.42 ± 0.01Å (A.R. Graham, 1955: Am. Mineralogist, 40, p. 560).

The X-ray powder pattern of cerianite has four strongest lines at 3.13 (10), 2.71 (4), 1.918 (7) and 1.635 (6) (X-ray Laboratory, Geol. Surv. Can.).

CERINITE

Aluminosilicate of calcium

Nova Scotia

21 H/2 The name cerinite was given by How to a mineral forming the outer layer of a nodule found near Black Rock. The other minerals comprising the nodule were centrallassite, and 'cyanolite'. Chemical analysis of cerinite (How): SiO_2 58.13, Al_2O_3 12.21, Fe_2O_3 1.01, CaO 9.49, MgO 1.83, K_2O 0.37, H_2O 15.96, total 99.00 (H. How, 1859: Edin. New Phil. J., N.S., X, pp. 84-94; Phil. Mag., 1, 1876, p. 128).

According to Hey (1955) cerinite is probably impure gyrolite (M.H. Hey, 1955: Chemical Index of Minerals, 2nd edition).

CERUSSITE

$PbCO_3$

Cerussite is a secondary mineral found typically in the oxidized portions of lead ore deposits. It is isostructural with aragonite, witherite and strontianite but shows very little isomorphous substitution for Pb by other elements.

British Columbia

82 F/6 Cerussite occurs on the property of the Ymir Gold Mine in the Nelson mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 55).

82 F/9 Some cerussite, is associated with the lead ores of the Donaldson and North Star mines in the Fort Steele mining division of British Columbia (G.M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., XI, 166 T).

82 F/14
82 K/3 Cerussite is fairly common in the zones of oxidation of the lead ores of the Slocan mining camp (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 123).

82 G/5 The upper workings of the Society Girl Mine in the Rossland district expose an oxidized ore body consisting of cerussite, and pyromorphite (C.W. Drysdale, 1915: Geol. Surv. Can., Mem. 77, p. 127).

Yukon

106 D/4 Cerussite, both massive and well-crystallized, is a common alteration product of galena at several ore deposits in the Keno Hill-Galena Hill area (R.W. Boyle, 1956: Geol. Surv. Can., Paper 55-30; 1957: Geol. Surv. Can., Paper 57-1). The X-ray powder pattern of cerussite from Dublin Gulch, Yukon, has seven strongest lines at 3.60 (10), 3.50 (6), 2.52 (3), 2.49 (4), 2.08 (3), 1.93 (3) and 1.86 (3) (X-ray Laboratory, Geol. Surv. Can.).

CHABAZITE

$CaAl_2Si_4O_{12}.6H_2O$

Chabazite is a mineral of the zeolite group. The zeolites are aluminosilicates, chiefly of Na and Ca, which have two characteristic features: the ease with which they may exchange cations; and the capability of losing their water content without change of crystal structure, and absorbing other compounds in place of the water removed. Like the other zeolites, chabazite typically occurs in cavities in basalts and andesites. It is distinguished from other zeolites by its crystal form - usually simple rhombohedrons closely resembling cubes.

British Columbia

92 P/3 Chabazite occurs in cavities in basalt at Chasm on the Bonaparte River, Clinton mining division (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, 118 A).

Manitoba

63 N/3 A porous crust of distinct crystals of chabazite and analcime has been noted on vein quartz at the Sherritt Gordon Mine. The chabazite crystals are well defined, grey-green, rhombohedrons and a few of them exhibit interpenetration twinning (G.M. Brownell, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 19).

Nova Scotia

21 A/12 Chabazite occurs in Digby County at Digby Neck, Mink Cove, Sandy Cove and Williams Brook (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 27 T).

21 H/7 Occurrences of chabazite have been reported at Cape d'Or in Cumberland County and at a number of other localities in the Fundy Bay-Minas Basin area. The chabazite is flesh red or lighter in colour and is associated with quartz, heulandite, stilbite, and other zeolites. A specimen from Wassons Bluff gave the following chemical analysis: SiO_2 49.58, Al_2O_3 18.07, Fe_2O_3 0.13, CaO 8.30, SnO 0.48, Na_2O 1.08, K_2O 1.16, H_2O 21.80, total 100.60 (A.L. Parsons, 1922: Univ. Toronto Stud. Geol. Ser., 14, p. 42).

21 H/8 The reddish variety of chabazite, which has been named acadialite, is found at Partridge Island, Swan Creek and Two Islands in Cumberland County and on Pinnacle Island in Colchester County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 15 T and 27 T).

Ontario

31 D/16 Chabazite has been identified in specimens from the Centre Lake property of Bicroft Uranium Mines Ltd. The property is in Haliburton County, Cardiff Township, conc. XI, lots 26 and 27. The spacings and intensities of the six strongest lines in the chabazite pattern are: 9.1 (7), 5.55 (4), 5.00 (4), 4.32 (9), 3.58 (4) and 2.92 (10) (X-ray Laboratory, Geol. Surv. Can.).

31 F/4 Pale wine, yellow and white crystals of chabazite occur in cavities in a vein composed of pyroxene, biotite, scapolite, quartz, and calcite on conc. VI, lots 24 and 25, Monteagle Township (G.C. Hoffmann, 1893: Geol. Surv. Can., Ann. Rept., VI, p. 27 R).

31 L/13 Crystals of chabazite of maximum diameter 3 millimetres, are found in veins with stilbite and heulandite on the west side of Cross Lake near Cobalt. They are of the common rhombohedral habit and in a few instances, form penetration twins (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 68).

31 M/5 An occurrence of chabazite has been reported on the King Cobalt claim in Coleman Township, Timiskaming County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 56).

Quebec

31 G/12 The Haldane Mine on lot 12, range I, of Wakefield Township, Gatineau County has been reported to contain chabazite (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., 18 L).

31 G/12 Crystals of chabazite, commonly forming penetration twins, occur with scapolite and pyroxene in the following townships of Papineau County: Templeton Township, range XII, lot 21; the Gore of Templeton, lot 3, at the Rheaume Lake Mine; East Portland Township, range III, lot 1, and range XII, lot 21 (H.S. de Schmidt, 1912: Can. Dept. Mines, Mines Br. Publ., 118, p. 284, and B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., 35 G).

31 G/13 Pyroxene, apatite, and chabazite are found at Crown Hill in lot 27, range IX, Portland East Township, in Papineau County (J.F. Terrance, 1883; National Mineral Collection).

CHALCANTHITE

$CuSO_4.5H_2O$

British Columbia

82 L/3 Chalcanthite, or blue vitreol as it is sometimes called, has been observed on a number of claims a short distance to the west of the city of Vernon (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 56).

92 H/8 Chalcanthite is found at Copper Mountain in the Similkameen mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 56).

92 I/14 Chalcanthite occurs in the Lillooet district at the Avoca claim on the Bonaparte River about 2 1/2 miles above Hat Creek, and also at a locality between the Chilcoten River and Big Creek (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 12 R).

The X-ray powder pattern of chalcanthite from the Avoca claim has five strong lines at 5.48 (4), 4.74 (10), 3.99 (7), 3.71 (8) and 3.30 (3) (X-ray Laboratory, Geol. Surv. Can.).

CHALCEDONY

(See quartz)

CHALCOCITE

Cu_2S

Chalcocite is an important ore mineral of copper. In copper deposits in arid and semi-arid climates it occurs as a secondary mineral at the water table level and may form a zone of secondary enrichment that contains a much higher copper content than the primary ore deposit. Chalcocite also occurs as a primary mineral in hydrothermal veins.

British Columbia

92 I/7 Massive chalcocite has been found at the Aberdeen Mine, near Merritt in the Nicola Mining division. The spacings and intensities of the four strongest lines in the X-ray powder pattern are 2.40 (8), 1.97 (9), 1.88 (10) and 1.703 (3) (X-ray Laboratory, Geol. Surv. Can.).

92 K/3 Chalcocite is a major constituent of a thin interlava sedimentary rock which outcrops west of Menzies Bay on Vancouver Island and north of Gowland Harbour on Quadra Island. Associated minerals are volborthite, malachite, brochantite, cuprite tenorite, azurite, cyanotrichite and connellite (J. L. Jambor, 1960: Am. Mineralogist, 45, pp. 1307-9).

New Brunswick

21 B/10, 21 B/15 Specimens of granular chalcocite have been obtained from Grand Manan Island, Charlotte County (National Mineral Collection).

Nova Scotia

21 A/12 Massive chalcocite has been found at New Ross (H. C. Burchell, 1917: National Mineral Collection).

21 H/1 Chalcocite occurs as a supergene mineral at the Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton (R. W. Boyle, 1960: Can. Mining J., vol. 83, No. 4, p. 104).

Ontario

31 M/5 Patches of chalcocite less than 1/4 inch in diameter occur in the Foster Mine near Cobalt. The sulphide is usually associated with quartz and was found upon analysis to be very pure, containing only a small amount of quartz impurity: Cu 79.58, S 20.10, SiO_2 0.34, total 100.02. Theoretical Composition: Cu 79.84, S 20.16, total 100.00 (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 208).

41 N/2 Veinlets up to an inch wide occur in three sets of closely spaced fractures on the Ranwick property, townships 28 and 29, ranges

41 N/2 XIV and XV, in the Montreal River area. They contain chalcocite and galena as well as uranium minerals (E.W. Nuffield, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. III, p. 25).

Chalcocite, chalcopyrite, and native copper occur at the C.C. Houston property in the Mamainse Point area. The sulphides occur in breccias, veins and as amygdules in a volcanic rock. Native copper is found along late cross fractures in vein material occupying a fissure (J.E. Thomson, 1953: Ont. Dept. Mines, Ann. Rept., vol. 62, Pt. IV, p. 22).

Quebec

21 L/3
21 L/6 Specimens of massive chalcocite in the National Mineral Collection were collected from Ireland Township, Inverness Township, and Leeds Township, lot 15, range XIV, and lot 17, range XV, all in Megantic County.

CHALCOMENITE

$CuSeO_3.2H_2O$

Saskatchewan

74 N/10 The rare selenite mineral, chalcomenite, is the principle alteration product in an occurrence of klockmannite, umangite, berzelianite, clausthalite, pyrite, hematite, and chalcopyrite in an area north of Hal Lake, which is about 1,500 feet west of the Eagle shaft, in the Goldfields district. The minerals occur with a small amount of quartz in a sheared and brecciated rock (S.C. Robinson and E.J. Brooker, 1952: Am. Mineralogist, 37, p. 542). The X-ray powder pattern has five strongest lines at 5.40 (10), 4.96 (9), 3.78 (7), 3.36 (5) and 2.533 (4) (X-ray Laboratory, Geol. Surv. Can.).

CHALCOPYRITE

$CuFeS_2$

Chalcopyrite, the most important ore mineral of copper, is of common occurrence and is widely distributed throughout Canada, so much so that no attempt has been made here to report all occurrences. Instead, a small number of typical occurrences have been arbitrarily selected.

The X-ray powder pattern of chalcopyrite is characterized by three strong lines having the following spacings and relative intensities: 3.03 (10), 1.85 (8) and 1.59 (4) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F Chalcopyrite occurs with pyrrhotite, pyrite, galena, and sphalerite in the Nelson River area. The sulphides are confined to the Purcell sills where they appear in differentiate deposits or in occurrences of the quartz-calcite vein type (H.M.A. Rice, 1937: Geol. Surv. Can., Paper 37-27, p. 16).

82 F/4 Massive chalcopyrite occurs in veinlets and impregnations associated with pyrrhotite and pyrite at Rossland (C.W. Drysdale, 1915: Geol. Surv. Can., Mem. 77, p. 74).

92 B/5 Chalcopyrite occurs in cracks and veinlets throughout a hornblendite body in the Sooke and Duncan map-areas. It is concentrated in persistent shear zones (H.C. Cooke and C.H. Clapp, 1917: Geol. Surv. Can., Mem. 96, p. 324).

92 H/6 Chalcopyrite occurs with pentlandite as irregular grains in a coarse-grained mosaic of pyrrhotite, in ultrabasic rocks at Giant Nickel Mines Ltd., near Hope (-, 1960: Western Miner and Oil Review, vol. 33, No. 11, p. 39).

92 H/10 The chief ore mineral at the Independence Mine, 1 1/2 miles due east of Coquihalla, is chalcopyrite. The sulphide occurs in a fracture zone in a granite porphyry near the contact between the Tulameen group and younger intrusives (C.E. Cairnes, 1924: Geol. Surv. Can., Mem. 139).

92 I/2 Chalcopyrite is mined at the Craigmont Mine in the Merritt area, 240 miles northwest of Vancouver. The mine is situated on the eastern slope of Promontory Hills 10 miles northwest of Merritt. Chalcopyrite occurs as disseminated grains in magnetite and hematite, as fracture fillings, as platings between specularite lamellae, as disseminations replacing breccia fragments, as coarse grains in calcite breccia cement, as massive patches several feet across, and rarely, as finely banded replacements (C.C. Rennie, 1961: Can. Inst. Mining Met., Bull., vol. 54, No. 588, p. 297).

92 I/6 The ore at Highland Valley consists mainly of chalcopyrite in grey quartz gangue. Secondary azurite, malachite, and chalcocite are conspicuous, and tourmaline occurs in the vicinity (S. Duffell, 1947: Geol. Surv. Can., Paper 47-10, p. 5).

92 I/9 Chalcopyrite has been found in selenite at the Iron Mask Mine near Kamloops (National Mineral Collection).

93 M/4 Sulphide lenses composed of pyrrhotite, chalcopyrite, and small amounts of pyrite and arsenopyrite occur near Hazelton on the Golden Wonder claim, on Rocher Déboulé Mountain (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 41).

93 M/4 Two distinct types of ore, silver-lead and chalcopyrite-hornblende, occur in the Rocher de Boule Mine in the Hazelton district. Each is associated with a distinctive suite of sulphide minerals. The mine is situated on the west side of Juniper Creek about a mile and a quarter from its head (J.J. O'Neill, 1919: Geol. Surv. Can., Mem. 110, p. 7).

103 P/5 Chalcopyrite, pyrite, pyrrhotite, sphalerite, and magnetite constitute the ores at Hidden Creek and Observatory Inlet, 80 miles northeast of Prince Rupert (N. Campbell and W.T. Irvine, 1960: Can. Inst. Mining Met., Bull. 53, pp. 153-6).

The ore from the Bonanza Mine in the Portland Canal area is composed of chalcopyrite, pyrrhotite, sphalerite, and pyrite. It has been deposited in a shear zone in an amphibolite. The mine is located on Bonanza Creek about three quarters of a mile from its mouth (G. Hanson, 1935: Geol. Surv. Can., Mem. 175, p. 88).

104 P/3 Galena, sphalerite, chalcopyrite, scheelite and hydrozincite occur in a shear zone in limestone at the McDame Belle property on McDame Creek, about one mile east of Centreville (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

Manitoba

63 K/13 Chalcopyrite, sphalerite, and pyrite are the common sulphide minerals in the Flin Flon ores. Gold, silver, and native copper occur in association with these (R.C. Wallace, 1920: Can. Mining J., 41, pp. 904-905).

The Don Jon deposit on the east side of Thompson Lake consists of strongly pyritized schist containing chalcopyrite. The schists have been derived from rhyolitic and dacitic flows and breccias with intercalated andesitic layers (J.D. Bateman and J.M. Harrison, 1944: Geol. Surv. Can., Paper 44-22, p. 6).

63 N/3 Chalcopyrite-pyrrhotite-sphalerite orebodies were worked at the Sherritt Gordon Mine at Sherridon from 1931 to 1951 (J.F. Davies, 1960: Can. Inst. Mining Met., Bull. 53, pp. 141-4).

Newfoundland

2 D/8 Massive chalcopyrite and pyrite occur at Terra Nova (D.M. Baird, 1960: Can. Inst. Mining Met., Bull. 53, p. 79).

2 E/12, 2 E/13 Chalcopyrite is found with pyrite at Pilleys Island; with pyrrhotite and pyrite at Little Bay; and with pyrite, sphalerite, magnetite and specularite at Tilt Cove, on Notre Dame Bay (D.M. Baird, 1960: Can. Inst. Mining Met., Bull. 53, p. 79).

2 F/4 Economic deposits consisting of chalcopyrite, arsenopyrite, and pyrite occur near the roof contact of a medium-grained gabbro with a fine-grained metavolcanic rock in western Newfoundland, near Bay of Islands (C.H. Smith, 1958: Geol. Surv. Can., Mem. 290, p. 88).

12 A/15 The lead-zinc-copper ore of the Buchans Mine, located 3 miles north of Red Indian Lake, contains chalcopyrite as aggregates and as exsolved blebs, always very fine-grained. It occurs as bands which have selectively replaced certain beds within the ore horizon (E.A. Swanson and R.L. Brown, 1962: Can. Inst. Mining Met., Bull. 55, No. 605, p. 624).

12 G/1 At York Harbour, chalcopyrite occurs with pyrite and sphalerite (D.M. Baird, 1960: Can. Inst. Mining Met., Bull. 53, p. 79).

Northwest Territories

75 L/7 Chalcopyrite occurs in a series of rusty weathering quartz-carbonate veins in the Snowdrift area on the north shore of Duhamel Lake. These veins strike at right angles to one of the large faults in the area (F.Q. Barnes, 1951: Geol. Surv. Can., Paper 51-6, p. 29).

85 J/9 Parts of shear zones in the lavas and associated rocks on the Homer property have been replaced by chalcopyrite, galena, and sphalerite. The property is situated twelve miles north of Yellowknife in the District of Mackenzie (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 98).

Ontario

31 C/6 Chalcopyrite crystals have been found in quartz near the town of Madoc in Hastings County (National Mineral Collection).

32 D/4 The ore at the Amity Mine in Pacaud Township consists of chalcopyrite with varying amounts of magnetite, pyrite, sphalerite and galena. The sulphides are banded with thin layers of grey cherty quartz. Chalcopyrite, bornite, and chalcocite are the principal ore minerals in the Tretheway-Ossian Mine in Pacaud Township. Pyrite and small amounts of galena and sphalerite are present as well. The ore is laminated consisting of alternate layers of sulphide and grey quartz (K.D. Lawton, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. IV, p. 51).

41 I Next to pyrrhotite, chalcopyrite is the most abundant ore mineral in the Sudbury ore deposits. A striking feature of massive, coarse-grained chalcopyrite from the Frood Mine is the beautifully developed lamellar twinning. In disseminated ores it occurs as composite blebs with pyrrhotite, and as veins and inclusions. Chemical analyses of two specimens of chalcopyrite by Michener:

41 I Cu 34.26, Fe 30.40, S 35.15, total 99.81; and Cu 33.68, Fe 30.94, S 35.00, total 99.62 (J.E. Hawley, 1962: Can. Mineralogist, 7, p. 59).

41 I/16 The number I ore body on the Temagami Island property of the Temagami Mining Company, consists of about 90 per cent chalcopyrite with pyrite, arsenides and carbonates. The host rock is a fragmental rhyolite (J.E. Thomson, 1960: Can. Inst. Mining Met., Bull. vol. 53, No. 575, pp. 136-140).

41 J/4, 41 J/5 Copper deposits in the Bruce Mines district are of the fissure vein type and consist of chalcopyrite and bornite in a gangue of quartz intermixed with ankerite. Copper mining in North America began at the old Bruce Mine in 1846. Other deposits include: the Rock Lake Mine, 14 miles north of Bruce Mines, and the Cameron or Stobie Mine, 2 1/2 miles northwest of Desbarats station on the Canadian Pacific line (R. Bell, 1902: Geol. Surv. Can., Ann. Rept., XV, pp. 246-52).

42 A/5 Chalcopyrite, associated with pyrite, pyrrhôtite and sphalerite, is the ore mineral at the copper mine of Kam-Kotia Porcupine Mines Ltd., in Robb Township, west of Timmins. The mineralization is in a shear zone in Precambrian lavas and fragmentals (W. Hogg, 1962: Western Miner and Oil Review, vol. 35, No. 8, p. 18).

42 F/4 Sulphide replacement bodies in the Manitouwadge area consist generally of massive pyrrhotite and sphalerite cores enclosed by disseminated chalcopyrite, pyrite, pyrrhotite and minor sphalerite (J.M. Harrison, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, p. 79).

Quebec

22 A/13 Chalcopyrite is found in the Needle Mountain, Copper Mountain area at the headwaters of York River, near Murdochville in Holland Township, Gaspé. Associated minerals are pyrite, pyrrhotite, galena, sphalerite, bornite, chalcocite, tennantite, cubanite, molybdenite, scheelite and bismuth (R.E. Ford, 1959: Can. Inst. Mining Met., Bull. vol. 52, No. 567, p. 425).

31 H/8 Chalcopyrite occurs at the Huntingdon Mine in a mineralized greenstone host rock as disseminated particles, and as a constituent of sulphide masses. The mine is in Brome County, near Eastman (R.E. Hare, 1919: Can. Min. J., 40, p. 582-584).

32 C/4 Variable amounts of chalcopyrite occur with pyrrhotite in quartz veins cutting a shear zone in the Golden Manitou and Bidlamaque mines in Bourlamaque Township, Abitibi County (G.W.H. Norman, 1943: Geol. Surv. Can., Paper 43-2, p. 12).

32 D/3 A small shatter zone on the property of West Wasa Mines Ltd., in Beauchastel Township is filled with pyrite and chalcopyrite (J. Claveau, W.N. Ingham, and W.G. Robinson, 1957: Que. Dept. Mines, Prelim. Rept., No. 256, p. 9-10).

32 D/6 Chalcopyrite, pyrite, pyrrhotite, and sphalerite are the principle ore minerals at the Amulet Mine and Waite-Ackerman-Montgomery Mine in Dufresnoy and Duprat townships in the Noranda district. The sulphides form veins and breccia fillings in the volcanics (M.E. Wilson, 1941: Geol. Surv. Can., Mem. 229, p. 105).

The Ribago Rouyn Mines property on range IX of Beauchastel Township is cut by a number of quartz veins which contain pyrite, pyrrhotite, chalcopyrite, and a little gold (J. Cleaveau, W.N. Ingham, and W.G. Robinson, 1957: Que. Dept. Mines, Prelim. Rept., No. 256, p. 8).

32 D/14 In the Normetal Mine, on lots 43 and 44 of Desmeloizes Township, the sulphide minerals pyrite, sphalerite, and chalcopyrite tend to occur in separate bodies rather than together. They occur massive, and as disseminated replacements. The No. 1 orebody is relatively rich in chalcopyrite (C. Tolman, 1942: Que. Dept. Mines, Prelim. Rept., No. 170, p. 8).

32 F/12 Chalcopyrite with pyrite, pyrrhotite, sphalerite, and magnetite form a sulphide body at Garon Lake in the Mattagami Lake district (G.F. Jocklick, 1960: Econ. Geol., 55, No. 12).

32 G/14 The Opemiska Copper Mine ore occurs in vein-like lenses that have high chalcopyrite content along with a little gold (G.W.H. Norman, 1938: Geol. Surv. Can., Paper 38-11, p. 7).

32 H/14 Sulphide mineralization occurs in, and adjacent to, a dyke cutting a sheared anorthosite breccia on the property of Kayrand Mining and Development Ltd., in Obalski Township, Abitibi East. Chalcopyrite, pyrite, pyrrhotite and sphalerite are the sulphide minerals. Small amounts of gold and silver are also present (R.B. Graham, 1956: Que. Dept. Mines, Geol. Rept., No. 71, p. 28 and 31).

Saskatchewan

63 L/9 Chalcopyrite occurs at Birch Lake with pyrrhotite, magnetite and pyrite, and at the Coronation Mine with pyrrhotite, magnetite, pyrite, sphalerite, gold and silver.

63 L/10 The sulphide occurrence at the Hudson Bay Mining and Smelting Company property at Hanson Lake contains as principle minerals chalcopyrite, pyrite, pyrrhotite, sphalerite and arsenopyrite.

64 D/5 Chalcopyrite occurs with sphalerite, pyrite, pyrrhotite, and gold on the property of Churchill Minerals at Nistoassini Lake (A.R. Byers, 1960: Can. Inst. Mining Met., Bull. 53, p. 149).

Yukon

115 A/11 High grade copper ore consisting of massive bornite and chalcopyrite replacing fractured andesite is found in the Kathleen Lakes area (- , 1961: Western Miner and Oil Review, vol. 34, No. 12, p. 45).

CHALCOSTIBITE

$CuSbS_2$

Northwest Territories

85 J/8 Chalcostibite has been found associated with other copper minerals in the gold deposits of the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist, 35, p. 516).

Yukon

105 D/3 Chalcostibite, intergrown with stibnite, occurs in a quartz vein cutting granodiorite on the Porter property at Carbon Hill in the Wheaton district. The chalcostibite occurs as laths rarely exceeding 3 millimetres in length (H.V. Warren and R.M. Thompson, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 82). The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.13 (10), 3.00 (9), 2.31 (4), 1.831 (4) and 1.762 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85).

CHAMOSITE

$(Fe^{++}, Fe^{+++}, Mg, Al)_6(Si, Al)_4O_{10}(O, OH)_8$

Newfoundland

23 J/1 X-ray powder patterns have served to identify chamosite from Dyke Lake and Howells River, Labrador (E.W. Nuffield, and D.H. Gorman, 1960: private communication).

Ontario

31 E/1 Chamosite has been identified in a specimen from the Bicroft Mine, Bancroft. The mineral gives an X-ray pattern having four strongest lines at 7.08 (10), 3.55 (8), 2.50 (6) and 1.550 (4) (X-ray Laboratory, Geol. Surv. Can.).

52 A/6 A mineral from the Gunflint iron range near Port Arthur has been identified as chamosite from its X-ray powder pattern (E.W. Nuffield and D.H. Gorman, 1960: private communication).

CHAPMANITE

$Sb_2O_3.2Fe_2O_3.4SiO_2.H_2O$

Ontario

31 M/5 In the Keeley Mine near Cobalt, in South Lorrain Township, chapmanite occurs as a fine-grained green mineral associated with native silver, and iron and cobalt arsenides. The mineral was named in honour of E.J. Chapman, former Professor of Mineralogy and Geology (1853-1895) at the University of Toronto. Chemical analysis by E.W. Todd: FeO 33.91, Ni 0.36, Co 0.03, Cu 0.17, Bi 0.20, As 1.28, Al_2O_3 0.28, SiO_2 28.28, Sb_2O_5 31.65, H_2O 3.46, total 99.62 (T.L. Walker, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 5).

The X-ray powder pattern of chapmanite from the Keeley Mine has six strongest lines at 7.63 (9), 3.88 (9), 3.58 (10), 3.19 (9), 2.90 (7) and 2.59 (7) (C. Milton, J.M. Axelrod and B. Ingram, 1958: Am. Mineralogist, 43, p. 668).

CHIASTOLITE

(See andalusite)

CHLOANTHITE

$(Ni, Co) As_{3-x}$

Chloanthite is the name applied to that portion of the cobalt-nickel arsenide series (skutterudite series) near (Ni, Co) As_{3-x} where $x = 0.5$ to 1. Fe commonly substitutes for Ni and Co; Bi and Ag, less commonly. Small amounts of S may substitute for As. Chloanthite alters to greenish annabergite in contrast with its cobalt-rich counterpart, smaltite, which alters to rose-coloured erythrite. X-ray powder diffraction data are given under skutterudite.

Northwest Territories

86 K/4 Chloanthite occurs as zoned crystals of cubic habit at the Eldorado Mine on Great Bear Lake. Associated metallic minerals are skutterudite and smaltite. Quartz, carbonates, and a little chloritic mica are the principle gangue constituents. An analysis of a

86 K/4 zoned crystal by A.E. Rothwell is as follows: Ni 19.23, Co 6.10, As 67.67, S 2.06, Fe 1.09, Sb nil, insol. 3.53, total 99.68 (Ellis Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 46).

Ontario

31 M/5 Chloanthite, cobaltite, smaltite, native silver, and dycrasite occur together on mining properties in Coleman Township in the Cobalt area (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, 201 A).

An analysis by Burrows of chloanthite from the La Rose Mine in Coleman Township is as follows: As 67.17, S 2.18, Ni 23.24, Co 4.11, Ag 2.78, total 99.48 (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14, Pt. II, p. 9).

Chloanthite has been found in veins on the south shore of Cross Lake, two miles southeast of Cobalt. Other minerals associated with the chloanthite are skutterudite, rammelsbergite, argentite, niccolite, cobaltite, safflorite, gersdorffite, smaltite, chalcopyrite, tetrahedrite, arsenopyrite, galena, sphalerite, pyrite, marcasite, pyrargyrite, silver, breithauptite and dycrasite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41).

Crystals of a grey to white, metallic, cubo-octahedral mineral from the Keeley Mine near Cobalt were found to contain chloanthite as a constituent of their inner zones along with some löllingite and skutterudite. The outer zones are composed almost exclusively of the latter but annabergite and iron hydroxides are present as coatings (J. Mackintosh and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., No. 17, p. 30).

Chloanthite intimately mixed with smaltite occurs in the Foster Mine in the Cobalt area. Analyses of two samples are as follows:

	Co	Ni	Fe	Cu	As	S	Total
(1)	13.81	11.35	1.21	0.96	71.61	0.75	99.69
(2)	12.61	14.14	2.10	0.40	66.87	4.13	99.80

(H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 220).

41 P/10 Veins at the Miller Lake O'Brien Mine in the Gowganda district contain a considerable amount of chloanthite with associated skutterudite, safflorite, rammelsbergite, tetrahedrite, smaltite, arsenopyrite, cobaltite, galena, niccolite, breithauptite, chalcopyrite, and sphalerite. Gangue minerals are calcite and quartz (Ellis Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61).

41 P/10 Chloanthite has been found with niccolite, smaltite, and native silver in a calcite vein an inch or two wide, on claim H.R. 439, Charters Township, Gowganda area. A shallow shaft has been sunk in the vicinity of the vein (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 42).

CHLORASTROLITE

(See pumpellyite)

CHLORITE

$$(Mg, Fe^{++}, Al, Fe^{+++})_6(Si, Al)_4O_{10}(OH)_8$$

The chlorites are a group of layered silicate minerals occurring mainly as products of hydrothermal alteration in igneous and metamorphic rocks. Varietal names include: clinochlore, penninite, ripidolite, corundophilite, colerainite, thuringite, sheridanite.

Ontario

31 F/7 A chemical analysis of dark green transparent clinochlore folia from conc. VII, lot 16 of Bagot Township is as follows: SiO_2 27.23, Al_2O_3 19.44, Fe_2O_3 2.17, FeO 4.91, Cr_2O_3 0.99, MgO 32.67, K_2O 0.08, H_2O 12.04, total 99.53 (G.C. Hoffmann, 1892: Geol. Surv. Can., Ann. Rept., VI, p. 17 R).

The X-ray powder pattern of this chlorite has the following strongest lines (Fe radiation): 7.09 (10), 4.73 (7), 3.54 (9), 2.57 (7), 2.442 (7), 2.002 (6). The mineral corresponds to the IIb polytype of S.W. Bailey and B.E. Brown, 1962: Am. Mineralogist, 47, pp. 819-850 (X-ray Laboratory, Geol. Surv. Can.).

Quebec

21 L/3 Chemical analysis of colerainite crystals (corundophilite) from Standard Mine, near Black Lake, by M.F. Connor: SiO_2 24.40, Al_2O_3 22.77, Fe_2O_3 0.45, MgO 32.70, CaO 0.10, $(Na,K)_2O$ 0.30, MnO 0.09, H_2O 19.63, total 100.44; S.G. 2.51 (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull. 27, p. 68).

Chlorite occurs as green plates in compact serpentine rock at the Montreal Chrome pit, Megantic County. Chemical analysis by R.J.C. Fabry (1930): SiO_2 34.39, Al_2O_3 17.35, Fe_2O_3 2.94, FeO 2.70, MgO 31.08, CaO 2.08, Na_2O 0.34, K_2O nil, H_2O^+ 9.25, H_2O^- 0.08, TiO_2 nil, MnO nil, CO_2 nil, total 100.21 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 365).

31 G/12 Chemical analysis of ripidolite from range IX, lot 18, Templeton Township, Papineau County, by Harrington: SiO_2 35.80, Al_2O_3 13.18, Fe_2O_3 4.28, FeO 10.18, MgO 22.80, H_2O 12.64 total 99.88; S.G. 2.61 (B.J. Harrington, 1877-8: Geol. Surv. Can., Rept. Prog., p. 34 G).

White or bluish white scales and broadly foliated aggregations of clinochlore have been found with scapolite and serpentine in Papineau County, Buckingham Township, range XII, lot 24. The following is a chemical analysis by Johnston of a specimen from this locality: SiO_2 28.65, Al_2O_3 18.96, MgO 37.49, H_2O 15.22, total 100.32; S.G. 2.631 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 17 R).

CHLORITOID

$$(Mg, Fe^{++})_2Al_4Si_2O_{10}(OH)_4$$

Chloritoid as a rock-forming mineral is a characteristic constituent of low and medium grade regionally metamorphosed pelitic sediments. It is also found in hydrothermal quartz-carbonate veins. The varietal name, ottrelite, is sometimes used for manganese-rich chloritoid.

Ontario

42 A/6 Chloritoid occurs in the Hollinger Mine at Timmins as small green plates from 1 to 5 millimetres across, which are randomly oriented with regard to the rock cleavage. In thin section the plates appear to be rectangular with multiple twinning parallel to their length. Inclusions of ankerite and quartz are common. Concentrations of the mineral about pyrite and tourmaline grains in altered rock suggests a genetic relationship between them and the chloritoid (J.K. Gustafson, 1946: Am. Mineralogist, 31, p. 313).

42 C/2 Single crystals, sheaf-like bundles, and rosettes of chloritoid make up as much as twenty per cent of the schists that occur in the Josephine-Bartlett iron range, township 28, range XXV, Algoma district (E.S. Moore and H.S. Armstrong, 1946: Ont. Dept. Mines, Ann. Rept., vol. 55, Pt. IV, pp. 43-4).

42 L/4 X-ray powder patterns have served to identify chloritoid in specimens obtained from a locality four miles west of Onaman Lake (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

21 L/3 Chemical analysis by Hunt, of chloritoid from Megantic County, Leeds Township: SiO_2 26.30, Al_2O_3 37.10, FeO 25.92, MnO 0.93, MgO 3.66, H_2O 6.10, total 100.01 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 498).

21 L/3 The chloritoid from this locality, now the Harvey Hill Mine, occurs as greenish black plates in quartz-carbonate veins. The X-ray powder pattern has five strongest lines at 4.46 (10), 2.96 (3), 2.36 (3), 2.30 (3) and 1.581 (3) (R.H. Milne, 1949: Am. Mineralogist, 34, p. 422).

31 H/2 Chloritoid has been reported from Brome and Sutton townships, Brome County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 28 T).

CHONDRODITE

$Mg(OH, F)_2 . 2Mg_2SiO_4$

The humite group minerals, norbergite, chondrodite, humite and clinohumite occur almost exclusively in metamorphosed and metasomatized limestone. Identification of individual minerals of the group is difficult and often impossible without the use of X-ray diffraction techniques.

Ontario

31 C/7 Chondrodite has been identified by X-ray diffraction in specimens from the Foxton Mine, near Sydenham. The X-ray pattern has four strongest lines at 4.84 (5), 2.256 (10), 1.741 (9) and 1.482 (8) (X-ray Laboratory, Geol. Surv. Can.).

31 C/9 Chondrodite occurs in crystalline limestone near Newboro on lot 27, conc. III, South Crosby Township, Leeds County (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 196) (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 28 T).

A remarkably bright chondrodite is exposed in limestone at a railway cut near the Chaffey's Locks station (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 69).

31 E/1 Minute grains of chondrodite are found in the calcite on lot 11, conc. I, Harcourt Township, Haliburton County (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, p. 201).

Quebec

21 M/2 Limestones at Sault de la Puce in Montmorency County contain chondrodite with spinel (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 67).

31 F/9 An occurrence of chondrodite has been reported in Pontiac County, Aldfield Township, range IV, lot 10 (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 28 T).

31 F/15 The limestone and skarn rocks of Grand Calumet Township contain chondrodite. The mineral occurs on the property of Calumet Uranium Mines Ltd., range VII, lots 28 to 31, and range VI, lots 31 and 32 (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 31).

31 H/13 Chondrodite has been found near St. Jerome in Terrebonne County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 28 T).

31 J/3 Occurrences of chondrodite in the Grenville limestone of McGill Township are fairly common (E. Aubert de La Rue, 1948: Que. Dept. Mines, Prelim. Rept., 215, p. 6).

31 J/4 Chondrodite, usually with spinel, is found on lot 17, range II of Bigelow Township where its host rock, a limestone, has been cut by small granitic bodies. In some parts of the area chondrodite forms up to thirty per cent by volume of the rock (E. Aubert de La Rue, 1956: Que. Dept. Mines, Geol. Rept., 68, p. 7).

31 J/6 Orange-brown grains of chondrodite occur in limestone intruded by pegmatite on lots 42 and 43 of range VI, Kiamika Township (E. Aubert de La Rue, 1948: Que. Dept. Mines, Geol. Rept., 23, p. 56).

31 J/16 An occurrence of chondrodite is known on the Milieu River, three miles north of Perrault Creek in Berthier County near the Maskinonge County line (R.W. Ells, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 26 J).

CHROMITE

$FeCr_2O_4$

Chromite, the only important ore mineral of chromium, has the theoretical composition $FeCr_2O_4$. The Cr_2O_3 content, however, is usually considerably less than the theoretical due to replacement of part of the iron by magnesium and part of the chromium by aluminium. Chromite occurs in ultrabasic rocks and in serpentine derived from them. It may occur in commercial amounts in stream sands derived from serpentine areas. Canadian chromites are generally low-grade, i.e., low Cr_2O_3 content and Cr:Fe ratio.

Chromite gives a spinel-type X-ray powder pattern showing variations in lattice spacings due to variations in composition. The four strongest lines in the X-ray pattern have the approximate spacings: 2.52 (10), 2.08 (5), 1.60 (6) and 1.475 (7) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 I/11 Massive and disseminated chromite occurs in lenses of serpentine near Highland Valley in the Ashcroft area (S. Duffell, 1947: Geol. Surv. Can., Paper 47-10, p. 5).

92 I/14 Chromite is found associated with magnetite and carbonates in serpentine rocks at Chrome Creek, at a point about one-third of a mile above its entrance into Scottie Creek, and roughly twenty miles north of Ashcroft. Chemical analysis by R.A.A. Johnston is as follows: Cr_2O_3 55.90, Al_2O_3 13.83, FeO 14.64, MgO 15.01, SiO_2 0.60, total 99.98 (Leopold Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 86).

92 J/15 Small black crystals and irregular lumps of chromite are found in the Bridge River mining camp. Chemical analysis of a specimen from the district is as follows: SiO_2 4.82, Al_2O_3 19.94, CaO 0.05, Cr_2O_3 48.72, MgO 12.79, FeO 12.80, total 99.12 (C.E. Cairnes, 1937: Geol. Surv. Can., Mem. 213, p. 69).

92 O/2 Chromite has been found as films on fracture planes and filling cavities in serpentine in the Bridge River area, on the northwest corner of Taylor Basin (W.S. McCann, 1922: Geol. Surv. Can., Mem. 130, p. 74).

Manitoba

52 L/5 Extensive deposits of chromite, occurring as small grains and octahedral crystals disseminated throughout a serpentine matrix, are present in the Bird River sill, a folded peridotite-gabbro intrusion in the Lac du Bonnet district. The chromite is consistently near the top of the sill (G.M. Brownell, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 101, J.D. Bateman, 1945: Am. Mineralogist, 30, p. 596, G.D. Springer, 1950: Manitoba Mines Br., Publ. 49-7, p. 6, J.P. Davies, 1952: Manitoba Mines Br., Publ. 51-3, p. 19).

New Brunswick

21 G/3 Chromite occurs in gabbro at the Atlantic Nickel Mine on Rogers Farm in Charlotte County (New Brunswick Mines Br., files).

Newfoundland

12 B/15, 12 B/16 Chromite occurs in the vicinity of the Bay of Islands igneous complex in Western Newfoundland, at (1) the Blow-Me-Down Mountain pluton on the Fox Island River; (2) the Lewis Hills pluton on the Fox Island River; (3) the Chrome Point deposits – a small hill southeast of the Fox Island River and south of Springers Hill; (4) Mine Cave in the Lewis Brook area.

12 G/1 Chromite also occurs as lenses in the upper part of the ultrabasic zone, in the Bay of Islands. At the Stowbridge deposit and at the southwest end of North Arm Mountain, the lenses are warped into flowage folds. The chromite is in dunite but peridotite layers occur nearby (C.H. Smith, 1958: Geol. Surv. Can., Mem. 290, p. 100).

Ontario

32 D/13 Analyses of samples taken from an outcrop of serpentine in Steele Township, conc. C, lots 3 and 4, indicate the presence of considerable chromite (M.B. Baker, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 273).

42 A/6 Chromite from the Porcupine district is represented in the National Mineral Collection.

42 A/10 Disseminated chromite and nests of chromite up to 3 inches in diameter occur in serpentine in Dundonald Township, on conc. I, lot 2, and on conc. II, lots 1 and 2 (P.E. Hopkins, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 207) (M.B. Baker, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 272).

42 A/14 A small body of chromiferous serpentine grading about 8 per cent Cr_2O_3 has been found in Reaume Township on conc. V and VI, lots 10 and 11 (P.E. Hopkins, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 206).

Quebec

Chromite has been found at many points in the serpentine rocks of the eastern townships and Gaspé. Some of the more noteworthy occurrences are as follows (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 67).

21 E/13 Wolfe County, South Ham Township, lots 24-27, range I.

21 E/14 Wolfe County, Garthby Township, lots b, c, i, range I and lot 8, range II.

21 L/3 Megantic County, Coleraine Township, A and B; Leeds Township, lot 1, range X, and lot 10, range X; Thetford Township, lots 16-18, range IV.

22 B/5 Matapedia County, Awantjish Township, lot 5, range III, and lots 10-12, range IV.

22 B/16 Gaspé County, Mount Albert.

31 H/1 Brome County, Bolton Township, lot 13, range IV; lot 26, range VI; lots 9, 13, 26, range VII.

31 H/8 Richmond County, Brompton Township, lots 25, 26, range IX.

31 H/9 Richmond County, Cleveland Township, lot 9, range X; Melbourne Township, lot 22, range VI.

CHROMPICOTITE

(See magnesiochromite)

CHRYSOBERYL

$BeAl_2O_4$

Quebec

31 I/13 An occurrence of chrysoberyl is reported near the forks of the Post River in Maskinonge County (H.S. Spence, 1930: Am. Mineralogist, 15, p. 439).

The crystals are tabular suggesting that they are of the alexandrite variety of the mineral (D.S.M. Field, 1952: Can. Mining J., 73, Pt. I, pp. 78-80).

31 J/5 A specimen of lime yellow chrysoberyl in the National Mineral Collection is reported to have been found on lot 25, range V, Robertson Township, near Mont Laurier.

The X-ray pattern has four strongest lines at 3.23 (6), 2.56 (5), 2.09 (10) and 1.617 (9) (X-ray Laboratory, Geol. Surv. Can.).

CHRYSOCOLLA

$(CuSiO_3.2H_2O)$

The X-ray powder pattern of chrysocolla has three strongest lines at 8.3 (6), 2.92 (8) and 1.49 (10) (A.S.T.M. card 11-322).

British Columbia

82 F/11 Specimens in the National Mineral Collection were collected from the mountainside about 500 feet up from Willow Point on the west arm of the Kootenay River (donated by R. McAllister).

92 H/6 Chrysocolla is associated with the copper ores of the King Solomon Mine in the Greenwood mining division (R. Bell, 1902-3: Geol. Surv. Can., Ann. Rept., XV, p. 125 A).

92 I/11 Chrysocolla occurs on the Transvaal claims in the Forge Mountains, Yale district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 68).

Northwest Territories

78 B/11 Chrysocolla has been found in volcanic rocks of the Natkusiak Formation in the Shaler Mountains on Victoria Island (R. Thorsteinsson and E.T. Tozer, 1962: Geol. Surv. Can., Mem. 330, p. 77).

Yukon

105 D/11 Chrysocolla, limonite, and green copper carbonate occur as incrustations on granite at the Pueblo claim on the west side of the Lewes River, Whitehorse mining division (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 19 R).

CHRYSOTILE

(See serpentine)

CINNABAR

HgS

Cinnabar is the most important ore mineral of mercury. It is generally found in veins that have formed at low temperatures relatively near the surface in regions of recent volcanic and hot-spring activity.

British Columbia

82 G/13 An occurrence, in the Fort Steele mining division, of massive tetrahedrite with minor pyrite in a quartz-siderite gangue, was found to contain small red crystals of cinnabar. The locality is on the Red Rock claim group, on Copper Creek, a tributary of Skookumchuck Creek (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 548).

82 N/7 Cinnabar occurs in calcite veins near Golden on the Kicking Horse River (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 66 R).

92 C/14 The greenish grey feldspathic rocks at the eastern entrance of Sechart Channel in Barkley Sound, Vancouver Island, contain cinnabar and native mercury (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 66 R).

92 H/14 The gold placers of the Fraser River in the Boston Bar area are said to contain cinnabar in small quantities (G. C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, p. 9 T).

92 I/3 Magnetite, garnet, ilmenite, zircon, rutile, olivine, platinum, gold, quartz, epidote, thorianite, chromite, feldspar, cinnabar, muscovite, calcite, scheelite, and sperrylite are present in the black sands of the Fraser River near Lytton (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

92 I/10, 92 I/15 Cinnabar is abundant in the volcanic rocks of the Nicola map-area between Tunkwa Lake and Criss Creek. It is accompanied by silicification or alteration to carbonates. Specimens have been obtained from a locality between Criss and Deadman creeks, one-quarter mile from their junction (W.E. Cockfield, 1961: Geol. Surv. Can., Mem. 249, p. 82).

Veins largely composed of quartz, calcite, dolomite, barite, and feldspar also contain cinnabar, at Six Mile Point in the Kamloops mining division (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 118 A).

Cinnabar also occurs at Copper Creek in the same area (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 31 R).

92 J/15, 92 O/2 A number of occurrences of cinnabar are known in the Bridge River district of British Columbia. It is disseminated in the rusty weathering greenstones of the Mercury Creek area, near Tyaughton Lake. It is present in small amounts in the Tyaughton Creek Valley scheelite deposit and is abundant in the vicinity of Tyaughton Creek near Relay, Mire, and Mercury Creeks (J.S. Stevenson, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 104) (C.E. Cairnes, 1943: Geol. Surv. Can., Paper 43-15, p. 33, K. Watson, 1950: Am. Mineralogist, 35, p. 457).

92 K/15 An occurrence of cinnabar has been reported in the vicinity of the Homathco River in the Nanaimo mining division (G. C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, p. 9 T).

93 K/9 Cinnabar deposits of economic size and grade are present in brecciated fault zones in the Permian limestones of the Pinchi Lake district. The cinnabar occurs as blebs, grains or veinlets, and may be red and massive or purplish red and crystalline (J.D. Gray, 1938: Geol. Surv. Can., Paper 38-14, p. 9, J.E. Armstrong, 1944: Geol. Surv. Can., Paper 44-5, p. 6, and 1949: Geol. Surv. Can., Mem. 252, p. 126).

The X-ray powder pattern of cinnabar from Pinchi Lake has six strong lines with the following spacings and intensities: 3.35 (10), 2.86 (9), 2.08 (3), 1.98 (3), 1.74 (3), 1.68 (3) (X-ray Laboratory, Geol. Surv. Can.).

New Brunswick

21 J/16 Cinnabar has been identified by X-ray powder pattern as present in specimens from Devils Brook (E.W. Nuffield and D.H. Gorman, 1960: private communication).

CLAUSTHALITE

PbSe

Ontario

41 N/2 Clausthalite from the Theano Point, Montreal River, area has been described as a lustrous lead grey mineral with a faint bluish cast on fresh surfaces and having occasional reddish brown spots. The X-ray powder pattern has five strongest lines at 3.05 (10), 2.16 (9), 1.840 (5), 1.763 (5), 1.366 (5) (J.W. Earley, 1950: Am. Mineralogist, 35, p. 338).

Clausthalite has been identified at the Camray Mine, near the mouth of the Montreal River. It was found in association with pitchblende, and an unidentified mineral (E.W. Nuffield, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. III, p. 18).

Saskatchewan

74 N/8, 74 N/10 Selenide minerals are found in some of the uranium deposits in the Goldfields district of Saskatchewan. Clausthalite is associated with the copper selenides, umangite, klockmannite, and berzelianite in a deposit north of Hal Lake, which is about 1,500 feet west of the Eagle shaft; and is the only selenide present in other deposits where it is associated with pitchblende, bornite, and chalcocite (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31, pp. 55-6).

CLEAVELANDITE

(See albite)

CLINOCHLORE

(See chlorite)

CLINOHUMITE

$Mg(OH, F)_2 . 4Mg_2SiO_4$

The humite group minerals, norbergite, chondrodite, humite and clinohumite occur almost exclusively in metamorphosed and metasomatized limestone. Identification of individual minerals of the group is difficult and often impossible without the use of X-ray diffraction techniques.

British Columbia

82 K/7 Clinohumite has been identified as a constituent in the 'Upper Hamill' schist at Duncan Lake. The X-ray powder pattern is similar to that of humite, with strongest lines at 3.71 (7), 2.77 (7), 2.26 (9), 1.75 (10), and 1.49 (doublet, 8) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 C/9 Fresh rounded grains of clinohumite are present in the crystalline limestones exposed at a railway cut near Chaffeys Locks. The mineral is amber yellow and has a vitreous lustre. Chemical analysis by H.C. Rickaby: SiO_2 37.42, TiO_2 1.14, Fe_2O_3 0.46, FeO 1.27, MgO 56.32, MnO 0.10, H_2O 0.56, F 5.04, total 102.31, less 0=F 2.12, total 100.19. S.G. 3.17 (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 15).

31 E/1 Clinohumite has been identified by X-ray powder pattern as present in a sample from a locality near the village of Wilberforce (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

31 J/4 Clinohumite has been identified by its X-ray powder pattern as an abundant constituent of limestone on lot 17, range II, Bigelow Township (X-ray Laboratory, Geol. Surv. Can.).

CLINOZOISITE

(See epidote)

COBALT BLOOM

(See erythrite)

COBALTITE

CoAsS

Cobaltite is an ore mineral of cobalt, found in vein deposits with sulphides and arsenides of cobalt, iron and nickel. It has a crystal structure similar to that of pyrite.

British Columbia

92 H/8 Mineralization on the Oregon property about 3 miles east of Hedley consists of massive garnet, hedenbergite, wollastonite, calcite, and minor quartz with sparsely disseminated sulphides. Hedleyite and joseite occur together. Native bismuth, molybdenite, and gold are associated with these tellurides while bornite, chalcopyrite, cobaltite, and safflorite occur apart and are locally abundant (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

93 M/4 Cobaltite occurs with allanite, arsenopyrite, erythrite, molybdenite, and gold at the Homestake Group near Hazelton (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 41).

104 M/1 Greenish black serpentine containing disseminated or massive magnetite with minor chalcopyrite, specularite, pyrite, and cobaltite occurs on the west side of Hoboe Creek, 2 miles from Atlin Lake. The deposit is at the contact between early Paleozoic amphibolites, schists and limestones and a granitic intrusion which is part of the Coast Range batholith (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

New Brunswick

21 O/8 Cobaltite occurs with Cu, Zn, Pb mineralization at Devils Elbow in Northumberland County (A.L. McAllister, 1959: New Brunswick Mines Br., reproduction of Can. Inst. Mining Met., Bull.). Also at the United Montanban Mine on Little River Lake in Northumberland County (New Brunswick Mines Br., files).

Northwest Territories

86 L/1 The cobalt and nickel minerals: safflorite, rammelsbergite, smaltite, chloanthite, cobaltite, and niccolite, occur in the uranium-silver deposits of the Great Bear Lake area (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 47).

Isolated cobaltite crystals of rough cubic habit are associated with native silver, chalcopyrite, tetrahedrite, chloanthite, and skutterudite in two sections of the Eldorado Mine on Great Bear Lake (Ellis Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 47).

Ontario

31 M/4 Cobaltite, arsenopyrite, and bismuthinite are the chief opaque minerals in a calcite-quartz vein in a narrow aplite dyke on the west side of claim H.R. 616, northeast of Lorrain Lake.

About half a mile to the west of the outlet of McDonald Lake, in the Matabitchuan area, is a small diabase dyke or vein containing cobaltite, arsenopyrite and pyrite (E.W. Todd, 1925: Ont. Dept. Mines, Ann. Rept., vol. 34, Pt. III, pp. 31, 34).

31 M/5 Cobaltite in massive and crystalline form is found in Bucke Township, at the Benn Mine, on conc. I, lot 15 (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14,Pt. II, p. 23).

Zoned crystals composed of breithauptite cores fringed by niccolite which is in turn bordered by cobaltite occur in the Hudson Bay Mines Ltd., workings at Cobalt. Cobaltite has been isolated and analyzed with the following results: Co 34.83, Ni nil, Fe 63.00, As 46.97, S 0.04, Ag 17.48, total 99.95 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 209).

Cobaltite from the Columbus claim in the Timiskaming district has been analyzed by De Lury. It was found to have the following composition: As 44.55, S 20.73, Co 29.10, Ni 0.97, Fe 4.55, total 99.90 (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14, Pt.II, p. 23).

The crystals from the Columbus claim are said to be octahedral in habit and unsurpassed for perfection (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 221).

Veins on the M.J. O'Brien property at Cross Lake near Cobalt contain cobaltite, skutterudite, argentite, rammelsbergite, chloanthite, safflorite, gersdorffite, smaltite, niccolite, chalcopyrite, tetrahedrite, arsenopyrite, sphalerite, galena, pyrite, pyrargyrite, marcasite, silver, and some breithauptite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41; and 1932: Geol. Ser., 32, p. 33).

Cobaltite is found in a vein with niccolite, and smaltite-chloanthite in the Silver Bar Mine near Cobalt. Small dendritic intergrowths of gersdorffite are present. Calcite is the principle gangue mineral (E.W. Todd, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 71).

31 M/4 Cobaltite occurs with skutterudite in the Keeley Mine as the outer zone of crystals whose inner area is composed of gersdorffite with minor amounts of cobaltite, löllingite, and skutterudite (J.M. Bell and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 33).

41 I/4 Cobaltite crystals varying in size from an inch to an inch and a half across have been found near a quartz vein cutting sedimentary rocks in Foster Township, conc. V, lot 11, southeast of Espanola. They have been exposed by an adit in a hill just east of Brazil Lake and many specimens have been collected from a nearby dump (Mrs. K. Edmond, 1963: private communication).

41 J/1 Cobaltite has been identified by X-ray powder pattern in a specimen from conc. V, lot 6, of Harrow Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

41 P/10 Isolated and well formed crystals of cobaltite are found with niccolite at the Coleroy Mine in the Gowganda area (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 76).

The La Rose Mine in Coleman Township contains cobaltite (W. Campbell, 1908: J. Can. Mining Inst., XI, p. 483).

Cobaltite is present in a vein with calcite, pyrite, and galena on claim W.D. 962, Nicol Township, northeast of Gowganda Lake (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 34).

Minute cubic crystals of cobaltite occur with radiating blades of löllingite-safflorite at the 585 foot level of the Miller Lake O'Brien Mine in the Gowganda area (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, pp. 65 and 68).

52 L/7 Cobaltite, chalcopyrite, pyrrhotite, pyrite, and magnetite occur together in a mineralized zone associated with a fault at the northeast end of Werner Lake (H.D. Carlson, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. IV, p. 25). Cobaltite also occurs at the west end of Werner Lake (E.R. Rose, private communication). The X-ray powder pattern of cobaltite from the latter locality has four strongest lines at 2.776 (7), 2.485 (10), 2.270 (8) and 1.675 (9) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

23 B/14 Cobaltite, bismuth, bismuthinite, safflorite-löllingite, and arsenopyrite have been identified in specimens from the Quebec Cobalt property in the Mount Wright area. Specimens were submitted by S. Duffell (1956) and identification was made in the X-ray Laboratory, Geol. Surv. Can.

32 G/16 Cobaltite has been identified by X-ray powder pattern in samples from Portage Island, Roy Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

COFFINITE

$U(SiO_4)_{1-x}(OH)_{4x}$

Coffinite has been described from the uranium deposits of the Colorado Plateau where it occurs in association with uraninite and low valence vanadium minerals. In this and other areas including Texas and Oklahoma it is also found in conjunction with asphaltic material. Coffinite is black with an adamantine lustre. A highly purified specimen gave a specific gravity of 5.5. An X-ray diffraction pattern with strongest lines at 4.66 (S), 3.47 (S), 2.64 (M), 1.801 (M) has been obtained from a specimen of specific gravity 2.2. X-ray data indicates that coffinite belongs to the tetragonal system (L.R. Stieff, T.W. Stern and A.M. Sherwood, 1956: Am. Mineralogist, 41, p. 675).

Ontario

41 J/2 X-ray powder patterns have identified coffinite in specimens from the Algom Nordic property at Blind River (E.W. Nuffield and D.H. Gorman, 1960: private communication).

COLERAINITE

(See chlorite)

COLLINSITE

$Ca_2(Mg, Fe)(PO_4)_2.2H_2O$

British Columbia

93 K/4 The mineral was named after William H. Collins, former Director, Geological Survey of Canada. It was found in a vein 4 to 12 inches wide between basaltic lava flows, 1,000 feet from a farmhouse, two miles northwest of the ferry landing on the north side of François Lake. The vein consists of botryoidal phosphate with some asphalt and brecciated andesite. Chemical analysis by E.A. Thompson: SiO_2 0.10, Al_2O_3 0.39, Fe_2O_3 0.80, FeO 6.86, MgO 6.34, CaO 32.18, H_2O^+ 12.28, H_2O^- 0.15, P_2O_5 39.83, CO_2 0.23, F 0.27, Mn_2O_3 0.36, organic matter 0.18; total 99.97, less O=F 0.11, final total 99.86; S.G. 2.95 (E. Poitevin, 1926: Geol. Surv. Can., Museum Bull. 46, pp. 1-21).

Chemical analysis by F.A. Gonyer: P_2O_5 41.13, CaO 32.03, MgO 9.31, FeO 7.31, H_2O 9.69, total 99.47 (C.W. Wolfe, 1940: Am. Mineralogist, 25, p. 746).

93 K/4 The X-ray powder pattern of collinsite has four strongest lines with the following spacings and intensities: 6.24 (5), 3.14 (5), 3.03 (8), 2.69 (10) (X-ray Laboratory, Geol. Surv. Can.).

COLORADOITE

HgTe

Coloradoite is an iron-black mercuric telluride. It was first recognized from Boulder County, Colorado where it occurs sparingly. The X-ray pattern has four strongest lines at 3.74 (10), 2.29 (9), 1.949 (7), 1.318 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 50).

Ontario

32 D/4 Large compact masses of coloradoite are associated with calaverite, altaite, gold, and molybdenite in brecciated quartz at the Bidgood Mine near Kirkland Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

42 A/1 Coloradoite has been reported by Todd (1929) to occur in the Teck-Hughes and Sylvanite mines in the Kirkland Lake district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

Gold and compact masses of coloradoite occur in quartz at the Wright-Hargreaves Mine, Kirkland Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

Coloradoite occurs in the Lakeshore Mine near Kirkland Lake. It is found in quartz veins in association with altaite, gold, and chalcopyrite. An analysis by Rickaby is as follows: Hg 58.55, Pb 1.60, Te 39.10, insol. 0.25, total 99.50 (E. Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 95) (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

Small compact masses of coloradoite are embedded in coarsely crystalline calcite in the Kirkland Lake Mine. Associated minerals are hessite, chalcopyrite, and tetrahedrite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

Coloradoite in association with altaite, calaverite, tetradymite, hessite, gold, pyrite, and melonite, is present in the Tough-Oakes Mine near Kirkland Lake (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 99).

42 A/6 Several fragments of coarsely crystalline calcite found in the Hollinger Mine at Timmins were coated with films of hessite, coloradoite, tetrahedrite, and chalcopyrite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

42 D/10 Galena and gold in the 210 vein of the McLeod-Cockshutt Mine in Ashmore Township, have been partly replaced by coloradoite and an undetermined mineral (E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. V, p. 44).

52 B/10 Coloradoite, petzite, altaite, gold, chalcopyrite, pyrite, sphalerite, and hematite occur together in the Moss Mine in Moss Township (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 99).

Quebec

32 D/8 Coloradoite occurs in the Robb-Montbray Mine in Montbray Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 364).

Yukon

115 K/15 Tetradymite nuggets from the Reno Placer property on Canadian Creek were examined in polished section for precious metals. They were found to contain pinkish grey, isotropic inclusions which were identified as coloradoite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 454).

COLUMBITE

$(Fe, Mn)(Nb, Ta)_2O_6$

Columbite is the niobium rich member of an isomorphous series involving mutual substitution of Nb and Ta. Like tantalite, the tantalum rich member, it commonly occurs in pegmatite. Intermediate varieties having approximately equal proportions of Nb and Ta are not uncommon and the iron-manganese ratio is allowed considerable fluctuation. Columbite is black to reddish brown and has submetallic lustre often showing iridescence.

British Columbia

92 I/9 A mineral regarded as midway between the end members of the columbite-tantalite isomorphous series has been found in the Kamloops area (H.V. Ellsworth, 1932: Geol. Surv. Can., Geol. Ser., 11, p. 137).

Manitoba

52 L/5 A small sample from a pegmatite near the Bird River, southeast of Lake Winnipeg contained granular columbite-tantalite with cassiterite, and hematite (Ellis Thomson, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 103).

52 L/5 Columbite is present as lustrous, black, prismatic crystals from 1/2 inch to 2 inches long in a pegmatite on the property of the Silver Leaf mining syndicate in township 16, range 16, lot 17, near Point du Bois. An analysis by V.J. Oswald is as follows: FeO 14.77, MnO 2.17, CaO 2.66, MgO 0.45, Nb_2O_5 52.26, Ta_2O_5 26.41, TiO_2 0.49, SiO_2 0.13, ZrO_2 0.65, H_2O 0.21, total 100.20; S.G. 5.87 (T.L. Walker, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 11).

52 L/6 A mineral belonging to the columbite-tantalite series has been found in each of the two pegmatite bodies on the Huron and Silverleaf claims at 50°21'N, 95°22'W, about 4 miles east of Lamprey Falls on the Winnipeg River (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 157).

52 L/16 Columbite-tantalite has been identified in specimens from a pegmatite near Shatford Lake at Lat. 50°23'N, Long. 95°29'W, in the Cat Lake, Winnipeg River district. Identification was made by the X-ray Laboratory, Geol. Surv. Can., from a sample collected by R. Mulligan in 1957.

Northwest Territories

85 I/1 A specimen of columbite from the DeStaffany Mine on Great Slave Lake was found to have a specific gravity of 5.808 and the following chemical composition: Nb_2O_5 59, Ta_2O_5 23, FeO 11, MnO 4, WO_3<2, ZrO_2 trace, TiO_2 not detected, Nb/Ta = 2.56, Fe/Mn = 2.75 (R.W. Hutchinson, 1955: Am. Mineralogist, 40, p. 435).

85 I/11 Columbite crystals are found in the Ross Lake area, District of Mackenzie, near the margins of the quartz-perthite cores of well zoned pegmatites (R.W. Hutchinson, 1915: Geol. Surv. Can., Mem. 34, p. 15).

85 I/12 Columbite occurs at Hidden Lake (R.W. Hutchinson, 1955: Am. Mineralogist, 40, p. 436).

85 I/13 Columbite has been identified in samples collected by R. Mulligan (1957) from a pegmatite on the Cota claim group in the Blaisdell Lake area at 62°51'N, 113°33'W. The X-ray powder pattern has five strongest lines at 3.65 (6), 2.97 (10), 2.49 (3), 1.716 (5) and 1.456 (6) (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

21 A/11 Crystals often weighing several grams are found in pegmatite dykes in the New Ross and Lavers mines in Lunenberg County. An analysis by E.W. Todd is as follows: SiO_2 0.34, TiO_2 1.47, FeO 10.46, MnO 10.44, SnO 0.22, Ta_2O_5 14.48, Nb_2O_5 63.08, total 100.49; S.G. 5.613 (E.R. Faribault, 1907: Geol. Surv. Can., Summ. Rept., pp. 81-82) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 257) (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 35).

Ontario

31 E/4 Columbite-tantalite occurs as crude crystals and masses in a feldspar quarry on lot 7, conc. X, of Conger Township. An analysis by Union Carbide and Carbon Research Laboratories indicated a niobium content of 20 per cent, and a tantalum content of 22 per cent (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 187).

31 F/4 Columbite is found with rutile and rare earth minerals at the abandoned Woodcox Mine on lot 17, conc. VIII, of Monteagle Township, Hastings County. Analysis by E.W. Todd: Nb_2O_5 66.60, Ta_2O_5 1.74, FeO 8.61, TiO_2 5.22, MnO 9.06, ThO_2 3.44, H_2O 1.41, SiO_2 0.64, ZrO_2 1.25, SnO_2 0.36, rare earths 1.68, total 100.01; S.G. 5.147 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 211) (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 35).

31 F/6 Thin, flat, disk-shaped masses of columbite occur on cleavages of feldspar in a pegmatite dyke in Lyndoch Township, conc. XV, lot 23, about a mile and a half north of Quadeville. Monazite, beryl, and cyrtolite are associated minerals. Analysis by E.W. Todd: Nb_2O_5 55.79, Ta_2O_5 15.21, MnO 10.24, FeO 10.90, TiO_2 5.19, SiO_2 1.28, CaO 0.15, SnO_2 0.56, rare earths 0.82, total 100.14 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 230) (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 35).

31 F/6 Columbite-tantalite has been found in a granite pegmatite in Renfrew County, Lyndoch Township, conc. XV, lot 30 (D.F. Hewitt, 1960: private communication).

41 I/7 Toddite, a variety of columbite in which some of the manganese and iron are replaced by uranium, has been found in a pegmatite dyke in the northwest corner of lot 4, conc. III, Dill Township. Chemical analysis by H.V. Ellsworth: SiO_2 1.77, TiO_2 0.85, BeO 0.47, Al_2O_3 0.04, Fe_2O_3 4.68, FeO 4.38, CaO 2.02, MgO 0.22, MnO 2.62, ZrO_2 0.06, SnO_2 0.53, Nb_2O_5 53.73, Ta_2O_5 8.97, PbO 0.44, UO_2 8.71, UO_3 2.37, ThO_2 0.47 $(Ce, La, Di)_2O_3$ 0.76 $(Y,Er)_2O_3$ 3.42, H_2O 4.94, loss on ignition (3.42), total 100.45; S.G. 5.041 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, pp. 171, 266).

52 F/15 Specimens from a pegmatite dyke located in Dryden Township south of Mavis Lake were found to contain columbite-tantalite. It was identified by the X-ray diffraction method in a specimen submitted by R. Mulligan, 1957 (X-ray Laboratory, Geol. Surv. Can.).

Quebec

32 C/5 Pegmatites in the Fiedmont area of Abitibi County contain a wide variety of minerals. Among them are spodumene, quartz, microcline, cleavelandite, lepidolite, albite, beryl, spessarite, columbite-tantalite, microlite, betafite, bismuthinite, molybdenite, and powellite (E.W. Heinrich and A.A. Levinson, 1958: Am. Mineralogist, 38, p. 35).

COOKEITE

$LiAl_4(Si, Al)_4O_{10}(OH)_8$

British Columbia

82 N/8 Cookeite associated with galenite is present in the rocks of the Ottertail Creek area in the Golden mining division (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 30 T).

92 P/11 Cookeite occurs in thin layers in sericite schist, and also in small cavities in a quartz vein that cuts the schist, on Wait-a-bit Creek. Analysis by Johnston: SiO_2 32.00, Al_2O_3 45.87, CaO 1.63, MgO 0.78, Li_2O 2.10, K_2O 0.06, Na_2O 0.65, F 0.02, H_2O 17.29, total 100.40, less O for F 0.01, total 100.39 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 22 R).

The X-ray powder pattern of cookeite from Wait-a-bit Creek shows seven strongest lines having the following spacings and intensities: 4.70 (10), 3.53 (8), 2.51 (6), 2.32 (8), 1.96 (5), 1.64 (5) and 1.490 (5) (X-ray Laboratory, Geol. Surv. Can.).

COPIAPITE

$(Fe^{++}, Mg, Cu, Zn)(Fe^{+++}Al)_4(SO_4)_6(OH)_2.2OH_2O$

Members of the copiapite series are secondary minerals formed by the oxidation of sulphides, especially pyrite. A complete series exists between Fe^{++} and Mg and possibly also with Cu and Zn. The names, copiapite, magnesiocopiapite and cuprocopiapite have been given to the composition regions where Fe^{++}, Mg, and Cu, respectively, are the dominant cations.

Alberta

82 O/1 The National Mineral Collection contains specimens of fine-grained yellow copiapite from the Elbow River area.

British Columbia

82 M/4, 82 M/6 Magnesiocopiapite is found as an alteration product of pyrite in muscovite schist at Adams Lake. The X-ray powder pattern has four strongest lines at 18.2 (8), 9.25 (10), 6.15 (4) and 5.58 (6) (X-ray Laboratory, Geol. Surv. Can.).

94 M/8 Copiapite occurs near Liard Post on the Liard River as yellow microscopic crystals and crystal aggregates. Analysis by E.W. Todd: SiO_2 37.92, Fe_2O_3 24.96, Al_2O_3 0.52, MgO 3.10, H_2O 31.51, insol. 1.96, total 99.97. S.G. 2.087 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 84).

Northwest Territories

88 H/16 A yellow mineral occurring in black shale in the Raglan range on Melville Island has been identified as copiapite by the X-ray diffraction method (X-ray Laboratory, Geol. Surv. Can.).

COPPER

Cu

Naturally occurring metallic copper may contain small amounts of iron, lead, tin, silver, and antimony as impurities. It occurs in sandstone, clay slate, limestone, and igneous rocks, forming veins and blebs, and it may be found in streams as a placer mineral. Native copper is usually, if not always, of secondary origin. It is possibly the result of reduction of copper bearing minerals by organic material. Oxides and sulphides of copper are characteristically present with the native mineral. Occurrences are not uncommon but seldom is the quantity sufficient for use as an ore. The X-ray pattern has strongest lines at 2.09 (10), 1.81 (5), 1.09 (4), 1.28 Å (2) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 G/12 Specimens of native copper containing native silver have been found in placers on Wildhorse Creek in the west half of the Fernie map-area (G.B. Leech: private communication).

82 K/3 Native copper occurs in the Wellington Mine, Slocan mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 77).

92 F/11 Native copper has been encountered in a number of diamond-drill holes in the Cumberland district of Vancouver Island. It occurs in amygdaloidal meta-andesites belonging to the Vancouver series underlying the coal measures of the district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 77).

92 G/4 Copper occurs in an amygdaloidal trap near Nanaimo and on South Valdes Island (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 77).

92 H/6 Native copper is present in gold placers in many of the streams and rivers in the province. Notable among these are the Thompson, the Fraser, and the Dease (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 154 R).

92 H/15 Native copper has been found at Aspen Grove (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, 74-78 A).

92 I/15 Copper-bearing igneous rocks occur in the Copper Creek area of the Greenwood mining division (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 154 R).

93 A/6 Copper occurs on the Big Sioux claims in a lava flow overlying placer gravels near Horsefly camp on Twenty Mile Creek, Quesnel mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 77).

104 N/5 Serpentine on Goat Island in Atlin Lake, about 19 miles south of Atlin, is cut by copper-bearing calcite veins (G.M. Dawson, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 69 A).

Native copper has also been reported on Copper Island in Atlin Lake.

Manitoba

62 O/9 Native copper occurs in the amygdaloidal traps at the north end of Lake Manitoba and on Sugar Island in Lake St. Martin (R. Bell, 1903: Geol. Surv. Can., Ann. Rept., XV, p. 9 AA).

New Brunswick

21 B/10 The triassic traps occurring on Grand Manan Island, particularly in the vicinity of Southwest Head, contain nodules and stringers of native copper. They are of small size and show no tendency to concentrate anywhere (L.W. Bailey, 1897: Geol. Surv. Can., Ann. Rept., X, p. 19, 20 M).

21 G/2 Native copper occurs in the igneous rocks at Clark Point on the Mascarien Peninsula, Charlotte County (L.W. Bailey, 1897: Geol. Surv. Can., Ann. Rept., X, p. 24 M).

Newfoundland

12 B/15 Small amounts of native copper and cuprite occur in sheared dunite near the head of Pope Cove (G.C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 56).

13 K/5 Mineralization in the Seal Lake area of Labrador consists of malachite, cuprite, native copper, chalcocite, bornite, chalcopyrite, pyrite, molybdenite, and covellite. Gangue minerals are quartz, calcite, albite, epidote, and chlorite (J.J. Brummer, 1960: Bull. Can. Inst. Mining Met., 53).

Northwest Territories

38 B/10 Native copper has been collected from Albert Harbour on Baffin Island (R.A.A. Johnston, 1908: Geol. Surv. Can., Summ. Rept., p. 166).

78 B/11 Small specks and flecks of native copper have been observed in the volcanic rocks of the Shaler Mountains on Victoria Island (R. Thorsteinsson and E.T. Tozer, 1962: Geol. Surv. Can., Mem. 330, p. 77).

86 N Native copper is reported to occur in slabs and scales in the amygdaloidal traps of the Coppermine Mountains, north and east of the Dismal Lakes. The metal has been used in the past by Indians and Eskimos who recovered it from loose material in the valleys (G.M. Dawson, 1886: Geol. Surv. Can., Ann. Rept., II, p. 25 R) (National Mineral Collection).

87 K The National Mineral Collection contains native copper from Prince Albert sound on Victoria Island. It was donated in 1911 by V. Stefansson.

Nova Scotia

Grains and irregular masses weighing up to several pounds have been found in trap rocks at the following localities (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 30 T).

21 B/8 Briar Island, Digby County.

21 H/3 Margaretville, Annapolis County.

21 H/7 Cape d'Or and Spencers Island, Cumberland County.

21 H/8 Five Islands, Colchester County, and Two Islands, Cumberland County.

Ontario

41 N/2 Mineralization on the Nipigon mining property in the Batchawana area consists of copper sulphides and native copper (E.S. Moore, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. II, p. 83).

41, 42, 52 Copper has been found on the north shore of Lake Superior and on adjacent islands at the following localities: Mamainse Point (41 N/2), Cape Gargantua (41 N/11), Michipicoten Island (41 N/12), 41, 42, 52 Battle Island (42 D/13), Ignace and Spar Islands (52 A) (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, 30 T).

52 A/5 The Beaver Mine in the Thunder Bay district contains native copper (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 197).

52 E/9 Small but perfect twinned octahedra of native copper have been found at Andrew Bay in Lake of the Woods (A. Blue, 1895: Ont. Bur. Mines, Ann. Rept., vol. 5, p. 105).

52 G/15 Native copper occurs at Sturgeon Lake, in the Thunder Bay district (R. Bell, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94 A).

Quebec

21 L/11 Native copper has been noted in drift in the Chaudiere Valley (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 515).

Thin plates of native copper occur in red slates in the bed of the Etchemin River. Debris of the same rock contains copper at Point Levis (W.E. Logan, 1863: Geol. Can., p. 516).

Yukon

105 D/3 The breccias on the southwest face of Chieftain Hill, contain appreciable amounts of native copper (J.O. Wheeler, 1961: Geol. Surv. Can., Mem. 312, p. 79).

115 A/6 Some native copper nuggets have been found in Beloud Creek in the Dezadeash area (E.D. Kindle, 1953: Geol. Surv. Can., Mem. 268, p. 55).

115 B Rounded nuggets and slabs of native copper weighing up to a pound and a half have been found in Bullion, Sheep, Kimberley, and Burwash creeks in the Kluane mining district. They are not abundant in the creeks and are believed to be of vein origin (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284).

CORACITE

(See uraninite)

CORDIERITE

$$(Mg, Fe^{++})_2Al_4Si_5O_{18}$$

Cordierite is found characteristically in schists and gneisses formed by medium to high grade metamorphism of aluminium-rich rocks. It is a typical contact metamorphic mineral and has even been formed in sediments adjacent to burning coal seams. Transparent blue cordierite is used as a gemstone. Cordierite is also known as iolite and dichroite.

The X-ray powder pattern has five strongest lines at 8.54 (10), 4.09 (8), 3.37 (8), 3.13 (8), 3.07 (8) (H.M. Richardson and G.M. Rigby, 1949: Mineralogical Mag., 28, p. 547).

British Columbia

104 P/5 Along the east contact of the Cassiar batholith, west of the Cassiar Asbestos Mine, McDame map-area, cordierite is a constituent of a grey-green, spotted, fine-grained hornfels (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 25).

Manitoba

63 N/2 Aggregates of blue, optically positive cordierite occur with quartz, feldspar, biotite, garnet, and amphibole in the Kisseynew gneiss at Sherridon (R.V. Rutherford, 1936: Am. Mineralogist, 21, p. 386).

Cordierite, some reported to be of gem quality, has been found in the Batty Lake area. Chemical analyses of two samples: (I) SiO_2 46.55, Al_2O_3 33.80, FeO 7.92, CaO nil, MgO 10.85, total 99.12. (II) SiO_2 46.72, Al_2O_3 35.90, FeO 8.30, CaO 0.60, MgO 9.21, total 100.73 (D.S. Robertson, 1953: Geol. Surv. Can., Mem. 271, p. 31).

64 B/3 Cordierite is present in injection gneisses east of Misinagu Lake (G.M. Wright, 1953: Geol. Surv. Can., Paper 53-12, p. 5).

Newfoundland

2 D/10 Cordierite is present in metamorphic rocks of the Gander Lake Group along the western margin of the Ackley granite batholith, and around the leucogranite near Dead Wolfe Pond (S.E. Jenness, 1963: Geol. Surv. Can., Mem. 327, p. 81).

Northwest Territories

46 K/2 Cordierite occurs on Garnet Island as flawless crystals up to two inches long (D.S.M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 76-78).

85 M/12 Cordierite is found with andalusite in metamorphosed greywackes and shales of the Yellowknife Group, Basler Lake (J.V. Ross and J.C. McGlynn, 1963: J. of Geology, vol. 71, No. 5, p. 644).

85 Optically positive, transparent, gem-quality cordierite occurs in an injection and assimilation gneiss in the area north of Great

85 Slave Lake. It is associated with garnet, sillimanite, green spinel, graphite, biotite, orthoclase, microcline, oligoclase, quartz, and tourmaline. A chemical analysis of the cordierite is as follows: SiO_2 48.19, TiO_2 0.01, Al_2O_3 33.45, FeO 8.40, Fe_2O_3 0.55, MgO 7.95, MnO 0.18, Na_2O 0.22, K_2O 0.02, CaO 0.17, H_2O^- 0.01, H_2O^+ 0.67, total 99.82. S.G. 2.631 (R.E. Folinsbee, 1941: Am. Mineralogist, 26, p. 485) (E.W. Heinrich, 1950: Am. Mineralogist, 35, p. 173).

85 O/4 The variety of cordierite known as dichroite occurs at a locality on the 115th meridian, 7 miles south of Ghost Lake. It forms irregular masses and prismatic crystals which when held up to the light and rotated, vary in colour from intense blue to dull yellow. Fine-grained graphite is an associated mineral (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 154).

Nova Scotia

11 D/12 Cordierite is present in metamorphosed slate near granite contacts in the vicinity of Halifax (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 132).

11 F/5 Cordierite is present in a number of samples taken from the Guysborough map-area (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 E/1 Cordierite is present in the amphibolite rocks on lot 11, conc. XI, Harcourt Township, Haliburton County (N.N. Evans and J.A. Bancroft: Am. J. Sci., Ser. 4, XXV, p. 509).

42 A/9 Rounded grains of cordierite are found in a groundmass of chlorite, carbonate, epidote, magnetite, and pyrite on lot 1, conc. VI, Beattie Township (P.E. Hopkins, 1915: Ont. Dept. Mines, Ann. Rept., vol. 24, Pt. IV, p. 173).

42 C/2 Cordierite occurs in a greenstone prong that cuts the west orebody at the Helen Mine in the Michipicoten district (E.S. Moore and H.S. Armstrong, 1946: Ont. Dept. Mines, Ann. Rept., vol. 55, Pt. IV, p. 97).

52 F/11 Cordierite has been identified by the X-ray diffraction method as present in metasediments southeast of Eagle River Station, Aubrey Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

31 I/16 Cordierite is a fine-grained constituent of the paragneisses in the vicinity of Montauban les Mines in Portneuf County. It occurs in masses weighing up to twenty pounds (J.J. O'Neill and F.F. Osborne, 1938: Que. Dept. Mines, Prelim. Rept., 136, p. 18).

31 I/16 Cordierite localities in Montauban are as follows: range I, lots 33-41, 312-322; range II, lots 38-41 (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 30).

32 D/6 Cordierite from the Amulet anticlinorium in the Noranda district is colourless, impregnated with inclusions, and sometimes twinned (M.E. Wilson, 1941: Geol. Surv. Can., Mem. 229, p. 72).

CORUNDUM

Al_2O_3

Corundum, like diamond, is best known for its hardness and gem qualities. As a gem, it is most highly prized in the form of ruby and sapphire which are, respectively, red and blue transparent varieties. Few minerals occur in a greater variety of colours than corundum. In addition to red and blue, gem corundum may be purple, yellow, green, brown and colourless. In its common form however it is usually brown or reddish. Among the naturally occurring minerals only diamond surpasses corundum in hardness.

The X-ray powder pattern of corundum has four strong lines with the following spacings and intensities: 3.47 (4), 2.55 (8), 2.09 (10), 1.60 (9) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F/4 A celandine green variety of corundum has been observed in the gold washings on the Pend d'Oreille River (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 15 R).

92 H/7 Minute grains of ruby corundum have been observed in the gravels of some of the creeks flowing into the Tulameen River (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 79).

Northwest Territories

85 H/11 Blue corundum occurs on the Outpost Islands in the east arm of Great Slave Lake. The crystals, in patches up to one-half inch in diameter, are embedded in andalusite in quartz pegmatite. They are more or less transparent but are not quite of gem quality (H.C. Cooke, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 74) (J.E. Hawley, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 53).

Ontario

31 C/5 Interbanded corundum-magnetite-muscovite syenite, bearing from 10 to 15 per cent corundum in crystals from 1/16 to 1/2 inch long, occurs in Carlow Township, conc. XIV, lot 15. In the same

31 C/5 locality, near O'Grady's Lake are corundum-bearing pegmatites in which the crystals vary in size from 1/4 of an inch to 4 inches.

On lot 18 of conc. XIV, crystals up to 6 inches long occur in a nepheline rock and smaller ones are found in syenites and pegmatites. The crystals are generally oriented with their long axis parallel to the foliation (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI).

Interbanded corundum syenite and scapolite gneiss on conc. XV, lots 11 and 12, Carlow Township, are cut by rusty weathering pegmatites. Bronze corundum in the rock southeast of Herb's Cuts makes up 20-30 per cent of the total volume for a length of about 10 feet (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, p. 35).

31 C/10 Corundum occurs at the following localities in Hinchenbrooke Township: (1) conc. V, lot 13; green and grey corundum is disseminated throughout a small syenite body. (2) conc. VI, lot 24; corundum occurs in granite gneiss. (3) conc. VII, lot 11; small quantities of green and grey corundum are disseminated throughout a syenite mass in gneissic country rock (W.D. Harding, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. VI, p. 47).

31 C/12 Corundum has been reported in lot 14, conc. IX, of Methuen Township (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 15 R).

Rounded crystals of blue corundum occur embedded in muscovite books in Methuen Township (D.S.M. Field, 1951: Can. Mining J., 72,Pt. 2, pp. 75-77).

31 C/16 Light red to sapphire blue corundum occurs as grains in a feldspar, quartz, calcite, mica, titanite rock aggregate in conc. IX, lot 2, South Burgess Township, Leeds County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 499).

31 D/9 A specimen of corundum donated to the National Mineral Collection by F.D. Adam, in 1898, is reported to have been found in Methuen Township, conc. X, lot 16.

31 D/15 An occurrence of corundum has been reported in Lutterworth Township along the boundary between concs. III and IV, on lot 12. It outcrops along the road from Kinmount to Mines Bay (L. Moyd, 1949: Am. Mineralogist, 34, p. 745).

31 F/4 Small crystals of corundum make up about 5 per cent of a corundum syenite exposed in a pit on lot 13, conc. I of Monteagle Township (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, p. 29).

31 F/4 Blue-grey corundum occurs at the property of Monteagle Minerals on conc. II, lots 2 and 3, Monteagle Township. It forms fine-grained aggregates in a nepheline-biotite-scapolite-plagioclase gneiss (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, p. 30).

Prismatic crystals up to two inches long have been observed in an outcrop on a ridge on the east bank of the York River in Monteagle Township 10 miles northeast of Bancroft. The occurrence is on property owned by Monteagle Minerals (L. Moyd, 1949: Am. Mineralogist, 34, p. 743).

Corundum has been found in the following Monteagle Township localities: conc. III, lot 20; conc. IV, lots 21 and 22; conc. V, lot 14; conc. VI, lots 16 and 17 (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, p. 30).

A blue corundum crystal approaching star sapphire quality was cut for Dr. H.V. Ellsworth from material collected along York Branch in Dungannon Township (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 20).

Light bluish grey corundum is present in Dungannon Township on conc. XI, lot 18 (J.E. Thomson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III, p. 19).

Near Egan Chute on the York River, the nepheline rich gneisses contain considerable amounts of bluish corundum. The mineral has been found on both banks of the river on conc. XII, lot 12 of Dungannon Township (L. Moyd, 1949: Am. Mineralogist, 34, p. 743) (J.E. Thomson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III, p. 19).

Corundum occurs in the dark gneiss on lots 12 and 13 of concs. XIII and XIV, Dungannon Township. The corundum is abundant in the vicinity of pegmatite dykes (L. Moyd, 1949: Am. Mineralogist, 34, pp. 743, 746).

Crystals of corundum with transparent blue centres fading to white or grey edges have been described from concs. XIV and XV, lot 12, Dungannon Township. Fine fractures or parting planes appear in all crystals but they are said to be the closest to gem quality sapphire known in Canada (J.E. Thomson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III, p. 20).

Nepheline rich gneisses in conc. XIII, lot 26, Dungannon Township, contain corundum (L. Moyd, 1949: Am. Mineralogist, 34, p. 743).

31 F/5 Corundum occurs in Carlow Township in an area comprising concs. XIII to XVI, lots 11 to 17. It is generally associated with syenitic and pegmatitic rocks. A number of cuts or trenches

31 F/5 have been made in the locality, many of which contain exposures of corundum (L. Moyd, 1949: Am. Mineralogist, 34, p. 745).

Erratically distributed corundum may be found in conc. XVI, lots 29 and 30, Carlow Township (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, p. 38).

The following is a list of corundum occurrences in Raglan Township, Renfrew County.

Conc. XIV, lot 14. Corundum occurs in small albite dykes. Yellow crystals up to 7 inches in diameter are intergrown with black tourmaline (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. IV, p. 31).

Conc. XV, lot 22. Corundum occurs in a zone about a foot wide (J. Satterly, 1944).

Conc. XVII, lots 3, 4 (G.M. Dawson, 1900: Geol. Surv. Can., Ann. Rept., XIII, p. 128 A), lots 9, 10, 13 and 17 (J. Satterly, 1944) (L. Moyd, 1949: Am. Mineralogist, 34, p. 745).

Conc. XVIII, lots 3 and 4, and conc. XIX, lots 2, 3, 4, and 11. Corundum is concentrated in a complex system of nepheline-anorthite syenites and pegmatites. The Craig Mine at this occurrence was once one of the world's largest corundum mines (J.E. Thomson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III, p. 20).

Conc. XVIII, lot 3. Corundum forms large barrel-like crystals (D.S.M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 74-77).

Conc. XVIII, lot 10. The rocks in the locality are pink and white syenitic gneisses cut by pink granite pegmatite. They contain about 1 per cent corundum in crystals from 1/4 to 1/2 inch long (J. Satterly, 1944: p. 33).

Conc. XVIII, lot 19. Corundum occurs in small patches which contain over 30 per cent of the mineral (J. Satterly, 1944: p. 33).

Conc. XVIII, lot 24. A small showing of corundum had been noted in brownish weathering syenitic gneiss (J. Satterly, 1944: p. 34).

Conc. XIX, lots 25, 26 and 27. Corundum occurs in syenite pegmatite and to a lesser extent in a hybrid syenitic gneiss. Accessory minerals are feldspar, apatite, pyroxene, garnet, and quartz (J. Satterly, 1944: pp. 34 and 35).

31 F/6 Corundum occurs in the following Lyndoch Township localities: Conc. XIV, and XV, lot 13. Crystals up to two inches in diameter occur in the syenitic rocks. Granite pegmatites appear to

31 F/6 have some control of the occurrence of the mineral (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, pp. 29-30) (L. Moyd, 1949: Am. Mineralogist, 34, p. 745).

In Sebastopol Township corundum has been found on: Conc. IV, lot 6; conc. V, lot 24; conc. V, lot 25. The corundum-bearing rocks occur near exposures of nepheline syenite (J. Satterly, 1944: p. 35).

Two open cuts about 25 feet apart, on conc. XIX, lot 28, Raglan Township expose corundum-bearing syenite lenses in a hybrid syenitic gneiss rock (J. Satterly, 1944: p. 35).

Interbanding of nepheline and corundum-rich rocks is well illustrated on conc. I, lots 28-31 (L. Moyd, 1949: p. 743).

On lot 29 the hybrid syenitic gneisses have been cut by syenitic pegmatite dykes with corundum zones at their centres; and on lot 31, scattered crystals of corundum are associated with hornblende granite pegmatites in an old pit (J. Satterly, 1944: p. 30).

A corundum-bearing zone of pink and white syenitic gneiss in a hybrid syenitic gneiss occurs in Radcliffe Township on conc. II, lots 31 and 32. The crystals are said to be from 1/8 to 1/2-inch across. They are present in bands of from 1 to 12 inches thick in which they comprise about 1 per cent of the rock (J. Satterly, 1944: p. 31).

Good quality bronze corundum is found on the Gutz farm in Brudenell Township (D.S.M. Field, 1951: Can. Min. J., 72, Pt. 2, pp. 75-77).

Occurrences of corundum are known at the following localities in Brudenell Township: Conc. IV, lot 34. Conc. V, lots 24 and 34; the mineral occurs in lenticular patches throughout a biotite pegmatite on lot 34. Conc. VI, lots 24 and 25. Conc. VII, lots 20, 32, 33, 34. Drag folding is common on lot 34. The corundum is banded with nepheline and many crystals are intergrown with magnetite. On lot 20, granite pegmatites are believed to have been significant in localizing the corundum (E.D. Ingall, 1897: Geol. Surv. Can., Ann. Rept., X, p. 16 S) (J. Satterly, 1944: p. 29) (L. Moyd, 1949: p. 745).

31 F/7 Corundum has been reported to occur on concs. XII and XIII, lots 11 and 12 of Brougham Township in the southern part of the Mount St. Patrick nepheline belt (L. Moyd, 1949: p. 745).

CORUNDOPHILITE

(See chlorite)

COSALITE

$CuPb_7Bi_8S_{22}$

British Columbia

93 E/6 Stubby crystals of cosalite occur in the easterly workings of the Harrison Group at Lindquist Lake in the Omenica mining district. They are associated with tetradymite and occasionally gold. One fragment of doubtful purity was found to have a specific gravity of 6.75 (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 85).

93 H/4 Cosalite is found in intimate association with gold in the Cariboo Gold Quartz Mine near Barkerville (H.V. Warren, 1936: Econ. Geol., 31, pp. 205-211).

The mineral is also present in the neighbouring Island Mountain Mine. X-ray powder photographs from the two Cariboo district occurrences are identical with those of cosalite from McElroy Township, Ont., and from Nordmark, Sweden. The spacings and intensities of the seven strongest lines are: 3.95 (5), 3.44 (10), 3.36 (5), 2.95 (6), 2.82 (5), 2.15 (6) and 2.04 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 148).

Ontario

31 M/5 Tarnished dark grey crystals of cosalite occur within the smaltite and cobaltite of the Columbus Mine near Cobalt. The mineral has also been observed as slender crystals in cavities. It appears to be younger than the other sulphides accompanying it. A chemical analysis by E.W. Todd is as follows: Pb 37.88, Cu 1.24, Ag 1.67, Ni 0.05, Co 0.44, Fe 1.79, Bi 39.21, S 15.76, As 1.47, Sb 0.36, insol. 0.14, total 100.01. S.G. 6.55 (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 9).

32 D/4 Cosalite occurs in the Mondoux claim in McElroy Township as nodular masses sometimes weighing several pounds. Crystals of the mineral are slender, acicular, elastic, and have a tendency to split lengthwise. They may be up to half an inch long and are usually bent and twisted. Associated with the cosalite are quartz, chlorite, and calcite, and small amounts of bismuth and gold (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 5) (L.G. Berry, 1939: Univ. Toronto Stud., Geol. Ser. 42, p. 24).

Cosalite has been recognized on the Peerless property in McElroy Township by Burrows and Hopkins and in the area broadly defined as the southwestern part of the same township, by Abraham (A.G. Burrows and P.E. Hopkins, 1921: Ont. Dept. Mines, Ann.

32 D/4 Rept., vol. 30, Pt. VI, p. 17) (E.M. Abraham, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. VI, p. 51).

41 I/10 An X-ray powder pattern has led to the identification of cosalite in a specimen from Loughrin Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

32 D/6 Cosalite has been found replacing pyrrhotite and chalcopyrite at the Waite-Ackerman-Montgomery Mine in the Noranda district (M.E. Wilson, 1937: Geol. Surv. Can., Mem. 209, p. 72).

COVELLITE

CuS

British Columbia

82 F/14 Small quantities of blue microcrystalline covellite have been found at the Highland Light mining claim on Ten Mile Creek in the Slocan mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 80).

103 I/9 The mineral association at the M and K Copper property consists of bornite, galena, and chalcopyrite in drag folds in Jurassic lavas and tuffaceous sedimentary rocks. Covellite occurs in narrow veinlets cutting the other minerals. The property is located on Legate Creek, 15 miles from the Pacific (W.L. Uglow, 1922: Am. Mineralogist, 7, p. 1).

New Brunswick

A publication of the New Brunswick Research and Productivity Council entitled The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, Record 2, Part B (1965), lists the following localities where covellite has been found.

21 G/7 Mount Pleasant Mine, Charlotte County.

21 O/8 Heath Steele Mine, Northumberland County.

21 O/9 Caribou-Chaleur Bay Mines Limited, Restigouche County.

21 P/5 Brunswick No. 6 Mine, Gloucester County.

21 P/13 Henry Brook, Beldune Station and Elmtree, Gloucester County.

Newfoundland

12 A/15 The lead-zinc sulphide ore mined at Buchans, contains covellite (R. Guimond, 1961: Precambrian, vol. 34, No. 9, p. 27).

Northwest Territories

85 H/11 Intergrowths of what has been interpreted as a solid solution of chalcocite and covellite occur on the Outpost Islands in Great Slave Lake. Associated minerals are pyrite, chalcopyrite, marcasite, limonite, ferberite, magnetite, specular hematite, ilmenite, bornite, chalcocite, chlorite, sericite, and gold (J.E. Hawley, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 64).

86 K/4 Covellite is present as a minor constituent, resulting from alteration of other copper minerals, at the Bear property 10 miles southeast of Labine Point on Great Bear Lake. Associated minerals are silver, uraninite, chalcocite, bornite, chalcopyrite, pyrite, hematite, psilomelane, pyrolusite, skutterudite, sphalerite, galena, magnetite, and safflorite. These are given in order of their abundance from greatest to least.

Veins of covellite follow the fracture and cleavage cracks in bornite, chalcocite, and chalcopyrite at the Eldorado Mine on Great Bear Lake. The mineral also tends to coat massive areas of chalcocite. In both occurrences it is the result of alteration of the other copper minerals (E. Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 27, 47).

Nova Scotia

11 E/11 Covellite occurs with chalcocite at New Annan in Colchester County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 30 T).

An analysis of a specimen of covellite from this locality was made by Louis. The results are as follows: S 25.64, Cu 64.11, Fe_2O_3 and Al_2O_3 3.89, insol. 5.78, total 99.42. S.G. 4.3888 (H. Louis, 1875-78: Trans. Nova Scotia Inst. Nat. Sci., IV, p. 424).

Ontario

41 P/9 Covellite has been reported to occur in James and Tudhope Townships (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 80).

On conc. IV, lot 12, of Tudhope Township the covellite is secondary with malachite after bornite and chalcopyrite (W.W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. IV, p. 41).

41 P/12 Covellite occurs in the Three Duck Lake area on the east shore of Mesomekenda Lake and on Narrow Peninsula near Clam Lake (H.C. Laird, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, pp. 27 and 33).

52 E/9 Covellite occurs with pyrite and other sulphide minerals at Pine Portage Bay on the north shore of Big Stone Bay in Lake of the Woods. It was found in a shaft being sunk into an auriferous vein about three quarters of a mile from the lake (E. Coste, 1882-84: Geol. Surv. Can., Rept. Prog., p. 15 K).

52 F/9 A quartz vein in the Dryden gold area at K. 641 (A.S. 15) contains covellite which has been described as forming a beautiful blue coating on other sulphides (Ellis Thomson, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 186).

CRYPTOMELANE

$K_2Mn_8O_{16}$

Cryptomelane is one of several hard hydrous manganese oxides that occur typically as secondary minerals formed by surface weathering of other manganese minerals. Much of the material referred to as psilomelane in earlier reports is probably cryptomelane.

Quebec

23 J/15 Cryptomelane has been identified by X-ray diffraction pattern in specimens from the Gagnon A Mine near Knob Lake. The X-ray pattern shows four strongest lines with the following spacings and intensities: 6.93 (5), 4.92 (7), 3.10 (7), and 2.40 (10) (X-ray Laboratory, Geol. Surv. Can.).

CRYPTOMORPHITE

(See ginorite)

CUBANITE

$CuFe_2S_3$

Manitoba

63 K/13 Cubanite is a minor constituent of the ore mined at Flin Flon (R.F. Coulter, 1962: Bull. Can. Inst. Mining Met., 55, No. 602, p. 376).

63 N/3 Slender needles of cubanite are sparsely distributed through chalcopyrite on the Sherritt claims at Cold Lake, 30 miles northwest of Flin Flon (E. Thomson, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 44).

Northwest Territories

86 J/7 Cubanite occurs disseminated in norite in the feeder dyke to the Muskox Intrusion at 66°28'N, 114°58'W. The X-ray powder pattern has five strongest lines at 3.48 (5), 3.22 (10), 3.00 (4), 1.86 (8) and 1.743 (6) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 F/6 Cubanite is the dominant metallic mineral at a sulphide occurrence in Raglan Township. It occurs both in acicular and granular forms but the latter is the more abundant. Chalcopyrite, arsenopyrite and sphalerite are also present; pyrrhotite has not been observed (E. Thomson, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 45).

41 I/7 Cubanite is estimated to supply about 15 per cent of the copper in the Sudbury ores. Chemical analysis by Michener: Cu 22.06, Fe 42.13, S 36.30, Co 0.01, total 100.50. Brassy yellow cubanite crystals, up to 5 millimetres across, have been obtained from the Frood Mine. Chemical analysis by Waern: Cu 22.88, Fe 41.41, S 35.35, total 99.64 (J.E. Hawley, 1962: Can. Mineralogist, 7, p. 62) (M.A. Peacock and G.M. Yatsevitch, 1936: Am. Mineralogist, 21, p. 55).

42 E/15 Cubanite has been recognized as a slender lath in a bleb of chalcopyrite enclosed in pyrite at the Hard Rock Mine in the Little Long Lac area (H.S. Armstrong, 1944: Am. Mineralogist, 29, p. 311).

CUMMINGTONITE

$(Mg, Fe)_7Si_8O_{22}$

Newfoundland

23 B, G Cummingtonite is one of the most abundant silicates in both the lower and upper Wabush formations, occurring as prismatic grains associated with quartz, carbonate and magnetite. Partial chemical analyses of 5 cummingtonites by Courville: Boulder Lake, SiO_2 51.60, Al_2O_3 0.62, Fe_2O_3 1.37, FeO 38.09, CaO nil, MgO 6.10, MnO 0.66, F 0.02; White Lake, SiO_2 46.54, Al_2O_3 7.64, Fe_2O_3 3.75, FeO 30.62, CaO 0.14, MgO 8.06, MnO 0.34; Carol Lake, SiO_2 51.45, Al_2O_3 nil, Fe_2O_3 2.18, FeO 35.11, CaO nil, MgO 8.00, MnO 0.83; Wabush Lake, SiO_2 47.64,

23 B, G Al_2O_3 4.46, Fe_2O_3 3.22, FeO 34.10, CaO 0.04, MgO 7.11, MnO 0.36; Luce Lake, SiO_2 51.46, Al_2O_3 0.61, Fe_2O_3 0.40, FeO 33.01, CaO 1.14, MgO 10.93, MnO 0.58. The four strongest lines on the X-ray powder pattern of the specimen from White Lake (high alumina) are: 8.33 (10), 3.06 (7), 2.756 (7) and 2.189 (5) (Fe radiation, Mn filter).

Manganian cummingtonite occurs in the quartz-specularite-magnetite member of the upper Wabush iron-formation in the Wabush No. 6 and No. 7 deposits and also south of Little Wabush Lake. Chemical analysis of specimen from Wabush No. 7 by Klein: SiO_2 53.7, Al_2O_3 0.75, Fe_2O_3 2.16, MgO 19.1, FeO 3.63, MnO 16.8, Na_2O 0.22, CaO 1.12, K_2O 0.01, H_2O 2.21, P_2O_5 0.04, total 99.74. Partial chemical analysis of specimen from south of Little Wabush Lake, by Courville: SiO_2 53.00, Al_2O_3 5.81, Fe_2O_3 5.72, MgO 17.39, FeO 5.44, MnO 7.29, CaO 1.50. The spacings and intensities of the four strongest lines in the X-ray pattern of the latter specimen are: 9.02 (8), 8.32 (10), 3.07 (10) and 2.72 (10) (Fe radiation, Mn filter).
(K.L. Chakraborty, 1963: Can. Mineralogist, 7, pp. 738-750).

Northwest Territories

86 B/12 Cummingtonite has been found in metamorphic rocks of the Snare Group near Boland Lake (J.C. McGlynn and J.V. Ross, 1963: Geol. Surv. Can., Paper 63-26, p. 4).

CUPRITE

Cu_2O

Cuprite, sometimes referred to as red copper ore, chalcotrichite, or tile ore, is of secondary origin formed by oxidation and alteration of copper minerals. The mineral has a simple cubic X-ray powder pattern with strongest lines at 2.46 (10), 2.13 (6), 1.51 (5) and 1.28 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 171).

British Columbia

82 E/2 Small transparent crystals of cuprite have been found in the King Solomon Mine at Copper Creek in the Greenwood mining division (R. Bell, 1902: Geol. Surv. Can., Ann. Rept., XV, p. 125 A).

Newfoundland

12 B/15 Small amounts of native copper and cuprite occur in a sheared dunite near the head of Pope Cove (G.C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 56).

Nova Scotia

21 H/7 Native copper, copper carbonate and cuprite occur at Bennett Brook, Cape d'Or, and Spencer Island in Cumberland County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 31 T).

21 H/8 Cuprite occurs at Two Islands in Cumberland County (National Mineral Collection: C.W. Willimott, 1901).

Ontario

41 N, 42 D, 52 A Cuprite has been found with native copper in the trap rocks on the north shore of Lake Superior (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 196).

Quebec

31 H/7 An earthy form of cuprite occurs with bornite and malachite on range IX, lot 9, Sutton Township, in Brome County (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 26 R).

31 H/8 Cuprite forms red stains on the shales at the copper deposits at Acton in Bagot County (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 31 T).

Yukon

105 D/11 Cuprite was encountered in several of the drillholes put down on the Pueblo property in the Whitehorse copper belt. Drillhole number 1 passed through 23 feet of cuprite at a depth 250 feet. Holes 5, 6, and 21 all encountered copper ore (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 582).

CUPROSKLODOWSKITE

$Cu(UO_2)_2Si_2O_7 . 6(or\ 7)H_2O$

The four strongest lines in the X-ray powder pattern of cuprosklodowskite are: 8.18 (10), 4.82 (7), 4.09 (9) and 2.97 (8) (C. Frondel, 1958: U.S. Geol. Surv., Bull. 1064, p. 306).

Saskatchewan

74 N/8 Cuprosklodowskite occurs as small bright yellowish green needles associated with other uranium minerals in a fissure at the Nicholson Mine, east of Goldfields. The fissure cuts the talcose argillaceous rock on the north shore of Lake Athabasca (D.D. Hogarth, 1951: Am. Mineralogist, 36, p. 411).

CURITE

$Pb_2U_5O_{17}.4H_2O$

Northwest Territories

86 L/1 Curite, becquerelite, and liebigite have been reported as secondary minerals at the Eldorado Mine on the east shore of Great Bear Lake (A.H. Lang, J.W. Griffith and H.R. Steacy, 1962: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 190).

Ontario

31 D/16 Curite has been identified in a specimen from lot 22, conc. IX of Cardiff Township. The locality is on a group of fifteen claims near Paudash Lake on the property of Aumacho River Mines Ltd. The X-ray powder pattern has five strongest lines with the following spacings and intensities: 6.26 (10), 3.51 (8), 3.35 (6), 3.13 (4) and 3.03 (3). Published X-ray data list a line at 3.97 of variable intensity which on some patterns is one of the strongest lines (X-ray Laboratory, Geol. Surv. Can.).

CYANITE

(See kyanite)

CYANOLITE

$CaSi_4O_9.H_2O$

The above is given only as an approximation of the formula for cyanolite. It is probable that cyanolite is not a distinct mineral species but rather, an impure form of gyrolite. For comparison, the composition of gyrolite is written $Ca_2Si_3O_7(OH)_2.H_2O$ (M.H. Hey, 1955: Chemical Index of Minerals, p. 54).

Nova Scotia

11 E/6 The name cyanolite was applied to the bluish inner portion of a nodule found in an amygdaloid near Black Rock in Colchester County. Associated minerals were centrallassite and cerinite. Two analyses by How are as follows: (1) SiO_2 74.15, Al_2O_3 0.84, CaO 17.52, MgO trace, K_2O 0.53, H_2O 7.39, total 100.43. S.G. 2.495, (2) SiO_2 72.32, Al_2O_3 1.24, CaO 18.19, MgO trace, K_2O 0.61, H_2O 6.91, total 99.47 (H. How, 1859: Edin. New Phil. J., X, p. 84).

CYRTOLITE

(See zircon)

DAMOURITE

(See muscovite)

DANAITE

(See arsenopyrite)

DANALITE

$(Fe, Mn, Zn)_4Be_3Si_3O_{12}S$

British Columbia

104 P/4 Translucent, reddish brown grains of danalite are present in an iron rich skarn on Needlepoint Mountain in the McDame area. They are anhedral, up to 3 millimetres across, and occur in a groundmass of magnetite, chlorite, fluorite, sericite, carbonate, and quartz with minor native bismuth. The locality is on the southwest slope at the 5,000 foot level and about 2 miles northeast of the junction of Bass Creek and the Cottonwood River. A partial chemical analysis by G.C.B. Cave is as follows: Fe 25.1, Mn 10.5, Zn 2.9; L.G. Berry of Queen's University reports the following composition: Fe 25.2, Mn 11.05, Zn 2.05. The X-ray powder pattern of the analyzed mineral has five strongest lines at 3.68 (4), 3.35 (10), 2.19 (5), 1.93 (7), and 1.45 (4) (R.M. Thompson, 1957: Can. Mineralogist, 6, pp. 68-71).

Quebec

33 D/15 Danalite has been observed as small crystals in a vein on Walrus Island on the east coast of James Bay. Other minerals in the vein were orthoclase, spodumene, and quartz (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 15 R).

DATOLITE

$CaBSiO_4OH$

Ontario

31 C/7 Fine crystals of datolite have been found in Loughborough Township, conc. VII, lot 11, at the Smith and Lacey Mine (L.V. Pirsson: Am. J. Sci., XLV, pp. 100-102).

31 C/10 Datolite has been reported to occur at the Bobs Lake Mine, conc. VI, lot 30, Bedford Township (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br. Publ., 118, p. 285).

52 A/10 An occurrence of datolite is located one mile west of Loon Station in the Thunder Bay district (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 83).

Quebec

31 G/11 Massive datolite from Derry Township, range I, lot 9, has been analyzed by Johnston with the following results: SiO_2 36.94, B_2O_3 22.34, CaO 34.90, Al_2O_3 0.12, Fe_2O_3 0.02, MgO 0.05, H_2O 5.68, total 100.08. S.G. 2.985. The sample was obtained from the Daisy Mine (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 17 R, 18 R).

The X-ray powder pattern of the above specimen of datolite has five strongest lines at 3.12 (10), 2.86 (8), 2.53 (5), 2.24 (6) and 2.19 (6) (X-ray Laboratory, Geol. Surv. Can.).

DAWSONITE

$NaAlCO_3(OH)_2$

Dawsonite was first described by B.J. Harrington in 1874. The name is in honour of John William Dawson, former Principal of McGill University, Montreal. The X-ray powder pattern of type material is characterized by six strongest lines having the following spacings and intensities: 5.67 (10), 2.78 (8), 2.60 (4), 2.15 (4), 1.984 (4) and 1.727 (4) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

31 H/12 An analysis of dawsonite from the Hochelaga County reservoir, Montreal, is as follows: CO_2 32.23, Al_2O_3 24.71, Na_2O 15.64, CaO 16.85, MnO_2 0.23, SiO_2 0.84, H_2O 9.06, total 99.26. The foregoing analysis by Harrison was made on a specimen which contained calcium carbonate and other impurities. If these are deducted, and the remaining constituents recalculated for 100 parts, the results are as follows: CO_2 27.78, Al_2O_3 36.12, Na_2O 22.86, H_2O 13.24. This represents the composition of the mineral (B.J. Harrington, 1874: Can. Nat., Ser. 2, VII, pp. 305-309; X, pp. 84-86).

31 H/12 Dawsonite occurs in the joints of a feldspathic dyke cutting the Trenton limestone near McGill University in Montreal. It was from this locality that the mineral was first described. Two analyses of specimens containing calcium and magnesium carbonate impurities are as follows: (1) CO_2 29.88, Al_2O_3 32.84, Na_2O 20.20, K_2O 0.38, CaO 5.95, MgO trace, SiO_2 0.40, H_2O 11.91, total 101.56. S.G. 2.40. (2) CO_2 30.72, Al_2O_3 32.68, Na_2O 20.17, CaO 5.65, MgO 0.45, H_2O 10.33, total 100.00. If the impurities are deducted and the remaining constituents recalculated for 100 parts, the following values for the compositions of the two specimens are obtained: (1) CO_2 27.96, Al_2O_3 36.42, Na_2O 22.41, H_2O 13.21. (2) CO_2 29.06, Al_2O_3 36.70, Na_2O 22.65, H_2O 11.59 (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 31 T).

DESMINE

(See stilbite)

DIAMOND

C

Speculation concerning the existence of Canadian diamonds began in the latter part of the 19th century soon after the discovery of gems in moraine material south of the Great Lakes. Their occurrence in the glacial drift indicates that they have been transported from the north, possibly from Canada. As yet, no source has been found but glacial evidence suggests that it lies somewhere between Lake Superior and James Bay. Diamonds have been reported from various other parts of Canada but unfortunately, many of the claims have since proved false and the rest simply remain unconfirmed for lack of evidence. None have been established as fact.

British Columbia

92 H/10 Diamonds in chromite have been reported to occur near Olivine Mountain in the Similkameen mining division (C. Camsell, 1910: Geol. Surv. Can., Sum. Rept., pp. 112-113).

The supposed microscopic-sized diamonds were subsequently shown to be periclase (A.H. Lang, 1956: Geol. Surv. Can., Econ. Geol. Ser., 7, p. 298).

92 I/4 Small diamonds have been reported with the chrompicotite at Scottie Creek in the Bonaparte River area north of Ashcroft. (R.A.A. Johnston, 1911: Geol. Surv. Can., Sum. Rept., p. 360)

92 I/14 The supposed microscopic-sized diamonds were subsequently shown to be periclase (A.H. Lang, 1956: Geol. Surv. Can., Econ. Geol. Ser., 7, p. 298).

Ontario

42 A/14 Microscopic diamonds are said to be present in certain deposits of chromite and in what appears to be an associated altered pyroxene rock in Reaume Township about 20 miles north of Porcupine (T.W. Gibson, 1914: Ont. Bur. Mines, Ann. Rept., vol. 23, p. 47).

Quebec

32 C/4 Diamond fragments were found to be present in a diamond-drill hole in range VII, Vassan Township. They were discovered in rock cuttings recovered from the hole after it had been stopped at a depth of 60 feet by some extremely hard material. The find prompted the sinking of a shaft to a depth of 65 feet from which a sample of 147.6 tons of rock was removed and sent for treatment. The results however, were inconclusive (D.S.M. Field: J. of Gemm., 3, No. 3, p. 119).

Saskatchewan

63 A kimberlite occurrence, from which five diamonds are said to have been obtained, has been reported in an area vaguely described as within 100 miles of Flin Flon. The Saskatchewan government made an offer of a tax free, 300 acre concession to the discoverer provided he could produce one specimen from the locality as proof of its existence. He declined the offer (D.S.M. Field: J. of Gemm., 2, No. 3, p. 103).

DIOPSIDE

$MgCaSi_2O_6$

Diopside is a monoclinic calcium-magnesium mineral of the pyroxene group. It usually contains a small amount of iron which replaces magnesium. Diopside may be white, yellowish, grey, green, black and occasionally colourless and pale blue. It occurs in prismatic crystals and also in massive form and is a common constituent of metamorphosed limestone. The X-ray powder pattern of diopside is very similar to that of augite and the two are not readily distinguishable on the basis of their strongest lines: 2.99 (10), 1.62 (10), 1.43 (10), 1.08 (10), 1.07 (10) (X-ray Laboratory, Geol. Surv. Can.).

Northwest Territories

35 P/10 Dark olive-green diopside forms elongated prismatic crystals on MacDonald Island, on the southwest coast of Baffin Island. The basal cleavage is perfectly developed as are the prismatic faces. Terminal faces however may be considerably etched. An analysis by E.W. Todd is as follows: SiO_2 53.28, Al_2O_3 nil, Fe_2O_3 1.07, FeO 4.42, MgO 16.06, CaO 24.48, Na_2O 0.44, K_2O 0.06, TiO_2 0.04, total 99.85. S.G. 3.313 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 74).

Ontario

31 C/7, 31 C/8, 31 C/9 Diopside crystals occur with phlogopite in a coarsely crystalline limestone in Storrington Township. They are pale to greenish yellow with a perfect basal cleavage. An analysis by E.W. Todd is as follows: SiO_2 55.26, Al_2O_3 0.48, Fe_2O_3 0.16, FeO 0.85, CaO 25.24, MgO 18.26, Na_2O 0.05, K_2O 0.02, TiO_2 0.12, total 100.43. S.G. 3.272 (A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 76).

31 C/16 Analyses of two specimens of diopside from Bathurst Township gave the following compositions (1) SiO_2 51.50, Al_2O_3 6.15, Fe_2O_3 0.35, CaO 23.80, MgO 17.69, H_2O 1.10, total 100.59. S.G. 3.19. (2) SiO_2 50.90, Fe_2O_3 6.77, CaO 23.74, MgO 18.14, H_2O 0.90, total 100.45 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 467).

31 F/1 Slender transparent to translucent crystals of bright green diopside have been collected from Cardiff Township, conc. XXI, lot 1. The mineral also occurs in granular massive form (National Mineral Collection).

31 F/2 Diopside from High Falls on the Madawaska River, Blyfield Township, has been analyzed and found to have the following composition: SiO_2 54.20, FeO 3.24, CaO 25.65, MgO 17.02, H_2O 0.45, total 100.56. S.G. 3.273 to 3.275 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 467).

31 F/4 Pale green diopside is intimately associated with vesuvianite in Dungannon Township, near Bancroft. An analysis by H.C. Rickaby, of material dried at 20°C, is as follows: SiO_2 54.15, Al_2O_3 0.50, Fe_2O_3 0.57, FeO 4.01, MnO 0.11, CaO 24.56, MgO 15.95, Na_2O 0.46, K_2O 0.28, total 100.59. S.G. 3.278 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 12).

Light green diopside occurs at Birds Creek in Herschel Township, Hastings County (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 76).

Quebec

21 E/14 Dyke-like bodies of diopsidic rock cut serpentine and massive chromite at the Montreal Chrome pit, lot 2, range XXV, Coleraine Township, Megantic County. The diopside is colourless and very fresh and clean. Chemical analysis: SiO_2 54.77, Fe_2O_3 0.17, FeO 0.89, MgO 18.46, CaO 26.33, MnO 0.11, total 100.73. S.G. 3.267 (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull. 27, p. 41).

Chemical analysis of diopside from the Montreal Chrome pit by R.J.C. Fabry (1929): SiO_2 51.94, Al_2O_3 3.46, Fe_2O_3 0.23, FeO 0.49, MgO 15.93, CaO 27.15, H_2O^+ 0.19, H_2O^- 0.25, TiO_2 nil, MnO 0.29, CO_2 nil, total 99.93 (J.A. Maxwell, et al., 1965: Geol. Surv. Can., Bull. 115, p. 349).

31 F/10 Analysis of diopside from Calumet Island near Calumet Falls: SiO_2 54.90, CaO 27.67, MgO 16.76, H_2O 0.80, total 100.13 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 468).

31 G/10 Diopside occurs with mica at a number of localities in Grenville Township. An analysis by Harrington of a specimen from a mica mine is as follows: SiO_2 51.27, Al_2O_3 4.00, Fe_2O_3 0.10, CaO 25.27, MgO 17.46, K_2O 0.14, Na_2O 0.62, Li_2O trace, H_2O 1.63, total 100.49. S.G. 3.35 (B.J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 302).

31 G/12 Diopside crystals, remarkable for their size and orthopinacoidal development, occur at the Rainville Mine in lot 15, range VIII, Templeton Township. Good specimens have been obtained from the dump although all exhibit etched surfaces.

In lot 23, range VIII, of Templeton Township is a small knoll of crystalline limestone in which crystals of diopside and phlogopite are present. They are usually rounded and less than 1 1/2 inches long. An analysis of diopside from this locality by A.R. Graham is as follows: SiO_2 53.82, Al_2O_3 0.87, Fe_2O_3 1.26, FeO 0.79, MnO 0.06, CaO 24.78, MgO 18.28, Na_2O 0.28, K_2O 0.08, H_2O 0.18, total 100.40 (A.L. Parsons, 1930: Univ. Toronto Stud., Geol. Ser., 29, pp. 25, 26).

31 G/12 Diopside crystals occur in mica deposits throughout the Gatineau district. A specimen from Hull Township has been analyzed by E.W. Todd: SiO_2 53.02, Al_2O_3 2.24, Fe_2O_3 0.94, FeO 2.28, CaO 23.50, MgO 17.12, Na_2O 0.49, K_2O 0.29, TiO_2 0.10, total 99.98. S.G. 3.275 (A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 78).

31 G/16 Pale green crystals of diopside are present in crystalline limestone near Laurel in Argenteuil County. They are transparent and have been cut into interesting gems (A.L. Parsons, 1938:

31 G/16 Univ. Toronto Stud., Geol. Ser., 41, p. 48) (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 76).

31 H/9 A few transparent green crystals of diopside as well as a brown columnar variety of the mineral have been obtained for the National Mineral Collection from Orford Township, range XII, lot 6. An analysis by Hunt of diopside from Orford Township is as follows: SiO_2 54.50, FeO 4.86, CaO 25.20, MgO 15.29, H_2O 0.55, total 100.40. S.G. 3.13 to 3.15 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, pp. 467-8).

DOLOMITE

$CaMg(CO_3)_2$

The term dolomite is usually applied to the carbonate mineral and to the rock it forms. Dolomite crystals may occur as the main constituent in coarse-grained dolomitic sedimentary rocks or in veins frequently associated with metallic minerals. Crystalline dolomite is not uncommonly found with serpentines and other magnesium rich rocks.

Northwest Territories

86 F/12 Chemical analysis of manganiferous dolomite from a silver-bearing vein cutting volcanics, How claims 4 and 5, north bank of the Camsell River: Al_2O_3 1.06, Fe_2O_3 0.97, FeO 1.06, MgO 16.88, CaO 29.87, MnO 2.89, CO_2 44.48, insol. 2.74, total 99.95.

Chemical analysis of coarsely crystalline, pale pink, manganiferous dolomite from a vein lying in diabase, White Eagle Silver Mine, north bank of Camsell River nine miles east of its mouth in Conjuror Bay: Al_2O_3 0.12, Fe_2O_3 0.69, FeO 1.16, MgO 14.96, CaO 24.93, MnO 2.12, CO_2 38.08, insol. 17.52, total 99.58 (J.A. Maxwell, et al., 1965: Geol. Surv. Can., Bull. 115, p. 318).

Ontario

31 E/1 An analysis of dolomite from conc. III, lots 22 and 23, Herschel Township, is as follows: SiO_2 1.40, $CaCO_3$ 53.25, $MgCO_3$ 41.84, H_2O 1.54 (J.E. Thomson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III, p. 23).

31 E/1 Polysynthetically twinned dolomite occurs in Herschel Township, lot 31, conc. I (A. L. Parsons, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 25).

31 F/6 Crystalline dolomite is associated with celestite on lot 7, conc. X of Bagot Township near Calabogie. Analysis by H. C. Rickaby: CO_2 45.55, FeO 0.66, CaO 30.68, MgO 22.07, MnO 0.12, H_2O 0.45, insol. 0.23, total 99.76. S. G. 2.829. The dolomite occurs in a vein which cuts diorite gneiss and is presumed to have formed at high temperature (T. L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 69).

31 F/10 A band of dolomite 3,500 feet long and 250 feet wide occurs on conc. V, lot 20, Ross Township, in the Renfrew area. An analysis of a specimen from this locality was made by Pidgeon: MgO 20.48 to 21.55, CaO 30.85 to 31.95, insol. 0.25 to 0.65, R_2O_3 0.25 to 0.60, loss on ignition 46.8 to 47.1, theoretical values: MgO 21.88, CaO 30.35, loss on ignition 47.77 (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, p. 65).

Chemical analysis of dolomite from Haley Station, Ross Township by R.A. Howie: SiO_2 0.12, FeO 0.22, MgO 21.12, CaO 31.27, CO_2 47.22, H_2O^- 0.02, total 99.97. S.G. 2.86 (R.I. Harker and O.F. Tuttle, 1955: Am. J. Sci., 253, pp. 209-224). The X-ray powder pattern has four strongest lines at 2.886 (10), 2.192 (3), 1.804 (2), and 1.786-1.781 (3) (R.A. Howie and F.M. Broadhurst, 1958: Am. Mineralogist, 43, pp. 1210-14).

DOMEYKITE

Cu_3As

X-ray study has shown two polymorphs of Cu_3As. Cubic material, called domeykite, has four strongest lines at 2.05 (10), 1.965 (5), 1.888 (7), 1.308 (5). Hexagonal material, called metadomeykite, has four strongest lines at 2.08 (10), 2.02 (10), 1.445 (5), 1.186 (5). The two minerals are generally intimately associated (L.G. Berry and R.M. Thompson, 1962: Geol. Soc., Am., Mem. 85).

Ontario

41 N/12 Domeykite occurs in association with niccolite in a vein on Michipicoten Island in Lake Superior (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 506).

52 A/7 An occurrence of domeykite has been reported on Silver Islet in Lake Superior (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 198).

DUFRENITE

$$Fe^{++}Fe^{+++}{}_4(PO_4)_3(OH)_5.2H_2O$$

Crystals of dufrenite are small, indistinct, and comparatively rare. Usually in the massive form, dufrenite most commonly occurs in association with limonite and as an alteration product of triplite. It is dull green with a silky lustre and may be found with other phosphate minerals. The X-ray powder pattern shows five strongest lines at 5.05 (9), 3.42 (9), 3.24 (8), 3.17 (10) and 2.11 (6) (C. Frondel, 1949: Am. Mineralogist, 34, p. 538).

Ontario

31 C/12 Dufrenite has been obtained from Moores Mine in conc. V, lot 17, Madoc Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 89).

DUMORTIERITE

$$(Al, Fe)_7BSi_3O_{18}$$

Ontario

31 F/3 Dumortierite occurs in lot 31, conc. XIV, Ashby Township, Addington County, in a pegmatite vein about a foot wide. Microcline, quartz, kyanite, muscovite, and tourmaline, in descending order of abundance are also present. The dumortierite forms slender prisms in the cleavage planes of the mica or stouter more complex crystal aggregates in quartz and feldspar. An analysis of dumortierite from this locality, by E.W. Todd is as follows: SiO_2 30.46, Al_2O_3 60.80, Fe_2O_3 1.08, Ti_2O_3 0.08, MnO 0.11, MgO 0.77, B_2O_3 5.37, H_2O 1.32, total 99.99 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 80).

The X-ray powder pattern of Addington County dumortierite has five strongest lines at 5.88 (10), 3.46 (7), 3.22 (7), 2.89 (6) and 2.08 (9) (X-ray Laboratory, Geol. Surv. Can.).

42 L/3 E.S. Moore has identified dumortierite in jasper and slate from the Flaherty claims in the Kowkash area (P.E. Hopkins, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 246).

42 L/3
42 L/6 Fibrous and prismatic crystals, irregular grains, and plates of deep blue dumortierite are associated with magnetite in slates from the Onaman iron range. Specimens have been obtained from the Miller claim at the headwaters of the Red Paint River, northeast of Humbolt Bay, Lake Nipigon (E.S. Moore, 1909: Ont. Bur. Mines, Ann. Rept., vol. 18, Pt. I, p. 213).

DURANGITE

$Na(AlF)AsO_4$

Durangite is an orange-red monoclinic fluo-arsenate of sodium. It was named after Durango, Mexico. Material from this locality gives an X-ray pattern with five strongest lines at 4.79 (9), 3.36 (5), 3.23 (7), 2.98 (7) and 2.56 (10) (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

21 A/9 A pegmatite dyke at New Ross in Lunenburg County is reported to contain a small amount of durangite, with amblygonite and cassiterite (R.A.A. Johnston, 1907: Geol. Surv. Can., Summ. Rept., p. 96). Examination of specimens from this locality in 1963 failed to reveal any durangite (X-ray Laboratory, Geol. Surv. Can.).

DYSCRASITE

Ag_3Sb

The X-ray powder diffraction pattern of dyscrasite shows three strongest lines having the following spacings and intensities: 2.42 (4), 2.29 (10) and 1.37 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 32).

British Columbia

104 P/4 Dyscrasite is present as pale yellowish grains in galena in a vein cutting dolomitized limestone near the headwaters of McDame and Cottonwood Creeks. The vein is composed chiefly of galena, sphalerite, and magnetite and is located on the Contact Group. The dyscrasite often shows rhombic outlines and tends to tarnish quite rapidly (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 527).

Ontario

31 M/5 Dyscrasite is abundant in the La Rose and O'Brien mines near Cobalt (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14, Pt. II, p. 23).

Skutterudite, löllingite, argentite, and cobaltite occur with silver and dyscrasite in the O'Brien Mine. An intergrowth of the grating type in which argentite replaces dyscrasite has been found in vein B at the 395-foot level of this mine on the shore of Cross Lake (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41).

31 M/5 X-ray powder photographs of a mineral specimen from the Buffalo Mine near Cobalt, indicate that it is composed chiefly of dyscrasite partially replaced by antimony and silver. In polished section the dyscrasite appears as needle and leaf-like areas in a matrix of antimonial silver (M.A. Peacock, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 45).

Polished section examination of a brittle metallic mineral specimen from the Kerr Lake Mine indicates that it is composed of an intimate intergrowth of silver and dyscrasite. An analysis by E.W. Todd follows: Ag 85.47, Sb 12.99, As 1.12, total 99.58. S.G. 9.93 (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 20) (M.A. Peacock, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 43).

42 A/1 Dyscrasite has been identified by X-ray powder patterns in specimens from the Kirkland Lake Mine (E.W. Nuffield and D. Gorman, 1960: private communication).

53 D/2 X-ray powder photographs by R.B. Ferguson have conclusively proved that dyscrasite occurs in the ore of the Berens River Mine in the Kenora district. The dyscrasite, in fact, appears to be the most abundant silver mineral in the ore. It is invariably associated with tetrahedrite and occurs as isolated blebs in the galena or in the contact areas between the galena and sphalerite or gangue (T.A. Oliver, 1949: Can. Mining J., 70, pp. 82-86).

EDENITE

(See hornblende)

ELECTRUM

Au, Ag

Ordinary native gold may contain considerable silver. The alloy produced when the silver content is higher than about 16 per cent is known as electrum. It is a soft, pale yellow mineral with a specific gravity of 12.5 to 15.5, somewhat lower than that of gold. Some varieties of electrum contain copper, palladium, bismuth, and rhodium.

British Columbia

104 B/1 Electrum was present in the ore from the Silbak-Premier Mine in the Salmon River district. Gold, silver and sulphides were closely associated (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 15).

104 B/8 The X-ray powder pattern of electrum from East Gold Mine in the Bowser River district, Portland Canal area, has strongest lines at 0.938 (6), 0.913 (6), 0.834 (7) and 0.786 (10). The composition of the electrum approximates $AuAg_3$ (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 11).

Manitoba

63 K/13 Electrum is one of the minor minerals associated with the copper-lead-zinc sulphide ores at Flin Flon (R.F. Coulter, 1962: Bull. Can. Inst. Mining Met., vol. 55, No. 602, p. 376).

Quebec

31 I/16 Electrum is reported to occur with the gold, silver, graphite, and sulphide minerals of the Montauban ore zone in Montauban and Price Townships, on the properties of Anacon Lead Mines Ltd., and the United Montauban Mines (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 28).

Yukon

116 B/3 The silver content in gold from placers in the Klondyke is high enough so that almost all of the nuggets could be called electrum. The silver to gold ratio varies from about 1:1 to about 1:5 (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 222).

ELLSWORTHITE

(See pyrochlore group)

EMPLECTITE

$CuBiS_2$

Northwest Territories

75 L Emplectite has been identified in specimens from the Nix claim on the north shore of the east arm of Great Slave Lake. The X-ray powder pattern has seven strongest lines at 7.3 (5), 4.68 (5), 3.23 (9), 3.12 (7), 3.05 (10), 2.34 (5) and 2.165 (5) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 M/8 Emplectite occurs in the Floyd Mine in Bucke Township, six miles west of Haileybury (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p. 264).

EMPRESSITE

$Ag_{5-x}Te_3$

Two different X-ray patterns are recorded for empressite found originally in the Empress Josephine Mine in Colorado. Empressite I, identical with artificial Ag_5Te_3 has strongest lines at 3.04 (2), 2.55 (5), 2.17 (10) and 2.12 (2). Empressite II with formula uncertain has strongest lines at 2.69 (10), 2.31 (4), 2.22 (7), 2.13 (4), 1.490 (4) and 1.359 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, pp. 72-3).

British Columbia

103 I/9 Small masses of empressite occur sparingly in a quartz vein on the Grotto Group on Hardscrabble Creek, a mile west of the Canadian National Railways line near Pitman. The vein is on the contact between an andesine porphyry dyke and andesite. Other minerals are pyrite, chalcopyrite, specularite and a little native tellurium and rickardite (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 527).

ENARGITE

Cu_3AsS_4

Although it is a comparatively rare mineral, enargite is sometimes found in sufficient quantity for economic exploitation. It is usually of primary origin and may be associated with bornite, chalcocite, covellite, tetrahedrite, sphalerite, pyrite, barite, and quartz. Enargite is the arsenic bearing end-member of an isomorphous series. Both it and famatinite, the antimony end member, tend to occur in near surface deposits.

The X-ray powder pattern of enargite has five strongest lines with the following spacings and intensities: 3.22 (10), 2.87 (8), 1.859 (9), 1.731 (6) and 1.590 (5) (L.G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 127).

Alberta

74 D/11 A solid cleavable mass of enargite with minor calcite and malachite has been found east of McMurray on the Clearwater River (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 546).

82 O/4 A small hand specimen from Copper Mountain on the Bow River was found to consist of granular quartz with azurite and malachite, and contained a patch of enargite one centimetre long. The identity of the enargite was confirmed by X-ray powder photograph (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 546).

New Brunswick

21 P/5 Enargite occurs with other sulphides at Brunswick No. 12 and No. 6 in Gloucester County (A. L. McAllister, 1959: New Brunswick, Mines Br., reproduction of Can. Inst. Mining Met., Bull.).

ENSTATITE

$MgSiO_3$

Enstatite is the magnesian end-member of the orthopyroxene series. The series ranges in composition from enstatite to a theoretical ferroan end-member orthoferrosilite (Fs). Intermediate members of the series have been named as follows: enstatite, Fs_{0-12}, bronzite, Fs_{12-30}; hypersthene, Fs_{30-50}; ferrohypersthene, Fs_{50-70}; eulite, Fs_{70-88}; orthoferrosilite, Fs_{88-100}.

Newfoundland

12 B/2 Enstatite is present in the ultrabasic rocks of the Lewis Hills and Blow Me Down Mountain, in the Stephenville map-area (G. C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 38).

Quebec

22 B/16 Chemical analysis of enstatite from the Mount Albert pluton by S. Courville: SiO_2 56.46, Al_2O_3 2.41, Cr_2O_3 0.33, Fe_2O_3 0.51, FeO 4.64, MnO 0.12, MgO 34.95, NiO 0.11, CaO 0.40, TiO_2 0.06, Na_2O 0.05, H_2O 0.15, total 99.86. The X-ray powder pattern of this material has five strongest lines at: 3.16 (10), 2.87 (7), 2.527 (4), 2.487 (3) and 1.484 (4) (X-ray Laboratory, Geol. Surv. Can.).

31 N/12 Bronzite, the iron rich variety of enstatite occurs in large crystals frequently enclosing other minerals at a locality on the east side of the Canimitic River and four miles above its junction with the Chochocouane River, in Pontiac County (N.B. Gillies, 1952: Que. Dept. Mines, Geol. Rept., No. 52).

Yukon

105 C/6 Enstatite as subhedral, tabular or prismatic crystals up to 6 millimetres long may be found in ultramafic intrusive bodies in the the Hayer Peak area west of Teslin Lake (R. Mulligan, 1963: Geol. Surv. Can., Mem. 326, p. 59).

EOSPHORITE

$(Mn, Fe)AlPO_4(OH)_2.H_2O$

Nova Scotia

21 A/9 Eosphorite is reported to occur sparingly near the Molybdenite Mine, Larder River, New Ross (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 90).

EPIDOTE

$Ca_2(Al, Fe)_3Si_3O_{12}OH$

The name epidote has been used both as a group and as a mineral name. The epidote group minerals, zoisite, clinozoisite, and epidote occur in low- to medium-grade regionally metamorphosed rocks and the latter two members also occur in igneous rocks. Because of the lack of a generally accepted nomenclature for the epidote minerals no attempt is made here to separate the reported occurrences into distinct species. The spacings and relative intensities of the strongest lines in the X-ray powder patterns have been reported as follows: epidote, ASTM 17-514, 4.02 (5), 2.90 (10), 2.69 (7), 2.68 (10); clinozoisite, ASTM 16-705, 2.87 (10), 2.77 (5), 1.86 (5), 1.62 (5); zoisite, ASTM 13-562, 8.09 (4), 4.03 (5), 2.87 (6), 2.69 (10).

Minerals of the epidote group characteristically occur in low- to medium-grade metamorphic rocks such as schists and gneisses, also in contact metamorphosed limestones and in cavities in basalts. No attempt has been made to record all such occurrences.

British Columbia

92 H/5, 92 H/12 Green prismatic crystals of epidote in a quartz matrix have been collected near Harrison Lake (National Mineral Collection: A.M. Bowman, 1884).

Newfoundland

12 G/1 Calcic hornfels, exposed in a stream flowing into the north arm of Bay of Islands in northwestern Newfoundland, has been altered to a mass of prehnite, xonotlite, calcite, and clinozoisite. Only ragged relicts of original diopside remain (C.H. Smith, 1954: Am. Mineralogist, 39, p. 531).

12 I/1 Clinozoisite forms clusters of euhedral prisms interstitial to feldspar laths in rocks near Baie Verte (K. Watson, 1942: Am. Mineralogist, 27, p. 638).

Ontario

31 C/13 Dark green acicular crystals of epidote have been found at Gilmour in Tudor Township (National Mineral Collection).

31 F/5 Slender crystals of dark green epidote occur in quartz in the northeast corner of Rawdon Township (National Mineral Collection: A.T. McKinnon, 1922).

32 D/5 Epidote occurs in quartz and garnet on claim 13138 in Harker Township. It forms radiating and sheaf-like aggregates up to four inches long and of a pistachio green colour. One unusual sample of this epidote-rich rock weighed around fifty pounds (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 70).

42 A/8 Red acicular crystals of epidote are present with granular epidote at the Elzina gold mine in Maisonville Township (National Mineral Collection).

52 B/13 Clinozoisite has been collected from two western Ontario localities: (1) at Straw Hat Lake, about 4 miles northeast of Atikokan; (2) west of Atikokan and about a mile north of Overflow, a station on the Canadian National Railways line (National Mineral Collection: T.L. Tanton).

Quebec

22 B/16 Clinozoisite occurs in the country rock surrounding the Mt. Albert ultramafic pluton. Chemical analysis by H. Asari: SiO_2 37.33, Al_2O_3 24.97, Fe_2O_3 11.42, FeO 0.76, CaO 22.97, MgO 0.56, Na_2O 0.21, K_2O 0.04, TiO_2 0.61, MnO 0.20, H_2O 1.01, total 100.08. The X-ray powder pattern has six strongest lines with the following spacings and intensities: 2.88 (10), 2.67 (5), 2.59 (4), 2.39 (7), 1.87 (5), 1.635 (6) (X-ray Laboratory, Geol. Surv. Can.).

31 I/16 Clinozoisite occurs as a constituent of a granitic rock in Montauban Township on range I, lots 1 to 3, and on range IV, lots 11 and 12 (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 13 and 18).

33 D/15 Green epidote in granular and acicular crystalline forms occurs on Walrus Island near the east coast of James Bay (National Mineral Collection).

34 C/1, 34 C/8 Granular green epidote has been reported from Richmond Gulf in Hudson Bay (National Mineral Collection).

EPISTILBITE

$CaAl_2Si_6O_{16}.5H_2O$

Epistilbite is a rare member of the zeolite group closely related in crystallographic and chemical characteristics to mordenite, heulandite, and brewsterite. The X-ray powder pattern however, is distinctive and has six strongest lines at 8.84 (8), 4.82 (8), 3.83 (10), 3.43 (10), 3.19 (9) and 2.98 (8) (ASTM 11-58).

Nova Scotia

21 H/3 Epistilbite was found with stilbite in trap rock at Margaretville, about 7 miles east of Port George (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 32 T).

Chemical analysis by How (1858): SiO_2 58.57, Al_2O_3 15.34, Fe_2O_3 1.58, CaO 7.00, K_2O 0.99, Na_2O 0.99, H_2O 15.42, total 99.89 (Am. J. Sci., XXVI, Ser. II, p. 33).

EPSOMITE

$MgSO_4.7H_2O$

The X-ray powder pattern of $MgSO_4.7H_2O$ is characterized by seven strongest lines having the following spacings and intensities: 5.99 (2), 5.35 (3), 4.21 (10), 3.45 (2), 2.88 (2), 2.68 (2) and 2.66 (2) (H.E. Swanson, N.T. Gilfrich and M.I. Cook, 1957: Nat. Bur. Stds. Circ. 539, vol. 7, p. 30).

Alberta

82 J/15 Chemical analysis by Johnston of epsomite from a spring near the Canyon Branch of the Elbow River: SO_3 36.43, Fe_2O_3 13.15, FeO 0.93, Al_2O_3 5.57, MgO 5.92, H_2O 36.98, insol. 0.48, total 99.46 (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, pp. 12-13 R).

British Columbia

92 I/11 Deposits of hydrous salts of magnesium, sodium, and calcium occur in a small valley midway between Venables Valley and the gorge of Oregon Jack Creek in the Ashcroft district. The most prominent minerals present are epsomite and bloedite (S. Duffell and K.C. McTaggart, 1952: Geol. Surv. Can., Mem. 262, p. 112).

92 I/14 Five lakes filled with white epsomite occur on the Hammond ranch, near Epsom Siding, 18 miles from Ashcroft. The material grades about 45 per cent epsomite and 11 per cent mirabilite. Imperfectly formed sodium sulphate crystals are also present.

92 I/14 A chemical analysis by E. W. Todd is as follows: MgO 16.26, $Na_2O + K_2O$ 0.055, $Al_2O_3 + Fe_2O_3 < 0.05$, SO_3 32.41, Cl .003, H_2O 51.32, insol. 0.005 (T. L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 43).

92 P/4 Fresh crystals of epsomite from 1/4 inch to 2 inches long, occur with their earthy alteration product, kieserite, at a deposit near Clinton (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 53).

94 A/2 Epsomite and mirabilite form encrustations on shale cliffs near the Peace River at Fort St. John (G. C. Hoffmann, 1875-6: Geol. Surv. Can., Rept. Prog., p. 421).

Nova Scotia

21 H/1 Epsomite occurs at the Clifton gypsum quarry in Hants County near Windsor (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 32 T).

Ontario

30 M/3 Encrustations of epsomite occur on sheltered surfaces of dolomites and shales in southern Ontario between Niagara Falls and Lake Huron.

Geodes found in the Niagara region have been reported to contain epsomite with gypsum (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 33 T).

31 C/12 Epsomite has formed as an efflorescence on serpentine rocks near the iron ore beds at Crow Lake in Marmora Township (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 33 T).

Quebec

21 L/14 Epsomite is found on some of the black shales at Quebec city (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 32 T).

31 H/12 The shale of the Utica Formation in the vicinity of Montreal is occasionally coated with an efflorescent layer of epsomite (G. C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 32 T).

Yukon

106 K/5 Epsomite forms a thin coating on clay at Alum Hill on the Peel River about three miles above the George River. It has been deposited in places where water seeps from the bank (C. Camsell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 34 CC).

ERYTHRITE

$Co_3(AsO_4)_2 \cdot 8H_2O$

British Columbia

82 F/2 Erythrite has been reported to occur between Creston and Kootenay Landing along the right-of-way of the Crows Nest branch of the Canadian Pacific railway (R. Bell, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 238 A).

82 F/4 Bladed crystals of erythrite are said to occur on the Evening Star claims near Rossland. Neighbouring mineral occurrences contain erythrite as an earthy coating on pyrrhotite and arsenopyrite (C.W. Drysdale, 1915: Geol. Surv. Can., Mem. 77, p. 80).

Cobalt bloom is found with the arsenic-bearing ores at Monte Christo Mountain, north of Rossland (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 13 R).

92 F/15 Erythrite occurs in the Little Billy Mine on Texada Island (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 94).

92 H/8 An earthy variety of erythrite is found at Nickel Plate Mountain in the Osoyoos mining division (C. Camsell, 1914: Geol. Surv. Can., Mem. 2, p. 149).

93 M/4 Erythrite with allanite, arsenopyrite, cobaltite, molybdenite, and gold is found on the Homestake Group near Hazelton (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 41).

Erythrite is present with the sulphides, arsenides, silver, and gold in the Hazelton View Mine on the north slope of Rocher Déboulé Mountain, south of Hazelton (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 453).

104 M/1 Erythrite is present as a surface coating on a sulphide-bearing serpentine occurring on the Laverdiere Group, two miles from Atlin Lake on the west side of Hobo Creek. The sulphides are found in the vicinity of the contact between the Paleozoic sedimentary rocks and a granitic intrusion which forms part of the coast range batholith (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

Specimens coated with erythrite have been obtained from the Holy Cross claim on Hobo Creek (National Mineral Collection).

Northwest Territories

75 L/8 A shear zone on the Rag Group, on the south shore of Stark Lake, cuts quartz diorite and contains erythrite with small amounts of

75 L/8 pitchblende, chalcopyrite, molybdenite, and gold. Stark Lake is 14 miles east of Snowdrift on the east arm of Great Slave Lake (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 65).

75 L/16 Erythrite occurs on a chalcopyrite-bearing greenstone near McLeod Bay, Great Slave Lake (G.M. Dawson, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 108 A).

86 E/1 Quartz veins on the Pitch 27 and 28 group at the northeast corner of Hottah Lake contain erythrite and sulphide minerals (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 59).

86 I Cobalt bloom forms a stain on some of the rocks east of McTavish Bay, Great Bear Lake (J.B. Tyrrell: J. Can. Min. Inst., XI, p. 361).

Ontario

31 C/6 Erythrite is present on rocks from the Cross Mine, near Madoc (G.M. Dawson, 1897: Geol. Surv. Can., Ann. Rept., X, p. 117 A).

31 C/12 Erythrite, magnetite, and arsenopyrite occur in quartz at the Dominion Iron Mine, conc. II, lot 2, Madoc Township, Hastings County (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 128 A).

31 L/13 Cobalt bloom is fairly common in many of the silver mines and prospects in the Timiskaming district. An occurrence on the west shore of Rabbit Lake in that district has been known for many years (W.F. Ferrier, 1896: Ottawa Naturalist, IX, No. 10, p. 193).

31 M/4 Erythrite is present in samples from the dump near an old shaft on claim E.D. 161 south of Sauve Lake. Associated minerals are cobaltite, arsenopyrite, pyrite, chalcopyrite, gold, and silver in traces (E.W. Todd, 1925: Ont. Dept. Mines, Ann. Rept., vol. 34, Pt. III, p. 31).

31 M/8 Erythrite has been found at the Timiskaming and Hudson Bay mine and at the Penn-Canadian Mine in the Cobalt area (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 240).

41 H/3 Erythrite occurs with other nickel and cobalt minerals, and a little silver in the Kilpatrick vein on the property of Castle-Tretheway Mines Ltd., near Miller Lake. The vein, situated near the Capitol shaft, has been trenched for a distance of 700 feet (E.S. Moore, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. V, p. 33).

41 H/3 Specimens of niccolite and smaltite containing considerable amounts of erythrite have been obtained from the above locality and donated by A. T. McKinnon to the National Mineral Collection. The X-ray powder pattern has five strongest lines at 6.62 (10), 3.22 (7), 3.00 (6), 2.73 (6) and 2.33 (4) (X-ray Laboratory, Geol. Surv. Can.).

41 J/5 Cobalt bloom has been noted in trap quarried for road material near Bruce Mines on an island opposite Desbarats (C. W. Knight, 1915: Ont. Dept. Mines, Ann. Rept., vol. 24, Pt. I, p. 239).

41 J/12 An irregular vein composed of quartz and white calcite cuts the Nipissing diabase in conc. II, lot 6, north half, McMahon Township, and is reported to contain erythrite, chalcopyrite, and pyrite (C. W. Knight, 1915: Ont. Dept. Mines, Ann. Rept., vol. 24, Pt. I, p. 239).

41 P/9 Cobalt bloom occurs with uranium stain on a sample from the Cane Silver property in Cane Township, 20 miles northwest of New Liskeard (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 150).

A specimen containing erythrite and silver from the Lucky Godfrey Mine in Willet Township has been donated to the National Mineral Collection.

41 P/10 Erythrite occurs along the walls of veins on the west side of the Montreal River in the south part of Charters Township (A.G. Burrows, 1921: Ont. Bur. Mines, Ann. Rept., vol. 30, Pt. III, p. 42).

41 P/15 The National Mineral Collection contains specimens of erythrite on quartz and calcite from Duncans Lake, Upper Montreal River. They were donated in 1908 by A.M. Campbell.

42 A/2 An excavation in an altered iron-formation on the O'Connor claim (10243), McNeil Township revealed the presence of erythrite, sulphide minerals and quartz-calcite gangue (P.E. Hopkins, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. III, p. 40).

52 A/3 Erythrite is found with the silver ores in Prince's Mine on Spar Island, Lake Superior (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 33 T).

52 A/7 The silver ore from Silver Islet in Lake Superior contains quantities of erythrite (E.D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 27 H).

52 B/9 Erythrite is present in fissures near Mine Centre in the Lake Shebandowan area (A. L. Parsons, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 176).

Yukon

105 D/11 The copper minerals found in pits on the Rabbits Foot claim, Whitehorse area, are associated in at least one locality with erythrite. The mineralization appears to be controlled by a fine-grained dyke, containing inclusions of limestone, and cutting granite (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 35).

ESCHYNITE-PRIORITE

AB_2O_6

Members of this series have a composition of the type AB_2O_6 where: A is dominantly rare earth elements, Ca, Fe and Th; and B is Ti and Nb, with Ti:Nb>1. The cerium group rare earths predominate in eschynite and yttrium group elements in priorite. The strongest lines in the X-ray powder pattern of ignited eschynite have the following spacings and intensities 3.03 (8), 2.98 (10), 1.72 (6), 1.60 (7) and 1.56 (6) (A.I. Komkov, 1959: Doklady Acad. Sci. U.S.S.R., 126, p. 644).

Ontario

41 H/15 Eschynite-priorite occurs in granite pegmatite in the Parry Sound district, Henvey Township, lot 3, conc. A (D.F. Hewitt, 1960: private communication).

Quebec

31 J/5 Eschynite and a number of other radioactive minerals have been reported to occur in a pegmatite sill on the property of Opawica Explorers Ltd., in Kensington (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 42).

EUCOLITE

(See eudialyte)

EUDIALYTE

Eudialyte is a silicate of sodium, calcium, iron and zirconium approximating $Na_4(Ca, Fe)_2ZrSi_6O_{17}(OH, Cl)_2$ in composition. The mineral is optically uniaxial and may be either positive or negative. Optically negative varieties have been called eucolite.

The X-ray powder pattern of eudialyte shows five strongest lines with the following spacings and intensities: 7.12 (6), 5.71 (5), 4.52 (6), 2.97 (8) and 2.85 (10) (X-ray Laboratory, Geol. Surv. Can.).

Newfoundland

13 K/5 A fine-grained, vitreous, pink mineral in syenite from Seal Lake, Labrador has been identified on the basis of X-ray powder pattern, quantitative spectrographic analysis, and optical study as eudialyte (W.D. Hicks, 1958: Can. Mineralogist, 6, p. 298).

Quebec

31 L/15 Eucolite has been identified, using X-ray and optical methods, in a sample found in Pontiac County near the Ontario-Quebec border. The mineral forms pink granular aggregates in a syenitic rock (W.D. Hicks, 1958: Can. Mineralogist, 6, p. 297).

EUDIDYMITE

$NaBeSi_3O_7OH$

Newfoundland

13 K/5 Eudidymite is an accessory mineral in a soda-rich paragneiss at Seal Lake, Labrador. It has been observed macroscopically in only a few samples where it forms relatively coarse-grained segregations up to 1 inch in diameter. It appears chiefly as disseminated grains. Specific gravity 1.598. Chemical analysis by Charette and Penner: Na_2O 12.20, K_2O 0.39, BeO 10.15, SiO_2 73.56, H_2O 3.62, total 99.92. The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 6.35 (7), 3.394 (9), 3.160 (10), 3.066 (8), 3.001 (6), 2.849 (6) (E.H. Nickel, 1963: Can. Mineralogist, vol. 7, p. 643).

EUXENITE-POLYCRASE

Members of this series have compositions of the type AB_2O_6 where A is Y, Ce, Ca, U, Th; and B is Ti, Nb, Ta, Fe^{+++}. Members having Nb+Ta>Ti are called euxenite, and the Ti rich members are called polycrase. The mineral named lyndochite (after Lyndoch Township, Ontario) is included in this series.

Ontario

31 C/7 Euxenite occurs associated with gadolinite in a pegmatite deposit in Loughborough Township, lot 11, conc. IX (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 146).

31 C/15 A considerable amount of euxenite has been found in a pegmatite dyke on the Maberly property on lot 13, conc. V, South Sherbrooke Township, about 3 miles south of Maberly. Chemical analysis by H.V. Ellsworth: SiO_2 1.08, TiO_2 25.04, BeO 0.05, Al_2O_3 0.45,

31 C/15 Fe_2O_3 2.16, FeO 0.14, CaO 2.03, MgO 0.07, MnO 0.19, SnO_2 0.14, Nb_2O_5 22.28, Ta_2O_5 5.32, PbO 1.01, UO_2 7.25, UO_3 1.51, ThO_2 2.64, $(Ce, La, Di)_2O_3$ 0.87, $(Y, Er)_2O_3$ 24.95, H_2O^- 0.08, H_2O^+ 2.29, total 99.55. S.G. 4.983 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 262).

31 C/16 Euxenite is present in the dump at a pegmatite mine on lot 22, conc. IX, Bathurst Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 137).

31 E/1 Euxenite-polycrase has been identified at the X-ray Laboratory, Geol. Surv. Can., in specimens from the following mining properties: Silver Crater Mines Ltd., Hastings County, Faraday Township, conc. XV, lot 31; Centre Lake property (Bicroft Uranium Mines Ltd.), Haliburton County, Cardiff Township, conc. XI, lots 26 and 27; Fission Mines Ltd., Haliburton County, Cardiff Township, conc. XXI, lot 5; W.A. Patterson property, Hastings County, Herschel Township, conc. XVI, lots 17 and 18.

Euxenite-polycrase has been found on lot 40, Herschel Township, Hastings County (D.F. Hewitt, 1960: private communication).

31 E/4 D.F. Hewitt (private communication) reports an occurrence of euxenite-polycrase in granite pegmatite on lot 7, conc. X, near Brignall, in Conger Township.

31 E/8 Masses of euxenite up to 4 inches in diameter occur in a pegmatite dyke on lot 28, conc. I, Sabine Township. Chemical analysis by H.V. Ellsworth: SiO_2 0.09, TiO_2 22.96, $BeO^+Al_2O_3$ 0.26, Fe_2O_3 2.07, CaO 1.92, MgO 0.03, MnO 0.28, K_2O 0.04, Na_2O 0.17, ZrO_2 0.05, SnO_2 0.07, Nb_2O_5 28.62, Ta_2O_5 2.65, PbO 1.35, UO_2 8.61, UO_3 0.20, ThO_2 3.94, $(Ce, La, Di)_2O_3$ 0.44, $(Y, Er)_2O_3$ 24.31, H_2O^- 0.08, H_2O^+ 2.15, total 100.29. S.G. 5.002 (H.V. Ellsworth, 1928: Am. Mineralogist, 13, p. 484; also 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 195).

31 E/9 Allanite and euxenite have been found in pegmatite on the Cameron property, lot 22, conc. VIII of Murchison Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 138).

31 F/4 Euxenite is present in a pegmatite dyke on lot 14, conc. VII of Monteagle Township. This property was formerly worked by the Genesee Feldspar Corp., and was known as Genesee No. 2 (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 145).

31 F/6 A variety of euxenite-polycrase, originally named lyndochite by H.V. Ellsworth was found in a pegmatite dyke on lot 23, conc. XV, Lyndoch Township. The mineral was associated with beryl, columbite, cyrtolite, and monazite. Chemical analysis by H.V. Ellsworth: SiO_2 0.07, TiO_2 16.39, $BeO^+Al_2O_3$ 0.13, Fe_2O_3 1.32, FeO 0.77, CaO 4.86, MgO 0.13, MnO 0.59, ZrO_2

31 F/6 0.04, SnO_2 0.12, Nb_2O_5 41.43, Ta_2O_5 3.84, PbO 0.37, UO_2 0.67, UO_3 0.04, ThO_2 4.95, $(Ce, La, Di)_2O_3$ 4.34, $(Y, Er)_2O_3$ 18.22, H_2O^- 0.06, H_2O^+ 1.90, loss on ignition (1.76), total 100.24, S.G. 4.909 (H.V. Ellsworth, 1927: Am. Mineralogist, 12, p. 212; also 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 229).

Subsequent analysis of type material by Butler confirmed the low uranium content and similar value for total rare earths (21.05%) but gave a higher ThO_2 content of 10.77%. Chemical analysis of rare earth plus thorium fraction separated from lyndochite, by Butler: Yt_2O_3 13.1, La_2O_3 1.50, CeO_2 13.5, Pr_6O_{11} 1.69, Nd_2O_3 17.0, Sm_2O_3 4.40, Gd_2O_3 5.41, Tb_4O_7 0.50, Dy_2O_3 2.94, Er_2O_3 1.09, Tm_2O_3 0.48, Yb_2O_3 1.20, Lu_2O_3 0.2, ThO_2 33.80, total 96.81 (J.R. Butler, 1957: Am. Mineralogist, 42, p. 671).

31 F/12 Euxenite is present with ellsworthite and a little monazite in a pegmatite sill worked in 1943 for feldspar and mica and located in Dickens Township, on lot 27, conc. V (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 142).

31 F/14 An occurrence of euxenite-polycrase in granite pegmatite is reported in lot 13, conc. XV, Alice Township (D.F. Hewitt, 1960: private communication).

31 L/7 The X-ray powder pattern of heated euxenite from lot 29, conc. III, Mattawan Township has five strongest lines at 3.66 (3), 2.98 (10), 1.823 (4), 1.723 (4) and 1.487 (4) (R.J. Arnott, 1950: Am. Mineralogist, 35, p. 386).

Chemical analysis of euxenite from the above locality by Ellsworth: SiO_2 0.03, TiO_2 26.17, $BeO+Al_2O_3$ 0.28, Fe_2O_3 1.40, FeO 0.29, CaO 1.08, MgO 0.05, MnO 0.03, ZrO_2 0.03, SnO_2 0.09, Nb_2O_5 18.49, Ta_2O_5 12.12, PbO 1.06, UO_2 6.42, UO_3 0.43, ThO_2 0.97, $(Ce, La, Di)_2O_3$ 0.20, $(Y, Er)_2O_3$ 28.07, H_2O^- 0.04, H_2O^+ 2.83, loss on ignition (2.99), total 100.08, S.G. 4.918 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 191).

Euxenite-polycrase has been found in granite pegmatite on lot 20, conc. IX, Calvin Township, about 1 mile northwest of Eau Claire station (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 14R) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 189). Also found in a zoned pegmatite on the property of Bobjo Mines Ltd., in Calvin Township (D.F. Hewitt, 1960: private communication).

Euxenite is reported to have been found on the No. 2 workings claim S 36274, on the property of the Mica Company of Canada in the Mattawan-Olrig area (W.D. Harding, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. VI, p. 21).

41 H/15 A pegmatite dyke 25 feet wide and 150 feet long on lot 4, conc. A, Henvey Township is reported to contain euxenite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 146).

41 I/2 Granite pegmatite on lot 6, conc. VI, Servas Township is reported to contain euxenite-polycrase (D.F. Hewitt: private communication).

41 I/7 Euxenite has been found in a feldspar quarry on lot 2, conc. II, in Dill Township near Wanup (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 142).

Quebec

31 F/15 Platy crystals of euxenite up to 2 inches across are found embedded in the rock at a quarry on lot 2, range V of West Portland Township. Monazite is an associated mineral (H.S. Spence, 1935: Am. Mineralogist, 20, p. 728).

31 G/12 Euxenite occurs in a pegmatite dyke on lot 20, range XII, Templeton Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 153).

Metamict euxenite occurs in a feldspar pit on lots 23 and 24, range IX, Wakefield Township. The pit is in a pegmatite dyke being worked by Mr. R. Lachainė for pale green microcline. Near the centre of the dyke is a zone of pink albite with interstitial microcline, containing purple fluorite associated with euxenite. The latter occurs in rounded subhedral crystals up to an inch in diameter (S.C. Robinson, W.D. Loveridge, J. Rimsaite, and J. VanPeteghem, 1963: Can. Mineralogist, 7, p. 533).

31 J/5 Euxenite and a number of other radioactive minerals are present in a pegmatite sill on the property of Opawica Explorers Ltd., in Kensington Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 42).

32 C/5 Euxenite-polycrase has been identified in specimens from the pegmatite mined for spodumene, feldspar and mica by the Quebec Lithium Corporation and located about 6 miles south from a point 17 miles east of Amos on Highway 45, Lacorne Township (X-ray Laboratory, Geol. Surv. Can.).

FAIRCHILDITE

$K_2CO_3 \cdot CaCO_3$

Ontario

31 C/3 Mottled grey and white stony material found in and near the trunk of a burned hickory tree near Deseronto was identified as a mixture of fairchildite and buetschliite. The X-ray powder pattern of fairchildite has six strongest lines at 6.68 (5), 4.56 (4), 3.20 (10), 2.71 (4), 2.64 (7) and 2.17 (4) (K.R. Dawson and A. Sabina, 1958: Can. Mineralogist, 6, p. 290).

FAUJASITE

$$(Na_2, Ca)_{1.75}Al_{3.5}Si_{8.5}O_{24}.16H_2O$$

Quebec

31 G/11 The rare zeolite mineral faujasite is reported to have been found with datolite at the Daisy Mica Mine on lot 9, range I, Derry Township. Chemical analysis by Johnston: SiO_2 48.7, Al_2O_3 17.0, CaO 4.6, Na_2O 3.2, H_2O (ign.) 26.0, total 99.5, S.G. 2.07 (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XII, p. 12, 13R).

The X-ray powder pattern of faujasite is given by R.M. Barrer et al. (J. Chem. Soc., London, 1959, pp. 195-208). Characteristic spacings and intensities of the seven strongest lines are: 14.3 (10), 8.70 (8), 7.38 (8), 5.66 (10), 4.76 (8), 4.36 (8), and 3.76 (10).

FAYALITE

(See olivine)

FELDSPAR

(See albite, andesine, bytownite,

labradorite, oligoclase, potassium feldspar)

FEMAGHASTINGSITE

(See hornblende)

FERGUSONITE-FORMANITE

$(Y, Er)(Nb, Ta)O_4$

The fergusonite series has been subdivided on the basis of the Nb:Ta ratio into predominantly Nb fergusonite, and Ta-rich formanite.

British Columbia

82 E/14 Fergusonite has been reported in a pegmatite 15 miles east of Kelowna (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 45).

82 F/11 Brownish black fergusonite with a subconchoidal fracture and a highly vitreous lustre has been found on the Tryagain claim, 2 1/2 miles above the Nelson-Nakusp highway bridge on Lemon Creek. Some admixed red feldspar is present. The fergusonite was found to be metamict. Upon ignition, however, the crystalline structure was restored and the X-ray powder pattern of fergusonite was obtained (R.M. Thompson, 1953: Am. Mineralogist, 58, p. 546).

Ontario

31 D/9 A leucogranite pegmatite on the Windover property contains black grains and prisms of fergusonite. The property is situated in conc. III, lot 3, Cavendish Township (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 23).

31 D/16 Black, resinòus, grains and crystals of fergusonite have been identified in specimens from a pegmatite occurring in Monmouth Township, conc. V and VI, lots 18, 19, 20 (X-ray Laboratory, Geol. Surv. Can.).

31 F/4 Fergusonite has been found on the property of Greyhawk Uranium Mines Ltd., in Faraday Township, conc. XII, lot 10 (X-ray Laboratory, Geol. Surv. Can.).

31 L/7 Fergusonite was found to be present in samples from lots 11 and 12, conc. I, Calvin Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 138).

32 E/9 Tapering crystals of fergusonite up to 2 inches long are found in books of biotite in the granite pegmatite at the John G. Gale feldspar Mine on conc. VI, lot 14, Murchison Township (D.F. Hewitt, 1960: private communication).

Fergusonite from Murchison Township is metamict and on ignition gives an X-ray powder pattern having the following six strongest lines 3.05 (10), 2.73 (4), 2.58 (3), 1.88 (6), 1.63 (2) and 1.565 (3) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

.21 M/16 Fergusonite is present near Lac Pied des Monts in Charlevoix County (J. Obalski, 1907: Mining Operations in the Province of Quebec for 1906, p. 42).

The X-ray powder pattern of ignited fergusonite from Lac Pied des Monts has eight strongest lines at 3.12 (10), 3.02 (4), 2.96 (10), 1.88 (6), 2.73 (4), 2.58 (3), 1.63 (2), and 1.565 (3) (X-ray Laboratory, Geol. Surv. Can.).

21 N/13 Uraninite, molybdenite, and pyrite are associated with fergusonite in a pegmatite dyke in range I, lot 11, Callières Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 152).

Fergusonite is the principle radioactive mineral in pegmatite rocks in ranges II and III, lots 8 and 9, Callières Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 21).

31 J/5 Assays of fergusonite-bearing samples from the Kensington Township property of Opawica Explorers Ltd., graded as high as 3.39 per cent Nb_2O_5 (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 42).

31 J/16 Fergusonite is associated with feldspar, mica, and quartz in the pegmatite dykes at the Maisonneuve Mine in Berthier County (J. Obalski, 1907: Mining Operations in the Province of Quebec for 1906, p. 42).

FERRIERITE

$$(Na,K)_4Mg_2(Si_{30}Al_6)O_{72}(OH)_2 18H_2O$$

British Columbia

92 I/15 The zeolite mineral ferrierite was described by R.P.D. Graham and named in honour of W.F. Ferrier, former mineralogist at the Geological Survey of Canada. This rare mineral has been found only from its originally described locality on the north shore of Kamloops Lake. Chemical analysis by Graham: SiO_2 69.13, Al_2O_3 11.44, MgO 2.92, Na_2O_3 3.97, K_2O 0.36, H_2O 13.05, total 100.87. S.G. 2.15. The mineral occurs as spherical aggregates of radiating blades enclosed in chalcedony filling seams in basalt (R.P.D. Graham, 1918: Trans. Roy. Soc. Can., 12, 3rd Ser., sec. IV, pp. 185-190).

The X-ray powder pattern of ferrierite has six strongest lines at 9.61 (10), 5.84 (5), 3.99 (9), 3.69 (5), 3.54 (8) and 3.49 (8) (L.W. Staples, 1955: Am. Mineralogist, 40, p. 1097).

FERRISYMPLESITE

$Fe_3(AsO_4)_2(OH)_3 \cdot 6\ 1/2H_2O$

Ontario

31 M/5 A brown fibrous mineral with a resinous lustre found in association with erythrite and annabergite at the Hudson Bay Mine near Cobalt has been named ferrisymplesite. The mineral is a hydrous arsenate of ferric iron. Chemical analysis of ferrisymplesite admixed with erythrite and annabergite: As_2O_5 38.79, CoO 16.86, NiO 5.73, CaO 1.46, MgO 1.05, Fe_2O_3 11.67, Al_2O_3 0.31, H_2O 24.05, insol. 0.88, total 100.80 (T.L. Walker and A.L. Parsons, 1925: Am. Mineralogist, 10, p. 134).

FERROHASTINGSITE

(See hornblende)

FIBROFERRITE

$FeSO_4OH \cdot 5H_2O$

Alberta

82 J/15 Fibroferrite is reported to be present in saline encrustations at the Canyon branch of the Elbow River (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 12R).

Subsequent examination of material from this locality in the National Mineral Collection showed copiapite to be present but no fibroferrite could be found (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F/10 Fibroferrite is associated with copiapite at the Bluebell Mine near Riondel. The X-ray powder pattern shows four strongest lines having the following spacings and intensities: 6.99 (10), 4.58 (8), 4.05 (7) and 2.78 (6) (X-ray Laboratory, Geol. Surv. Can.).

92 L/12 Finely divided fibroferrite crystals occur with bog iron near Quatsino. Most are colourless, but if large, or in bundles they may appear yellowish. An analysis by E.W. Todd is as follows: Fe_2O_3 32.68, FeO 0.28, SO_3 32.48, H_2O 33.20, insol. 1.08, total 99.72. S.G. 1.901 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 87).

FLUORITE

CaF_2

Fluorite or fluorspar is common as a vein mineral associated with metallic ores, particularly those of lead, zinc and silver. Quartz, barite and calcite are common nonmetallic associates. It also occurs as a sublimation product in volcanic rocks and as a minor accessory mineral in acid igneous rocks. Fluorite is valued as a flux and is the only important commercial source of fluorine. The X-ray powder pattern has five strongest lines at 3.16 (6), 1.933 (10), 1.653 (4), 1.117 (5) and 0.926 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 216).

British Columbia

82 E/1 Considerable amounts of fluorite have been mined at the Rock Candy Mine located 15 miles north of Grand Forks. The fluorite occurs as a stockwork of veins in syenite. Associated minerals are barite, chert, quartz, calcite, and pyrite (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 375).

82 F/11 A green, cleavable, variety of fluorite occurs near Willow Point on the west arm of the Kootenay River (National Mineral Collection).

82 M/12 A large amount of disseminated fluorite is reported to occur near Birch Island at the property of the Rexspar Uranium and Metals Mining Company.

92 P/8
92 P/9 Purple fluorite occurs with rhodonite in Boulder Creek near the North Thompson River (National Mineral Collection).

94 M/8 Fluorite occurs near the Liard River Hotsprings in association with witherite (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 375).

New Brunswick

21 G/2 An occurrence of fluorite has been reported on Frye Island, Charlotte County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, Ind. and Ed. Publ., Co., Gardenvale, Quebec).

21 G/7 Fluorite occurs with the tin ores at Mount Pleasant, Charlotte County (A.A. Ruitenberg, 1963: M.Sc. Thesis, Univ. New Brunswick).

21 G/8 An association of fluorite with sulphides has been noted at Square Lake, Queen's County (New Brunswick Mines Br., files).

21G/9 Fluorite occurs at Ferris, Queen's County (G.S. Mackenzie, 1951: Geol. Surv. Can., Paper 51-15).

21 G/11 21 H/16 Fluorite occurs in vugs in acid volcanics at Harvey Station and at Lister Mills, York County. It is associated with chalcocite at Beech Hill, Westmorland County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, Ind. and Ed. Pub. Co., Gardenvale, Quebec).

21 I/2 Barite and fluorite have been found at Memramcook, Westmorland County (New Brunswick Mines Br., Ann. Rept., 1940).

21 J/10 The following occurrences of fluorite with wolframite have been reported; all in York County: Burnt Hill Brook, Snake Brook, Little Dungarvon River, Rocky Brook, Sisters Brook, Fall Brook, McBean Brook and Southwest Miramichi River (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

Newfoundland

1 L/4 Large deposits of fluorite occur in epithermal veins filling fault fissures in the St. Lawrence granite, at St. Lawrence on the Burin Peninsula. The high grade veins average 4 to 5 feet thick while others range from 1 inch to over 50 feet. Commonly in cubes, the fluorite displays a considerable variety of colours including yellow, red, grey, blue, purple, green, pink and white. It is commonly accompanied by sulphides (C.K. Howse, 1951: Can. Inst. Mining Met., Bull. 471, pp. 478-484) also (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 204).

Northwest Territories

66 A/1 Fluorite is found with quartz and calcite in veins cutting schists at the west end of Baker Lake (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 96).

85 O/13 Purple fluorite is abundant in a body of crystalline limestone at Bigspruce Lake on the Snare River (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 61).

Nova Scotia

11 K/3 Fluorite has been mined from veins at Lake Ainslie, Cape Breton Island (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 204).

Ontario

31 C/6 31 C/11 Alternating bands of fluorite with barite, calcite, and a little celestite occupy a number of northwesterly trending veins of post Ordovician age in the Madoc district. Mining and development work has been carried out in the north part of Huntingdon Township, concs. XIII and XIV, lots 10 and 11, and in Madoc Township. Pale green cubo-octahedrons from the former locality are present

31 C/6 31 C/11 in the National Mineral Collection (M.E. Wilson, 1921: Can. Mining J., 42) (W.R. Rogers, 1923: Ont. Dept. Mines, Ann. Rept., vol. 32, Pt. I, p. 23).

31 C/12 Specimens of pale green and transparent blue fluorite have been collected at the Bailey Mine, conc. IV, lot 1, Madoc Township (National Mineral Collection).

Pale sea green fluorite occurs embedded in magnetite, pyrite and calcite in Marmora Township, conc. VIII, lot 6 (B.J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 200).

31 D/16 A vein composed of apatite, fluorspar, and calcite has been exposed by trenching in conc. XII, lot 9, Cardiff Township (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., 52, Pt. II, p. 34).

31 E/1 Vein material on the property of Cardiff Fluorite Mines, concs. XVII to XIX, Cardiff Township, consists of purple fluorspar and calcite with lesser amounts of uraninite, apatite, hornblende, and biotite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 138).

A lens of purple fluorite occurs in pegmatite cutting an impure crystalline limestone in conc. XVIII, lot 2, Cardiff Township (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. II, p. 25).

Fluorite occurs in veins with calcite, feldspar, apatite, hornblende, mica, magnetite, and occasionally, uraninite, allanite, zircon, titanite, molybdenite, pyrite, and pyrrhotite, near Wilberforce in Cardiff Township. The veins cut gneissic country rock on lots 4 and 5, conc. XXI (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 44).

Deposits similar to the above are present in lot 9, conc. XI, of the same township (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. II, p. 33).

A specimen composed of fluorite, calcite, and apatite, from conc. XXII, lot 7, Cardiff Township has been donated to the National Mineral Collection.

Six northeasterly striking fluorite veins occur in conc. XXII, lot 13, Cardiff Township. They have been trenched and found to contain a deep purple or smoky amethystine type of fluorspar. The veins cut a complex pegmatitic rock (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. II, p. 34).

31 F/4 A dark purple variety of fluorite known as antozonite occurs with ellsworthite, quartz, zircon, and calcite in the MacDonald quarry on lot 18, conc. VII, Monteagle Township. The order of crystallization appears to be zircon, quartz, fluorite, ellsworthite, and

31 F/4 calcite but the fluorite seems to have recrystallized about fractures as well. Although usually opaque, in the recrystallized form it appears as transparent cubic crystals (F.L. Sine, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 22).

31 F/10 Purple fluorite has been noted in Ross Township, conc. III, lots 13 and 14, and conc. VI, lot 13 (C.W. Willimott, 1882-4: Geol. Surv. Can., Rept. Prog., 6 L).

Salmon-pink calcite and purple fluorite are present in a pit on conc. V, lot 14, Ross Township. Accessory minerals are dark green pyroxene and scapolite (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, p. 40).

31 F/12 Fluorite from a locality near Cobden, in Renfrew County is present in the National Mineral Collection.

31 L/1 Massive, blue, cleavable fluorite has been found in Cameron Township, conc. A, lot 6, and donated to the National Mineral Collection.

41 P/15 Small masses of purple fluorite are present in quartz veins and the adjacent rock in Cairo Township in the Matachewan area.

A quartz vein 7 inches wide and several hundred feet long, cuts syenite on claim 18285 west of Fox Rapids. It contains masses of fluorite up to 2 inches across (A.G. Burrows, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 235).

42 A/2 Fluorite appears as a deep purple mineral in a quartz vein and the adjacent wall rock in Alma Township (A.G. Burrows, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 235).

42 D/14 A fluorite-bearing vein outcrops at the 90-foot falls near the mouth of the Black River in the Schreiber-Duck Lake area. Silver, assaying at 2 ounces to the ton, is associated with the fluorite (P.E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. IV, p. 7).

42 D
52 A Fluorite has been recorded as occurring at the following localities in the Thunder Bay district by R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 97: in veins in syenite on the mainland opposite Pic Island (42 D/10); near Terrace Bay (42 D/14); at Prince's Mine (52 A/3); with calcite, quartz, pyrite and sphalerite at the Star Mine, Strange Township (52 A/5); the deep purple variety at Blueberry Lake (52 A/7); near Black Bay (52 A/8); in cubes, 2 inches in diameter with large crystals of amethyst at the mouth of the Mackenzie River (52 A/9); and on Fluor Island (52 A/9).

Fluorite has also been found at Silver Mountain (52 A/4); Badger Mine in Gillies Township, Beaver Mine in Connor Township and

42 D
52 A
Federal Mine in Paipoonge Township (52 A/5); and Silver Islet (52 A/7) (A.L. Parsons, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. IV, p. 32).

Quebec

12 L/7 A small amount of clear green fluorite occurs in a group of veins on the north shore of the St. Lawrence River, 1 mile southwest of Johan Beetz Bay (W.W. Longley, 1944: Que. Dept. Mines, Prelim. Rept., 184, p. 15).

21 M/8 Green fluorite occurs with calcite and sphalerite on the east side of Baie St. Paul in Charlevoix County. Specimens collected by R.L. Broadhurst in 1908 are included in the National Mineral Collection.

31 F/15 Coarse-grained purple fluorite occurs in areas of high radioactivity on the property of Calumet Contract Uranium Mines Ltd., range VIII, lot 31, Grand Calumet Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 30).

31 G/12 Fluorite from Wakefield Township, Gatineau County was donated by C.W. Willimott to the National Mineral Collection in 1901.

A specimen consisting of pale green fluorite and barite from Hull Township, range X, lot 7 was donated to the same collection in 1901 by R.L. Broadbent.

31 J/3 A fluorite specimen from the Villeneuve Mica Mine in Labelle County was presented to the National Mineral Collection in 1909.

31 J/12 A violet coloured variety of fluorite occurs as disseminated small crystals in an aplite body in Aumond Township, range IV, lot 49 (E. Aubert de la Rue, 1948: Que. Dept. Mines, Geol. Rept., 23, p. 50).

FOLGERITE

(See pentlandite)

FOURMARIERITE

$PbU_4O_{13}.nH_2O$

Northwest Territories

86 L/1 Fourmarierite occurs as thin crusts on uraninite at the Eldorado Mine, Great Bear Lake. The X-ray powder pattern has five strongest lines at 3.45 (9), 3.09 (10), 2.44 (6), 1.996 (6), and 1.907 (8) (C. Frondel, 1956: Am. Mineralogist, 41, p. 553).

FRANCKEITE

$Pb_5Sn_3Sb_2S_{14}$

Yukon

95 E/8 This rare sulphosalt has been found in a calcite vein on the headwaters of the east branch of the Coal River at about 61°25'N, 127°21'W. Associated minerals include stannite, geocronite, sphalerite, galena and pyrite. The X-ray powder pattern of franckeite from the above locality has four strongest lines at 4.31 (4), 3.40 (8), 2.90 (10) and 2.08 (6) (A.N. Evans, 1957: Can. Mineralogist, 6, pp. 119-127).

FRANKLINITE

$(Zn, Mn, Fe)(Fe, Mn)_2O_4$

Franklinite, from the type locality Franklin Furnace, N.J., gives an X-ray powder pattern characterized by four strongest lines with the following spacings and intensities: 2.99 (7), 2.55 (10), 1.632 (7) and 1.499 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem., 85, p. 193).

Ontario

31 C/6 Franklinite is reported to occur on Tenney's farm located about 2 miles from Madoc in Madoc Township (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 198).

FREIBERGITE

(See tetrahedrite)

FROHBERGITE

$FeTe_2$

Quebec

32 C/6 This rare telluride mineral found in microscopic amounts at the Robb-Montbray Mine, Montbray Township, was named in honour of Dr. Hans Frohberg, mining geologist and ardent mineralogist. The mineral is associated with altaite, tellurbismuth, montbrayite, chalcocite, covellite and free gold (R.M. Thompson, 1947: Univ. Toronto Stud., Geol. Ser., 51, pp. 35-40).

32 C/6 The X-ray powder pattern of frohbergite has four strongest lines at 2.81 (10), 2.71 (7), 2.07 (5), and 1.846 (4). Unit cell dimensions: a 5.29, b 6.27, c 3.86 Å (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 103).

FROODITE

$PbBi_2$

Ontario

41 I/7 This rare palladium bismuthide mineral, detected in mill concentrates from the Frood Mine, Sudbury, and described originally by C.E. Michener, has been redescribed and named by J.E. Hawley and L.G. Berry. The X-ray powder pattern has five strongest lines at 2.97 (7), 2.77 (10), 2.48 (7), 2.21 (7) and 1.556 (8) (J.E. Hawley and L.G. Berry, 1958: Can. Mineralogist, 6, pp. 200-209).

FUCHSITE

(See muscovite)

GADOLINITE

$Be_2FeY_2Si_2O_{10}$

Manitoba

52 L/16 Gadolinite has been identified by X-ray diffraction pattern in pegmatite from Shatford Lake. The four strongest lines in the X-ray pattern are at 4.75 (10), 3.13 (7), 2.83 (8) and 2.57 (8) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 C/7 Chemical analysis by H.V. Ellsworth of gadolinite from a pegmatite on lot 11, conc. IX, Loughborough Township: SiO_2 25.97, BeO 10.29, Al_2O_3 0.32, Fe_2O_3 2.34, FeO 5.82, CaO 2.36, MgO 0.55 MnO 1.17, K_2O+Na_2O 0.09, ThO_2 0.14, $(Ce, La, Di)_2O_3$ 2.85, $(Y, Er)_2O_3$ 46.47, H_2O 1.23, total 99.60. S.G. 4.101. Only one crystal of gadolinite, weighing about a quarter of a pound, was found in the dyke. A minor amount of euxenite was also recovered (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 232).

GAHNITE

$ZnAl_2O_4$

Manitoba

63 K/16 Gahnite from the Chisel Lake area has been identified by X-ray diffraction pattern at the X-ray Laboratory, Geol. Surv. Can. Subsequent optical and spectrographic analysis have confirmed this identification. The four lines in the X-ray pattern are at 2.86 (8), 2.44 (10), 1.557 (5) and 1.431 (4).

Ontario

31 F/5 Disseminated crystals of dark green gahnite are present in the property of Monteagle Minerals on the east bank of the York River in Monteagle Township, 10 miles northeast of Bancroft (L. Moyd, P. Moyd and H. L. Noblitt, 1961: Paper presented Can. Inst. Mining Met. - Soc. Mining Eng., joint meeting, Ottawa, Ont.).

Dark green crystals of gahnite are found lining cavities in brown corundum in Renfrew County, Raglan Township, conc. XVIII, lot 2 (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 15R).

GALENA

PbS

Galena is the most important ore mineral of lead. It is commonly associated with sphalerite and most lead mines produce zinc as well. Argentiferous galena is a valuable source of silver. Galena is one of the most common sulphide minerals and is distributed widely throughout Canada; accordingly, no attempt is made here to catalogue all of the known occurrences.

The spacings and intensities of the four strongest lines in the X-ray powder pattern of galena have the following values: 3.43 (8), 2.97 (10), 2.10 (6) and 1.79 (4) (H.E. Swanson and R.K. Fuyat, 1953: Nat. Bur. Std., Circ., 539, II).

British Columbia

82 E/6 Galena is present in veins ranging from a few inches to several feet thick at the Highland Bell Mine near Beaverdell, 23 miles east of Penticton. It is generally coarsely crystalline and is associated with pyrite and sphalerite. The results of an analysis by Williams are as follows: Pb 85.69, Fe 0.52, Sb 0.45, S 13.04, insol. 0.20, total 99.90. S.G. 7.50 ± 0.04 (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 28).

82 F/9 The Sullivan Mine near Kimberley is the largest lead-zinc-silver mine in Canada. The ore consists of pyrite, pyrrhotite, sphalerite, and argentiferous galena. Associated minerals are garnet, cassiterite, and tourmaline. The deposit is of the replacement type and is of high temperature origin (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 323).

82 F/10 Coarse-grained galena occurs at the Highland Group on Cedar Creek 1 1/2 miles from Ainsworth (S.J. Schofield, 1920: Geol. Surv. Can., Mem. 117, p. 37).

82 F/14 The Slocan camp, centred about 15 miles west-northwest of Kaslo, is noted for its large number of rich silver-lead-zinc deposits (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., No. 1, 4th ed., p. 371).

82 F/15 Galena occurs on the Florence Silver Mining Company property in the Ainsworth mining camp as a replacement mineral and as a fissure filling (S.J. Schofield, 1920: Geol. Surv. Can., Mem. 117, p. 40).

82 G/5 The St. Eugene Mine at Moyie, 15 miles south of Cranbrook was at one time the largest lead producer in Canada. The mine has been inactive since 1923 (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., No. 1, 4th ed., p. 371).

82 K/7 Galena, sphalerite, and pyrite occur with a quartz-barite gangue in the Mineral King Mine, 28 miles southwest of Invermere in the Purcell range (J.F. Walker, 1926: Geol. Surv. Can., Mem. 148, p. 49).

93 E/11 Sphalerite and galena with minor chalcopyrite occur in a gangue of quartz and calcite on the south side of Sweeney Mountain, 6 miles from the Tahtsa River, in the Whitesail Lake area. A picked sample of ore from the Captain Group in this district graded Pb 12.40, Zn 5.42, Ag 63.07 ounces, and Au trace (S. Duffell, 1952: Geol. Surv. Can., Paper 52-21).

93 M/5 Parallel veins containing galena are present in the rocks of the Hazelton series at the American Boy property on the southwest slope of Nine Mile Mountain, 6 miles from New Hazelton. Silver-bearing lead sulphide occurs in fissure replacement veins on the northwest side of Glen Mountain at the Silver Standard Mine (J.J. O'Neill, 1919: Geol. Surv. Can., Mem. 110, pp. 27, 32).

94 C/11 A quartz-siderite rock in the Aiken Lake area, 1 mile south of the Ingenika River has been replaced by pyrite, sphalerite, galena and some sulphides of copper and silver. Four mineralized zones which have undergone some supergene enrichment occur at the Ferguson property at this locality about 16 miles west of the junction of the Ingenika and Finlay Rivers. At the Onward Group, about a mile and a half south of the above locality, galena, sphalerite, and pyrite form discontinuous lenses in a breccia (E.F. Roots, 1957: Geol. Surv. Can., Mem. 274, p. 204).

103 I/9 The mineral association at the Mr. K copper property, 15 miles up Legate Creek from the Skeena River, consists of bornite, galena, and chalcopyrite forming solid masses in the basins of drag folds in Jurassic lavas and tuffs (W.L. Uglow, 1922: Am. Mineralogist, 7, p. 1).

104 P/3 Galena, sphalerite, chalcopyrite, scheelite, and hydrozincite are present in a shear zone in limestone at the McDame Belle property, on McDame Creek about 1 mile east of Centreville (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

Manitoba

63 I/6 X-ray powder patterns have identified galena from specimens found near the Echimamish River in Manitoba (E.W. Nuffield and D.H. Gorman, 1960: private communication).

New Brunswick

21 O
21 P Galena is an important constituent of the sulphide bodies of the Bathurst area. It is associated with sphalerite and chalcopyrite, commonly in massive pyrite bodies, and is frequently argentiferous. A report of the New Brunswick Research and Productivity Council entitled The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, Record 2, Part B, 1965, lists 120 occurrences of galena. A list of those occurrences where large ore reserves have been reported is as follows.

21 O/1 Chesterville Mines, Clearwater, Northumberland County.

21 O/7 Restigouche Exploration, Portage Lakes, Restigouche County.

21 O/8 Devils Elbow, Northumberland County; Halfmile Lake, Northumberland County; Golden West Mines, Great Sweet Grass, Northumberland County; Bay Copper, Little Bald Mountain, Northumberland County; United Montanban, Little River Lake, Northumberland County; Heath Steele Mines, Northumberland County; Stratmat 61, Northumberland County; Nepisiguit River A and B, Northumberland County; Smith Group, Ninemile Brook, Gloucester County; Wedge Mine, Northumberland County; Canoe Landing Lake, Northumberland County.

21 O/9 Kennco Limited, Murray Brook, Restigouche County; Caribou-Chaleur Bay Mines, Restigouche County; Tetagouche Exploration, Orvan Brook, Restigouche County; Rocky Turn, Gloucester County; Anaconda Limited, Armstrong Brook, Gloucester County.

21 O/10 Group D, Portage Lakes, Restigouche County.

21 P/5 Brunswick No. 12, Gloucester County; Quebec S and R, Pabineau River, Gloucester County; Headway Limited, Pabineau River, Gloucester County; Brunswick No. 6, Gloucester County; Captain Yellowknife, Portage River, Gloucester County; Drummond Iron Mine, Gloucester County; Fab Metals, Pabineau River, Gloucester County; Key Anacon Limited, Nepisiguit River, Gloucester County.

21 P/12 Nigadoo River Mines Limited, Gloucester County; Nicholas Denys, Sturgeon River, Gloucester County; Beresford Mines, Gloucester County.

21 P/13 Keymet Mines, Elmtree River, Gloucester County; Nigadoo Mines (Anthonian Group), Gloucester County.

Newfoundland

1 N/5 A mixture of galena, sphalerite, and pyrite is present with a small amount of gangue, in veins which occupy fault zones near the east side of Placentia Bay. Three sets of sulphide-bearing faults cut the sedimentary rocks of the area at a locality about 1,800 feet up Broad Cove Creek Ravine, near the junction of Argentia Harbour with Placentia Sound (N.E. Chute: Geol. Surv. Can., Unpublished File, 21-C-28, p. 55).

1 N/12 Galena forms in short lenticular bodies near the centre of the La Manche vein near La Manche Cove, on the northeast side of Placentia Bay. It also occurs as irregular mushroom shaped

1 N/12 masses which appear to be syngenetic with the enclosing calcite gangue material (N.E. Chute: Geol. Surv. Can., Unpublished File, 21-C-28, p. 6).

12 A/15 The Buchans orebody on the northwest shore of Red Indian Lake contains a large tonnage of massive sulphides consisting of an intimate mixture of fine-grained sphalerite, galena, pyrite, chalcopyrite and a very little tetrahedrite. A large amount of barite is present as a gangue mineral (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., No. 1, 4th ed., p. 182).

12 B/10 Small cubo-octahedrons of galena have been found at Port-a-Port Bay (National Mineral Collection).

Nova Scotia

11 D/4 Galena occurs in the Deenbrock Mine located between Musquodoboit Harbour and Meagher's Grant in Halifax County (National Mineral Collection: A.O. Hayes, 1917).

11 E/6 Lead-zinc sulphide mineralization occurs in Colchester and Hants Counties at the Smithfield lead deposit, 13 miles east of Brookfield Station. The ore is in brecciated Windsor limestone near its contact with the Horton Group (I.M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 93).

11 F/15 Massive intergrown galena and sphalerite occur in Windsor limestone near Jubilee (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., No. 1, 4th ed., p. 184).

Ontario

31 C/7 Disseminated grains and clusters of galena in calcite comprise the ore at the Frontenac Lead mine in Loughborough Township, 18 miles north of Kingston. The galena occurs in a fissure vein which was first worked in 1866. Small amounts of pyrite and sphalerite accompany the galena, and marcasite and celestite are present in vugs and openings in the vein material. Silver content in the galena is usually less than 1 1/4 ounces to the ton (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, pp. 142-145).

31 C/10 Large cubic crystals of galena have been obtained from a vein in Bedford Township, conc. VIII, lot 18 (National Mineral Collection: E. Smith, 1900).

A number of other veins in the vicinity have been examined for economic possibilities. They are located on conc. VIII, lots 19 and 21; conc. VII, lot 19; conc. VI, lots 16, 17 and 18; conc. V, lot 13 (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 152).

31 C/12 Galena occurs with negligible amounts of sphalerite and pyrite in a vein at the Hollandia Lead mine, 2 miles northeast of Bannockburn in Madoc Township. Gangue minerals in the vein are calcite and barite (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 155).

31 F/8 Galena is the chief ore mineral at the now inoperative Kingdon Mine on Chats Island in the Ottawa River 5 miles east of Arnprior and about 40 miles west of Ottawa. It occurs in two fissure veins cutting both the Precambrian and Paleozoic rocks of the area (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 136).

Calcite veins which contain lenses and masses of galena occur in McNab Township, conc. XI, lot 9, in the Renfrew area. The occurrence has been trenched and a number of diamond-drill holes have been put down (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, p. 61).

31 M/5 Several large crystals of galena have been obtained from the O'Brien Mine near Cobalt. They range up to 2.5 inches in diameter, are octahedral in habit and are remarkably pure. A chemical analysis is as follows: Pb 86.56, Fe 0.05, S 13.45, total 100.06 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 208).

32 D/4 Argentiferous galena occurs in Skead Township in lot 12, conc. V, and in lot 12, conc. VI. At the latter locality the galena assayed 4 ounces of silver to the ton and was found in a calcite vein with sphalerite, pyrite and erythrite (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, pp. 177-178).

41 K/9 The Jardun Mine in Jarvis and Duncan Townships, about 18 miles northeast of Sault Ste Marie, was mined as early as 1878. The ore minerals, argentiferous galena and sphalerite, occur with pyrite and chalcopyrite in a band of greenstone schist bounded by granite (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 91).

42 D/14 A quartz vein near the mouth of the Aquasabon River (formerly the Black River) east of Schreiber on the north shore of Lake Superior, is reported to contain galena and pyrite. A trace of selenium has been detected in the galena which also contains some silver (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, pp. 689-690) (W.L. Uglow, 1916: Ont. Dept. Mines, Ann. Rept., vol. 25, Pt. II, p. 12).

52 A/10 Small amounts of galena occur in the silver ores at Silver Islet in Lake Superior. It is present both as a primary and a secondary mineral and is associated with a wide variety of other sulphide minerals (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 187).

Quebec

21 N
22 C — The massive Silurian sandstones in the Temiscouata, Rivière du Loup, and Rimouski districts contain in places as much as 40 per cent pyrite and sheared galena (P.J. Lesperance, 1959: Que. Dept. Mines, P.R. 385, p. 9).

22 B/2 — Argentiferous galena occurs with sphalerite and pitchblende in a vein located about 1/2 mile north of the highway and 2 miles east of Cross Point, a village on the south coast of the Gaspé Peninsula near Restigouche. The vein cuts porphyritic volcanic rock, is about 14 inches wide and is reported to have been exposed at one time, for a length of about 25 feet (A.H. Lang, 1950: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 154).

31 F/10 — Crystals of auriferous galena are reported to occur in calcite-tremolite rock at the New Calumet Mine on Calumet Island in the Ottawa River (C.H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, 4th ed., p. 90).

31 M/6 — Galena-bearing ore from the property of Villa Lead Mines in Duhamel Township assayed 6.08 per cent lead and 1.27 ounces of silver per ton (J. Calveau, W.N. Ingham, W.G. Robinson, 1957: Que. Dept. Mines, P.R. 256, p. 31).

32 D/3 — Pyrite, chalcopyrite, and galena occur in a quartz vein at the Caron Malartic Gold Mine, Beauchastel Township. The vein is in a diorite body near its contact with volcanic rocks (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, P.R. 256, p. 3).

Yukon

105 A/2 — Galena occurs in lenses with sphalerite and skarn minerals replacing lenses of limestone in phyllite, at a deposit located 35 miles north of Watson Lake. The deposit contains economical values in lead, zinc, and silver (- 1962: Western Miner and Oil Review, vol. 35, No. 11, p. 32).

105 F/4 — Silver-bearing galena occurs in quartz veins on claims on the north side of the Boswell River, in an area between 20 and 24 miles from its mouth. In some of the veins, molybdenite is also present. Three selected samples assayed 45.68, 22.10, and 21.58 ounces Ag per ton (E.J. Lees, 1936: Geol. Surv. Can., Mem. 203, p. 24).

Quartz veins containing argentiferous galena occur on a ridge between the north fork of the Boswell River and the first creek to the west about 15 miles above the Teslin. A selected sample of quartz and galena was assayed and found to grade 94.14 ounces of silver per ton with a trace of gold. The veins, which are up to 10 feet wide, cut the sedimentary rocks of the Yukon Group (E.J. Lees, 1936: Geol. Surv. Can., Mem. 203, p. 23).

105 M/13 Most of the Yukon's production of lead-zinc-silver has come from
105 M/14 the Keno Hill-Galena Hill area. The principal ore minerals are argentiferous galena, tetrahedrite, and sphalerite. Locally important secondary minerals include cerussite and ruby silvers (R.W. Boyle, 1956, 1957: Geol. Surv. Can., Papers 55-30, 57-1).

GALENOBISMUTITE

$RbBi_2S_4$

British Columbia

93 H/4 Galenobismutite occurs in quartz-filled fissures with cosalite and gold at the Cariboo Gold Quartz Mine near Barkerville (H.V. Warren, 1936: Econ. Geol., 31, pp. 205-211).

An analysis of a sample which contained a little cosalite and pyrite was made by E.W. Johnson with the following results: Pb 30.5, Bi 51.0, S 16.4, Fe 1.5, total 99.4 (H.V. Warren and P. Davies, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 107).

Specimens from this locality have been studied by X-ray methods (M.A. Peacock and L.G. Berry, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 56).

Ontario

32 D/4 Galenobismutite is associated with cosalite at the Mondoux claim in McElroy Township. The X-ray powder pattern has five strongest lines at 3.61 (5), 3.44 (10), 3.02 (5), 2.04 (4) and 1.955 (5) (X-ray Laboratory, Geol. Surv. Can.).

Yukon

106 D/4 Galenobismutite has been found surrounding a small nugget of gold from a placer at Dublin Gulch in the Mayo district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

GARNET

(See almandine, andradite, grossular, pyrope, spessartine, uvarovite)

GEDRITE

(See anthophyllite)

GEOCRONITE

near $PB_{27-28}(As, Sb)_{12}S_{45-46}$

Yukon

95 E/8 A mineral tentatively identified as geocronite has been found as a very minor constituent in a calcite vein cutting slates near the headwaters of the east branch of the Coal River at approximately 61°25'N, 127°21'W. The mineral is associated with franckeite, stannite, galena, sphalerite, and pyrite. The six strongest lines in the X-ray diffraction pattern have the following spacings and intensities: 3.38 (7), 3.21 (7), 2.88 (7), 2.26 (10), 1.84 (10) and 1.78 (7) (A.M. Evans, 1957: Can. Mineralogist, 6, pp. 119-127).

GERSDORFFITE

NiAsS

British Columbia

82 E/1 Small octahedral crystals of gersdorffite are found in the sulphide ores of mines in the Rossland district (C.W. Drysdale, 1917: Geol. Surv. Can., Mem. 77, p. 76).

82 F/14 Gersdorffite has been reported by W. Thomlinson on Silverton Creek near Slocan where it is associated with quartz and pyrite (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 125).

82 M/1 Cubo-octahedral crystals of gersdorffite are embedded in sphalerite and galena in ore from the Mastodon Mine near Revelstoke. The crystals are about 1/2 millimetre across and give positive microchemical tests for nickel and arsenic but negative for cobalt (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 546).

Northwest Territories

85 J/8 Antimonial gersdorffite has been found on Easter Island near Yellowknife (X-ray Laboratory, Geol. Surv. Can.).

86 E/9 Gersdorffite is reported to occur in veins on the Elite claims. This group is located on the south bank of the Camsell River, opposite the White Eagle Mine and about 10 miles south of Conjuror Bay on McTavish Arm of Great Bear Lake. The veins, which are from 1/2 inch to 12 inches wide, contain a gangue of quartz and buff coloured carbonate and a variety of metallic minerals in addition to the gersdorffite. Among them are chalcopyrite, safflorite-rammelsbergite, galena, native silver, argentite, covellite, and an undetermined bismuth-lead-copper mineral (D.F. Kidd, 1936: Geol. Surv. Can., Mem. 187, p. 34).

Nova Scotia

21 H/1 The Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton, contains amounts of the mineral gersdorffite. The sulphide-sulphate ore deposit is located in the brecciated zone at the junction of two faults (R.W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Ontario

31 M/4 Gersdorffite has been identified by X-ray diffraction in a specimen from the Timagami Copper Mine (E.W. Nuffield and D.H. Gorman, 1960: private communication).

31 M/5 Veins at the Cross Lake property of M.J. O'Brien Ltd., two miles southeast of Cobalt, contain gersdorffite with rammelsbergite, skutterudite, argentite, niccolite, cobaltite, chloanthite, safflorite, smaltite, chalcopyrite, tetrahedrite, arsenopyrite, sphalerite, galena, pyrite, pyrargyrite, marcasite, silver, and a little breithauptite and dyscrasite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41) (E. Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 33).

Fine dendritic intergrowths of gersdorffite occur with niccolite, smaltite-chloanthite and a calcite gangue, in a vein at the Silver Bar Mine near Cobalt. The following are the results of an analysis of vein material, by E.W. Todd: Ni 14.35, Co 13.10, Fe 5.82, As 47.35, Sb 0.30, S 16.82, insol. 2.56, total 100.30. S.G. 6.15 (E. Thomson, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 71).

31 M/12 At the Keeley Mine in the Cobalt district, gersdorffite occurs in the centre of altered crystals with minor amounts of cobaltite, skutterudite, and loellingite. The outer part of the crystal consists of a rim of cobaltite or a mixture of cobaltite and skutterudite, and a thick coating of erythrite (J. Mackintosh Bell and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 33).

41 I/6 Chemical analysis by Johnston of gersdorffite from the Macdonnell or Gersdorffite Mine, lot 12, conc. III, Denison Township: As 46.96, Ni 26.32, Fe 7.90, Co 2.01, Cu 0.10, S 16.71, total 100.00, S.G. 6.23 (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 22R).

The X-ray powder pattern of gersdorffite from Denison Township has four strongest lines at 2.82 (6), 2.53 (9), 2.30 (8) and 1.702 (10) (X-ray Laboratory, Geol. Surv. Can.).

Chemical analysis of gersdorffite from the Crean Hill Mine, Sudbury district: As 44.33, Sb 0.54, Fe 5.71, Cu 4.20, Ni 23.48, S 17.76, insol. 0.44, total 96.46. S.G. 5.96 (E. Thomson, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 35).

41 I/6 The X-ray powder pattern of Crean Hill gersdorffite has five strongest lines at 2.51 (9), 2.30 (8), 1.710 (10), 1.508 (7) and 1.088 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 95).

The National Mineral Collection includes specimens of gersdorffite from the Copper Cliff Mine, Sudbury district.

41 I/7 Massive aggregates and isolated crystals of gersdorffite occur in a quartz chlorite schist at the Denison Mine near Worthington station in the Sudbury district. It is associated with niccolite and chalcopyrite, and minor amounts of pyrrhotite, pentlandite, sphalerite, native silver, and tetrahedrite (E. Thomson, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 72).

41 I/10 In the Sudbury ores, the arsenic-bearing minerals, gersdorffite, niccolite and maucherite are most abundant in offset deposits such as the Worthington and Frood and to a lesser extent are present along the marginal parts of normal types of ore deposits of the south range, particularly Garson and Falconbridge. The chemical composition of gersdorffite is variable and it contains considerable cobalt and iron, as shown by the following partial analyses:

Location	Ni	Co	Fe
Falconbridge	15.90	9.55	6.90
Falconbridge	16.80	9.40	6.70
Falconbridge	18.80	7.40	7.35
Falconbridge	21.80	4.90	7.05
Falconbridge	22.54	4.26	6.99
Falconbridge	18.20	7.50	7.25
Garson	21.20	5.60	6.65
Garson	25.60	2.36	6.35
Garson	25.70	1.98	6.65
Garson	22.80	3.85	6.80
Garson	26.03	1.38	6.50
Garson	22.30	6.95	5.95
Garson	21.40	7.20	6.68
Frood	27.70	2.50	5.40
Frood	17.06	12.00	4.96
Frood	18.30	9.10	5.60

(J.E. Hawley, 1962: Can. Mineralogist, 7, p. 76).

41 I/16 Indistinct crystals and massive aggregates of gersdorffite are accompanied by millerite and chalcopyrite at the Timagami Mine on Timagami Island in Timagami Lake. It occurs only in small quantities in quartz veins near the periphery of massive chalcopyrite lenses (M.H. Frohberg, 1960: private communication).

GINORITE

$Ca_2B_{14}O_{23}.8H_2O$

The X-ray powder pattern has five strongest lines at 7.14 (10), 5.36 (3), 3.27 (2), 3.18 (2), 2.08 (2) (R.D. Allen and H. Kramer, 1957: Am. Mineralogist, 42, pp. 56-61).

Nova Scotia

21 A/16 Ginorite occurs with mirabilite in seams between anhydrite and gypsum at the Clifton quarry in Hants County, near Windsor (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 31 T). An analysis by How, of ginorite from the above locality is as follows: B_2O_3 59.10, CaO 15.55, Na_2O 5.61, H_2O 19.72, total 99.98 (H. How, 1861: Am. J. Sci., Ser. 2, vol. 32, p. 9).

GIRASOL

(See opal)

GISMONDITE

$CaAl_2Si_2O_8.4H_2O$

The X-ray powder pattern of gismondite has four strongest lines at 7.3 (10), 4.19 (8) 3.24 (10) and 2.73 (10) (A.S.T.M. card No. 2-0096).

Nova Scotia

21 H/8 Gismondite is reported to occur at Two Islands in Cumberland County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 105).

GLAUCODOT

(Co, Fe)AsS

The four strongest lines in the X-ray powder pattern of glaucodot are: 2.72 (10), 2.45 (8), 2.43 (7) and 1.828 (9) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 105).

New Brunswick

21 G/7 Glaucodot is reported to be a constituent of the tin ore at Mount Pleasant, Charlotte County (K.F.G. Hosking, 1963: Precambrian, 36, No. 4, p. 20).

GLAUCONITE

near $K_{1.5}(Fe^{+++}, Mg, Al, Fe^{++})_{4-6}(Si, Al)_8O_{20}(OH)_4$

Glauconite is of frequent occurrence in marine sediments and is generally found to persist over considerable areas. Typical examples include the Mount Whyte, Ellis and Bearpaw formations in Alberta, the Swan River and Ashville formations in Manitoba and Saskatchewan, the Norfolk Formation in southern Ontario and the Lauzon Formation in Quebec.

Quebec

21 L/14
21 L/15 The sandstone of the Lauzon Formation on the Island of Orleans, contains glauconite (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., IV, p. 35 T).

An analysis by Hunt, of glauconite from the Island of Orleans, is as follows: SiO_2 50.7, Al_2O_3 19.8, FeO 8.6, MgO 3.7, K_2O 8.2, Na_2O 0.5, H_2O (ign.) 8.5, total 100.00 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 487).

The X-ray powder pattern of glauconite from the Island of Orleans has four strongest lines at 4.52 (10), 3.33 (8), 2.58 (6) and 1.507 (4) (X-ray Laboratory, Geol. Surv. Can.).

GLOCKERITE

$Fe_4^{+++}SO_4(OH)_{10}H_2O$

Quebec

31 I/1 Glockerite is reported to occur as a canary yellow powder, coating Utica shale along the south bank of the Bécancour River, 3 miles below Daveluyville (Mrs. J.S. Stevenson, 1960: private communication).

GMELINITE

near $(Na_2Ca)Al_2Si_4O_{12}.6H_2O$

British Columbia

82 F/4 Gmelinite has been reported to occur in the War Eagle Mine near Rossland (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 21 R).

Nova Scotia

21 H/8 Crystals of salmon-red gmelinite suitable for crystallographic measurements occur at Five Islands. Chemical analysis of specimens from Long Island and Pinnacle Island, respectively, are as follows: SiO_2 51.66, Al_2O 17.88, CaO 1.42, Na_2O 1.54, K_2O 11.16, H_2O 15.86, total 99.52; S.G. 2.135; SiO_2 50.24, Al_2O_3 17.93, Fe_2O_3 0.37, CaO 0.41, Na_2O 10.08, K_2O 0.69, H_2O 20.38, total 100.10; S.G. 2.045 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 49).

Chemical analysis of gmelinite from Five Islands, by How: SiO_2 50.45, Al_2O_3 18.27, Fe_2O_3 0.17, CaO 1.12, Na_2O 9.79, K_2O 0.20, H_2O 20.71, total 100.71 (A.B. How, 1876: Am. J. Sci., Ser. 3, XII, p. 272).

Chemical analysis of outer shell (I) and nucleus (II) of crystals from Five Islands, by Pirsson: I, SiO_2 50.35, Al_2O_3 18.33, Fe_2O_3 0.26, CaO 1.01, Na_2O 9.76, K_2O 0.15, H_2O 20.33, total 100.09; S.G. 2.037; II, SiO_2 50.67, Al_2O_3 18.50, Fe_2O_3 0.15, CaO 1.05, Na_2O 9.88, K_2O 0.16, H_2O 20.15, total 100.56; S.G. 2.037 (L.V. Pirsson, 1891: Am. J. Sci., Ser. 3, XLII, p. 62).

Calcium rich gmelinite from Cape Blomidon was described in 1834 under the name ledererite. Chemical analysis by Hayes gave: SiO_2 49.47, Al_2O_3 21.48, Fe_2O_3 0.14, CaO 11.48, Na_2O 3.94, H_2O 8.58, P_2O_5 3.48, insol. 0.03, loss on ignition 1.40, total 100.00 (A.A. Hayes, 1834: Am. J. Sci., XXV, p. 80).

Chemical analysis of gmelinite from the same locality, by Marsh: SiO_2 51.32, Al_2O_3 18.45, CaO 6.40, Na_2O+K_2O 3.48, H_2O 20.35, total 100.00; S.G. 2.099 (O.C. Marsh, 1867: Am. J. Sci., Ser. 2, XLIV, p. 365).

Chemical analysis of gmelinite from Two Islands: SiO_2 51.36, Al_2O_3 17.81, Fe_2O_3 0.15, CaO 5.68, Na_2O 3.92, K_2O 0.23, H_2O 20.96, total 100.11 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 106). The X-ray powder pattern of gmelinite from Two Islands has six strongest lines at: 5.11 (7), 4.12 (10), 3.25 (5), 2.98 (6), 2.86 (5) and 2.69 (6) (X-ray Laboratory, Geol. Surv. Can.).

GOETHITE

FeO.OH

New Brunswick

21 P/12 The spacings and intensities of the four strongest lines in the X-ray powder pattern of goethite from gossans in the Bathurst area are as follows: 4.19 (10), 2.69 (5), 2.45 (8) and 1.72 (4) (X-ray Laboratory, Geol. Surv. Can.).

Newfoundland

2 C/4 Red hematite and goethite occur in large lumps up to 2 or 3 feet in diameter with stalactitic and colloform structures near Lower Island Cove, southeast corner of the Bonavista map-area (S.E. Jenness, 1963: Geol. Surv. Can., Mem.327, p. 137).

Nova Scotia

11 E/5 Radiating and concentric structures appear in goethite from the Black Rock area near the mouth of the Shubanacadie River (National Mineral Collection).

11 E/7 Goethite occurs in the iron mines near Bridgeville on the East River, Pictou County (National Mineral Collection).

Ontario

52 B/13 The ore from Steeprock Lake Mine is a hard, brown, compact material consisting of goethite, limonite, hematite, turgite, and quartz. Proportions of each mineral vary widely resulting in a gradation from nearly pure iron oxide to ferruginous chert. Small vugs have been noted in float ore in the district. These occasionally have surfaces encrusted with minute but brilliant crystals of goethite and quartz (F.G. Smith, 1942: Univ. Toronto Stud., Geol. Ser., 47, p. 71).

Quebec

23 J/15 Goethite occurs as an ore mineral in the Sokoman iron-formation at Knob Lake. Associated with it are chert, hematite, magnetite, minnesotaite, and quartz. It is of secondary origin after the magnetite, silicates, and carbonates (R.D. Westervelt, 1957: Can. Inst. Mining Met., Bull. 50, No. 547, pp. 678-688).

31 J/4 Goethite occurs in a small replacement deposit near the east side of Heney Lake in Hincks Township (T.L. Tanton, 1944: Geol. Surv. Can., Paper 44-21, p. 6).

32 I/14 The carbonate-bearing slaty member of the Temiscamie iron-formation east of Conwest Bay, near Lac Albanel, contains goethite as an alteration product (J.M. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 23).

GOLD

Au

The four strongest lines in the X-ray powder pattern of gold have the following spacings and intensities: 2.36 (10), 2.04 (7), 1.443 (6) and 1.229 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 11).

Alberta

83 A/6 The alluvium of the Red Deer River contains gold along with several other heavy metals. Development work has been carried out on placer deposits near Ardley, 24 miles east of Red Deer (A. MacS. Stalker, 1960: Geol. Surv. Can., Mem. 306, p. 112).

83 G/12 A dredging operation near Peers Alberta has recovered gold from the gravels of the McLeod River (H. C. Cooke and W. A. Johnston, 1933: Geol. Surv. Can., Econ. Geol. Ser., 10, p. 69).

83 H Fine gold is associated with the gravels of the North Saskatchewan River and placer mining has been carried on along the stretch from Battleford to the outcrop of the 'Big Coal Seam', 50 miles above Edmonton (H. C. Cooke and W. A. Johnston, 1933: Geol. Surv. Can., Econ. Geol. Ser., 10, p. 69).

British Columbia

82 E/1 A number of gold-bearing veins occur on the lower slopes of Red and Monte Cristo Mountains in the Rossland district. Much of the ore mined from the various properties of the area consists of sulphides with high values but little or no visible gold. The native metal however, occurs in the Giant and Jumbo Mines with sulphide minerals, on the O. K. Group as small flakes in quartz, and in the War Eagle Mine with molybdenite and as disseminated specks in quartz (C. W. Drysdale, 1915: Geol. Surv. Can., Mem. 77, pp. 73-74).

82 E/ East-half Placer gold has been mined from the gravels of Rock and Mission Creeks as well as from buried tertiary stream gravels in their vicinity, in the west half of the Kettle River area (C. E. Cairnes, 1937: Geol. Surv. Can., Paper 37-21, p. 10).

82 E/3 Small amounts of free gold are reported to occur with galena and sphalerite in the quartz vein which comprises the orebody of the Cariboo-Amelia Mine at Camp McKinney in the Kettle River area. Free gold is said to have been found on the Waterloo Consolidated fraction at Camp McKinney while development work was being carried on in the 1890's. According to old reports it occurred in blue quartz but available information is limited (M. S. Hedley, 1940: British Columbia Dept. Mines, Bull. 6, pp. 20, 24).

82 F/6 Gold values occur in many of the veins in the Ymir district. The greater part of the gold production in the area comes from zones of sulphide mineralization where the metal is present in close association with galena, pyrite, sphalerite, and possibly tellurides. Native gold occurs as flakes and small specks in many of the quartz veins (C. W. Drysdale, 1917: Geol. Surv. Can., Mem. 94, pp. 55-56).

Among the mines of the Ymir area from which free gold has been reported are the following: (1) The Tamarac-King Solomon Group

82 F/6 at the south end of Elise Mountain, about 2 miles north of Ymir. (2) The Fern Mine on the south side of Hall Creek about 6 miles north of Ymir; in small weathered veins near the surface. (3) The Gold King Group on the north side of Hall Creek, in a quartz vein. (4) The Euphrates Group about 6 miles north of Ymir in oxidized material. (5) The Granite Poorman Mine about 4 miles west of Nelson (W.E. Cockfield, 1936: Geol. Surv. Can., Mem. 191).

82 F/8 Veins in the valley of Perry Creek are reported to contain small amounts of gold both in the native form and in close association with sulphides (C.E. Cairnes, 1932: Geol. Surv. Can., Summ. Rept., AII, p. 85).

92 C/13 Black beach sands northwest of Velvelet at Wreck Bay, Vancouver Island, were staked and worked for gold during the first years of the present century. The gold appears to have been derived from the sediments of the Wreck Bay Formation which, upon analysis showed a trace of the metal (M.F. Bancroft, 1937: Geol. Surv. Can., Mem. 204, p. 31).

92 E/9 A sample from the Baltic Group on the south side of Kings Passage, Muchalat Arm, Vancouver Island, ran 6.955 ounces of gold to the ton and 7.06 ounces of silver to the ton. About half of the gold occurred in the free state while the remainder was associated with sulphides (M.F. Bancroft, 1937: Geol. Surv. Can., Mem. 204, p. 18).

92 E/15 Gold in the free state occurs in a vein on the Friend property in the canyon of Friend Creek on the western slope of Beano Mountain (J.W. Hoadley, 1953: Geol. Surv. Can., Mem. 272, p. 52).

92 F/2 Excellent specimens of free gold occur in the workings of Vancouver Island Gold Mines Ltd., near the headwater of Mineral Creek, 10 miles from Port Alberni (M.F. Bancroft, 1937: Geol. Surv. Can., Mem. 204, p. 28).

92 F/5 Veins near the head of Herbert Arm on the west coast of Vancouver Island contain gold, both native and linked to sulphide minerals. The native metal has been reported from the Big Boy, Mary McQuilton, and Moyeha claim groups.

Placer as well as lode gold occurs in the area. The finding of gold in Cotter Creek which flows into Herbert Arm, led to the discovery and staking of the lode deposits (M.F. Bancroft, 1937: Geol. Surv. Can., Mem. 204, pp. 20-24).

92 H/6 Small but rich pockets of gold occur in a talcose shear zone in serpentine on the Aurum property a mile north of Jessica (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 21).

92 H/7 Platinum occurs with placer gold in the gravels of the Tulameen River and its tributaries, Granite, Cedar, Slate, and Lawless (Bear) Creeks (Officers of Dept., 1946: British Columbia Dept. Mines, Bull. 21, p. 24).

Gold-bearing quartz veins cut the rocks of the Tulameen Group on the eastern side of Grasshopper Mountain, 5 miles from Tulameen. Although mineralization is not abundant, pockets of high grade ore have been found (M.S. Hedley and K.DeP. Watson, 1945: British Columbia Dept. Mines, Bull. 20, Pt. III, p. 23).

92 I/8 Veins bearing gold and silver cut the greenstones at Stump Lake in the Nicola map-area (W.E. Cockfield, 1944: Geol. Surv. Can., Paper 44-20, p. 5).

92 J/15 Scales of gold are present in the quartz of the Coronation Mine near Cadwaller Creek in the Bridge River district (National Mineral Collection).

Free gold occurs with tellurides, pyrite, and arsenopyrite in the mines of the Bridge River district. High values are most abundant in quartz veins which have been fractured or ribboned by post depositional movement. In the Pioneer Mine slickensided native gold is found with sulphides, sericite, white mica, and gouge, as a film between ribbons of quartz which parallel the strikes and inclinations of many of the quartz veins (J.S. Stevenson, 1944: British Columbia Dept. Mines, Bull. 20, Pt. IV, p. 31) (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, pp. 19-20).

92 L/2 Five quartz veins are reported to occur on the White Star property near Spud Creek south of the Zeballos River. Of these, only two produce ore. They contain a little free gold in addition to sulphide minerals.

The ore minerals occurring in the veins of the Privateer Mine on Spud Creek near its confluence with Privateer Creek are, in order of deposition, pyrrhotite, arsenopyrite, pyrite, sphalerite, chalcopyrite, galena, and gold.

Native gold occurs at the Van Isle property just south of the Zeballos River at Van Isle Creek.

Specks of free gold are present in the quartz of some of the veins on the Barnacle Group. These claims are located on the mountainside between Lime and Blacksand creeks (J.S. Stevenson, 1950: British Columbia Dept. Mines, Bull. 27).

Quartz veins containing sulphides and native gold occur on the King Midas Group on the Zeballos River, 9 miles from its mouth (J.W. Hoadley, 1953: Geol. Surv. Can., Mem. 272, p. 59).

92 L/2 Native gold occurs in a vein cutting the Zeballos granodiorite batholith on the Gold Peak Group, south of the Zeballos River and about 5 miles from its mouth on Esperanza Inlet, Vancouver Island.

A vein of quartz with visible gold occurs on the Tagore property on the bank of the Zeballos 1 1/2 miles from the Tidewater.

The native metal has been found on the Goldfield claim on the summit between Spud and Gold creeks just south of the Gold Peak Group.

Gold occurs in placer deposits on the Zeballos River and its tributary, Spud Creek (M.F. Bancroft, 1937: Geol. Surv. Can., Mem. 204).

92 O/4, 92 O/5 Gold has been discovered in the vicinity of Taseko Lake and Taseko River. It occurs in veins which are related to the Coast Range Intrusions (J.S. Stevenson, 1944: British Columbia Dept. Mines, Bull. 20, p. 35).

92 P/2 In the Vidette Lake area, gold is present in a series of quartz veins which cut the massive greenstones of the Nicola series. Although these veins occur over a considerable area they are only of economic importance in the vicinity of the now closed Vidette Mine near the head of the Deadman River (W.E. Cockfield, 1935: Geol. Surv. Can., Mem. 179, p. 29) (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 19).

92 P/4 A specimen of gold in pegmatite found near Clinton, was donated by I. Elwyn to the National Mineral Collection.

92 P/8 Minor amounts of native gold occur in a quartz vein cutting a sill composed of pyroxenite and pegmatite near Dunn Lake in the North Thompson River district. At the Windpass Mine, 7 miles northeast of Chu Chua, the vein strikes east-west, dips from 35 to 80 degrees north, and is in a quartz diorite host rock. In addition to the gold it contains pyrite, chalcopyrite, pyrrhotite, cobaltite, bismuthinite, gold tellurides, and native bismuth. Towards its eastern end however it loses the vein-like character and passes into a series of gold-bearing magnetite lenses (M.S. Hedley and K.DeP. Watson, 1945: British Columbia Dept. Mines, Bull. 20, Pt. III, p. 26) (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 18).

93 A, 93 H Both lode and placer gold occur in the Cariboo district. Veins and replacement bodies cutting the sedimentary rocks of the Cariboo series carry good values in free gold along with considerable amounts of pyrite and a little arsenopyrite, galena, sphalerite, and a lead-bismuth sulphide (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 17). Important deposits of both types are in the vicinity of Wells, Barkerville, and Keithley

93 A, 93 H Creek. The Cariboo Gold Quartz Mine and the neighbouring Island Mountain Mine are probably the most important lode gold producers.

A list of the creeks in the district from which placer gold has been recovered would be extremely long. A few of the more important ones however are Hixon and Government creeks, Lightning Creek and its tributaries, the Willow River and its tributaries, Grouse, Antler, Cunningham, Keithley, Harvey, and Cedar creeks and the Horsefly, Quesnel, and Cottonwood rivers (Officers of Dept., 1946: British Columbia Dept. Mines, Bull. 21, p. 21) also (A.H. Lang, 1936: Geol. Surv. Can., Paper 36-15, p. 13) (N.F.G. Davis, 1937: Geol. Surv. Can., Paper 37-15, p. 2) (G. Hanson, 1935: Geol. Surv. Can., Mem. 181, pp. 19, 22).

93 J/15 Placer gold occurs in the McLeod Lake area near the Parsnip River (E. Bronlund, 1959: Can. Inst. Mining Met., Bull. 52, No. 565, p. 334).

93 M/5 A number of the sulphide bodies in the Hazelton area contain gold though not always in the native form. At the Silver Standard Mine on the northwest side of Glen Mountain, free gold is found associated with arsenopyrite in the sulphide-bearing veins. Other vein minerals are galena, sphalerite, freibergite, pyrrhotite, pyrite, chalcopyrite, and jamesonite. Calcite and quartz are both abundant as gangue (F.J. Alcock, 1930: Geol. Surv. Can., Econ. Geol. Ser., 8, p. 281).

93 N/7 Several quartz-carbonate veins, one of which has been observed to contain free gold, occur near the head of the west fork of the Klawli River.

93 N/9, 93 N/10 Both recent and pre-glacial placers occur in the Manson Creek area. On this stream and on the Germansen River many nuggets weighing 2 and 3 ounces have been found and one from this district is reported to have weighed 24 ounces.

93 N/15 Free gold occurs in a vein of milky quartz on the Farrell property which is located on the east side of the Germansen River about 3 miles from its mouth. The vein is 2 feet wide and contains copper minerals in addition to the gold (J. E. Armstrong and J. B. Thurber, 1945: Geol. Surv. Can., Paper 45-9, p. 16).

94 D/9 Visible gold has been reported from the Bruce claims which are located 1 1/4 miles to the southeast of Goldway Peak in the McConnell Creek map-area. The deposit is a quartz vein cutting the Takla greenstones, and granitic rocks related to the Omineca batholith. Galena and pyrite are associated minerals.

94 D/16 Placer gold occurs in the gravels of the McConnell Creek valley. It occurs as small rounded grains and flattened nuggets accompanied

94 D/16 by black sand and a little platinum. Values are rather erratically distributed throughout the gravels (C.S. Lord, 1948: Geol. Surv. Can., Mem. 251, p. 56).

103 C/16 The Early Bird property at Mitchell Inlet on the west coast of Moresby Island in the Queen Charlottes, was the site of the first lode gold discovery, in 1852 (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 27).

103 G/5, 103 G/12, 103 G/13, 103 J/4 Gold is present in black sands on the east coast of Graham Island from Lawn Hill to Rose Spit. Other minerals in the beach placers are magnetite, ilmenite, pink garnet, epidote, and zircon (J.D. Mackenzie, 1916: Geol. Surv. Can., Mem. 88, p. 173).

103 I/8 Free gold has been found in a quartz vein on the Globe claim, 6 miles southeast of Terrace on the lower slopes of Thornhill Mountain. Specimens on the dump of the Annie Laurie claim on Thornhill Mountain were found to contain sphalerite, galena, pyrite, and native gold. The latter was present in weathered crevices in quartz. A vein at A claim on Thornhill Mountain, contains visible gold where it cuts a quartz diorite dyke on the south side of a small stream on the southwest slope (E.D. Kindle, 1937: Geol. Surv. Can., Mem. 205).

103 I/9 A little free gold has been obtained from the Cordillera Mine located about a mile southwest of Usk at the base of Kitselas Mountain. Free gold is associated with chalcocite in the Lucky Lake Mine on the east slope of Kitselas Mountain, 1 1/2 miles southwest of Usk. Specks of visible gold occur in a quartz vein cutting andesitic rock in a stream bed on the Nugget Group. The claims are located on the south slope of Kitselas Mountain, 5 miles from Vanarsdol station. Gold placers have been worked on Douglas, Lorne, Fiddler, Chimdemash, Kleanza, and Phillips creeks in the Skeena River area near Terrace (E.D. Kindle, 1937: Geol. Surv. Can., Mem. 205).

104 B/1 Quartz veins of several different ages cut the volcanic rocks of the Salmon River district. The youngest of these contained considerable amounts of gold both free and associated with sulphides. Secondary enrichment appears to have been an important factor in the deposition of much of the ore at two important properties, the Silbak-Premier and the Big Missouri. Both of these mines have now shut down (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 14).

104 K/12 The ore minerals at the Polaris-Taku Mine on the Taku River, Atlin district, are pyrite, stibnite, arsenopyrite, and native gold. With carbonate, quartz, and fuchsite, they occupy veins which appear to be related to the Coast Range batholith (J.E. Armstrong, 1946: Geol. Surv. Can., Bull. 5, p. 23).

104 M/8 Native gold is the chief ore mineral at the Engineer Mine near the town of Atlin. Tellurides, pyrite, and antimony are also present. The ore occurs in veins in a shear zone near the eastern edge of the Coast Range batholith to which the deposits, like those of the Polaris-Taku Mine, may be genetically related (J. E. Armstrong, 1946: Geol. Surv. Can., Bull. 5, p. 22).

104 N/11, 104 N/12 A few gold-bearing quartz veins occur near Pine Creek in the Atlin area. Mining has been carried on at the Imperial and Lakeview occurrences but the grade of ore is not high. Placer as well as lode mining is carried on in the district. Among the creeks on which gold placers are known to occur are Pine, Otter, Wright, Gold Run, Birch, Dominion, McKee, Spruce, Ruby, and though values are low, the O'Donnell River (J. D. Aitken, 1959: Geol. Surv. Can., Mem. 307, pp. 73-75).

104 P/4 Placer gold has been mined on Walker Creek (1887) in the McDame map-area. Other placer gold in the area has been found in McDame Creek, Rosella Creek, Denis Creek and the Dease River (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 112).

Manitoba

52 L/11 Smoky and white quartz on the G. X. Group near the west end of Bud Lake carries free gold.

52 L/12 Free gold was discovered in 1924 near Little Bear Lake in the northeast part of township 18, range 14, east of the principal meridian. It occurs in quartz in a shear zone cutting granite. Associated minerals are galena, pyrite, chalcopyrite, and sphalerite.

52 L/13 Pyrite, chalcopyrite, and native gold are present in quartz on the Moose claim in the Gold Lake area. Quartz veins in shear zones on the Montcalm, Eva and Tine groups southwest of Red Rice Lake are reported to contain small amounts of free gold (J. F. Wright, 1938: Geol. Surv. Can., Mem. 169, pp. 86, 87).

52 L/14 Visible gold occurs commonly with quartz and to a lesser extent with sulphides in the vein material at the Gunnar Mine at Beresford Lake (C. H. Stockwell and C. S. Lord, 1939: Geol. Surv. Can., Mem. 219, p. 33).

Coarse particles of gold are found in the quartz in the Cryderman deposit between Moore and Bennett Lakes. Small stringers of quartz at the Moore Lake Mines property in the same area carry free gold though not in sufficient quantity for development. Native gold is abundant in three small quartz lenses exposed along a narrow, northwest-trending shear zone in granite on the Eldorado claim near Halfway Lake. It has also been discovered on a number of neighbouring mineral properties. These include the Calumet, Orion, Rockland, Ogama and Blenn claims as well as those comprising the holdings of Kingfisher Gold Mines Ltd. The

52 L/14 Mirage Group, east of Bidow Lake, is of special interest for the specimens of crystalline gold which have been found there (J. E. Wright, 1938: Geol. Surv. Can., Mem. 169).

A small amount of visible gold has been reported from the Edna claim on the southwest corner of Tinney Lake. It occurs with pyrite in quartz lenses occupying a shear zone which cuts basic volcanic rocks (C. H. Stockwell and C. S. Lord, 1939: Geol. Surv. Can., Mem. 219, p. 38) (J. F. Wright, 1938: Geol. Surv. Can., Mem. 169, p. 63).

Free gold was discovered in 1923 on what later became the property of Oro Grande Mines Ltd., near Beresford Lake. Free gold is present also in some of the quartz in a shear zone on the Midway Group, west of Beresford Lake (J. F. Wright, 1938: Geol. Surv. Can., Mem. 169).

Although gold occurs in the free state at the Central Manitoba Mine in the Halfway Lake district, it is rarely if ever coarse enough to be seen even under the hand lens. It appears to be associated with pyrite and chalcopyrite in a grey quartz gangue. Pyrrhotite is also present but contains no gold (C. H. Stockwell and C. S. Lord, 1939: Geol. Surv. Can., Mem. 219, p. 50).

52 M/4 Pyrite, chalcopyrite, arsenopyrite, and free gold are present with chloritic material in a quartz body on the Clinton Group in the Saxton Lake area (J. F. Wright, 1938: Geol. Surv. Can., Mem. 169, p. 88).

Visible gold is said to occur in and near the shaft in the No. 1 zone of the Rice Lake Mine near the east end of Rice Lake. Free gold in grains large enough to be seen by the unaided eye is present in the San Antonio Mine on the north shore of Rice Lake, southern Manitoba. Ore from the underground workings in No. 2 vein of the Normandy Gold Mine at the east end of Rice Lake has been reported to contain native gold (C. H. Stockwell, 1938: Geol. Surv. Can., Mem. 210).

A red surface coating appears on some of the native gold from the San Antonio Mine. X-ray powder patterns for red gold and the ordinary yellow variety are identical but spectrographic studies indicate that while the yellow metal contains silver, copper and iron impurities, the red material contains only silver and copper. The coating appears to be a 'natural electroplate' of copper, or copper-gold alloy (R. B. Ferguson, 1950: Am. Mineralogist, 35, p. 459).

52 M/4, 62 P/1 Free gold with pyrite, chalcopyrite and carbonate is present in quartz in the Wanipigow Lake area. Development work has been carried out on the 32 claim property of Roderick Gold Mines Ltd., where the quartz occupies shear zones in granitic and schistose rocks (J. F. Wright, 1938: Geol. Surv. Can., Mem. 169, p. 89).

62 P/12 A specimen of gold-bearing quartz from the Red Rose mining claim in northern Manitoba was donated by H. H. Rowatt to the National Mineral Collection.

63 I/6 Gold-bearing quartz veins occur on the east shore of Birch Lake 2 miles north of Echimanish River. They cut the altered rocks of the Hayes River group in the vicinity of dykes and small intrusive bodies (T. L. Tanton, 1937: Geol. Surv. Can., Paper 37-18, p. 15).

63 J/13 Gold-bearing veins cut the Precambrian rocks of the Wekusko Lake district of northern Manitoba. They are believed to be related to granitic intrusions and usually contain sulphides and tourmaline in addition to the gold. Free gold has been mined from the Rex vein which is located on the east shore of Wekusko Lake. On the Northern Manitoba Group, 1 1/2 miles south of the Rex Group, a vein carrying native gold, sulphides and a telluride, probably petzite, cuts an altered lamprophyre dyke. A mile south of the preceding property is the Kiski-Wekusko Group. The gold-bearing veins on these claims were the first to be discovered in the area. Visible gold has also been found in a vein in the Syndicate Group, on a peninsula northwest of Campbell Island, Wekusko Lake (F. J. Alcock, 1920: Geol. Surv. Can., Mem. 119, pp. 32-37).

63 K/10 Free gold is present in a number of pits on Fourmile Island in Reed Lake. It occurs as a constituent of milky white quartz veins and stringers in sheared granite (J. M. Harrison, 1949: Geol. Surv. Can., Mem. 250, p. 82).

63 K/11 Coarse gold has been found in a vein cutting sheared greenstones at Copper Lake, headwater of the Grass River (R. C. Wallace, 1919: Can. Mining J., 40, pp. 731-733).

63 K/13 Gold has been reported from the altered gabbro, rhyolite, and greenstones west of Alberts Lake. Gold, some of which is sufficiently coarse to be visible to the unaided eye, occurs in a mineralized zone on the Ruby Group between Ruby and Tartan lakes. The ore zone consists of quartz veins and stringers in an altered schistose tuff mineralized with pyrite, chalcopyrite, and a little pyrrhotite and arsenopyrite. Tourmaline, ankerite, sericite and green mica are gangue minerals (J. D. Bateman, 1945: Geol. Surv. Can., Paper 45-12).

63 K/15 Veins at the Elbow Lake property on the west shore of Elbow Lake contain pockets of coarse gold from which small high grading operations have recovered a small amount of ore. Ore at the Century Mine on an island in the northern part of Elbow Lake, occurs in mineralized shears cutting small bodies of quartz-feldspar porphyry which intrude the basic lavas of the area. The minerals present are pyrite, chalcopyrite, and native gold in a gangue of quartz, the most abundant mineral, and carbonate (J. C. McGlynn, 1959: Geol. Surv. Can., Mem. 305, p. 61).

63 K/16 South of Snow Lake, between Gaspard and Anderson lakes, are a number of small gold-bearing quartz veins cutting basic lavas and fragmental rocks. Coarse gold has been exposed in trenches on the G.M. Group near the southwest end of Corley Lake. At least eleven gold occurrences have been found on the property of Koona Lake Mines Ltd., near Snow Lake. Sulphides are commonly present with the gold. Native gold may be seen in polished sections of ore from the Nor-Acme Gold Mine on the northeastern shore of Snow Lake east of the narrows. The gold appears to be closely associated with arsenopyrite, the most abundant metallic mineral in the sections studied. A reef near the west shore of Threehouse Lake is made up of buff-coloured quartz rubble which is sparsely mineralized with pyrite, magnetite, and coarse gold. No outcrop is visible at the occurrence but eight drillholes have been put down. They intersect narrow quartz veins, some of which contain good gold values (J.M. Harrison, 1949: Geol. Surv. Can., Mem. 250).

64 C/14 At the Sherritt Gordon Mine in the McVeigh Lake area, gold occurs in a fractured albitite dyke cutting tuffaceous sediments. Associated minerals are galena, pyrite, and sphalerite (J.D. Bateman, 1945: Geol. Surv. Can., Paper 45-14, p. 30).

New Brunswick

21 G/2 Chalcopyrite, copper, bismuth and gold occur in quartz veins at the Oliver Lode, Letite, Charlotte County (New Brunswick, Mines Br. files).

21 G/6 Quartz veins containing gold in association with arsenopyrite have been noted at Rolling Dam, Charlotte County (L.W. Bailey, 1864: Rept. on Mines and Minerals of New Brunswick).

21 J/4 Native gold occurs in quartz veins at the Cobbler Sexton Mine in Carleton County. It is associated with silver, pyrite, chalcopyrite, sphalerite and galena (R.A.A. Johnston, 1908: Geol. Surv. Can., Summ. Rept., p. 166).

21 J/6 Veins containing pyrite, pyrrhotite, arsenopyrite and gold have been reported at the Gaugus Stream, Northumberland County (E.W. Shaw, 1936: Geol. Surv. Can., Mem. 197).

21 O/1 Gold is found with chalcopyrite in rhyolite at Burchil Camp, Northumberland County (J.R.A. McNutt, 1962: M.Sc. thesis, Univ. New Brunswick).

21 O/2 An occurrence of gold with pyrite in a quartz vein has been reported at Gough, Northumberland County (New Brunswick, Mines Br. files).

21 O/3 Placer gold has been found at Blue Mountain, Victoria County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, Industrial and Educational Publishing Company, Gardenvale, Quebec).

Newfoundland

11 O/9 Native gold occurs with pyrite, bornite, and two unidentified sulphide minerals at the Chetwynd main shaft on the south side of Cinq Cerf Brook, 2 1/2 miles from its mouth (J. R. Cooper, 1954: Geol. Surv. Can., Mem. 276, p. 53).

12 H/15 Gold-bearing quartz occurs in a talcose schist at White Bay (J. W. McGrath, 1915: Can. Mining J., 36, p. 568).

Northwest Territories

76 D/3 Visible gold occurs in a vein on the property of Salmita Consolidated Gold Mines, Ltd., on the east side of Mathews Lake, District of Mackenzie. Quartz veins containing sulphides, scheelite, tourmaline and visible gold are present on the fifty-four claim property of Bulldog Yellowknife Gold Mines Ltd., at the south end of Mathews Lake.

Gold has been observed in veins at the Kennedy showings about 2 miles east of Courageous Lake; on the TMK Group in the northern part of the Courageous-Mathews Lake district; near Courageous Lake on the Payne Yellowknife property; and on the Newnorth property in the northern part of the area (J. C. G. Moore, 1956: Geol. Surv. Can., Mem. 283).

85 I/14 At the Camlaren Mine, gold is present as a fine powder in white quartz usually closely associated with sulphide minerals. The property is located on the southern tip of an island in Gordon Lake (J. F. Henderson, 1938: Geol. Surv. Can., Paper 38-1, p. 14).

85 J/8 Near Yellowknife on the northern shore of Great Slave Lake, gold is concentrated in a number of shear zones cutting the greenstones and granodiorites of the district. These zones are occupied by systems of quartz veins and lenses, some of which are mineralized in economic quantities.

High gold assays occur in the Kam Point system but no orebody has yet been found.

A similar situation exists for the A.E.S. system which outcrops just north of the Yellowknife townsite.

The Con system contains several ore zones which are highly mineralized with sulphides, sulphosalts, and gold. The Negus-Rycon system may be traced from Negus Point at Rat Lake beneath which it presumably joins the Con system. It is made up of several narrow interlacing shear zones which are mineralized with sulphides, sulphosalts, and gold. The known orebodies have been worked out.

85 J/8 The most extensive and economically important shear zone system in the area is the Giant-Campbell. The metallic minerals include pyrite, arsenopyrite, chalcopyrite, stibnite, sulphosalts, and gold. Ore from this system is mined at the Giant, Con, and Negus mines near Yellowknife.

Gold has been found in the Crestaurum system east of Ryan Lake and although a shaft has been sunk, mining operations were never begun (R. W. Boyle, 1961: Geol. Surv. Can., Mem. 310, pp. 15-30, 58, 59).

85 O/1 Native gold occurs in irregular quartz bodies in a sill of altered diorite on the Morris Lake property of Viking Yellowknife Gold Mines. Some native gold is present in stringers and irregular masses of quartz on the Greenlee Mines property north of Morris Lake (L. P. Tremblay, 1952: Geol. Surv. Can., Mem. 266).

85 P/4 Gold is the most important ore mineral at the Discovery Yellowknife Mine near the western shore of Giauque Lake. It is often quite coarse and is believed not to be closely associated with sulphide. Grey and black quartz in veins on the Lasalle Yellowknife property, northeast of Narrow Lake, contain gold values (L. P. Tremblay, 1952: Geol. Surv. Can., Mem. 266).

86 B/3 A number of gold occurrences are known in the Ranji Lake area. They consist of black to milky white quartz veins mineralized with sulphides and free gold. The most important property is that of Snowdon Yellowknife Mines Ltd. (L. P. Tremblay, 1948: Geol. Surv. Can., Paper 48-10, p. 5).

86 B/6 Glassy white quartz at the Central Mining Services property in the Chalco Lake area has a gold content averaging 2 to 3 dollars per ton (1947). Visible gold is present in association with pyrite, pyrrhotite, arsenopyrite, and sphalerite.

Visible gold is present in a mottled grey and white variety of quartz on the Arseno No. 1 claim on the isthmus of North Inca Peninsula in Leta Arm, Indin Lake. Free gold has also been reported from the Arseno No. 3 claim located 1, 100 feet south of the Arseno No. 1.

Metallic minerals, on the property of North Inca Gold Mines Ltd., at Indin Lake, include pyrite, arsenopyrite, pyrrhotite, and native gold.

Small amounts of gold have been obtained from the Lex Group at Lex Lake.

Gold is reported to have been obtained by panning rusty material associated with quartz veins on the Leta Group at Leta Arm, Indin Lake (M. S. Stanton, 1947: Geol. Surv. Can., Paper 47-18).

Nova Scotia

Gold-bearing veins cut the sedimentary rocks of the Goldenville and Halifax formations which, with a number of granitic intrusive bodies, underlie much of eastern Nova Scotia. Mining in the province began in earnest during the eighteen-sixties with the opening of the Mooseland and Tangier gold districts. The gold occurs both in the native form and in intimate association or combination with sulphides. It has been found at the following localities many of which were actually producing districts at one time (W. Malcolm and E. R. Faribault, 1929: Geol. Surv. Can., Mem. 156, pp. 56-232).

11 D/10 Gold occurs in the Clam Harbour mining district, near Clam Bay, Halifax County.

11 D/11 Gold has been mined in the Salmon River, Lake Catcha, Lawrencetown, and Cow Bay districts, of Halifax County. A vein carrying visible gold and sulphides was found in the city of Halifax between Lockman and Upper Water streets, south of North Street.

11 D/12 Mining for gold has been carried out in the Montague district, 5 miles from Dartmouth, Halifax County, and the South Uniake district of Halifax and Hants counties. The metal has been found in prospects near Birch Cove and Prince Lodge.

11 D/13 Specimens of gold-bearing ore from both the Mount Uniake district, Hants County, and the Waverly district, Halifax County are present in the National Mineral Collection. Gold also occurs in the Ardoise district of Hants County.

11 D/14 Gold mining has taken place in the Oldham district of northern Halifax County and native gold has been reported from a prospect on the west side of O'Brien Lake, south of Oldham.

11 D/15 Gold was mined from the Halifax County districts of Tangier, Mooseland, and Moose River. A specimen from the Mooseland area is present in the National Mineral Collection.

11 D/16 The Harrigan Cove district in Halifax County was once a gold producing area.

11 E/1 Native gold occurs near Liscomb Mills and Little Liscomb Lake, Guysborough County, and has been mined at Cochrane Hill and Miller Lake in the same county, and in the Fifteen Mile Stream district in eastern Halifax County.

11 E/2 Veins of the Goldville Formation at Beaver Dam in Halifax County are the source of gold production in that district.

11 E/3 Placer gold has been reported from the head of the St. Andrews River and from Gays River in the southwestern part of Colchester County. At Gays River the gold is present in the conglomerate of a fossil placer.

11 E/4 Hants County gold-producing districts include Central Rawdon, Renfrew, and West Gore. At the latter locality free gold is reported to occur with stibnite which was the original ore mineral. Placer gold occurs in the Ninemile and Little Ninemile rivers.

11 F/4 Gold has been found in drift at Gegogan, and mined at the following localities in Guysborough County: Country Harbour, Isaac Harbour, Seal Harbour, Sherbrooke, and Wine Harbour.

11 F/5 Native gold occurs in the Forest Hill mining district, Guysborough County.

11 K/2 Both placer and lode gold occur in the Middle River district of Cape Breton Island.

11 K/10 At Cheticamp, Cape Breton Island, a little gold occurs with sulphides in some of the L'Abime Brook deposits.

21 A/2 Auriferous boulders have been found at Somerset on the Canadian National Railways line south of Italy Cross. Gold was mined at Voglers Cove in Lunenburg County and at Mill Village in southern Queens County.

21 A/4 In Yarmouth County, gold-quartz has been mined in the Kemptville and Carleton districts.

21 A/6 A gold occurrence has been reported at West Caledonia, and mining has been carried out in the districts of Westfield and Whiteburn in Queens County.

21 A/7 Gold has been found in the Malaga and Brookfield district of Queens County. In Lunenburg County, the mineral was mined in the Leipsigate and Pleasant River districts.

21 A/8 Float containing free gold was discovered at Centry, 3 miles from Lunenburg. Native gold also occurs at Ovens on the west side of Lunenburg Bay, at Indian Path, and at Blockhouse, all in Lunenburg County.

21 A/9 Lode gold is present in the Gold River district of Lunenburg County.

Ontario

31 C/11 Visible gold and arsenopyrite are the ore minerals at the Diamond (or Sophia) Mine in lots 4 and 5, conc. X, of Madoc Township (E.D. Kindle, 1936: Geol. Surv. Can., Mem. 192, p. 114).

A low grade gold occurrence from which native gold has been obtained is the Golden Fleece property on lot 25, conc. VI, of Kaladar Township (W. G. Miller, 1901: Ont. Dept. Mines, Ann. Rept., vol. II, p. 201).

31 C/12 The Richardson Mine near the village of Eldorado in Madoc Township is the site of the first gold discovery in Ontario. The gold formed leaves and nuggets in solution cavities along the contact between a chlorite and epidotic gneiss and a bed of siliceous dolomite (H. C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 38). A specimen from this mine is present in the National Mineral Collection.

Rich gold-bearing specimens are reported to have been found at the Bannockburn Mine in Madoc Township. Most of the gold occurring at the Deloro Mine in southeastern Marmora Township, is finely divided throughout arsenopyrite. Some, however, occurs as visible scales and grains in quartz.

Free gold and gold-bearing sulphides comprised the ore at the now abandoned Cordova Mine on lot 20, conc. I, Belmont Township (W. G. Miller, 1901: Ont. Dept. Mines, Ann. Rept. vol. 11).

31 M/4 Free gold from Bear Lake, southwest of Cobalt, is present in the National Mineral Collection.

A gold-bearing quartz vein mineralized predominantly with pyrite and chalcopyrite occurs on the Strathy Township property of Manitoba and Eastern Mines Ltd. (W.S. Savage, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. VII, p. 53).

32 D/4 Fine gold is disseminated throughout sulphide and gangue minerals at the Upper Canada Mine in Gauthier Township (J.E. Thomson and A. T. Griffis, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. VIII, pp. 23-25).

Veins on the property of LaFond Gold Mines Ltd., in Skead Township, lot 10, concs. V and VI, contain pyrite, molybdenite, gold, and tellurides.

A considerable amount of native gold was found in 1919 along the contact between a quartz porphyry and a band of greenish carbonate on the property of Manor Gold Mines, formerly the Manley-O'Reilly claim, lot 6, conc. VI, Skead Township. A stockwork of porphyry and quartz on the Sampson claims, lot 10, conc. VI, Skead Township, contains pyrite, molybdenite, telluride, and free gold (D.F. Hewitt, 1949: Ont. Dept. Mines, Ann. Rept., vol. 58, Pt. VI).

Scattered gold-bearing sulphide bodies replace volcanic and brecciated rocks on the property of Barber-Larder Gold Mines Ltd., in McGarry Township.

The highest gold values in the Fernland Mine, McVittie Township, are in zones of coarse-grained pyrite. The ore tends to follow bands of tuff and altered volcanic rocks.

32 D/4 Native gold is irregularly distributed throughout the quartz of the Kerr-Addison Mine in McGarry Township. Concentrations occasionally occur along vein margins and in fractures containing green mica.

Visible gold occurs in quartz veins and to a lesser extent in the sulphide zones of the Omega Gold Mine in McGarry Township (J. E. Thomson, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. VII).

Narrow veins carrying chalcopyrite, magnetite, and pyrite comprise the ore at Beaverhouse Lake Gold Mines in Gauthier Township. Visible gold is present in small quantities with these minerals but it makes up only a part of the total production (J. E. Thomson, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. VIII, p. 15).

Pyrite, arsenopyrite, and gold occur on the Costello property at Pancake Lake, 1 1/2 miles north of Larder Village (P. E. Hopkins, 1925: Can. Mining J., 46, pp. 601-604).

The first gold occurrence found in the Boston Creek area was the Kenzie vein which is 5 feet wide and extends from the property of the R. A. P. Company to that of the Boston Creek Mining Company in Boston Township. Minerals present are gold, pyrite, chalcopyrite, molybdenite, and galena (P. E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 21) (K. D. Lawton, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. IV, p. 25).

32 D/5 Visible gold is reported to have been found in a vein on claim L 12,739 in southeastern Garrison Township. The occurrence is on the property of Bambi Mines Ltd. (J. Satterly, 1949: Ont. Dept. Mines, Ann. Rept., vol. 58, Pt. IV, p. 17).

32 D/12 The original gold discovery in the Lightning River district consisted of a quartz vein bearing calcite, chlorite, feldspar, pyrite, sphalerite, galena, and visible gold. The vein, which is located in Holloway Township was explored by a 70 foot inclined shaft but values were found to decrease at depth (P. E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 29).

41 I/3 The orebodies of the St. Anthony Mine at Sturgeon Lake consist of three gold-bearing quartz lenses cutting the contact between granitic rocks and the Keewatin schists of the area (P. E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 41).

41 I/4 High gold values have been obtained from the quartz vein which is the source of the ore for the Bousquet Mine at the eastern end of Charlton Lake in Curtin Township (H. C. Rickaby, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. VI, pp. 60-61).

41 I/4 Arsenopyrite and free gold are the chief metallic constituents of quartz-ankerite veins at Howry Creek, a tributary of the Whitefish River, Curtin Township (1921: Can. Mining J., 42, pp. 226-227).

41 I/7 The National Mineral Collection includes a specimen of free gold from the Mountain Mine and small fragments of gold from the Crystal Mine, in the Wahnapitae district. The Crystal deposit occurs near the contact between Cobalt sediments and the Keweenawan diabase and consists of narrow veins mineralized with pyrite, gold, chalcopyrite, and pyrrhotite (P. E. Hopkins, 1922: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 17).

41 I/10 Native gold is found in the Frood Mine, Sudbury. It occurs typically as irregularly shaped, rounded particles, scattered through the sulphides. Average grain size is 0.03 to 0.05 millimetre (J. E. Hawley and R. L. Stanton, 1962: Can. Mineralogist, vol. 7, p. 97).

41 J/6 Both free and combined gold have been obtained from the Ophir or Havilah Mine, lot 12, conc. III, Galbraith Township (Archibald Blue, 1893: Ont. Dept. Mines, Ann. Rept., vol. 3, pp. 37-45).

41 N/15 Gold-bearing veins are distributed throughout much of the Michipicoten region. The following are localities from which gold has been reported: Parkhill Mine, township 29, range 23; Minto Mine, township 29, range 23, at Minto Lake, 2 miles southeast of Wawa; Darwin Mine, formerly the Grace Mine, 4 miles southeast of Wawa (E.S. Moore, 1931: Ont. Dept. Mines, Ann. Rept., vol. 40, Pt. IV, pp. 51-54) (E. D. Kindle, 1936: Geol. Surv. Can., Mem. 192, p. 81).

41 O/9 Native gold and sulphides comprise the ore in the complex mineralized zone at the Jerome Mine in Osway Township (W. W. Moorhouse, 1949: Ont. Dept. Mines, Ann. Rept., vol. 58, Pt. V, p. 16).

Narrow quartz stringers carrying visible gold occur in the Horwood Lake area (E. D. Kindle, 1936: Geol. Surv. Can., Mem. 192, p. 34).

41 P/11 At the Canyon Creek Gold Mines Ltd., holdings in Asquith Township, 1 mile south of Shiningtree, quartz is reported to be mineralized with pyrite, pyrrhotite, chalcopyrite, galena, sphalerite and a little visible gold (H. C. Laird, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. VII, p. 44).

Visible gold is reported to occur at the Wasapika or Ribble property in the West Shiningtree area, MacMurchy and Churchill townships.

Small amounts of silver are sometimes present in the native gold from the West Tree, Saville, Atlas, McIntyre-McDonald and

41 P/11 Bennet properties in western MacMurchy Township. The gold occurs in fractured quartz with sericite, talc, chlorite, and pyrite.

Coarse gold is present in quartz stringers on the Clark claim in northeastern Asquith Township (P.E. Hopkins, 1922: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 37).

41 P/15 Quartz stringers cutting the schist at the Matachewan Consolidated Mine in the Matachewan area are often found to contain native gold.

Gold often coats pyrite on the Young-Davidson property in Powell and Cairo townships. The pyrite is auriferous but much of the gold is found in the free state (W.S. Dyer, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. II, p. 33).

Auriferous pyrite and native gold are present at the Davidson and the Matachewan (formerly Otisse) properties (H.C. Cooke, 1919: Can. Mining J., 40, pp. 519-524).

42 A/1 The principal ore minerals in the mines at Kirkland Lake are gold and gold tellurides. Gold deposits occur in Timiskaming sediments which have been intruded by dioritic and syenitic rocks, then cut by a fault. Along this break, the main gold producers are: Macassa, Teck-Hughes, Kirkland Lake, Sylvanite, Lake Shore, Wright-Hargreaves and Toburn mines in Teck Township and the Bidgood Kirkland Mine in Lebel Township (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, pp. 57-58).

A number of other important gold mines are found in the Kirkland Lake district. Among those from which the native metal has been reported are the Kirkland Golden Gate, Kirkland Gateway, Hudson Rand, Baldwin Consolidated, Black, and Amalgamated Kirkland Gold mines (J.E. Thomson, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V).

Native gold and tellurides comprise the ore minerals at the Tough-Oakes Gold Mine near Kirkland Lake. Gold tends to be found in association with molybdenite (R.E. Hose, 1914: Can. Mining J., 35, pp. 259-263).

42 A/6 Many of the mines in the Porcupine district contain free gold, occasionally in fairly coarse grains. Gold producers in the area are as follows: McIntyre Porcupine, Hollinger Consolidated, Moneta Porcupine, Coniaurum, Paymaster, Dome, Mace (Vipond), and Preston East Dome in Tisdale Township; Delnite, Aunor, Buffalo Ankerite and Faymar in Deloro Township; DeSantis and Naybob in Ogden Township; and Pamour, Broulan, Hayle, and Hallnor in Whitney Township (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 46).

42 A/8 Free gold in grains large enough to be seen by the unaided eye has been found at the Vimy Gold Mine, conc. II, lot 10 of Hislop Township (E.S. Moore, 1937: Ont. Dept. Mines, Ann. Rept., vol. 45, Pt. VI, pp. 29-30).

42 A/9 Native gold with tellurides and sulphides is found near Painkiller Lake where it occurs in a number of small fissure deposits. Gold has been reported from mining properties at the following localities in Beatty Township: lot 9, conc. VI; lot 8, conc. V; lot 11, conc. V; lot 7, conc. VI and lot 9, conc. V (P.E. Hopkins, 1922: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 28).

42 C/2 Two localities in township 28 from which native gold has been reported are the Reid property, claim A.C. 2301, range 24 and the Goudreau Mine on the north side of Murphy Lake, range 26 (E.S. Moore, 1932: Ont. Dept. Mines, Ann. Rept., vol. 40, Pt. IV, pp. 20-25, 41).

42 C/8 Visible gold is reported to occur in a rusty weathering mineralized zone on the property of Bankfield Consolidated Mining Ltd., in the east central part of township 47. Small particles of gold have been found with pyrite and chalcopyrite in quartz veins and lenses on the Camex property on the west side of Dog Lake, township 47 (E.L. Bruce, 1945: Ont. Dept. Mines, Ann. Rept., vol. 54, Pt. IV, p. 19).

Native gold is reported to occur on the property of the Michael Syndicate, townships 48 and 49, near Maskinonge Lake, and on the Kremzar claims between Goudreau and Miller lakes in township 49, range 27 (E.S. Moore, 1932: Ont. Dept. Mines, Ann. Rept., vol. 40, Pt. IV, pp. 26-32).

42 E/11 Free gold, often in particles large enough to be seen by the unaided eye occurs in quartz and sulphides at the Bankfield property at the south end of Magnet Lake, Little Long Lac area (E. L. Bruce, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. III, p. 46).

42 E/11, 42 E/14, 42 E/15 Spectacular samples of free gold are reported to occur in several of the mines of the Little Long Lac area, notably, the MacLeod-Cockshutt, Little Long Lac, Magnet Consolidated, Bankfield Consolidated, Tombill, and Jellico mines (H.S. Armstrong, 1944: Am. Mineralogist, 29, p. 309).

42 E/13 Pyrite, sphalerite, arsenopyrite, chalcopyrite, galena, tetrahedrite, and native gold have been identified in polished sections of ore from the Orphan Mine in the eastern Sturgeon River area. Gold has been observed in fractures in pyrite in quartz veins at the Sturgeon River Mine, in the eastern Sturgeon River area; and in quartz on the property of Agoura Explorations Limited (E.L. Bruce, 1936: Ont. Dept. Mines, Ann. Rept., vol. 45, Pt. II).

42 E/13 Thin flakes of visible gold occur in fractures in quartz on the Macjoe Sturgeon property at Macjoe Landing in the western part of the Sturgeon River area. At least five veins on the property of Casey Contact Gold Mines also in the western Sturgeon River area, are reported to carry visible gold (H.C. Laird, 1936: Ont. Dept. Mines, Ann. Rept., vol. 45, Pt. II).

52 A/11 The quartz occupying a shear zone at Lake Head Gold Mines in Gorham Township is mineralized with pyrite, chalcopyrite, and native gold (H.C. Horwood, 1939: Ont. Dept. Mines, Ann. Rept., vol. 48, Pt. III, p. 12).

52 A/12 Quartz lenses carrying native gold occur at the Birch Bay Gold Mine, 36 miles west of Port Arthur on the south side of the Trans-Canada Highway (J.E. Thomson, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. IV, pp. 49-52).

52 E/8 A gold-bearing vein of white quartz cuts the schists, granites and greenstones of the Lake of the Woods area at the Horseshoe Mine, formerly the Regina Mine, on Whitefish Bay. The best values are said to occur in the part of the vein which occurs in the granite (J.E. Thomson, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. IV, p. 32).

52 E/10 The fissure vein which is the main orebody at the Mikado Mine, at the south end of Bag Bay, Shoal Lake, is mineralized with pyrite, chalcopyrite, bismuthinite, molybdenite, malachite, native gold, and tetradymite (P.E. Hopkins, 1922: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 52). A specimen of quartz containing disseminated gold from this mine is present in the National Mineral Collection.

Native gold occurs in association with pyrrhotite on the property of the Duport Mining Co. Ltd., and quartz veins mineralized with pyrite, chalcopyrite, galena, and native gold occur at the Kenrica property, in the Lake of the Woods area (J.E. Thomson, 1936: Ont. Dept. Mines, Ann. Rept., vol. 45, Pt. III, p. 35).

52 G/14 Native gold occurs along fracture planes in quartz at the Darkwater Mine at the southwest end of Sturgeon Lake, Kenora District (H.C. Horwood, 1937: Ont. Dept. Mines, Ann. Rept., vol. 46, Pt. VI, p. 32).

52 H/9 Two veins, numbers 1 and 2, on the property of Amarada Gold Mines in the Sturgeon River area, have yielded specimens of visible gold. Quartz veins occupying a shear zone at Leitch Gold Mines in the western part of the Sturgeon River area, contain pyrite, tetrahedrite, sphalerite, and native gold, in order of decreasing abundance. Specks of visible gold are reported to be fairly common in quartz at the property of Sand River Gold Mines in Eva Township (H.C. Laird, 1936: Ont. Dept. Mines, Ann. Rept., vol. 45, Pt. II).

52 J/4 Native gold occurs with sulphides in carbonate at the Alcona Mine in the Superior Junction-Sturgeon Lake area (H. C. Horwood, 1937: Ont. Dept. Mines, Ann. Rept., vol. 46, Pt. VI, p. 18).

52 K/13 Gold is associated with pyrite, pyrrhotite, arsenopyrite, chalcopyrite, sphalerite, and magnetite in the Madsen Red Lake Mine, near Red Lake. The gold at the Howey Mine in Heyson and Dome townships is usually in a finely divided state but some specimens containing visible gold have been found (H. C. Horwood, 1940: Ont. Dept. Mines, Ann. Rept., vol. 49, Pt. II).

52 M/1 Small grains of gold are present in quartz at Cole Gold Mines Ltd., in Ball Township, near Red Lake. A massive grey quartz vein containing visible gold occurs on the property of the Gold Frontier Mine, Todd Township (northwest part), Red Lake area (H. C. Horwood, 1940: Ont. Dept. Mines, Ann. Rept., vol. 49, Pt. II).

Grey quartz at the West Red Lake Gold Mine contains coarse pyrite crystals, a little chalcopyrite, sphalerite, galena, and native gold. The quartz forms a vein which follows the contact between a quartz porphyry and a greenstone. Fractures in quartz veins at the Red Crest Mine, east of the head of Golden Arm, Red Lake, are occupied by pyrite, molybdenite, tellurides, and native gold (M. E. Hurst, 1935: Ont. Dept. Mines, Ann. Rept., vol. 44, Pt. VI, p. 37).

52 N/4 Native gold has been reported from the following mines and mining properties in the Red Lake area. (1) The Hasaga or Red Lake Gold Shore Mine; associated minerals are tetrahedrite, altaite, or pyrite (H. C. Horwood, 1940). (2) The McKenzie-Red Lake Mine; as minute particles (H. C. Horwood, 1940 and M. E. Hurst, 1935). (3) The McMarmac Red Lake Mine in northeastern Dome Township; with either quartz or arsenopyrite (H. C. Horwood, 1940). (4) The Gold Eagle Mine; associated with sphalerite and pyrite (H. C. Horwood, 1940 and M. E. Hurst, 1935). (5) The Cochenour Willans Mine; gold occurs as small grains associated with arsenopyrite (H. C. Horwood, 1940). (6) The Bounty Consolidated property in the southwest corner of Dome and northwest corner of Heyson Township. Values are high but erratic (H. C. Horwood, 1940).

52 N/9 Quartz containing some native gold and several sulphide minerals occurs at the Argosy Mine in the Cusummit Lake area (H. C. Horwood, 1937: Ont. Dept. Mines, Ann. Rept., vol. 46, Pt. VII, p. 21).

52 P/5 A quartz vein cutting greenstone and iron-formation at the Pickle Crow Mine at Pickle Lake, is mineralized with pyrite, arsenopyrite, some chalcopyrite, and free gold. The pyrite and arsenopyrite are commonly auriferous (H. C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 43).

Quebec

21 L/6 A specimen of free gold in dolomite, collected in range XIV, lot 15, Leeds Township, Megantic County, is in the National Mineral Collection.

22 L/7 Gold occurs in the Tertiary gravels of several tributaries of the Chaudiere River. Among these are the Rivière des Plantes, the Famine River, and the Gilbert River. The native metal has also been reported to occur in a quartz-bearing zone of the Beauceville slate in the vicinity of the placers (Carl Tolman, 1936: Geol. Surv. Can., Mem. 199, p. 17).

31 M/6 Several narrow gold-bearing quartz veins have been discovered in the area between Thibault and Guillet lakes, 10 miles east of Cobalt (J.F. Henderson, 1936: Geol. Surv. Can., Mem. 201, p. 29).

31 M/7 Free gold is present in the ore of the Lake Expanse Mine in Guillet Township. Associated minerals are pyrite, chalcopyrite, pyrrhotite, galena, and sphalerite. The highest values accompany the latter two minerals (P.E. Auger, 1950: Que. Dept. Mines, Prelim. Rept., 245, p. 5).

32 B/13 Some of the sulphide-bearing quartz stringers at the Rouleau Mine in Barry and 118 townships are reported to carry visible gold (R.L. Milner, 1939: Que. Dept. Mines, Prelim. Rept., 143, pp. 6, 7).

32 C/2 Visible gold is scattered throughout quartz stringers at the Norbenite Malartic Mine in Vassan Township, Abitibi County. Thin plates of native gold are reported to occur with clusters of coarse pyrite crystals in the Buffadison Gold Mine, Louvicourt Township. Gold values occur in quartz cutting sheared granodiorite in the Bevcourt Mine, Louvicourt Township (J. Claveau, W.N. Ingham, and W.R. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 41).

32 C/4 Tellurides and native gold occur in the Lamaque Mine in Bourlamaque. They are found in faults and in altered wall-rocks. Vein material at the Sigma Mine, which adjoins the Lamaque property to the north, consists of quartz, tourmaline, pyrite, chalcopyrite, and native gold (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 75).

Free gold in close association with pyrite constitutes ore at the Perron Gold Mine in Abitibi-East County (D.J. McDougal, 1951: Que. Dept. Mines, Prelim. Rept., 258, p. 13).

Pockets containing high values in native gold are irregularly dispersed throughout the quartz at the Siscoe Mine on Siscoe Island in Lake de Montigny, Dubuisson Township (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 74).

32 C/4 Two quartz veins at Paramaque Mines Ltd., have yielded high grade gold (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 13).

Free gold is present in the quartz veins of the Sullivan Mine in Dubuisson Township (S.H. Ross, T. Denis, W.N. Asbury, W.W. Langley and P.E. Auger, 1938: Que. Dept. Mines, Prelim. Rept., 120, p. 14).

Small flakes of native gold are reported to occur in sulphide and tourmaline-bearing quartz veins on the Sullivan claims on the eastern shore of Lake De Montigny (H.C. Cooke, W.F. James, and J.B. Mawdsley, 1931: Geol. Surv. Can., Mem. 166, p. 253).

32 C/12 A spectacular occurrence of native gold has been reported from the property of Soma-Duverny Mines Ltd., in Duverny Township (W.W. Weber, 1951: Que. Dept. Mines, Prelim. Rept., 255, p. 22).

32 D/1 Visible gold occurs in a small quartz vein on the property of Angus Mines Ltd., in Cadillac Township (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 18).

Pegmatite veins carrying gold occur in the Canadian Malartic Mine at Malartic. The ore is finely divided native gold associated with pyrite (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, p. 73).

32 D/1
32 D/2
32 D/8 Native gold occurs in spectacular shoots in the quartz veins associated with the Cadillac break. This vertical fault which has been traced through Bousquet, Cadillac, Malartic, and Joannes townships has resulted in the formation of several important orebodies. Among them are the Mic-Mac, Thompson Cadillac, O'Brien, Central Cadillac, Amm, Lapa-Cadillac, and Pan Canadian mines (H.C. Cooke, 1946: Geol. Surv. Can., Econ. Geol. Ser., 15, pp. 71, 72).

32 D/2 Coarse visible gold is quite common in the ore from the Hosco Gold Mine, and coarse pyrite and fine gold occur in a network of quartz veins at Heva Gold Mines, in Joannes Township (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 38).

32 D/3 The main vein at Granada-Rouyn Mines, south of Rouyn, consists of parallel stringers of quartz, cutting conglomerate and carrying coarse gold (H.C. Cooke, W.J. James and J.B. Mawdsley, 1931: Geol. Surv. Can., Mem. 166, p. 235).

Gold occurs in a silicified shear zone on the property of the Lake Wasa Mining Corporation in Beauchastel Township. Coarse

32 D/3 seams of gold cut quartz and auriferous pyrite at the Bordulac Mine in Dasserat Township (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256).

Veinlets of quartz and calcite mineralized with native gold and gold tellurides cut two dykes of altered quartz porphyry on the north shore of Lake Renauld in Timiskaming County (M.E. Wilson, 1918: Geol. Surv. Can., Mem. 103, p. 149).

Gold and fine pyrite occur together at Arntfield Gold Mines in Beauchastel Township (S.E. Malouf, 1938: Can. Mining J., 59, pp. 427-434).

32 D/6 The minerals comprising the copper-gold ore of the Noranda Mine at Noranda are pyrrhotite, pyrite, chalcopyrite, magnetite and a little sphalerite. Galena, native gold, tetrahedrite, and gold tellurides are present but not abundant (M.E. Wilson, 1941: Geol. Surv. Can., Mem. 229, p. 97).

Gold occurs with pyrite, chalcopyrite, and black tourmaline in quartz veins at the Anglo Rouyn Mine in Rouyn Township. Free gold occupies fine fractures in bluish quartz at Caron Malartic Gold Mines Ltd., in Beauchastel Township (J. Claveau, W.N. Ingham and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256).

32 D/7 Quartz veins carrying sulphides and free gold comprise the ore at the Donaldson Mine in Rouyn Township (J. Claveau, W.N. Ingham, W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 56).

32 D/9 Several veins in the New Goldvue Mine in Dalquier Township are mineralized with visible gold. Chalcopyrite, sphalerite, and galena are associated minerals (W.W. Weber, 1951: Que. Dept. Mines, Prelim. Rept., 257, pp. 12, 13).

Argentiferous gold is associated with pyrite, epidote, tourmaline, scheelite, and tellurides at the Dalquier Township property of the Notrac Mining Company (S.H. Ross, T. Denis, W.N. Asbury, W.W. Langley and P.E. Auger, 1938: Que. Dept. Mines, Prelim. Rept., 120, p. 10).

32 D/13 Free gold is reported to occur with chalcopyrite at the Barry Lake Mining Company property in Barry Township (R.L. Milner, 1939: Que. Dept. Mines, Prelim. Rept., 143, p. 8).

32 F/7 Quartz veins cutting the Keewatin rocks at Madeleine Lake, 6 miles southwest of Lake Waswanipi, are reported to contain gold as fracture fillings and disseminated through fine-grained quartz (G.S. Mackenzie, 1935: Can. Mining J., 56, pp. 324-326).

32 G/4 Native gold occurs in quartz veins occupying a shear zone on the holdings of Macho River Gold Mines Ltd., in Urgan Township, Abitibi County (J. Claveau, W. Ingham, and W.G. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 64).

32 G/9 Gold is present with sulphides in quartz lenses in sheared basalt at the Chibougamau Explorations property in Dauversiere Township (J.E. Gilbert, 1952: Que. Dept. Mines, Prelim. Rept., 267, p. 8).

A little free gold is found distributed throughout the mineralized zone on the Dauversiere Township property of New Mosher Longlac Mines Ltd. (P.E. Imbault, 1951: Que. Dept. Mines, Prelim. Rept., 250, p. 13).

32 G/13 Quartz veins at the La Ronciere Gold Mines property in La Ronciere Township carry pyrite, arsenopyrite, and spectacular free gold (J. Claveau, W.N. Ingham, W.C. Robinson, 1951: Que. Dept. Mines, Prelim. Rept., 256, p. 39).

32 G/16 Promising gold values have been reported from the A, C, and D veins on the Obalski property, Obalski Township, Abitibi-East County (R.B. Graham, 1956: Que. Dept. Mines, Prelim. Rept., 71, p. 33).

A vein of mottled grey quartz on the Noranda property at Bourbeau Lake, near Chibougamau, carries considerable free gold (J.B. Mawdsley and G.W.H. Norman, 1935: Geol. Surv. Can., Mem. 185, p. 65).

Saskatchewan

73 P/7 Visible gold is present in fracture and shear planes in the vein quartz of the Sulphide Lake Belt in the Lac la Ronge district. Located about 9 miles south of Hebden Lake, the belt has a north-easterly trend (J.B. Mawdsley, 1940: Precambrian, pp. 47-49).

74 N/7 Most of the gold at the Box Mine near Goldfields is intimately associated with pyrite. It has been observed with quartz and chlorite in microscopic fractures in the pyrite. Scattered specks of gold are also reported to occur in vein quartz and granite.

Gold occurs at the Frontier Trust property located near a small lake northwest of Frontier Lake, in a sill of fine-grained granite. It is found associated with pyrite or as flakes coating fracture surfaces in the granite (A.M. Christie, 1953: Geol. Surv. Can., Mem. 269, p. 79).

74 N/8 Native gold at the Athona property southeast of Goldfields occurs in quartz veinlets either alone or with sulphides. It is quite coarse and if present at all can be seen by the unaided eye (A.M. Christie, 1953: Geol. Surv. Can., Mem. 269, pp. 76, 77).

74 O/7 Quartz veins carrying gold and arsenopyrite cut the garnetiferous sedimentary rocks at Sucker Bay, Lake Athabasca (G. M. Furnival, 1940: Geol. Surv. Can., Paper 40-10, p. 9).

Yukon

105 D/2 Gold-bearing quartz veins have been found about 7 miles south of Carcross on Montana Mountain (R. Skinner, 1961: Geol. Surv. Can., Paper 61-23, p. 38).

105 D/3 Quartz at the Buffalo Hump Group contains galena, free gold, and sylvanite. The property is located on the western side of Mount Stevens in the Wheaton River area (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 122, pp. 176, 177).

105 D/11 Specimens of gold from the placers of Reddick Creek in the Whitehorse District are included in the National Mineral Collection.

105 E/8 Streams in the Livingstone Creek area, 51 miles northeast of Whitehorse, have been worked for placer gold. Among them are St. Germain, May, Mendocina, Cottoneva, Lake, Little Violet and Summit creeks. Livingstone Creek itself has probably been the most productive. Gold valued at over one million dollars is said to have been recovered from its gravels during the period from 1898 to 1920, after which production ceased (H. S. Bostock, 1952: Geol. Surv. Can., Mem. 284, pp. 623-626).

106 D/4 Gold-bearing quartz veins are widely distributed throughout a fissured belt in the schistose rocks of the Dublin Gulch area in the Duncan Creek mining district (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 222, pp. 127-158).

Placer gold in addition to lode gold, occurs at Dublin Gulch. A specimen from this area, now in the National Mineral Collection consists of quartz, scheelite, magnetite and gold.

115 A/6
115 A/11 The ore at the Lone Star Mine on the eastern side of Victoria Gulch, a tributary of Bonanza Creek, consists for the most part of fine free gold in quartz. Some coarse grains and nuggets have however, been taken from the quartz and small values are reported to occur with sulphides. Gold is present in Victoria Gulch both as a constituent of the gravels and in veins which are related to the Lone Star orebody (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 222, pp. 20-37).

115 B/16 Many of the streams flowing from the St. Elias range in the Kluane mining district are known to carry placer gold. Among these are Bullion, Sheep, Burwash, Kimberley, Telluride, Canyon, Canada and Vulcan creeks (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, pp. 123-126).

115 G/1 115 H/4	Auriferous gravels have been mined from the valleys of Ruby and Fourth of July creeks in the Kluane district (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 114).
115 G/8 115 H/3 115 H/4	Among the streams from which placer gold has been mined in the Ruby range, Kluane district, are Dixie, Marshall, and Gladstone (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 114).
115 I/6	Patches of visible gold are scattered through limonite on the Augusta claim at Freegold Mountain between Seymour and Stoddard creeks. These two minerals occur in a contact metamorphic magnetite deposit which appears to be associated with intrusions of syenite porphyry. Both Seymour and Stoddard creeks have yielded placer gold (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, pp. 630, 642).
115 I/14	Colours of gold have been found along the Pelly River between the MacMillan River and Hoole Canyon. Their occurrences coincide with those of quartz veins cutting the older metamorphic rocks of the area (J.R. Johnston, 1936: Geol. Surv. Can., Mem. 200, p. 17).
115 J/4	Detrital gold occurs in the matrix of a conglomerate horizon near MacKinnon Creek about 4 miles above its confluence with the Indian River. The deposit is believed to have originated as a beach placer possibly in Tertiary time. A number of claims have been staked in the district the most important of which are the Britannia and Thistle (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 222, pp. 62-72).
115 N/15 116 C/2	Placer gold has been found in the gravels of Miller, Glacier, Big Gold, Matson, and Sixty Mile creeks in the Sixty Mile Creek district (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 635).
115 O/1 115 O/2 115 O/3	Scroggie, Barker, Thistle and Kirkman creeks flowing into the Stewart and Yukon rivers have produced placer gold (H. S. Bostock, 1957: Geol. Surv. Can., Mem. 284, pp. 384-410).
115 O/10	A small showing of free gold has been noted on the Gold Run Group at the head of Gold Run Creek near Portland Gulch (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 222, pp. 83, 84).
115 O/14	Crystalline gold has been found in quartz and fine disseminated gold in schists at the Eldorado Dome property which occupies the area between Bonanza and Eldorado creeks, and Victoria, Oro Grande, and Gay gulches, and adjoins the holdings of the Lone Star Mine. Colours of gold have been panned from quartz at the Virgin claim on Bear Creek (T.A. MacLean, 1914: Can. Dept. Mines, Mines Br. Publ., 222, pp. 38-44).

115 O/N1/2 The most productive gold placers in Canada are situated in the Klondike gold field in the western Yukon. The area is bounded by the Klondike River to the north, the Yukon River to the west, the Indian River to the south, and Dominion and Flat creeks to the east. It comprises about 800 square miles upland dissected by many streams, almost all of which are to some extent auriferous. The most important of these however, are the Klondike River with its tributaries: Bear, Hunker, and Bonanza creeks; Eldorado Creek, a tributary of Bonanza; the Indian River, its tributaries Eureka, Quartz, and Dominion creeks; Gold Run and Sulphur creeks which flow into Dominion, and Allgold Creek which empties into Flat Creek (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 65).

115 P/16 Creeks in the Mayo district from which placer gold has been recovered are the Stewart River and Duncan, Haggart, Minto, Highet and Johnson creeks (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, pp. 384-410).

116 B/3 A triangular-shaped gold-bearing area lies between Eldorado Creek, Upper Bonanza Creek and Victoria Gulch about 10 miles south-southeast of Dawson (R. Skinner, 1961: Geol. Surv. Can., Paper 61-23).

GONNARDITE

$Na_2CaAl_4Si_6O_{20}.7H_2O$

Quebec

31 G/8 Gonnardite, one of the rarer members of the zeolite family has been identified by X-ray diffraction in a specimen from the Oka district. The powder pattern has four strongest lines at 6.66 (4), 5.90 (8), 4.42 (6) and 2.92 (10) (X-ray Laboratory, Geol. Surv. Can.).

GRAPHITE

C

Graphite is of common occurrence in metamorphic rocks such as crystalline limestone, gneiss, schist, quartzite, and metamorphosed coal seams. It has also been found in igneous rocks such as granite, basic volcanics, veins and pegmatites. The X-ray powder pattern is hexagonal with four strongest lines at 3.36 (10), 2.03 (5), 1.678 (8) and 1.158 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85).

British Columbia

104 K/11 Samples of high-grade graphite have been found on a ridge top, 1 mile northwest of Mount Lester Jones, in the Taku River district (F.A. Kerr, 1948: Geol. Surv. Can., Mem. 248, p. 73).

New Brunswick

21 G/1 Graphite is found at Saint John, Pisarinco Peninsula, Lorneville, Musquash, and Clear Lake, all in Saint John County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st. ed., Industrial and Educational Publ. Co., Gardenvale, Que.).

21 G/6 Amorphous graphite is found at Dumbarton Station in Charlotte County (H.S. Spence, 1920: Can. Dept. Mines, Mines Br. Publ., 511).

21 G/8 Graphite associated with limestone can be found at Saint John in Saint John County (W.L. Goodwin, 1928).

21 H/5 Graphite in bands up to 40 inches thick interbedded in limestone occurs on Golden Grove Mountain in Saint John County (W.J. Wright, 1942: New Brunswick, Mines Br., files).

21 H/11 Graphite occurs at Goose River in Saint John County (H.S. Spence, 1920).

21 H/14 Graphite occurs in the form of graphitic schists at Thorne Brook in Kings County (W.L. Goodwin, 1928).

21 H/15 Graphite occurs at Dorchester in Westmorland County (H.S. Spence, 1920).

Newfoundland

14 C/12 Graphitic gneisses occur on the northern coast of Labrador between Grenville Sound and Port Manvers. Graphite has been found in sheared rocks at Machvah Fiord (A.M. Christie, 1952: Geol. Surv. Can., Paper 52-22, p. 14).

14 L/7 Fine crystalline graphite of high purity occurs in seams and lenses varying in thickness from 1 to 10 inches at Saglek Bay, Labrador (G.V. Douglas, 1953: Geol. Surv. Can., Paper 53-1, p. 49).

25 A/7 A specimen of foliated graphite from Cape Chidley, Labrador, was contributed by A.P. Low to the National Mineral Collection in 1902.

Northwest Territories

25 K/13 Garnet, mica, and graphite have been mined from a deposit near Lake Harbour on the south coast of Baffin Island (R. B. Blackadar, 1960: Can. Mining J., 81, No. 4, p. 110).

26 G A small amount of graphite was mined prior to World War I from a deposit in the vicinity of Cumberland Sound on Baffin Island (R. B. Blackadar, 1960: Can. Mining J., 81, No. 4, p. 110).

Ontario

31 F/1 Graphite from a deposit in conc. VII, lot 21, of North Elmsley Township, Lanark County, was donated by M. E. Wilson to the National Mineral Collection in 1916.

31 F/2 At the Black Donald Mine, lot 18, conc. III, Brougham Township, a bed of graphite from 10 to 30 feet thick was mined from 1895 to 1954. The bed was in the form of a northeasterly plunging syncline, and had an average graphite content of about 60 per cent (C. H. Stockwell, 1957: Geol. Surv. Can., Econ. Geol. Ser., 1, p. 120).

41 I/2 Flakes of graphite averaging 1/8 of an inch in diameter occur in bands parallel to the foliation in rocks found on lot 10, concs. I and II, Bigwood Township, French River area (R. H. Pegrum, 1925: Geol. Surv. Can., Unpubl. file, No. 21, p. 1).

Quebec

31 F/15 Small hexagonal crystals of graphite found in the Coulonge River near Fort Coulonge were donated by E. Davis to the National Mineral Collection.

31 F/16 Graphite from Low Township, Gatineau County, was donated by H. Spence in 1923, to the National Mineral Collection.

31 G/10 Large foliated masses of graphite have been found in Grenville Township, range II, lot 3. A sample from this locality was contributed to the National Mineral Collection by R. Bell in 1856.

31 G/11 A graphite specimen from the Walker property in Buckingham Township was donated to the National Mineral Collection by C. W. Willimott.

Graphite occurs in Lochaber Township, Papineau County. A specimen from this area is present in the National Mineral Collection.

31 G/12 Columnar graphite has been found in lot 28, range V of Buckingham Township. H. G. Vennor contributed a specimen from this locality to the National Mineral Collection in 1877. Also present in the collection is a specimen found near Tenaga in Hull Township.

31 G/16 Graphite occurs in pegmatites and skarn zones in Wentworth Township, Argenteuil County, about 10 miles north of Lachute. The graphite is columnar in the pegmatite dykes and in flake and massive forms in the skarn zones (G. W. Bain, 1929: Econ. Geol., 24, pp. 733-752).

31 J/11 A foliated mass of graphite, found near Mont Laurier, has been donated to the National Mineral Collection by T. Laderoute.

Saskatchewan

74 P/4 Flakes of graphite are found disseminated throughout the sedimentary rocks of the Stony Rapids area at the western end of Lake Athabasca (G. M. Furnival, 1940: Geol. Surv. Can., Paper 40-10).

GREENALITE

Greenalite is a ferrous iron silicate, possibly isomorphous with serpentine. It is an important constituent of iron ores of the Lake Superior type. The X-ray powder pattern has four strongest lines having the following spacings and intensities: 7.12 (8), 3.56 (8), 2.57 (10) and 1.593 (6) (J. W. Gruner, 1936: Am. Mineralogist, 21, p. 449).

Quebec

32 I/14 Greenalite has been identified in an iron-silicate slate at Trout Point in the Albanel area (J. N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 23).

GREENOCKITE

CdS

Greenockite, the hexagonal modification of CdS, is found as an earthy yellow coating on zinc minerals. The X-ray powder pattern has four strongest lines having the following spacings and intensities: 3.59 (8), 3.36 (7), 3.18 (10) and 2.07 (7) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 60).

Quebec

31 J/4 Powdery coatings of lemon yellow greenockite occur in cracks in a vein of sphalerite on lot 36, range II, of Northfield Township in the Trente-et-Un-Mille Lake area (E. Aubert de la Rue, 1956: Que. Dept. Mines, Geol. Rept., 67, p. 22).

GROSSULAR

$Ca_3Al_2(SiO_4)_3$

Grossular, the calcium-aluminium garnet, occurs in a variety of colours including white, colourless, pale green, amber, yellow, cinnamon brown, red, and in rare instances, emerald green. The calcium and aluminium may be replaced by ferrous and ferric iron respectively. This results in a compositional gradation into almandine, the iron-aluminium garnet, and andradite, the calcium garnet. The names hessonite and cinnamon stone have been applied to varieties of grossular.

British Columbia

92 F/10 Large buff-coloured masses of grossular occur in the host rocks away from the ore zones at the Marble Bay Mine on Texada Island. Chemical analysis of grossular: SiO_2 38.40, TiO_2 0.58, Al_2O_3 17.53, Fe_2O_3 4.74, FeO 1.08, MgO 1.62, CaO 34.06, MnO 1.23, Na_2O 0.01, K_2O 0.42, H_2O 0.53, P_2O_5 0.19, total 100.41; S.G. 3.62. Crystals of andradite garnet are commonly found within the ore zone (T.L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 7).

Ontario

31 F/4 Crystals of hessonite occur in considerable numbers embedded in bluish calcite and cancrinite, north of an occurrence of sodalite near Bancroft in Dungannon Township. Chemical analysis by H.C. Rickaby: SiO_2 38.78, TiO_2 0.31, Al_2O_3 20.98, Fe_2O_3 2.94, FeO 1.33, CaO 33.84, MgO 0.62, MnO 0.62, Na_2O 0.40, K_2O 0.34, H_2O 0.20, total 99.74; S.G. 3.596 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 10).

Quebec

21 L/3 Grossular has been identified at the following localities in the Black Lake area, Coleraine Township: Hall Chrome pit, Thetford quarry, range A, lot 16; Union pit, block B, lots 27, 28; Southwark pit, block B, lot 28; American Chrome pit, range IV, lot 25; Caribou pit, block A; and Black Lake Chrome and Asbestos pit, block A. Chemical analysis by Graham of colourless grossular from the Southwark pit: SiO_2 39.49, Al_2O_3 22.35, FeO 1.00, CaO 36.62, MgO 0.28, MnO 0.15, total 99.89; S.G. 3.60 (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull., 27, p. 47).

31 F/15 An analysis by Wait of grossular from range I, lot 12 of Litchfield Township is as follows: SiO_2 36.80, Al_2O_3 20.53, Fe_2O_3 2.38, FeO 0.56, MnO 0.50, CaO 37.41, MgO 1.51, H_2O 0.07, total 99.76; S.G. 3.623 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 16R).

31 G/12 Large brownish yellow crystals of grossular from range I, lot 7 of Wakefield Township are represented in the National Mineral Collection.

An analysis by Bullman of grossular from this locality is as follows: SiO_2 38.80, Al_2O_3 22.66, Fe_2O_3 1.75, MnO 0.30, CaO 35.00, MgO 0.68, total 99.19; S.G. 3.525 (G.F. Kunz, 1884: Am. J. Sci., Ser., 3, vol. 27, p. 306).

31 H/8 Grossular from lot 16, range 16, Orford Township, Sherbrooke County was analyzed by Hunt with the following results: SiO_2 38.60, Al_2O_3 22.71, Fe_2O_3+MnO 1.60, CaO 34.83, MgO 0.49, H_2O 1.10, Na_2O + K_2O 0.47, total 99.80; S.G. 3.52-3.53 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 496).

Yukon

105 D/11 The following is an analysis by Johnston, of grossular from a locality in the Whitehorse copper belt: SiO_2 38.94, Al_2O_3 15.11, Fe_2O_3 6.30, MnO 0.78, CaO 36.93, MgO 1.62, H_2O 0.35, total 100.03; S.G. 3.603 (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 14R).

GRUNERITE

$(Fe,Mg)_7Si_8O_{22}(OH)_2$

Grunerite and its magnesium dominant analogue, cummingtonite, are members of the amphibole group, typically found in medium-grade, calcium-poor, metamorphic rocks. The X-ray powder pattern has five strongest lines at 8.38 (8), 3.08 (10), 2.77 (10), 2.64 (8) and 2.51 (8) (A.S.T.M. card 7-394).

Ontario

52 F/16 Grunerite occurs with coarse sugary quartz and magnetite in the southern part of Echo Township, lot 2, conc. I (H.S. Amstrong, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. V, p. 16).

Quebec

32 I/14 A thin section of an iron-silicate slate from Trout Point in the Albanel area was found to contain yellowish laths of grunerite (J.N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p.23).

32 P/2 Grunerite is the dominant mineral above the magnetite zone in a banded iron-formation in the Temiscamie River area, Mistassini territory (W.G. Wahl, 1953: Que. Dept. Mines, Geol. Rept., 54, p. 18).

GUDMUNDITE

FeSbS

The spacings and intensities (Fe/Mn radiation) of the four strongest lines in the X-ray powder pattern of gudmundite are: 4.09 (5), 2.55 (10), 1.917 (7) and 1.416 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 106).

Manitoba

63 K/16 Gudmundite is a constituent of the sulphide ore of the Chisel Lake Mine (A.E. Bence and L.C. Coleman, 1963: Can. Mineralogist, 7, p. 663).

Northwest Territories

85 J/8 A fine-grained granular mass of gudmundite has been identified in a sample from the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist, 38, p. 514).

Quebec

21 E/13 Gudmundite has been found in an old antimony mine in lot 28, range I of South Ham Township, Wolfe County. Identification was made from X-ray powder pattern at the X-ray Laboratory of the Geological Survey of Canada. The four strongest lines in the pattern are: 4.06 (4), 2.80 (5), 2.55 (10), and 1.91 (7).

GUNNINGITE

$ZnSO_4 . H_2O$

Gunningite is isostructural with kieserite, szomolnokite and szmikite, the sulphate monohydrates of Mg, Fe and Mn, respectively. It was first identified in 1960 and named in honour of H.C. Gunning, a former geologist with the Geological Survey of Canada, and later, Head of the Geology Department of the University of British Columbia. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 4.80 (7), 3.41 (10), 3.06 (6) and 2.52 (4).

Yukon

105 M/14 Gunningite occurs as sparse white efflorescences in sphalerite in several mines in the Keno Hill area. It was originally identified on a specimen from the Comstock-Keno property (J.L. Jambor and R.W. Boyle, 1962: Can. Mineralogist, 7, p. 209).

GYPSUM

$CaSO_4 . 2H_2O$

Gypsum, probably the most common sulphate found in nature, is widely distributed in deposits of sedimentary origin. It has also been found around volcanic fumaroles, as a precipitate from thermal springs, and as a vein-mineral associated with sulphides. The name selenite is often used for coarsely crystalline transparent gypsum, the fibrous variety is known as satin spar, and fine-grained massive gypsum is called alabaster. Gypsum is an important mineral of commerce and is used mainly for making plaster of Paris.

Alberta

72 E/13 Crystals of selenite occur at Fort Kipp. Several specimens from this locality are in the National Mineral Collection.

72 M/8 Rosettes of gypsum from Benton Station were donated to the National Mineral Collection by J. Hall.

74 D/11 Interbedded gypsum and anhydrite, 130 feet thick, has been discovered at a depth of 500 feet at McMurray (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 13).

74 M/6 On the west side of the Slave River, a few miles below La Butte, earthy gypsum is exposed in a bed about 10 feet thick. The colour varies from white to grey to bluish (C. Camsell, W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., p. 107).

83 F/5 In Jasper park, granular white gypsum of Triassic age outcrops in the area north of Brûlé Lake (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 13).

84 P/1, 84 P/2 Limestone, gypsum, and anhydrite of Silurian age are exposed on the banks of the Peace River between the mouth of the Jackfish River and Peace Point, a few miles below Boyer (formerly Little Rapids) (C. Camsell and W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., pp. 62, 106).

British Columbia

82 J/4 A fine-grained, bedded deposit of gypsum occurs 8 miles northeast of Canal Flats. The mineral varies in colour from white to dark grey. The largest exposure forms a series of slopes and bluffs up to 300 feet high and extending for a distance of about 1/3 of a mile (G.B. Leech, 1954: Geol. Surv. Can., Paper 54-7).

82 J/5 An important deposit of gypsum is located 4 miles northeast of Windermere (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 14).

82 L/11 Gypsum is found near Salmon Arm on Shuswap Lake. It occurs along a fault zone (A.G. Jones, 1948: Geol. Surv. Can., Paper 48-4, p. 7).

92 P/4 Gypsum and anhydrite occur on the steep hillside near the main masses of hydromagnesite just above the wagon road north, at 1/4 mile from the west end of Kelly Lake, Clinton area. Chemical analysis: SiO_2 3.75, Al_2O_3 0.67, Fe_2O_3 0.41, MgO 0.48, CaO 31.48, H_2O^+ 2.18, H_2O^- 18.00, CO_2 2.22, SO_3 41.09; total 100.28 (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 32).

Manitoba

62 H/3, 62 H/14 Beds of gypsum have been encountered in drillholes east of Dominion City, and at Charleswood, near Winnipeg (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 13).

62 J/8 Selenite crystals found at Pembina Mountain are represented in the National Mineral Collection.

62 J/10 At Amaranth, beds of gypsum about 40 feet thick occur at a depth of 95 feet (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 12).

62 O/15 Bedded gypsum deposits over 30 feet thick occur as low ridges that rise 20 to 25 feet above the surrounding countryside at Gypsumville, northwest of Lake St. Martin. The gypsum beds are usually underlain by anhydrite (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 12).

New Brunswick

The gypsum deposits of New Brunswick mostly occur in the southeastern section of the province in rocks of Carboniferous age. The following localities are listed in Record 2, Part A, The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, by the New Brunswick Research and Productivity Council, 1965:

21 H/5 Upham, Kings County;
21 H/6 St. Martins Head, Saint John County;
21 H/10 Lockhart Lake and Cape Maringouin, Albert County;
21 H/11 Mount Pisgah and Sussex Corner, Kings County;
21 H/12 Fox Hill, Kings County;
21 H/13 McGregor Brook, Kings County;
21 H/14 Fawcetts Brook, Westmorland County;
21 H/15 Wilson Brook, Curryville, Hopewell Hill, Lower Cape, Edgett Landing, and Hillsborough, Albert County;
21 J/14 Plaster Rock, Victoria County.

21 H/15 Selenite crystals found in anhydrite near Hillsborough in Albert County, were donated to the National Mineral Collection in 1923, by L.H. Cole. The X-ray powder diffraction pattern has four

21 H/15 strongest lines with the following spacings and intensities: 7.6 (7), 4.28 (10), 3.07 (7) and 2.87 (6) (X-ray Laboratory, Geol. Surv. Can.).

Newfoundland

11 O/14, 12 B/2, 12 B/7, 12 B/11 Large massive gypsum deposits occur in the St. George's Bay area, mostly at or near surface. Numerous outcrops may be seen in the area south of St. George's Bay between St. George's on the north and Searston on the south. A large deposit has been worked at Flat Bay. Other gypsum localities are: the Boswarlos-Piccadilly area, the mouth of Romaines Brook, along Sheep Brook and Coal Brook, and in the valley of the Crabbs River (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 8).

Northwest Territories

85 A/1 A bed of gypsum is reported to have been encountered in an excavation at Bell Rock, 7 miles below Fort Smith on the Slave River (C. Camsell and W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., p. 107).

85 A/14 A 4-foot-thick band of thin-bedded impure gypsum occurs on the banks of the Slave River immediately below Point Ennuyeux (C. Camsell and W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., pp. 27, 107).

85 G/15 Flesh coloured gypsum occurs at Gypsum Point on the north shore of Great Slave Lake and at several other localities on the southwest shore of the north arm of Great Slave Lake (C. Camsell and W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., p. 107).

95 J/8 Small selenite crystals occur in outcrops on Ebbutt Hills, south of Willowlake River (R.J.W. Douglas and D.K. Norris, 1961: Geol. Surv. Can., Paper 61-13, p. 24).

96 F/2 Gypsum beds are reported to occur on Mount St. Charles (formerly Mount Charles) on the north side of the Great Bear River and about 40 miles above its mouth (C. Camsell and W. Malcolm, 1921: Geol. Surv. Can., Mem. 108, revised ed., p. 107).

Nova Scotia

11 E, 11 F, 11 K, 21 H, Some of the largest gypsum deposits in Canada are located in the central and northern parts of Nova Scotia. The gypsum is found in Windsor Group sediments of Mississippian age, interbedded with limestone, shale and clay. The gypsum is fine-grained and generally white to grey in colour. Alabaster, satin spar and selenite are found in many of the deposits, and in most cases the gypsum is underlain by thick beds of anhydrite. Most deposits

11 E, 11 F, 11 K, 21 H — are at or near surface. The main gypsum areas are in the counties of Hants, Cumberland, Antigonish, Victoria, Richmond and Inverness. Large quarries are located near Windsor, Walton and Cheverie in Hants County, and at Little Narrows on Cape Breton Island (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 9).

11 K/3 — A dense, fine- to medium-grained variety of gypsum occurs at Mabow Mines north of Mabow Inlet on the western coast of Cape Breton, near Lake Ainslie. It varies in colour from white to mottled grey and in places is tinged red. Selenite crystals in the gypsum groundmass give the deposit a porphyritic texture. An analysis by Cole, of gypsum containing a small amount of $CaCO_3$, is as follows: CaO 33.23, MgO 0.05, SO_3 45.90, H_2O 18.55 CO_2 0.77, insol. 0.40, Fe_2O_3 0.04, Al_2O_3 0.02, total 98.96 (G.W.H. Norman, 1935: Geol. Surv. Can., Mem. 177, p. 71).

Ontario

30 L/13, 30 M/4, 40 I/16, 40 P/2 — Major deposits of gypsum occur in the Salina Group of Silurian age, associated with anhydrite, dolomite and limestone, in the Grand River area, south and west of Hamilton. The lens-shaped deposits measure up to 15 feet thick, extend laterally for hundreds of feet and usually occur within 200 feet of the surface. Underground mining operations have been conducted at Caledonia and Hagersville. Other deposits are known at Cooks, Lythmore and Cayuga in the area to the south and east of Hagersville, and at Princeton, east of Woodstock.

42 I/11, 42 I/14, 42 P/3 — Beds of gypsum are well exposed along the banks of the Moose River near the village of Moose River, and along the banks of the Cheepash about 20 miles above the point at which it joins Moose River. Large deposits occur on Gypsum Mountain, 12 miles southeast of Moose River village (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 11).

Quebec

11 N/4, 11 N/5 — Gypsum is exposed along the coasts of Grindstone, Alright, Amherst and Entry islands of the Magdalen Islands in the Gulf of St. Lawrence (R.K. Collings, 1959: Can. Dept. Mines, Mines Br., Info. Circ. 114, p. 10).

32 C/3 — Selenite has been found in a quartz vein at the Buffadison Mine in Louvicourt Township, Abitibi County. Associated minerals are pyrite, chalcopyrite, scheelite, and tellurbismuth (J. Claveau, W.N. Ingham, W.R. Robinson, 1957: Que. Dept. Mines, Rept., 256, p. 44).

GYROLITE

$Ca_2Si_3O_7(OH)_2 . H_2O$

The five strongest lines in the X-ray powder diffraction pattern of gyrolite from Bombay, India are reported to be: 4.20 (s), 3.65 (ms), 3.12 (vs), 2.80 (ms) and 1.82 (s) (A. L. Mackay and H. F. W. Taylor, 1953: Min. Mag., 30, p. 80).

Nova Scotia

21 H/2 The name centrallassite was given by How to one of three mineral substances found by him in a nodule picked up in the Triassic trap debris of Black Rock, Kings County. Chemical analysis by How: SiO_2 58.86, Al_2O_3 1.14, CaO 27.91, MgO 0.16, K_2O 0.59, H_2O 11.41, total 100.07; S.G. 2.455 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 277) (H. How, 1859: Edin. New Phil. J., vol. X, pp. 84-99). Centrallassite is believed to be identical to gyrolite, which name has precedence.

21 H/3 Gyrolite is found on apophyllite in trap rock at a locality 25 miles southwest of Cape Blomidon, between Margaretville and Port George. An analysis by How follows: SiO_2 51.90, Al_2O_3 1.27, CaO 29.95, MgO 0.08, K_2O 1.60, H_2O 15.05, total 99.85 (H. How, 1861: Edin. New Phil. J., vol. XIV, p. 117 and Am. J. Sci., XXXII, p. 13).

HALITE

NaCl

Halite or common salt is abundantly distributed in solution in oceans, salt lakes, and saline springs, and is frequently produced from these solutions by evaporation. It occurs with gypsum, anhydrite and other salts in sedimentary deposits often of very large extent, and has also been found as efflorescence crusts on soils in arid regions, and as a sublimation product near volcanoes. The X-ray powder pattern of halite has four strongest lines at 3.258 (1), 2.821 (10), 1.994 (5) and 1.628 (1) (H. E. Swanson and R. R. Fuyat, 1953: Nat. Bur. Stds., Circ. 539, II, p. 41).

Alberta

73 E/15 Fine salt, obtained by vacuum-pan evaporation of brine from salt beds 1,000 to 3,500 feet below the surface, is produced at Lindberg (R.K. Collings, 1963: Can. Dept. Mines, Min. Res. Div., Mineral Rept., 7, p. 468).

74 D/11 A deposit of rock salt occurs at depth beneath Fort McMurray at the junction of the Clearwater and Athabasca rivers (L. H. Cole, 1930: Can. Dept. Mines, Mines Br., 716, p. 65).

74 D/11 Efflorescences of halite have been reported to occur at La Saline and at a number of other localities along the Athabasca River (R.G. McConnell, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 35).

82 G/7 Crystals of halite occur in sedimentary rocks in the North Kootenay Pass. Specimens were donated by L.H. Cole to the National Mineral Collection in 1923.

British Columbia

92 G/4 Halite has been reported to occur at Nanaimo (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 112R).

93 B/14 Halite has been found on Saltspring Island in the Victoria mining division (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 112R).

103 I/6 A deposit of halite is reported to cover an area of several hundred acres in a basin near the north shore of the Skeena River, about 40 miles from its mouth (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 115).

Manitoba

62 J/3 Fine salt, obtained by vacuum-pan evaporation of brine from salt beds 1,000 to 3,500 feet below the surface, is produced at Neepawa (R.K. Collings, 1963: Can. Dept. Mines, Mines Res. Div., Mineral Rept., 7, p. 468).

New Brunswick

21 H/15 A drillhole near the village of Gautreau, 20 miles southeast of Moncton, intersected a salt horizon at a depth of 485 feet (L.H. Cole, 1930: Can. Dept. Mines, Mines Br., 716, p. 21).

Halite occurs associated with anhydrite at Dorchester in Westmorland County and at Weldon-Gautreau Salt Basin in Albert County (J.B. Hamilton, 1961: New Brunswick Mines Br., Min. Res. Rept., 1).

Northwest Territories

85 A/1 Halite occurs as efflorescences on clay and as small salt deposits in natural evaporating basins near brine springs along the Salt River (R.G. McConnell, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 63D).

Nova Scotia

11 E/9 Lumps of rock salt weighing from 1 to 2 pounds have been found with glauber salt, calcite, aragonite, and iron oxide in the McDonald and Allison quarries near Newport Landing (formerly Avondale), north of Windsor in Hants County (W.F. Jennison, 1911: Can. Dept. Mines, Mines Br., 84, p. 150).

11 E/13 Coarse rock salt for use in ice and dust control on highways, in fisheries, and by the chemical and agricultural industries, is mined at Pugwash in Cumberland County from a bed 630 feet below the surface (R.K. Collings, 1963: Can. Dept. Mines, Res. Div., Mineral Rept., 7, p. 468).

11 E/14 Salt beds occur in folded Mississippian rocks near Malagash on the Malagash Peninsula in Cumberland County. Production of halite from this deposit began in 1919 (L.H. Cole, 1930: Can. Dept. Mines, Mines Br., Rept. 716, pp. 11-18).

11 F/12 Halite is reported to occur at Antigonish (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 115).

11 K/3 Salt has been found at Whycocomagh in Inverness County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 115).

21 H/16 Brine for the production of fine salts is obtained from halite horizons buried from 1,100 to 1,800 feet below the surface at Nappan, near Amherst (R.K. Collins, 1963: Can. Dept. Mines, Min. Res. Div., Mineral Rept., 7, p. 468).

Ontario

40 P/12 The first discovery of halite in southwestern Ontario was made at Goderich where it was found at a depth of about 1,000 feet in a well drilled for oil. In 1960 more than 90 per cent of Canada's salt production was from salt beds 800 to 1,800 feet below the surface in the area between Amherstburg (40 J/3) and Goderich. Salt producing companies are located at Amherstburg, Goderich, Ojibway, Sandwich, Sarnia and Watford (L.H. Cole, 1930: Can. Dept. Mines, Mines Br., Rept. 716, pp. 36, 37).

42 E/12 Small veins of salt were found beneath a diabase sill in the Undersill Mine, now the property of Leitch Gold Mines in the Beardmore area, Thunder Bay district. The halite occurs in conjunction with quartz veins. Salt water and methane, both under high pressure are also present in the workings (F.J. Scarles, 1956: Econ. Geol., 51, pp. 192-196).

Saskatchewan

73 C/6 Fine salt, obtained by vacuum-pan evaporation of brine from salt beds 1,000 to 3,500 feet below the surface, is reported at Unity

73 C/6 (R.K. Collings, 1963: Can. Dept. Mines, Mines Res. Div. Mineral Rept., 7, p. 468).

HALOTRICHITE

$FeAl_2(SO_4)_4.22H_2O$

Nova Scotia

11 J/4 Halotrichite has been found in shale heaps at the mines at Glace Bay (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, 37T). Chemical analysis by Gilpin: Al_2O_3 9.13, FeO 16.57, SO_3 39.71, H_2O 35.10, total 100.51 (Gilpin, 1886: Nova Scotia Inst. Nat. Sci., VI, p. 175).

The X-ray powder pattern of halotrichite from the above locality shows four strongest lines at 4.79 (10), 4.30 (9), 4.11 (8) and 3.49 (7) (X-ray Laboratory, Geol. Surv. Can.).

HARMOTOME

$BaAl_2Si_6O_{16}.6H_2O$

Harmotome is a zeolite mineral having the ideal composition noted above. There is, however, considerable replacement of Si by Al, with corresponding introduction of alkalies into the Ba position. Small amounts of Ca are often present.

British Columbia

92 I/2 Harmotome has been found as a crust on diorite from the 3,500-foot level of the Craigmont Mine, about 10 miles northwest of the town of Merritt (R.M. Thompson, 1960: personal communication).

Ontario

52 A/5 Small crystals of harmotome are implanted on calcite prisms which in turn rest on a layer of crystalline quartz coating a dark grey shale in the Beaver Mine, O'Connor Township, Thunder Bay district. An analysis by Hoffmann is as follows: SiO_2 46.36, Al_2O_3 17.16, BaO 21.18, CaO 2.25, H_2O 14.54, total 101.49; S.G. 2.39 (G.C. Hoffmann, 1889-90: Geol. Surv. Can., Ann. Rept., V, p. 16R). The X-ray powder pattern of harmotome from the Thunder Bay area has the following strongest lines: 6.38 (7), 4.08 (10), 3.12 (7) and 2.68 (6) (X-ray Laboratory, Geol. Surv. Can.).

Saskatchewan

74 O/13 Harmotome is found with hyalophane in apatite-bearing veins that cut gneisses in the Nissikkatch and Northwest lakes areas, 35 and 40 miles northeast of Uranium City (D.D. Hogarth, 1957: Can. Mineralogist, 6, p. 147).

HASTINGSITE

(See hornblende)

HATCHETTOLITE

(See pyrochlore group)

HAUSMANNITE

$MnMn_2O_4$

The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 3.09 (5), 2.77 (9), 2.49 (10), 1.795 (5), 1.579 (5) and 1.544 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., 85, p. 195).

New Brunswick

21 H/11 Lenses of hausmannite have been found in limestone at the Upham Mine, Markhamville, King's County. The mineral has also been reported at Jordan Mountain (K.O.J. Sidwell, 1952: New Brunswick Res. Develop. Bd.).

HAWLEYITE

CdS

Yukon

105 M/14 Hawleyite, named in honour of Professor J.E. Hawley, Queen's University, Kingston, Ontario, occurs as a bright yellow, earthy coating on sphalerite and siderite in the Hector-Calumet Mine, Galena Hill, near Mayo. The mineral is dimorphous with greenockite and has four strongest lines at: 3.36 (10), 2.90 (4), 2.058 (8) and 1.753 (6) (R.J. Traill and R.W. Boyle, 1955: Am. Mineralogist, 40, pp. 555-559).

HEAZLEWOODITE

Ni_3S_2

Yukon

115 F/15 This rare sulphide mineral has been found with pentlandite and magnetite near the top of Miles Ridge, about 2 miles west of the Alaska Highway bridge across the White River. The sulphides form short narrow stringers cutting the contact between a serpentinized peridotite dyke and a series of tuffs and limestones. Identification of heazlewoodite was confirmed by X-ray powder pattern by R.M. Thompson (V.S. Papezik, 1955: Am. Mineralogist, 40, p. 692).

The strongest lines in the X-ray powder pattern of heazlewoodite from Heazlewood, Tasmania, are: 2.88 (9), 1.828, 1.817 (10) and 1.66 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 45).

HEDENBERGITE

$CaFeSi_2O_6$

Hedenbergite is a monoclinic calcium-iron mineral of the pyroxene group which forms a continuous solid solution series with diopside, the calcium-magnesium end-member. The X-ray powder pattern is not readily distinguishable from that of diopside, i.e., strong lines at: 2.99 (10), 1.62 (10), 1.43 (10), 1.08 (10) and 1.07 (10) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 H/8 Hedenbergite occurs at the Oregon property between Sixteen Mile and Eighteen Mile creeks, 3 miles east of Hedley in the Osoyoos mining division. It is associated with garnet, wollastonite, calcite, minor quartz, and sparsely disseminated sulphides (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

Ontario

31 L/7 A rock containing chiefly hedenbergite, fayalite, garnet, magnetite and apatite, with labradorite porphyroblasts, outcrops on lot 24, conc. V, Calvin Township, west of Amable du Fond River and southwest of Smith Lake (E.M. Heinrich, 1962: Can. Mineralogist, 7, p. 314).

HEDLEYITE

$Bi_5.Bi_2Te_3$

British Columbia

92 H/8 Hedleyite was first found, and named for the locality, at the Good Hope mineral claim, 4 miles southeast of the town of Hedley. Chemical analyses: I. Bi 80.60, Te 18.52, S 0.12, total 99.24; II. Bi 81.55, Te 17.60, S 0.04, total 99.19 (H.V. Warren and M.A. Peacock, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 55). The five strongest lines in the X-ray pattern are: 3.25 (10), 2.37 (5), 2.24 (4), 1.626 (4) and 1.484 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 28).

Hedleyite and Joseite II occur together at the Oregon property, 3 miles east of Hedley. Other associated minerals are native bismuth, molybdenite, and gold. Bornite, chalcopyrite, safflorite, and cobaltite are also present but occur apart from the tellurides. The metallic minerals are sparsely disseminated in a gangue of garnet, hedenbergite, wollastonite, calcite and minor quartz (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

Yukon

115 G/5 Several laths of a bismuth telluride were found in a polished section of a nugget of gold and hessite from Upper Burwash Creek in the Kluane Lake district. The laths occurred with the hessite and when examined by X-ray, gave the hedleyite pattern (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 365).

HELIOTROPE

(See quartz)

HEMATITE

Fe_2O_3

Hematite is the most important ore mineral of iron. It occurs in rocks of all ages as large deposits mainly of sedimentary origin and often subjected to enrichment by subsequent geological processes. It is also found as an accessory mineral in igneous rocks; as a contact metamorphic mineral; as a sublimation product associated with vulcanism; in cracks and crevices in giant quartz veins; and as a product of weathering of iron-bearing minerals. Well-known habit varieties include: rosettes or iron roses, specularite, kidney ore, ochre, and martite. The spacings and intensities (Fe radiation) of the four strongest lines in the X-ray pattern of hematite are: 3.67 (5), 2.70 (10), 2.515 (9) and 1.694 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 E/2 Specimens of specularite from Phoenix were donated to the National Mineral Collection in 1917 by W. Thomlinson.

92 I/11 Large amounts of specular hematite and tourmaline occur in the quartz-diorite rocks of the Highland Valley copper area, east of Ashcroft (J.S. Stevenson, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 131).

New Brunswick

21 G/1 Veins containing hematite occur in sedimentary rock in Chance Harbour, Saint John County (F.J. Alcock, 1938: Geol. Surv. Can., Mem. 216).

21 G/8 Hematite occurs at Clifton in King's County (L.W. Bailey, 1864: Rept. on the Mines and Minerals of New Brunswick).

21 I/4 Quartz veins carrying hematite have been reported at West Bend, Saint John County (F.J. Alcock, 1938: Geol. Surv. Can., Mem. 216).

Nodules of hematite have been found in slate at Coal Creek, Queen's County (K.O.J. Sidwell, 1951: Iron Ore Occurrences in New Brunswick, New Brunswick Res. Dev. Board, Fredericton).

21 J/6 Bands of hematite occur in manganiferous slate at Coldstream in Carleton County (F.D. Anderson, 1956: Geol. Surv. Can., Paper 55-29).

21 P/5 Hematite occurs at Austin Brook and Drummond Iron Mines in Gloucester County (G.S. McKenzie, 1949: New Brunswick Mines Br., Paper 49-2).

Newfoundland

1 M/10 Platy blue hematite which has been partly altered to limonite occurs in a quartz vein near the Cross Hills fault north of Round Hill (D.A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 53).

1 N/10 Five zones of oolitic hematite are exposed in the Ordovician sedimentary rocks on Bell Island in Conception Bay. Three of these zones, known as the Dominion, Scotia, and Little Upper beds comprise the ore of the Wabana Iron Mine. Minerals occurring with the hematite in the ore are chamosite, siderite, calcium phosphate, calcite and quartz (E.R. Rose, 1952: Geol. Surv. Can., Mem. 265, pp. 47-53).

1 N/11 Blebs and seams of hematite occur in a zone about 50 feet wide in conglomerate and greywacke near the north end of Snows Pond, 6 miles southwest of Clarke's Beach (R.D. Hutchinson, 1953: Geol. Surv. Can., Mem. 275, p. 35).

2 C/3 A low-phosphorus, low-silicate, red hematite occurs at the Workington iron prospect, northwest of Lower Island Cove on Bay de Verde Peninsula (A.M. Christie, 1950: Geol. Surv. Can., Paper 50-7, p. 36).

23 B/15 Specular hematite iron-formation is mined at the Wabush Lake Mine located 190 miles north of Sept Iles and near the southern end of Wabush Lake (R.B. Elver, 1963: Can. Dept. Mines, Min. Res. Div., Min. Rept., 7, p. 298).

23 G/2 Ore at the Carol Lake Iron Mine near Wabush Lake, 200 miles north of Sept Iles, consists of specular hematite and magnetite with a small amount of quartz gangue (C. Mamen, 1962: Can. Mining J., vol. 83, No. 11, pp. 45-57).

Nova Scotia

11 E/5 Turgite (hydrohematite) a variety of hematite reported to contain 5.51 per cent adsorbed water occurs at Tennycape in Hants County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 63T).

11 E/6 A deposit of red hematite, limonite, red ochre and goethite occurs about 1/2-mile southwest of Clifton Station, 6 miles west of Truro. The deposit was worked in 1873 and in 1903 but is now abandoned and the two shafts which comprised the workings are caved.

Ore from the Weatherbe Brook deposit on the upper reaches of Weatherbe Brook is reported to consist of limonite, siderite, ankerite and specularite. It was mined from underground workings which are now inaccessible.

The workings at the Upper Kempton deposit consist of two shafts, both now flooded. Ore from the dumps consists of specular hematite now altered by weathering to limonite, goethite and specular oxide. The deposit is 2 miles northwest of Kemptown, about 1,000 feet east of the Kemptown-New Annan Road (I.M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 93).

11 E/9 About 1 mile northeast of Browns Mountain post office is an occurrence of hematite in a bed about 20 feet across and dipping to the south. The hematite impregnates a coarse grit and has been exposed in a number of trenches. East of these is another occurrence, about 5 feet wide, in which the hematite is more compact and of higher grade than the above.

Oolitic hematite, and grit impregnated with hematite, occur in a belt extending for about 4 miles to the southwest of a point located 3/4 of a mile southwest of Malignant Cove in Antigonish County. The most extensive exposures of ore appear in trenches between the east branch of Doctors Brook and the western brook flowing north from Little Hollow.

11 E/9 A bed of hematite from 2 to 3 feet thick outcrops in Arisaig Brook (M. Y. Williams, 1914: Geol. Surv. Can., Mem. 60, pp. 145-148).

11 F/5 A specimen of specular hematite from the Salmon River in Guysborough County was presented to the National Mineral Collection by H. Fletcher in 1883.

11 F/16 Magnetite and hematite are present in two mineralized bands, believed to be of sedimentary origin, in the mid-Cambrian rocks on Gillies Brook at Grand Mira South, Cape Breton Island (L. J. Weeks, 1954: Geol. Surv. Can., Mem. 277, p. 108).

21 A/12 Martite occurs in triassic traps in the North Mountain area, Digby County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 45T).

21 B/8, 21 B/9 It has also been reported from Digby Neck in the same county (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 153).

21 H/8 Martite is reported to have been found at Two Islands, in Cumberland County (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 153).

Ontario

31 C/6 Specular hematite occurs at the Kane Mine in lot 9, conc. XIV, Huntingdon Township, Hastings County. A specimen from this locality is in the National Mineral Collection.

31 C/12 A hematite specimen in the National Mineral Collection was found in lot 12, conc. V, Madoc Township, Hastings County.

31 D/11, 31 D/12 Martite has been found in a gneissoid boulder near Bass Lake about 2 miles west of Orillia (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 45T).

31 E/8 Nodules of martite 1 inch in diameter have been found in lot 28, conc. I, Sabine Township, Nipissing district (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 195).

41 K/15 Specular hematite and jasper occur together at the Batchawana Mine (E. S. Moore, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. II, p. 77).

An iron-formation consisting of hematite and interbanded granular silica occurs on the western shore of the Gross Cap Peninsula near Michipicoten Harbour. A similar but smaller formation is exposed on the southeastern shore of the peninsula and a magnetite-bearing deposit occurs at its eastern point (W. H. Collins, T. T. Quirke, and E. Thomson, 1926: Geol. Surv. Can., Mem. 147, p. 78).

42 C/2 A banded quartz-hematite horizon occurs in the Long Lake iron range at Cuthbertson Lake in the Michipicoten district. The orebody of the old Helen Mine was located at the eastern end of Boyer Lake in the Michipicoten district. Exhausted in 1918, it consisted of a large pocket of hematite formed by oxidation of the siderite ore of the new Helen Mine (W. H. Collins, T. T. Quirke, and E. Thomson, 1926: Geol. Surv. Can., Mem. 147).

52 B/13 The ore at the Steep Rock Lake Iron Mine in the Rainy River district is a hard, brown, compact material consisting of goethite, limonite, hematite, turgite, and quartz in varying amounts. The ore ranges in quality from nearly pure iron oxide to ferruginous chert. Other iron-bearing minerals in the deposit are magnetite, magnetic ferric oxide, siderite, and ankerite (F.G. Smith, 1942: Univ. Toronto Stud., Geol. Ser., 47, p. 71).

52 H/7 Martite is reported to occur at Black Sturgeon Lake, south of Lake Nipigon in the Thunder Bay district (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 153).

Quebec

23 B/16 Hematite is the principal iron-bearing mineral in the ore mined by the Mount Wright Iron Mines Co., Ltd. The deposit occurs in a well-banded quartzite containing many layers of well-crystallized specular hematite. The mine is located about 170 miles northwest of Seven Islands and some 50 miles west of the Quebec North Shore and Labrador Railway (T. Koulomzine and R. P. Jaeggin, 1961: Can. Inst. Mining Met., Bull. 54, p. 766).

23 J/15 Specular hematite, with some magnetite, constitutes the iron ore mined at Schefferville. The ore is fairly hard and is located in a body from 0 to 10 feet underground (R. Grimond, 1961: Precambrian, vol. 34, p. 39).

31 G/12 Specular hematite occurs in range VI, lot 28, Templeton Township, Papineau County. A specimen is in the National Mineral Collection.

31 G/13 A specimen of hematite from range XI, lot 3, Portland Township, Papineau County, is in the National Mineral Collection.

31 H/2 Hematite is irregularly distributed in Dunham Township, range I, lot 5 (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 3).

31 H/3 A specimen of specularite from lot 15 in the township of St. Armand West is present in the National Mineral Collection.

31 H/7 Specularite has been found in Shefford Township on range III, lot 22 (National Mineral Collection).

31 J/4 Near the south shore of the large bay on the east side of Heney Lake is a small deposit of goethite and hematite. The minerals were originally detected in float on a burned-over hillside and subsequent trenching in the vicinity has exposed a few hundred tons of ore grade material (T. L. Tanton, 1944: Geol. Surv. Can., Paper 44-21).

34 C, 34 F Hematite and magnetite are reported to occur in the Nastapoka Islands near the eastern coast of Hudson Bay (H. W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, p. 29).

Yukon

105 D/11 A mass of specular hematite about 150 feet thick occurs at a contact between granite and sedimentary rocks at the Puebla prospect near Whitehorse. Copper minerals occur scattered throughout the deposit (H. S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 39).

106 B/5 An extensive deposit of hematite-jasper iron-formation occurs in the vicinity of the headwaters of the Snake River. Beds up to 200 feet thick are reported to range over an area of some 200 square miles (D. K. Norris, 1963: Geol. Surv. Can., Paper 63-1, p. 19).

106 C, 106 D, 106 E, 106 F In 1905, Charles Camsell reported finding iron ore as float in the Bonnet Plume, Snake, Peel, Rackla, and Bear rivers. It consisted of hematite and magnetite and was presumed to have been derived from the mountains in the vicinity of the headwaters of these streams (H. S. Boctock, 1957: Geol. Surv. Can., Mem. 284, p. 204).

HEMIMORPHITE

$$Zn_4Si_2O_7(OH)_2 . H_2O$$

Hemimorphite is a secondary mineral formed by the action of silica-bearing waters on zinc minerals, and may be a minor ore mineral of zinc, occurring in the oxidized zones of zinc deposits. The mineral was originally known as calamine, which name has also been used for zinc carbonate. The name hemimorphite has been adopted by international agreement. The four strongest lines in the X-ray powder pattern have the following spacings and intensities: 6.54 (7), 3.28 (8), 3.10 (10) and 2.39 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F/3 Hemimorphite occurs in the Hudson Bay Mine, on Sheep Creek in the Nelson mining division (R. A. A. Johnston, 1911: Geol. Surv. Can., Sum. Rept., p. 363).

82 F/10 Small quantities of hemimorphite have been found in the Skyline claim, 2 miles west-southwest of Ainsworth (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 28R).

HESSITE

Ag_2Te

British Columbia

82 E/2 Hessite occurs at the Long Lake or (Jewel Lake) camp, Greenwood mining division, on the Lakeview and North Star claims. At the former, located on the north side of Jewel Lake, hessite is associated with altaite, native gold, native copper, and native tellurium in a segregated quartz vein carrying chalcopyrite, pyrrhotite, and chalcocite. At the latter locality, hessite occurs with native gold, chalcopyrite, pyrite, and galena in a quartz vein. Chemical analysis of hessite from the Lakeview claim by H.A. and J.A. Guess: Te 37.33, Ag 60.68, Au 2.29, total 100.30 (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 12R) (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

Hessite from the Lakeview claim gives an X-ray powder pattern in agreement with the data given by Berry and Thompson (Geol. Soc. Am., Bull. 85, p. 37). The spacings and intensities of the five strongest lines are: 3.01 (6), 2.87 (8), 2.31 (10), 2.25 (7) and 2.14 (6) (X-ray Laboratory, Geol. Surv. Can.).

82 E/4 A quartz-siderite vein on the Calumet claim, Kruger Mountain, Osoyoos mining division, contains hessite, petzite, and gold (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, pp. 11, 12R).

82 E/4, 82 E/5 Hessite occurs in the Hedley Monarch Mine in the Osoyoos mining division. This mine is near Olalla; its holdings extend southerly down Keremeos Creek for nearly 2 miles from Olalla. The hessite was identified in a polished section, and was seen to be in close contact with altaite and petzite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 356).

92 F/10 Hessite is intimately mixed with wehrlite in massive chalcopyrite and bornite at the Marble Bay and Little Billy mines, near Vananda on Texada Island (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 76).

92 O/4 The ore of the Pellaire Mines on Fall Creek, 5 miles southwest of Taseko Lake, consists mainly of sphalerite, pyrite and chalcopyrite. Hessite occurs in both pyrite and chalcopyrite, often as veinlets or inclusions in the former (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 76).

92 O/4, 92 O/5 Polished sections of material from the Con West property at Taseko Lake, Clinton mining division, have shown small areas of hessite embedded in chalcopyrite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 355).

93 E/6 Vuggy limonite-stained quartz veins containing altaite, hessite and galena occur in greenstone close to a granite contact on the Hebson property, near the southwest end of Surel Lake, Tweedsmuir Park, Omineca mining division. Hessite was also identified in polished sections from the Harrison Group on Lindquist Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 355; 35, 452).

Ontario

41 I/6 Hessite is a common constituent of lead-rich ores at the Frood Mine and has also been detected with massive maucherite (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 98).

42 A/1 Hessite is associated with native gold in the quartz veins of the Kirkland Lake area (A.G. Burrows, 1923: Ont. Dept. Mines, Ann. Rept., vol. 32, Pt. IV, pp. 10-20).

Hessite is associated with tetradymite, altaite, and calaverite on the Tough-Oakes claim at Kirkland Lake (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 98).

Grains of hessite are associated with small compact masses of coloradoite, chalcopyrite, and tetrahedrite in coarsely crystalline calcite at the Kirkland Lake Mine (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 356).

42 A/6 Hessite has been identified as thin films on cleavage planes of ankerite at the Hollinger Mine in the Porcupine District (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 356).

Hessite has been identified from the Powell claim (M.E. 22), Deloro Township, Porcupine area. It occurs with native gold in a quartz-ankerite deposit (E. Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 98).

52 B/10 Hessite is found at the Huronian (Moss or Ardeen) Mine in Moss Township, Thunder Bay District. It occurs either in grains with altaite in a gangue of quartz and calcite, or with petzite as a massive black crust, or with gold as a thin bronzy to black film on the surface of a quartz vein (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

52 E/9 Hessite occurs in lead-grey, plate-like masses with quartz, pyrite and chalcopyrite on Gold Creek, east of the head of Pine Portage Bay, Lake of the Woods. An analysis of the hessite

52 E/9 from this locality by Lawson gave the following results: Te 36.72, Ag 63.28, total 100.00; S.G. 7.968 (A.P. Coleman, 1895: Ont. Bur. Mines, Ann. Rept., vol. 5, p. 105).

Quebec

31 M/7 An X-ray powder pattern identification has shown the presence of hessite, as well as petzite, at the Belleterre Mine, in the Mud Lake area, Guillet Township, Temiscamingue County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

32 C/4 Disseminated grains of hessite occur in quartz, along with tourmaline, pyrite, chalcopyrite, and gold, at the Sullivan Mine, Bourlamaque Township, Abitibi County (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 356).

32 D/2 Hessite in association with pyrite and arsenopyrite is found at the McWatter Mine in Rouyn Township, Abitibi County (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 100).

Yukon

105 D/3 Sparsely disseminated hessite occurs with galena in quartz at the Buffalo Hump Group on Mount Stevens, in the Wheaton River District (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 355).

105 D/6 A few pockets containing free gold, pyrite, petzite, sylvanite, hessite, and telluric ochre have been found in a quartz vein on the Gold Reef claim on Gold Hill, Wheaton River district (D.D. Cairnes, 1909: Geol. Surv. Can., Sum. Rept., p. 54) (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

115 G/6 A number of small nuggets of gold and hessite have been obtained from placer workings on upper Burwash Creek (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 355).

HETEROGENITE

CoO.OH

The name heterogenite is applied to a microcrystalline or cryptocrystalline hydrated oxide of cobalt formerly described under four names: nierite, trievite, mindigite and that given above. It occurs in globular uniform masses as a product of the alteration of cobalt-bearing minerals. As no crystals have been isolated for study, crystallographic data are unavailable. Chemical studies have suggested several compositions including some in which copper is an essential constituent. The composition chosen here for use is from M.H. Hey, 1955: "A Chemical Index of Minerals".

The X-ray powder pattern of heterogenite from Katanga, Belgian Congo, has four strongest lines at 4.43 (10), 2.31 (7), 1.81 (5), and 1.425 (3) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 M/5 Small black spheroidal masses of heterogenite occur with vein silver near Cobalt, Ontario (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 158H).

HEULANDITE

$$(Ca, Na_2)Al_2Si_7O_{18}.6H_2O$$

Heulandite is a common mineral of the zeolite group found in cavities in basaltic rocks. It has also been found as a constituent of metalliferous veins, as an alteration product of acidic volcanic rocks, and as an authigenic mineral in sedimentary rocks.

British Columbia

82 F/4 A specimen of heulandite, found near Rossland at the seventh level of the War Eagle Mine, has been donated by R.W. Brock to the National Mineral Collection.

82 F/14 Heulandite occurs near Four Mile (or Silverton) Creek at the Fishermaiden Mine, Slocan division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 121).

82 G/9 A reddish mineral occurring in veins in the Blairmore-Carbondale region has been identified as heulandite (X-ray Laboratory, Geol. Surv. Can.).

92 I/15 The National Mineral Collection includes heulandite from a locality about 1/4 mile above the mouth of Criss Creek in the Ashcroft mining division. The specimen was contributed in 1918 by W.F. Ferrier.

The X-ray powder pattern has four strongest lines at 5.08 (5), 4.64 (3), 3.95 (10) and 2.97 (9). There are some variations in patterns reported by different authors. The three strongest lines are given in the A.S.T.M. Index as 5.16 (7), 3.93 (10), and 2.94 (8) (X-ray Laboratory, Geol. Surv. Can.).

New Brunswick

21 O/15 Heulandite is reported to occur at Dalhousie in Restigouche County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74).

Nova Scotia

21 A/12 Heulandite occurs at Waterford on Digby Neck, Digby County (L.W. Bailey, 1892-93: Geol. Surv. Can., Ann. Rept., IX, p. 147M) also at Williams Brook, a stream flowing into the head of St. Mary's Bay in Digby County (E. Gilpin: Nova Scotia Inst. Nat. Sci., V, p. 294) and in the North Mountain area of Annapolis County (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 97A).

21 A/14 Crystals of heulandite from incrustations on the surfaces of cavities in an amygdaloidal rock at Ste. Croix Cove, Annapolis County. The cavities are from 1/2 to 2 inches in diameter and up to a foot long. Where crystals project into a cavity they exhibit perfect crystal form (T.L. Walker and A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 7).

21 B/8 An analysis of a specimen of heulandite from Petit Passage at the western end of Digby Neck gave the following results: SiO_2 57.26, Al_2O_3 16.81, Fe_2O_3 0.05, CaO 6.58, SnO 1.26, Na_2O 0.54, K_2O 1.02, H_2O 16.22, total 99.74; S.G. 2.216 (A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 52). The mineral has also been found at Mink Cove, Digby County (E. Gilpin: Nova Scotia Inst. Nat. Sci., V, p. 294).

21 H/1 Heulandite, stilbite, clear quartz, amethyst, agate, and jasper are common as amygdules and coatings in large vesicles in the basalts of the Wolfville map-area (D.G. Crosby, 1962: Geol. Surv. Can., Mem. 325, p. 47).

21 H/2 A flesh coloured variety of heulandite is found at Harbourville on the south shore of Minas Channel in King's County (A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 29, p. 52).

Heulandite occurs at Morden about 8 miles southwest along the coast from the above locality (C.W. Willimott, 1882-84: Geol. Surv. Can., Sum. Rept., p. 261).

Three miles northeast of Harbourville, at the settlement of Canada Creek, heulandite occurs as amygdules in basalt (R.A. Wyman, 1960: Can. Dept. Mines, Mines Br., IR 60-63). The mineral also occurs at Hall's Harbour some 6 miles farther east along the coast (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T).

21 H/3 Heulandite has been found on the Ile Haute in the Bay of Fundy (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T).

21 H/7 Occurrences of heulandite are known at Cape D'Or and at Spencer Island on the northern side of Minas Channel (A.R.C. Selwyn, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 55AA).

21 H/8 A number of heulandite occurrences have been reported from the vicinity of Minas Basin. Several attractive specimens have been obtained from Amethyst Cape and a flesh-coloured variety occurs on nearby Cape Blomidon at the eastern end of Minas Basin. On the northern shore, heulandite is found at Wassens Bluff and Clarkes Head where it occurs as honey yellow crystals (A. L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 52). In the same area are the occurrences at Partridge Island (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T) and at Five Islands (A. R. C. Selwyn, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 55AA). The mineral has also been reported from a locality near Swan Creek, Cumberland County (E. Gilpin: Nova Scotia Inst. Nat. Sci., V, p. 294).

Ontario

31 M/5 Heulandite forms a colourless drusy crust on chabazite crystals and stilbite exposed on the west side of Cross Lake near Cobalt (T. L. Walker and A. L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 68).

HEXAHYDRITE

$MgSO_4 . 6H_2O$

Hexahydrite is a white opaque mineral which crystallizes in the monoclinic system. It has a columnar to fibrous structure and a salty, bitter taste. The X-ray powder pattern has four strongest lines with the following spacings and intensities: 5.45 (4), 4.40 (10), 4.03 (4) and 2.97 (7) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 I/14 Chemical analysis of hexahydrite from a locality near the Bonaparte River, halfway between Scottie and Carquill creeks in the Clinton mining division: MgO 17.48, SO_3 35.19, H_2O 47.33, total 100.00; S.G. 1.757 (R. A. A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., pp. 256-57).

HISINGERITE

$Fe_2Si_2O_5(OH)_4 . 2H_2O$

Hisingerite is a brownish black to black, amorphous or finely crystalline material of somewhat uncertain composition. The X-ray powder patterns of hisingerites from different localities consist of broad and relatively weak lines that vary in detail. Several patterns are given by J. A. Whelan and S. S. Goldich, 1961: Am. Mineralogist, 46, p. 1412 .

Ontario

41 H/1 Hisingerite occurs at the Wilcox Mine in conc. IV, lots 19, 20, 21, 22, Cowper Township, in the Parry Sound district. It is associated with pyrite, chalcopyrite, magnetite, pyrrhotite, cubanite and sphalerite. Chemical analysis by R. J. Leonard: SiO_2 35.57, TiO_2 0.12, Fe_2O_3 39.20, FeO 4.80, Al_2O_3 0.38, CaO 0.85, MgO 1.60, H_2O (above 110°C) 11.60; H_2O (below 110°C) 6.00, total 100.07; S.G. 2.50 (G.M. Schwartz, 1924: Am. Mineralogist, 9, p. 141).

Quebec

31 F/10 Hisingerite and pyrrhotite occur together in Pontiac County, Calumet Township, range IX, lot 12. A specimen from this locality was donated by C. W. Willimott, in 1898, to the National Mineral Collection.

31 I/16 At Tetrault Mines near Montauban-les-Mines in Portneuf County, hisingerite is found in a carbonate rock. It is associated with sulphides and is believed to have formed late in the sequence of mineralization (J. J. O'Neill and F. F. Osborne, 1938: Que. Dept. Mines, Prelim. Rept., 138, p. 18).

Chemical analysis of hisingerite from Montauban-les-Mines by H. Boileau: SiO_2 37.54, Al_2O_3 0.56, TiO_2 6.00, Fe_2O_3 37.02, FeO 4.66, MnO 0.75, MgO 2.81, CaO 1.52, H_2O^+ 9.20, H_2O^- 6.00, organic matter 0.05, total 100.11; S.G. 2.53-2.55 (F.F. Osborne and M. Archambault, 1950: Le Naturalistie Canadien, 77, pp. 283-290).

Hisingerite is reported to occur at the following localities in Montauban Township; range I, lots 33-41 and 312-322; range II, lots 38-41 (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 30).

32 D/3 A black glistening mineral occurring in fault zones at the Horne Mine, near Noranda, was identified by Ellsworth as hisingerite (M. E. Wilson, 1941: Geol. Surv. Can., Mem. 229, p. 73).

HOLMQUISTITE

$$Li_2(Mg, Fe)_3(Al, Fe)_2Si_8O_{22}(OH)_2$$

Quebec

32 C/5 Specimens of holmquistite have been found on the property of the Quebec Lithium Corporation near Barraute in Lacorne and Fiedmont townships, Abitibi County. This rare lithium amphibole occurs as massive aggregates at or near the contacts between

32 C/5 spodumene-bearing pegmatite dykes and a hornblende rich rock. Chemical analysis by J.A. Maxwell: SiO_2 59.73, Al_2O_3 11.21, Fe_2O_3 2.97, FeO 8.92, MgO 10.16, CaO 0.56, Na_2O 0.18, K_2O 0.15, Li_2O 3.56, H_2O^+ 2.08, H_2O^- 0.02, TiO_2 0.17, MnO 0.20, F 0.24, total 100.15, less O≡F 0.10, total 100.05; S.G. 3.13. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 8.107 (10), 4.427 (7), 3.612 (5), 3.339 (6), 2.538 (5) (E.H. Nickel, B.S. Karpoff, J.A. Maxwell and J.F. Rowland, 1960: Can. Mineralogist, 6, pp. 504-512).

HORNBLENDE

$(Ca, Na, K)_{2-3}(Mg, Fe^{++}, Fe^{+++}, Al)_5(Si, Al)_8O_{22}(OH)_2$

A relatively common member of the amphibole group, hornblende occurs in a wide variety of rock types including gneisses and schists of metamorphic origin and igneous rocks such as granite, syenite, diorite, gabbro, and basalt. Colour depends upon chemical composition and may be dark green, brown or black. Because the composition is somewhat variable, a number of names are in use to describe the many resulting varieties, notably, hastingsite, edenite, pargasite, and tschermakite. Further distinctions are often made by adding prefixes to the foregoing varietal names so that a particularly iron rich hastingsite might be called ferrohastingsite. Hornblendes form over a relatively wide range of pressures and temperatures and are all characterized by a relatively high calcium content. The distinct prismatic cleavage angles of 56 and 124 degrees distinguish hornblende from pyroxene and tourmaline with which it could otherwise be confused.

The X-ray powder pattern of common hornblende has four strongest lines with the following spacings and relative intensities: 3.38 (9), 3.09 (9), 2.74 (4) and 2.70 (10) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 I/12 The following is a chemical analysis by Wait of a specimen of hornblende from Foster Bar in the Lillooet mining division: SiO_2 38.79, Al_2O_3 11.51, Fe_2O_3 16.88, FeO 15.96, MnO 0.62, MgO 2.86, CaO 11.57, K_2O 1.36, Na_2O 0.71, H_2O 0.92, total 101.18; S.G. 3.404 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 17R).

92 K/13 Hornblende occurs in hornblendite, about 2 miles beyond the Ahnuhati Valley on the north side of Knight Inlet, in the form of small greenish black prisms upon which crystal faces are seldom seen, and as blade-like crystals sometimes 2 or 3 inches long. Chemical analysis by W.B. Campbell: SiO_2 41.0, Al_2O_3 14.6, Fe_2O_3 4.1, FeO 10.5, MgO 13.2, CaO 11.6, Na_2O 2.7, K_2O 0.4, TiO_2 2.7, total 100.8 (J.A. Bancroft, 1913: Geol. Surv. Can., Mem. 23, p. 87).

Newfoundland

12 G/1 The metamorphic rocks in the contact zone of the North Arm Mountain pluton at Bay of Islands, grade from a calcic hornfels adjacent to the ultrabasic material to amphibolite and finally phyllite at the outer edge of the aureole. The amphibolite zone is composed of banded hornblende and plagioclase. The hornblende is poikiloblastic and pleochroic (X golden yellow, Z deep red-brown) with slightly more Mg than Fe. Crystals are aligned with the long axis parallel to the banding (C. H. Smith, 1958: Geol. Surv. Can., Mem. 290, pp. 14-16).

Ontario

31 C/16 An analysis by Harrington of hornblende from conc. VIII, lot 11, Bathurst Township, Lanark County, is as follows: SiO 40.02, Al_2O_3 15.55, Fe_2O_3 3.44, FeO 8.60, MgO 14.37, CaO 12.21, K_2O 2.13, Na_2O 2.40, H_2O 1.81, total 100.53 (B. J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., 201).

31 F/4 An analysis of hastingsite from the York River in Dungannon Township is as follows: SiO_2 34.184, TiO_2 1.527, Al_2O_3 11.517, Fe_2O_3 12.621, FeO 21.979, MnO 0.629, CaO 9.867, MgO 1.353, K_2O 2.286, Na_2O 3.290, H_2O (ign.) 0.348, total 99.601; S.G. 3.433 (B.J. Harrington, 1897: Can. Rec. Sci., VII, pp. 77-87).

31 F/6 Black prismatic crystals of hornblende from conc. XII, lot 32, Sebastopol Township, Renfrew County, are present in the National Mineral Collection.

Chemical analysis by Stanley of hornblende from Renfrew County: SiO_2 43.76, TiO_2 0.78, Al_2O_3 8.33, Fe_2O_3 6.90, FeO 10.47, MnO 0.50, MgO 12.63, CaO 9.84, K_2O 1.28, Na_2O 3.43, H_2O 0.65, F 1.82, total 100.39, less O≡F 0.76, total 99.63; S.G. 3.290 (S.L. Penfield and F.C. Stanley, 1907: Am. J. Sci., Ser. IV, vol. XXIII, p. 39).

Quebec

31 G/10 Fine specimens of edenite are reported from lot 15, range IX, Grenville Township, Argenteuil County. The following chemical analyses are listed by Johnston, 1915, in Geol. Surv. Can., Mem. 74, p. 123. I. SiO_2 45.50, TiO_2 0.68, Al_2O_3 12.25, Fe_2O_3 0.28, FeO 0.75, MnO 0.11, MgO 20.63, CaO 13.31, K_2O 1.76, Na_2O 2.76, H_2O 0.40, F 2.80, total 101.23, less O≡F 1.17, total 100.06; S.G. 3.110 (B.J. Harrington, 1903: Am. J. Sci., Ser. IV, vol. XV, p. 392). II. SiO_2 46.09, Al_2O_3 12.93, Fe_2O_3 0.79, MnO 0.36, MgO 20.82, CaO 12.91, K_2O 1.84, Na_2O 2.36, H_2O 0.66, F 2.84, total 101.60, less O≡F 1.19, total 100.41; S.G. 3.108 (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, p. 14R). III. SiO_2 45.79, TiO_2 1.20, Al_2O_3 11.37, Fe_2O_3 0.42, FeO 0.42, MnO 0.39, MgO 21.11, CaO

31 G/10 12.71, K_2O 1.69, Na_2O 2.51, H_2O 0.67, F 2.76, less O≡F 1.16, total 99.88 (S.L. Penfield and F.C. Stanley, 1907: Am. J. Sci., Ser. IV, vol. XXIII, p. 49).

31 G/12 Hornblende crystals occur in Hull Township, range XVI, lot 12. Specimens from this locality have been donated to the National Mineral Collection.

The National Mineral Collection contains crystals of hornblende from range I, lot 17, Wakefield Township, Gatineau County. They were contributed in 1882 by C.W. Willimott.

31 H/6 Chemical analysis of 'femaghastingsite' from essexite at Mount Johnson: SiO_2 38.633, Al_2O_3 11.974, Fe_2O_3 3.903, FeO 11.523, MgO 10.200, CaO 12.807, Na_2O 3.139, K_2O 1.489, MnO 0.720, TiO_2 5.035, total 99.432 (M. Billings, 1928: Am. Mineralogist, 13, p. 290).

31 H/12 Chemical analysis of 'titaniferous femaghastingsite' from diorite at Montreal: SiO_2 39.23, Al_2O_3 11.94, Fe_2O_3 5.92, FeO 12.04, TiO_2 7.99, total 103.12.

Chemical analysis of 'magnesiohastingsite' from essexite at Montreal: SiO_2 39.23, Al_2O_3 14.38, Fe_2O_3 2.92, FeO 8.56, MgO 13.01, CaO 11.70, Na_2O 3.05, K_2O 0.98, H_2O 0.36, MnO 0.65, TiO_2 4.53, total 99.37; S.G. 3.159 (M. Billings, 1928: Am. Mineralogist, 13, p. 290).

32 I/14 Hastingsite occurs in the rocks along the Metawishish River in the Mistassini Territory as large grains containing inclusions of other minerals. Bluish green hastingsite comprises about 20 per cent of a granite near Grenier Lake in the Albanel area of the Mistassini Territory (J.N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, pp. 14, 15).

31 I/16 Migmatite from Montauban-les-Mines in Chavigny Township is composed mainly of oligoclase and hastingsite. The rock also contains biotite, garnet, quartz, K-feldspar, sphene, apatite and zircon (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 16).

32 F/11 Ferrohastingsite has been identified in a specimen from a locality on the south shore of Alga Lake in the county of Abitibi-East (P.E. Imbault, 1952: Que. Dept. Mines, Geol. Rept., 51, p. 47).

HOWLITE

$Ca_2B_5SiO_9(OH)_5$

Nova Scotia

Howlite was first identified as a new species by Professor H. How who described it under the name of silicoborocalcite. It occurs in earthy form and as nodules embedded in gypsum and anhydrite. Howlite is commonly white but may have streaks of other colours, notably black. Polished howlite has been used as an ornamental stone.

Chemical analysis by How of a specimen from Hants County: SiO_2 15.25, B_2O_3 44.22, CaO 28.69, H_2O 11.84, total 100.00; S.G. 2.55 (Phil. Mag., IV, vol. XXV, pp. 32-41).

Chemical analysis of howlite by Penfield and Sperry: SiO_2 15.33, B_2O_3 44.52, CaO 27.94, Na_2O 0.53, K_2O 0.13, H_2O 11.55, total 100.00; S.G. 2.59 (S.L. Penfield and E.S. Sperry, 1887: Am. J. Sci., Ser. 3, vol. XXXIV, pp. 220-223).

The X-ray powder pattern of howlite from Hants County has five strongest lines with the following spacings and intensities: 6.16 (10), 3.90 (9), 3.10 (8), 2.90 (4), 2.03 (4) (X-ray Laboratory, Geol. Surv. Can.).

11 E/5 Howlite has been reported to occur at Noel, Hants County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T).

21 A/16 Nodules of howlite have been found at Wentworth, a few miles east of Windsor in Hants County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T).

It is also reported to occur with ulexite in gypsum beds near Windsor (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 54).

21 H/1 Howlite occurs at Newport station (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 38T).

HÜHNERKOBELITE

$(Ca, Na)(Fe, Mn)(PO_4)_2$

Northwest Territories

85 I/1 Hühnerkobelite associated with triphylite has been identified in specimens of pegmatite from the Best Bet property at lat. 62°11'N, long. 112°17'W. The spacings and intensities of the four strongest lines in the X-ray pattern of this mineral are: 6.25 (8), 3.47 (4), 2.71 (10) and 2.53 (8) (X-ray Laboratory, Geol. Surv. Can.).

85 I/13 The X-ray Laboratory, Geol. Surv. Can., has identified hühnerkobelite in specimens of pegmatite from the Cota Group at lat. 62°51'N, long. 113°33'W, in the Blaisdell Lake area. It occurs with triphylite, columbite, and apatite.

Ontario

52 H/1 Hühnerkobelite makes up from 1 to 3 per cent of a pegmatite dyke located at lat. 49°13'30"N, long. 88°00'W, about 1 1/2 miles west of the western end of Cosgrave Lake in the Port Arthur mining division. Other minerals in the dyke are microcline, quartz, albite, and muscovite. The identification was made at the Provincial Assay Laboratory, Ont. Dept. Mines (M. H. Frohberg, private communication).

HUMBOLDTINE

$FeC_2O_4 . 1\ 1/2H_2O$

Ontario

40 O/1 Humboldtine has been observed as a sulphur yellow crust on black schists at Kettle Point in Bosanquet Township (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 39T).

HUMITE

$Mg(F, OH)_2 . 3Mg_2SiO_4$

The humite group minerals, norbergite, chondrodite, humite and clinohumite occur almost exclusively in metamorphosed and metasomatized limestone. Identification of individual minerals of the group is difficult and often impossible without the use of X-ray diffraction techniques.

The four strongest lines in the X-ray powder pattern of humite from Monte Somma, Italy, have the following spacings and intensities: 2.44 (8), 2.25 (10), 1.74 (9), and 1.50 (8) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

31 E/11 Humite has been identified by X-ray powder pattern in a specimen taken from the property of Cardiff Uranium Mines in Wilberforce Township, Haliburton County (E. W. Nuffield and D. H. Gorman, 1960: private communication).

HUTTONITE

$ThSiO_4$

The X-ray powder pattern of huttonite has four strongest lines with the following spacings and intensities: 4.23 (7), 3.29 (7), 3.09 (10) and 2.89 (8) (A. Pabst and C.O. Hutton, 1951: Am. Mineralogist, 36, p. 60).

Ontario

41 I/5 Huttonite has been found on the Canadian Thorium property in the Agnew Lake area, Hyman Township, Sudbury district. The mineral was identified by X-ray diffraction (E.W. Nuffield and D.H. Gorman, 1960: private communication).

HYALITE

(See opal)

HYALOPHANE

(See potassium feldspar)

HYDROCARBONS

Naturally-occurring hydrocarbon compounds that possess neither a definite chemical composition nor atomic structure cannot be properly classified as mineral species. Some of the better known occurrences are listed together for convenience.

British Columbia

103 Ozocerite, a paraffin wax of variable melting point, has been found at several points on Graham Island, Queen Charlotte mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 173).

Manitoba

63 F/8 Pieces of amber up to the size of a robin's egg were found in gravel and sand along the shore of Cedar Lake, near the mouth of the Saskatchewan River. The amber was named chemawinite after a nearby Hudson Bay Company post. Chemical analysis by B.J. Harrington: C 80.03, H 10.47, O 9.50, total 100.00 (J.B. Tyrrell, 1892: Geol. Surv. Can., Ann. Rept., V, p. 255E).

New Brunswick

21 H/15 A wedge-shaped vein of hydrocarbon, having a width at the surface of 16 feet, was discovered along Frederick Brook, 4 miles southwest of Hillsborough, Albert County, by one John Duffy in 1849. The hydrocarbon, named albertite after the county, was subsequently mined as coal for 14 years, during which time more than 200,000 tons of albertite were recovered and shipped to the United States (G.S. Hume, 1932: Geol. Surv. Can., Econ. Geol. Ser., 9, p. 177).

Chemical analysis of albertite by Rogers: C 78.80, H 6.16, N 1.50, S 2.03, O 10.11, ash 1.40, total 100.00 (A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 33).

Northwest Territories

75 E/13, 85 H/16 Anthraxolite has been found on Union Island in Great Slave Lake. It occurs as a vein a few inches thick in a metamorphosed, fine-grained, sedimentary rock. It is associated with sulphides and quartz (R.L. Rutherford, 1928: Am. Mineralogist, 13, p. 516) (R.L. Rutherford, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 124).

95 F/7 A thin irregular band of anthraxolite occupies the medial part of a vein at Meilleur Creek in the South Nahanni River area. It also occurs finely intermixed with calcite, quartz, and sulphides (R.L. Rutherford, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 123).

Ontario

31 E/4 Thucholite occurs in a pegmatite dyke on lots 9 and 10, conc. IX, Conger Township, Parry Sound district. Approximate analysis: volatile gases 26.08 (H_2O, direct, 12.96; gas, by difference, 13.12), ash 28.06, fixed carbon 45.86, total 100.00. Chemical analysis of ash: water soluble 1.60, PbO 0.20, U_3O_8 5.80, ThO_2 48.48 $(Ce, La, Di)_2O_3$ 5.45, $(Yt, Er)_2O_3$ 10.95, Fe_2O_3 1.50, V_2O_5 2.25, MnO 0.02, Al_2O_3 1.45, CaO 0.50, ZrO_2 0.80, K_2O 0.15, Na_2O 0.22, P_2O_5 3.21, SiO_2 14.70, total 97.28. Volatile gases (volume per cent): CO_2 6.444, CO 35.827, CH_4 1.500, H_2 44.498, N_2 3.562, A 0.010, S_2 0.063, Cl_2 0.033, F_2 0.167, H_2O 7.857, total 99.961 (H.V. Ellsworth, 1928: Am. Mineralogist, 13, p. 419) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 178).

41 H/15 Thucholite is intimately associated with uraninite at the Beaver Mine, lot 5, conc. B, Henvey Township. Approximate analysis: ash 24.13, volatiles 26.42, free carbon 49.45, total 100.00. Chemical analysis of ash (average of two samples): SiO_2 15.52, PbO 1.03, R.E. oxides + ThO_2 19.64, U_3O_8 53.09, Al_2O_3 0.97, Fe_2O_3 0.63 BeO 1.20, CaO 5.50, MgO 1.86, total 99.44

41 H/15 (G. L. Barthauer, C. L. Rulfs, and D. W. Pearce, 1953: Am. Mineralogist, 38, pp. 802-814).

41 I/11 Veins of anthraxolite occur in the rocks of the Onwatin Formation in the Sudbury Basin. Some development work has been carried out on a small deposit of the mineral in Balfour Township, lot 10, conc. I (H. C. Cooke, 1946: Geol. Surv. Can., Bull. 3, p. 48).

Chemical analysis of Sudbury anthraxolite by Coleman: approximate analysis - volatiles 5.3, 5.3; fixed carbon 74.2, 64.7, ash 20.5, 30.0; ultimate analysis: C 94.92, H 0.52, N 1.04, O 1.69, S 0.31, ash 1.52, total 100.00 (A. P. Coleman, 1928: Am. J. Sci., vol. 15, pp. 21-25).

Anthraxolite has been found on lot 9, conc. VI, Fairbank Township (G. M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., X, p. 124A).

41 J/10 Nodules and blebs of hydrocarbon occur in fractures in the radioactive conglomerate at the Quirke Mine in the Blind River camp. The fractures also contain calcite, pyrite, sphalerite, and chalcopyrite. Analysis by Fuels Division, Mines Br., Can. Dept. Mines: proximate - ash 3.6, volatile matter 23.8, fixed carbon 72.6; ultimate - C 84.7, H 4.7, S 1.8, N 0.7, ash 3.6, O by difference 4.5. Spectrographic analysis of ash showed uranium and thorium contents less than 0.05 per cent (Unpublished report, R. J. Traill, 1956).

52 A/6 Veins of uranium-bearing anthraxolite occur in and near the city of Port Arthur. Other minerals present in the veins are silver, argentite, galena, chalcopyrite, sphalerite, pyrite, quartz, calcite, fluorite, and barite (A. H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 120).

Quebec

21 L/12 Thucholite is present in a pegmatite dyke on lot 331, range III in the Parish of Notre Dame de Portneuf. Uranophane and autunite have been tentatively identified as associated minerals (A. H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 152).

21 M/16 A pegmatite dyke near the north shore of Lac du Pieds des Monts, 18 miles north of Murray Bay, is reported to contain some thucholite (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 250).

31 F/9 A low density radioactive mineral from Pontiac County has been identified as thucholite. It is reported to occur in Clarendon Township on range XII, lot 5, and on range XIII, lot 3 (D. M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 24).

31 G/14 Thucholite has been described from a pegmatite that constitutes the Wallingford Mine on lot 14, range II of Derry Township,

31 G/14 Papineau County. It most commonly occurs as rounded grains but it is also found intergrown with altered uraninite and possibly replacing the latter mineral as cubes and octahedrons. A pseudomorph of thucholite after tourmaline was also noted. Approximate analysis: water 13.53, gases 28.70, ash 19.84, fixed carbon 37.93, total 100.00. Approximate chemical analysis of ash: U_3O_8 18.2, ThO_2 10.4 $(Ce, La, Di)_2O_3$ 22.8, $(Yt, Er)_2O_3$ 12.8, CaO 15.7, $Fe_2O_3 + Al_2O_3$ etc. 4.3, SiO_2 6.4, total 90.6 (H.V. Ellsworth, 1928: Am. Mineralogist, 13, pp. 442-448).

Saskatchewan

74 N/7 Thucholite occurs with pitchblende, chalcopyrite, and pyrite in altered volcanic rocks on the eastern side of Black Bay, Lake Athabasca (A.H. Lang, 1957: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 93).

74 N/8 Thucholite is fairly abundant in surface exposures at the Consolidated Nicholson No. 4 deposit as well as underground. It has been reported also from the Box Mine and Fish Hook Bay. Chemical analysis of purest available material by E.J. Brooker: loss on ignition 94.66, SiO_2 0.18, PbO 0.32, CaO 1.75, MgO 0.24, NiO 0.58, CoO 0.26, $Fe_2O_3 + Al_2O_3$ 0.11, CuO 0.26, U_3O_8 0.28, R.E. oxides 0.05, Al group insol. 0.02, total 98.71 (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31, p. 69).

74 N/9 Shear zones on the Hab Group, 1 mile north of Donaldson Lake, are mineralized with thucholite, quartz, chlorite, carbonate, pitchblende, hematite, and a little pyrite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 91).

HYDROMAGNESITE

$3MgCO_3.Mg(OH)_2.3H_2O$

British Columbia

92 I/9 A hydromagnesite deposit occurs east of Buce Lake and 1/4 of a mile south of Vernon road, 17 miles east of Kamloops. It occupies a depression about 1/4 of a mile long and from 200 to 400 feet wide. The hydromagnesite appears to be in horizon from 1 to 2 1/2 feet thick, and overlain by 10 to 30 inches of drift. The results of a partial analysis are as follows: insol. in HCl 20.74, Fe, Al group 3.91, CaO 1.76, MgO 34.20, MnO 0.07, SO_3 0.05, H_2O 6.56, loss on ignition 38.45.

A dry lake on the road to Campbell Range, 2 miles east of Barnhart Vale and 12 miles east of Kamloops is filled to a depth of about 6 feet with hydromagnesite. The deposit is covered by a 6-inch layer of overburden.

92 I/9 Irregular patches of hydromagnesite occur in a depression west of the road to Campbell Range and 13 miles southeast of Kamloops. Thicknesses vary from 3 to 20 feet and the diameter of the depression is about 250 feet (W.E. Cockfield, 1948: Geol. Surv. Can., Mem. 249, p. 146).

92 O, 92 P Hydromagnesite has been found at several localities in the Lillooet district, including the following: Clinton (92 P/4), Meadow Lake (92 P/5), Watson Lake (92 P/11); and Riske Creek (92 O/15).

Chemical analyses of some of the purest beds of hydromagnesite are as follows: Clinton, analyst F. Baridon: SiO_2 2.30, Al_2O_3 0.63, Fe_2O_3 0.13, MgO 41.60, CaO 0.22, CO_2 35.88, SO_3 0.36, H_2O^+ 17.53, H_2O^- 1.12, total 99.77. Meadow Lake, analyst F. Baridon, average of 5 samples: SiO_2 1.22, Al_2O_3 0.67, Fe_2O_3 0.18, FeO 0.63, MgO 40.56, CaO 1.26, CO_2 35.95, H_2O^+ 18.00, H_2O^- 1.45, total 99.93. Watson Lake, analyst R.A.A. Johnston: SiO_2 1.73, Al_2O_3 0.12, Fe_2O_3 0.07, MgO 43.73, CO_2 37.03, H_2O^+ 17.79, total 100.90. Riske Creek, analyst A. Sadler: lot 178, SiO_2 1.85, Al_2O_3 0.48, Fe_2O_3 0.20, FeO 0.16, MgO 41.74, CaO 0.17, CO_2 40.85, SO_3 0.11, H_2O^+ 12.98, H_2O^- 1.67, total 100.21; lot 1188, SiO_2 1.22, Al_2O_3 0.48, Fe_2O_3 0.25, FeO 0.09, MgO 41.14, CaO 0.10, CO_2 37.70, SO_3 0.08, H_2O^+ 17.78, H_2O^- 1.28, total 100.11 (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 29).

104 N/12 Extensive deposits of earthy hydromagnesite are reported to occur in the Atlin area in northwestern British Columbia (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 11R).

Average of 8 analyses of pure white material by N.L. Turner: SiO_2 1.40, Al_2O_3 0.66, Fe_2O_3 0.22, FeO 0.59, MgO 41.10, CaO 0.90, CO_2 35.39, H_2O^+ 18.36, H_2O^- 1.38, total 100.00 (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 29).

The X-ray powder pattern of hydromagnesite from Atlin shows five strongest lines having the following spacings and intensities: 6.32 (5), 5.80 (10), 4.15 (7), 2.91 (9) and 2.15 (5) (X-ray Laboratory, Geol. Surv. Can.).

Northwest Territories

86 L/11, 86 L/12, 86 L/14 White and pinkish coloured hydromagnesite occurs along the south shore of Dease Bay, Great Bear Lake. It forms amorphous incrustations on the surfaces of cavities in a porous dolomite (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 22R).

Quebec

21 E/14 Hydromagnesite specimens in the National Mineral Collection were obtained from an occurrence on the Montreal Chrome property, northeast of Little Lake St. Francis, Coleraine Township.

HYDRONEPHELITE

(aluminosilicate of Na)

British Columbia

82 N/1 Occurs as white and pinkish spherules in the nepheline syenites of Ice River, Beaverfoot River, and Kicking Horse River. Chemical analysis by Johnston: SiO_2 42.80, Al_2O_3 28.50, Fe_2O_3 0.34, CaO 1.90, Na_2O 14.33, K_2O 0.30, H_2O 10.81, total 98.98 (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 13R).

This species is of doubtful validity and may be a mixture of natrolite or nepheline, or both, with diaspore or gibbsite (M. H. Hey, 1962: Chemical Index of Minerals, p. 142).

HYDROTALCITE

$MgCO_3 . 5Mg(OH)_2 . 2Al(OH)_3 . 4H_2O$

Quebec

21 L/3 Chemical analysis of hydrotalcite from Vimy Ridge Mine, Megantic County, by R.J.C. Fabry: SiO_2 3.92, Al_2O_3 21.08, MgO 34.79, CaO trace, H_2O 32.25, CO_2 8.51, insol. 0.13, total 100.68 (J. A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 308).

31 G/15 Hydrotalcite has been identified by its X-ray diffraction pattern in a specimen from the Kilmar Mine in Argenteuil County. The pattern has five strongest lines at 7.41 (8), 3.82 (10), 2.57 (7), 2.28 (6) and 1.94 (8) (X-ray Laboratory, Geol. Surv. Can.).

HYDROZINCITE

$Zn_5(CO_3)_2(OH)_6$

Hydrozincite is pure white to grey, fluoresces pale blue or lilac in ultraviolet light, and occurs as a secondary mineral found in the oxidized zone of copper and zinc deposits. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 6.66 (10), 3.14 (5), 2.72 (7), 1.687 (5) and 1.465 (5) (Ann P. Sabina and R.J. Traill, 1960: Geol. Surv. Can., Paper 60-4, p. 51).

British Columbia

104 P/3 Galena, sphalerite, chalcopyrite, scheelite, and hydrozincite occur in a shear zone in limestone at the McDame Belle property,

104 P/3 on McDame Creek, about 1 mile east of Centreville (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

HYPERSTHENE

$(Fe, Mg)SiO_3$

The orthorhombic pyroxene, hypersthene, is found in many basic igneous rocks both of an intrusive and, more commonly an extrusive nature. It is the iron rich member of a series which, with increasing magnesium content grades into bronzite $(Mg, Fe)SiO_3$, and finally enstatite, $MgSiO_3$, the magnesium rich end-member. The minimum FeO content for hypersthene is about 15 per cent, and in many cases alumina is present, 10 per cent being its upper limit.

Newfoundland

14 C/11 The five strongest lines in the A.S.T.M. standard X-ray powder pattern of hypersthene are listed as: 3.20 (10), 2.98 (8), 1.60 (6), 1.49 (8), 1.39 (6). The hypersthene is reported to have come from Isle Paul, and the following chemical analysis is given: SiO_2 52.19, TiO_2 0.50, Al_2O_3 6.23, Fe_2O_3 1.21, FeO 14.25, MgO 20.06, CaO 3.26, MnO 0.32, total 98.02 (A.S.T.M. X-ray diffraction pattern 2-0520).

14 C/12 Chemical analysis of colourless hypersthene from Nain, Labrador, by H.S. Washington: SiO_2 51.81, TiO_2 0.76, Al_2O_3 2.16, Fe_2O_3 4.52, FeO 13.96, MnO 0.16, MgO 24.57, CaO 1.95, Na_2O 0.39, K_2O 0.03, H_2O 0.19, total 100.50; S.G. 3.415 (H.S. Washington and H.E. Merwin, 1923: Am. Mineralogist, 8, p. 64).

Quebec

21 L/14 The following are the results of two analyses of hypersthene from Chateau Richer, Montmorency County, by Hunt: I. SiO_2 51.35, Al_2O_3 3.70, FeO 20.56, CaO 1.68, MgO 22.59, volatiles 0.10, total 99.98; S.G. 3.41; II. SiO_2 51.85, Al_2O_3 3.90, FeO 20.20, CaO 1.60, MgO 21.91, volatiles 0.20, total 99.66 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 468).

22 D, 22 F Hypersthene is a common mineral in the dark-coloured anorthosites in Roberval and Chicoutimi counties to the northeast of Lake St. John. In the area between Passe Dangereuse and St. Ludger-de-Milot, crystals of hypersthene attaining lengths of 6 inches are often found (S.H. Ross, 1949: Que. Dept. Mines, Geol. Rept., 39).

Saskatchewan

74 N/9 A mineralized zone located about 24 miles northeast of Goldfields consists of brecciated norite cemented and partly replaced by

74 N/9 pyrrhotite. The norite is comprised almost completely of hypersthene and plagioclase. In spite of a high ferrous iron content, the hypersthene is colourless and nonpleochroic. Chemical analysis of hypersthene by R. J. C. Fabry is as follows: SiO_2 48.91, Al_2O_3 3.50, Fe_2O_3 0.30, FeO 24.16, CaO 0.59, MgO 19.59, Na_2O 0.01, K_2O 0.12, H_2O^+ 0.99, H_2O^- n.d., TiO_2 0.83, MnO 0.16, total 99.16 (H.C. Cooke, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 67).

IDOCRASE

(See vesuvianite)

ILMENITE

$FeTiO_3$

Ilmenite may form both as a result of crystallization from a magma and as a product of metamorphism. It commonly occurs disseminated in basic to intermediate igneous rocks, and as a heavy constituent of beach sands. In many of its occurrences it is associated with magnetite. Ilmenite is an important ore mineral of titanium.

British Columbia

82 N/1 An analysis by G.C. Hoffmann of ilmenite from the Ice River in the Golden mining division yielded the following results: TiO_2 47.5, FeO 39.8, MnO 6.5, total 93.8.

The ilmenite occurs as crystals in veins in a mass of intrusive syenitic rocks which is extensively developed along the Ice River (G.M. Dawson, 1885: Geol. Surv. Can., Ann. Rept., I, p. 124B).

New Brunswick

21 H/11 Ilmenite occurs in gabbro at Point Wolfe River in Saint John County (E.D. Kindle, 1961: Geol. Surv. Can., Map 1109A).

Nova Scotia

20 O/16 Massive ilmenite from Chegoggin Point, about 3 miles west of Yarmouth, in Yarmouth County was donated to the National Mineral Collection. The X-ray powder pattern of this specimen has six strongest lines with the following spacings and intensities: 2.75 (10), 2.54 (7), 1.87 (5), 1.726 (8), 1.505 (5) and 1.469 (4) (X-ray Laboratory, Geol. Surv. Can.).

20 P, 21 A — Iserine, a variety of ilmenite, is found in the sands of the western counties of Nova Scotia. A sample examined by H. How contained 30 per cent iserine (Henry How, 1864: Nova Scotia Inst. Nat. Sci., I, pp. 78-86).

21 A/12 — Iserine, a variety of ilmenite has been found on the north shore of St. Mary's Bay in Digby County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 40T).

Ontario

31 F/4 — Abundant ilmenite is associated with titanite, allanite, pyroxene, and zircon in the north dyke of the McDonald Mine. This mine is located in conc. VII, lots 18 and 19, Monteagle Township, Hastings County (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 209).

Quebec

21 L/14 — Chemical analysis by Hunt of ilmenite from Chateau Richer, Montmorency County: TiO_2 39.86, Fe_2O_3 and FeO 56.64, MgO 1.44, insol. 4.90, total 102.84 (W. E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 501).

21 M/8 — Chemical analyses of samples of ilmenite found in feldspar at Baie St. Paul, Charlevoix County, have yielded the following results: I. Hunt, 1863: TiO_2 48.60, Fe_2O_3 10.42, FeO 37.06, MgO 3.60, total 99.68; II. Penny, 1873-74: TiO_2 40.00, Fe_2O_3 20.35, FeO 29.57, Al_2O_3 4.00, MgO 3.17, CaO 1.00, SiO_2 1.91, total 100.00 (W. E. Logan, 1863: Geol. Surv. Can., Rept. Prog., p. 501) (B. J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 227).

21 M/9 — Ilmenite occurs on the east bank of the northeast fork of the Gouffre River, Charlevoix County. Partial analyses of five samples gave: I. Fe 44.13, Ti 38.88, V 0.14; II. Fe 43.00, Ti 38.07, V 0.15; III. Fe 44.60, Ti 36.60, V 0.16; IV. Fe 43.94, Ti 36.09, V 0.16; V. Fe 42.45, Ti 36.14, V 0.14 (H. W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, revised ed., p. 11).

Ilmenite specimens from the Brassard deposit, which is located 20 miles northwest of la Malbaie and 1/2 mile east of the northeast arm of the Gouffre River, a mile beyond the point where the river crosses the west boundary of Lacoste Township, Charlevoix County, have been analyzed with the following results: Sample 1. massive ore: Fe 42.28, TiO_2 39.89. Sample 2. ore with rock inclusions: Fe 30.37, TiO_2 27.03. Sample 3. massive ore: Fe 41.79, TiO_2 39.28. Sample 4. ore with rock inclusions: Fe 30.21, TiO_2 29.04. Sample 5. massive ore: Fe 43.33, TiO_2 36.92. Sample 6. massive ore: Fe 42.22, TiO_2 27.76 (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, pp. 15, 16).

21 M/10 A mass of ilmenite is exposed at the Coulombe Mine on lot 319, Saint-Urbain range, Charlevoix County. Partial chemical analyses gave: I. SiO_2 2.64, FeO 51.54, TiO_2 41.00, P 0.04, S 0.041; II. SiO_2 3.12, FeO 55.14, TiO_2 35.46, P 0.044, S 0.04; III. SiO_2 2.68, FeO 52.98, TiO_2 38.40, P 0.041, S 0.04.

Partial chemical analyses of specimens from the Fourneau or Furnace Mine, lots 352, 361, Saint-Urbian range, Charlevoix County: I. Fe 36.25, Ti 29.16, SiO_2 --; II. Fe 37.21, Ti 24.00, SiO_2 1.91.

At Glen Prospects, lot 312, Saint-Urbain range, Charlevoix County, a mass of ilmenite 35 by 30 feet was exposed. Partial chemical analysis: SiO_2 1.68, FeO 55.36, TiO_2 38.26, S 0.041, P tr. (H.W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173).

22 I/7 An outcrop of ilmenite occurs 1 3/4 miles northeast of the village of Thunder River (Rivière au Tonnerre) located at the confluence of the river of the same name with the St. Lawrence River. Partial analysis gave: Fe 49.75, Ti 21.20 (H.W.McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 21).

22 J/1, 22 J/8 Chemical analysis by Hunt of ilmenite from the Bay of Seven Islands, Saguenay County: TiO_2 34.30, Fe_2O_3 49.77, insol. 6.35, total 90.42 (T.S. Hunt, 1866-69: Geol. Surv. Can., Rept. Prog., p. 260).

22 J/2 Ilmenite occurs near Clarke City on the Sainte Marguerite River. Below the falls at the city, lenticular masses of the ore occur in anorthosite. Partial analysis of the material gave the following results: Fe 55.10, Ti 12.42, P 0.049, SiO_2 1.52. A quarry about 1/2 mile above the falls exposed ore giving the following analysis: Fe 38.86, Ti 9.06, P 0.08, SiO_2 15.96 (H.W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 20).

22 J/8 Ilmenite occurs on the Des Rapides River at a point 100 feet below Outarde Falls (Chute aux Outardes) and in an outcrop 100 feet west of the river. Analysis of ore from the former locality gave: FeO 33.11, TiO_2 17.54, and from the latter: FeO 70.70, TiO_2 18.12, P_2O_5 0.075, S 0.08 (H.W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 19).

31 G/16 A partial chemical analysis of ilmenite found at St. Jerome in Terrebonne County gave: TiO_2 32.36, Fe 24.65 (B.J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 227).

31 H/1 A partial analysis of ore from conc. III, lot 1, Brome Township, Brome County, gave: TiO_2 24.16, Fe 41.46 (B.J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., pp. 227-228).

31 H/2 Ilmenite has been reported in conc. IX, lot 8, and in conc. XI, lot 7, Sutton Township, Brome County. Partial analysis of ore from the former location: TiO_2 29.86, Fe 39.14, and from the latter: TiO_2 27.20, Fe 40.87 (B. J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 228).

31 H/13 Partial chemical analysis of ilmenite obtained at St. Julienne in Montcalm County gave: TiO_2 33.67, Fe 38.27 (B. J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 227).

31 J/1 Ilmenite has been found to occur in range VI, lots 39-41, Beresford Township, Terrebonne County.

Specimens of ilmenite from the Ivry Mine in lots 37, 38, range V, Beresford Township, Terrebonne County were donated to the National Mineral Collection in 1926 by E. A. Thompson. Partial chemical analyses of ilmenite ore from the Ivry Mine gave: Fe 48.05, 47.86 and Ti 18.18, 19.00 (H. W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, revised ed., p. 14).

ILVAITE

$$CaFe_2(FeOH)(SiO_4)_2$$

Ilvaite is a black opaque mineral which commonly forms striated prisms. It is found in association with magnetite, zeolites, and ores of zinc and copper. It often contains manganese replacing ferrous iron.

British Columbia

92 C/15 Ilvaite has been reported to occur at the Monitor Copper Mine, which is located at Montier Landing on the north shore of the Alberni Canal, 2 miles above the entrance into Barclay Sound.

Chemical analysis by Hoffmann of a sample from this locality gave: SiO_2 29.81, Al_2O_3 0.16, Fe_2O_3 18.89, FeO 32.50, MnO 2.22, CaO 13.82, MgO 0.30, H_2O 1.62, total 99.32. A specimen of ilvaite found near the head of Barclay Sound was given to the National Mineral Collection (G. C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 11R) (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 130).

The X-ray pattern of this material have five strongest lines at 7.23 (10), 2.84 (9), 2.71 (8), 2.67 (6), 2.17 (5) (X-ray Laboratory, Geol. Surv. Can.).

INYOITE

$$Ca_2B_6O_{11}.13H_2O$$

New Brunswick

21 H/15 Inyoite occurs at Hillsborough in Albert County with ulexite. Specimens of this material were identified by R. P. D. Graham and stored at the Redpath Museum, McGill University (T. L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 54; and Mrs. J. S. Stevenson, 1960: private communication).

Inyoite has been identified in a specimen collected at the Whitehead gypsum quarry, Hillsborough. It occurs with selenite crystals, sometimes superimposed on them, on a piece of greyish white, fairly compact gypsum. The inyoite forms white translucent crystals, which are remarkably well developed and clear, and with rare exceptions are doubly terminated. Chemical analysis by H. V. Ellsworth: CaO 20.42, H_2O^+ 9.46, H_2O^- 32.46, SO_3 0.55, B_2O_3 37.44, total 100.33 (E. Poitevin and H. V. Ellsworth, 1921: Geol. Surv. Can., Museum Bull. 32).

The X-ray powder pattern of inyoite from Hillsborough shows five strongest lines having the following spacings and intensities: 7.60 (10), 4.72 (6), 3.03 (4), 2.78 (4), and 2.29 (4) (X-ray Laboratory, Geol. Surv. Can.).

IRIDOSMINE

Os, Ir

Iridosmine is the osmium-rich phase of the Os-Ir system. Rhodium, platinum, ruthenium and a few other elements are usually present in minor and trace amounts. It is found occasionally in placer deposits, usually in association with gold or platinum.

The X-ray powder pattern of iridosmine shows four strongest lines having the following spacings and intensities: 2.36 (4), 2.16 (5), 2.07 (10), 1.23 (4) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 H/7 Iridosmine, in association with platinum and alluvial gold, has been reported on Granite Creek, a branch of the Tulameen River, Similkameen mining division (G. C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, pp. 5-9T).

104 J/8 Iridosmine occurs at Dease Lake in the Quesnel mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 132).

104 N/11 Iridosmine occurs in deep or buried placer deposits on Ruby Creek, northeast of Atlin, in the Atlin mining division. The stream has cut a deep narrow canyon through a basalt flow to the gravels which were deposited before the volcanic eruption. The

104 N/11 main mineral components of the black sand are: cassiterite 38%, wolframite 52%, magnetite 10% (T. L. Gledhill, 1921: Univ. Toronto Stud., Geol. Ser., 32, p. 40).

Quebec

21 E/16, 21 L/2 Iridosmine is associated with platinum in the gold washings of the Riviere du Loup, now known as the Rivière Liniere, a branch of the Chaudiere River, in Beauce County (T. S. Hunt, 1863: Geol. Surv. Can., Rept. Prog., p. 520) (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 40T).

IRON

Fe

Naturally occurring iron may be either of terrestrial or meteoric origin. The terrestrial variety has been found in a number of placer deposits and is known also to occur embedded in feldspar and basalt. Most meteorites contain iron invariably alloyed with nickel. It may comprise the whole mass of the meteorite, or form a spongy matrix containing grains of silicates, or occur disseminated throughout a stony matrix.

The X-ray powder pattern taken with Fe/Mn radiation, has the following four strongest lines: 2.03 (10), 1.438 (4), 1.173 (8) and 1.015 (5) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 13).

Alberta

83 G/8 Metallic iron reduced from clay ironstone by the action of burning lignite has been observed by Tyrrell at a point on the North Saskatchewan River about 70 miles above Edmonton. Some masses were found having a weight of 15 to 20 pounds (J. B. Tyrrell, 1887: Am. J. Sci., XXXIII, Ser., 3, p. 73).

Ontario

31 L/7 Minute steel grey spherules of native iron have been found in a perthitic pegmatite on lot 7, conc. B of Cameron Township. They occur with magnetite in association with kaolinite and limonite. The following is an analysis by Johnston, of iron from this locality: Fe 90.45, Mn 0.75, Ni trace, S undetected, P undetected, organic mar., undetected, insol. 7.26, total 98.46; S.G. 7.257 (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, pp. 23, 24R).

41 J/5 Iron is found as spherules embedded in limonite which coats fissures in quartzite on the north shore of St. Joseph Island and on Campement d'Ours Island in Lake Huron, Algoma district. An analysis of the iron from St. Joseph Island gave: Fe 88.00, Mn

41 J/5 0.51, Ni 0.10, Co 0.21, Cu 0.09, S 0.12, P 0.96, insol. 9.76 (SiO_2 9.17, Al_2O_3 0.11, Fe_2O_3 0.10, CaO 0.06, MgO 0.03, loss 0.29, total 9.76), total 99.75; S.G. 6.8612 (G.C. Hoffmann, 1890: Trans. Roy. Soc. Can., VIII, sec. 3, pp. 39-42).

41 P/7 Iron occurs as scales with silicates in a gossan at Smooth Water Lake in the Gowganda mining division, Timiskaming district (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p.266).

JADE

(See actinolite)

JAMESONITE

$4PbS.FeS.3Sb_2S_3$

Most jamesonite contains up to 3 per cent Fe and minor amounts of other elements, notably Ag, Cu, Zn, in addition to the major elements, Pb, Sb, and S. This sulphosalt mineral is found in ore veins associated with other sulphosalts, galena, stibnite, sphalerite, pyrite, tetrahedrite, etc., in a quartz or carbonate gangue.

The six strongest lines in the X-ray powder pattern have the following spacings and intensities: 3.44 (10), 3.18 (5), 3.09 (5), 2.84 (9), 2.75 (8) and 2.06 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 150).

British Columbia

82 F/9 Jamesonite occurs at the Sullivan Mine at Kimberley in the form of long fine needles or curved fibrous aggregates with galena in schist (L.G. Berry, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 6).

82 F/14 Massive, compact to fibrous lumps of jamesonite occur in vein quartz at the Reco claim located southwest of Reco Mountain, Slocan mining camp (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 126).

At the Boadicea claim on Robb Creek, Ainsworth mining division, jamesonite is found disseminated in quartz and in the form of needles in vugs. Associated minerals are galena and sphalerite. (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 85).

82 K/3 Jamesonite occurs at the Best claim located south of the headwaters of McGuigan Creek in the Slocan mining camp. It is in massive, compact to fibrous lumps in vein quartz (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 126).

82 K/15 Fibrous massive jamesonite is reported on Vermont and Deception creeks, branches of Bobbie Burns Creek, in the Golden mining division (G. C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 60R).

Granular jamesonite in association with galena has been reported at the East Kootenay Mine on Vermont Creek in the Golden mining division (L. G. Berry, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 6).

82 L/1 The David Whitley (or Red Paddy) claim at the head of the Kettle River, Greenwood mining division, reportedly yielded fine specimens of jamesonite. The jamesonite occurs with native gold in a gangue of white subtranslucent quartz (G. C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 22R).

Jamesonite occurs as a fibrous mineral in association with arsenopyrite, pyrite, and pyrrhotite at the St. Paul Mine on Monashee Mountain, Vernon mining division (H. V. Warren and R.M. Thompson, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 82).

92 H/3 Finely fibrous jamesonite partially fills vugs in quartz at the Defiance Group on the south bank of the Sumallo River about 1 mile above its confluence with the Skagit River, Yale mining division. A spectrographic analysis showed traces of Ag, Cu, and As, in addition to the main constituents (H. V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 86).

92 N/9 At the Morris Mine, Tallayoko Lake, Clinton mining division, jamesonite, closely associated with tetrahedrite and galena, is found as minute needles along fractures and disseminated in quartz veins (H. V. Warren and R.M. Thompson, 1949: Am. Mineralogist, 34, p. 458).

92 O/2 Fibrous jamesonite intergrown with calcite is found near Bonanza Creek at the Robson Group, Tyaughton Lake area, Bridge River district. Associated minerals are sphalerite, tetrahedrite, gold, arsenopyrite, pyrrhotite and chalcopyrite (H. V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 71).

93 M/5 A specimen of jamesonite from the Comet Mine on the south side of Four Mile Mountain near Hazelton was donated to the National Mineral Collection in 1917 by J. J. O'Neill.

Jamesonite has been reported at the Silver Bell Mine in association with silver-lead ores. The mine is located on the road west of the Skeena River, about 1/2 mile south of the mouth of the Kispion River, in the Omineca mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 136).

93 M/5 Fibrous aggregates of jamesonite occur on the Silver Cup claim on the north side of Nine Mile Mountain, 8 miles north of New Hazelton Station (L.G. Berry, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 7).

93 N/11 At the Kay Group, 20 miles east of Oakla Landing on Stuart Lake, on the hillside on the west side of the pass from Kwanika Creek to Silver Creek, ore composed largely of jamesonite, stibnite, arsenopyrite, sphalerite, pyrite, andorite, freibergite, native silver and realgar, occurs erratically in a vein that stands nearly vertical and is heavily weathered to a depth of 15 feet. The jamesonite has the appearance of a very compact, felted mass of needle-like crystals which range up to 1/8 inch in length (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 71).

103 P/13 Jamesonite is found on the Black Hill Mining Company holdings on the east side of the south fork of Glacier Creek; on the Mother Lode claim located 5 1/2 miles from Stewart on a creek on the east side of the Bear River; and on the Ruth and Francis claim on the north side of Glacier Creek; all of which are in the Portland Canal area (G. Hanson, 1935: Geol. Surv. Can., Mem. 175, pp. 109, 132, 145).

104 K/12 Radiating needles of silver grey jamesonite are found in milky-white quartz-calcite vein material in the Polaris Taku Mine on the west bank of the Tulsequah River about 6 miles above its confluence with the Taku River, Atlin mining division. A cleavage perpendicular to the elongation was seen in both the crystals and the more compact material (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

Jamesonite is found with pyrite, sphalerite and galena in short, irregular lenses of mixed sulphides in the Potlatch-Banker Group of claims located just above the valley flat, east side of Tulsequah River valley about 2 1/2 miles above its mouth (F.A. Kerr, 1948: Geol. Surv. Can., Mem. 248, pp. 70, 71).

Manitoba

64 I/7 Jamesonite is found in altered volcanic rock on the Echimamish gold property. The mineral may contain blebs of blue quartz (C.K. Bell, 1961: Geol. Surv. Can., Paper 61-22, p. 17).

New Brunswick

21 P/13 The ore of the Sturgeon River Mine, Bathurst area, contains analcite and jamesonite (X-ray Laboratory, Geol. Surv. Can.).

Northwest Territories

85 J/8 Jamesonite occurs in the Yellowknife Bay area in the Con, P and G, and Negus groups. Pyrite, stibnite and tetrahedrite are the

85 J/8 commonest associated minerals. These minerals are found in quartz-carbonate veins, either filling cracks, vugs and drusy joints in the vein, or disseminated throughout. The three claims are located about 1 mile west and slightly south of Mosher Island in Yellowknife Bay (A. W. Jolliffe, 1938: Geol. Surv. Can., Paper 38-21, pp. 19-22, 28) (L. C. Coleman, 1953: Am. Mineralogist, 38, p. 516).

Jamesonite occurs in small pockets and fine veinlets associated with stibnite, pyrite, arsenopyrite, bournonite and gold at the Akaitcho property in the Yellowknife area. The gangue is quartz and calcite. Spectrographic analysis showed Ag present in addition to Au, Pb, Fe and Sb; but As was not found (H. V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 86).

85 J/9 Samples from the 306 stope of the Giant Mine, located about 1 mile west of Yellowknife Bay, consist of quartz-calcite vein material with large compact areas of jamesonite in contact with brown sphalerite and minor amounts of pyrite. The cleavage perpendicular to the elongation of the mineral is well developed (R. M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

85 J/16 Irregular veins and masses of white and grey quartz which locally are mineralized with pyrrhotite, pyrite, chalcopyrite, arsenopyrite, gold, and jamesonite, have been found on the Howey property, 1,000 feet west of the southwest arm of Clan Lake. The jamesonite, which shows a distinct cleavage across the elongation of the crystals, was identified by means of an X-ray powder photograph (H. V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 50, p. 71).

Ontario

31 C/11 In 1919, A. T. McKinnon donated to the National Mineral Collection a specimen of jamesonite from lot 11, conc. XIV, Madoc (Huntingdon Township), Hastings County.

31 C/14 Good specimens of fibrous massive jamesonite were obtained on lot 10, conc. VIII, and lot 7, conc. X, Barrie Township, Frontenac County. Jamesonite from the first locality was associated with chalcopyrite and occurred in a gangue of fine-grained impure dolomite, while in the latter specimen it was associated with sphalerite (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 30R).

31 C/15 Jamesonite is found with pyrite and pyrrhotite in a gangue of crystalline dolomite, lot 30, conc. II, Clarendon Township, Frontenac County (G. C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 15R).

52 N/4 Jamesonite is a constituent of massive sulphide ore at the Cochenour Willans Mine, located just east of Mackenzie Island,

52 N/4 in Red Lake, Dome Township. Associated minerals include: stibnite, berthierite, tetrahedrite, pyrite, pyrrhotite, arsenopyrite and gold (E. W. Nuffield and D. H. Gorman, 1960: private communication).

Yukon

106 D/4 The No. 1 vein at Peso Silver Mines Limited contains abundant jamesonite. The vein is located about 1/2 mile west of Secret Creek at an altitude of about 3,700 feet at lat. 64°00'30"N, long. 135°54'W (R. Skinner, 1962: Geol. Surv. Can., Paper 62-27, p. 32).

115 I/3 Minor amounts of jamesonite have been detected in polished sections of drill core from the Brown-McDagle property on Pony or Victoria Creek, 35 miles west of Carmacks (H. V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 86).

JAROSITE

$KFe_3(SO_4)_2(OH)_6$

New Brunswick

21 H/5 Jarosite occurs in Saint John County between Grassy Lake and Golden Grove Mountain as a yellow coating on weathered graphite-quartz schist. The mineral was identified by means of X-ray diffraction in the Assay Laboratory of the Ontario Department of Mines (D. A. Moddle, 1960: private communication).

Ontario

31 E/11 Jarosite has been identified in specimens from the property of Silver Crater Mines Limited, lot 31, conc. XV, Faraday Township, Hastings County (X-ray Laboratory, Geol. Surv. Can.).

52 L/2 Jarosite has been reported on a hillside at the northwest corner of Vermilion Lake, about 8 miles north of Minaki. Several pits have exposed a mixture of friable and nonfriable hydrous silica. Some of the fragments are coated by orange to yellowish jarosite, and some narrow veinlets of jarosite cut the hydrous silica. Chemical analysis by R. J. C. Fabry gave: Fe_2O_3 48.09, K_2O 11.82, Na_2O 3.61, SO_3 33.13, H_2O 3.35, total 100.00 (J. F. Wright and C. H. Stockwell, 1933: Geol. Surv. Can., Sum. Rept., Pt. D, pp. 2 -4).

Quebec

31 K/8 The X-ray powder pattern of jarosite from Egan Township, Gatineau County, has five strongest lines at 5.09 (7), 3.09 (10), 2.28 (5), 1.984 (5), 1.827 (5) (X-ray Laboratory, Geol. Surv. Can.).

JASPER

(See quartz)

JOHANNITE

$Cu(UO_2)_2(SO_4)_2(OH)_2 \cdot 6H_2O$

Northwest Territories

86 L/1 Minor amounts of tiny, radial, fibrous globules of johannite, together with golden yellow zippeite, erythrite, fourmarierite and uranopilite are found as crusts on massive pitchblende at Great Bear Lake. The seven strongest lines in the X-ray powder pattern have the following spacings and intensities: 7.81 (10), 6.24 (9), 3.89 (4), 3.42 (5), 3.13 (4), 3.06 (4), 1.832 (4) (X-ray Laboratory, Geol. Surv. Can.).

JOSEITE

near Bi_4TeS_2

Two types of joseite are known. Joseite I, with unit cell dimensions a = 4.25, c = 39.77Å, gives an X-ray powder pattern with the following strongest lines: 3.08 (10), 2.24 (5), 2.11 (5), 1.749 (3). Joseite II, with unit cell dimensions a = 4.34, c = 40.83 Å, gives the following X-ray pattern: 3.16 (10), 2.30 (4), 2.17 (5), 1.784 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., 85, p. 27).

British Columbia

82 L/4 A roughly tetrahedral mass of untarnished joseite, with visible spongy gold and calcite, was found at the White Elephant Group, 2 miles west of Okanagan Lake, near Vernon (M.A. Peacock, 1941: Univ. Toronto Stud., Geol. Ser., 46, pp. 85, 103).

92 H/8 Joseite II has been found at the Good Hope claim near Hedley, in the Osoyoos mining division. It occurs as coarse plates which are often intergrown with native bismuth and associated with

92 H/8 hedleyite, pyrrhotite, arsenopyrite, molybdenite, and gold. These minerals occur in quartz and skarn (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 367).

Joseite II occurs on the Oregon (French) property between Sixteen Mile and Eighteen Mile (now Cahill) Creek, about 3 miles east of Hedley, in the Osoyoos mining division. It appears with hedleyite in polished sections as rounded grains with smooth boundaries. Native bismuth, molybdenite and gold are closely associated with the tellurides (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

92 P/8 Gold, bismuth, and bismuthinite are associated with jöseite at Windpass Mine on Baldy Mountain, 1/2 mile east of Boulder Station on the Canadian National railway line north of Kamloops (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 78). Windpass material is cited in Berry and Thompson as joseite I (L.G. Berry and M. Thompson, 1962: Geol. Soc. Am., Mem. 85).

93 L/14 Both joseite I and joseite II have been found at Glacier Gulch on Hudson Bay Mountain near Smithers, in association with bismuth, bismuthinite and electrum. Joseite occurs in cleavable, platy masses and also in similarly oriented fragments intergrown with quartzose gangue. Its specific gravity varies from 8 to 9. An analysis by F.A. Forward of a sample with an average S.G. of 8.6 gave: Bi 79.3, Te 12.2, S 6.0, Se nil, Au trace, insol. trace, total 97.5. Joseite I was identified by X-ray powder photographs. Analysis of joseite II gave: Bi 75.14, Te 19.25, S 3.64, Pb 0.68, Fe 0.52, insol. 0.30, total 99.53; S.G. 8.3 (H.V. Warren and P. Davis, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 110) (M.A. Peacock, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 103) (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 367).

Yukon

115 P/9 An examination of the heavy minerals from a placer operation on Highet Creek in the Mayo district revealed a few small flexible plates of a bismuth telluride which was identified by means of an X-ray powder photograph as joseite I (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 452).

115 P/14 An examination of the heavy minerals from a dredge operating on Clear Creek in the McQueston district showed an occasional plate of joseite I (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 453).

JOSEPHINITE

(See nickel-iron)

KAINOSITE

$Ca_2(Ce, Yt)_2Si_4O_{12}CO_3.H_2O$

Kainosite was first described from Hiterö, Norway, in 1886. The name subsequently was changed to cenosite in Dana's System of Mineralogy. Although cenosite is commonly used, kainosite clearly has priority.

Ontario

31 C/11 Kainosite has been identified in specimens from the property of the Cavendish Uranium and Mining Company, Cavendish Township, conc. VII, lots 14 and 15 (X-ray Laboratory, Geol. Surv. Can.).

31 C/16 An occurrence of kainosite has been reported in South Sherbrooke Township on lot 8, conc. V (D.F. Hewitt, 1960: private communication).
Kainosite occurs in an apatite vein on lot 8, conc. V, North Burgess Township, Lanark County. An analysis by Ellsworth gave: SiO_2 34.66, CaO 16.72, $(Yt, Er)_2O_3$ 35.46, CO_2 6.58, $(Ce, La, Di)_2O_3$ 3.22, SrO 0.31, H_2O 2.58, Na_2O 0.27, Fe_2O_3 0.22, MgO 0.19, MnO 0.02, SO_3 0.04, total 100.23; S.G. 3.612 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 237).

31 D/16 Kainosite has been found at the Centre Lake property of Bicroft Uranium Mines, Ltd., Cardiff Township, Haliburton County, conc. XI, lots 26 and 27. A chemical analysis of kainosite from the Dicroft Uranium Mine by J.A. Maxwell and G.R. Lachance gave the following results: CaO 16.78, Na_2O 0.04, K_2O 0.01, Ce_2O_3 0.38, Nd_2O_3 0.19, Sm_2O_3 0.27, Y_2O_3 25.27, Gd_2O_3 2.44, Dy_2O_3 3.10, Er_2O_3 3.53, Yb_2O_3 2.71, Al_2O_3 1.20, SiO_2 35.24, TiO_2 0.02, ThO_2 0.03, CO_2 4.60, H_2O 2.59, Fe_2O_3 0.57, total 98.97. The X-ray powder pattern of the analyzed material has six strongest lines at 6.52 (10), 3.45 (7), 3.29 (8), 3.19 (7), 2.76 (10) and 2.17 (7) (X-ray Laboratory, Geol. Surv. Can.).

31 F/4 Kainosite occurs at the Greyhawk Uranium Mines property, Faraday Township, conc. XII, lot 10 (X-ray Laboratory, Geol. Surv. Can.).

KALINITE

$KAl(SO_4)_2.11H_2O$

Ontario

52 A/3, 52 A/6 Kalinite is abundant on the exposed faces of high bluffs of argillaceous rocks along the Kaministikwia and Slate rivers in the

52 A/3, 52 A/6 Thunder Bay district (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 41T).

KAMMERERITE

$Mg_5(Al, Cr)_2Si_3O_{10}(OH)_8$

Kammererite is a reddish alumino-silicate of magnesium and chromium, possibly a variety of chlorite. The spacings of the five strongest lines of the X-ray powder pattern are: 14.1 (7), 7.15 (8), 2.55 (10), 2.452 (7), 1.54 (8) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

31 H/1, 31 H/8 Kammererite occurs in Bolton Township, Brome County with chromite and serpentine.

31 H/9 It has also been found in a similar occurrence in Melbourne Township, Richmond County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 41T).

KAOLINITE

$Al_2Si_2O_5(OH)_4$

Kaolinite and its polymorphs, nacrite and dickite, constitute the kaolinite group of clay minerals. The kaolinites are secondary products of the decomposition of aluminous minerals, notably feldspars. The strongest lines on the X-ray powder pattern are: 7.15 (10), 3.57 (10), 2.49 (9), 2.33 (10), 2.28 (9) (H. H. Murray, 1954: Am. Mineralogist, 39, p. 100).

Quebec

21 L/11 An analysis by Hunt of kaolinite from Chaudiere Falls, Levis County, gave the following results: SiO_2 46.05, Al_2O_3 38.37, CaO 0.61, MgO 0.63, H_2O 14.00, total 99.66 (W. E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 495).

31 G/9 Kaolinite occurs at Grand Fresniere in Two Mountains County. Specimens from this locality are present in the National Mineral Collection.

31 G/13 Kaolinite occurs in the Villeneuve Mine, lot 31, range I, Villeneuve Township, Papineau County. A specimen from the property was presented to the National Mineral Collection by A. T. McKinnon.

31 H/9, 31 H/10 The following are the results obtained from an analysis of kaolinite from range V, lot 23, of Acton Township, Bagot County: SiO_2

31 H/9, 31 H/10 44.604, Al_2O_3 39.145, Fe_2O_3 1.035, CaO 0.390, MgO 0.213, Na_2O 0.270, K_2O 0.196, H_2O 14.240, total 100.093; S.G. 2.577 (G.C. Hoffmann, 1874-75: Geol. Surv. Can., Rept. Prog., p. 314).

32 F/14 Kaolinite is reported to occur on the east side of Olga Lake, Abitibi East County (P.E. Imbault, 1952: Que. Dept. Mines, Geol. Rept., 51, p. 12).

KASOLITE

$PbUO_2SiO_4.H_2O$

A secondary uranium mineral, kasolite occurs as yellow to brownish coatings associated with primary uranium minerals. It forms minute prismatic crystals of monoclinic habit. The strongest lines of the X-ray powder pattern have the following spacings and intensities: 6.61 (6), 4.19 (8), 3.53 (7), 3.26 (10), 2.93 (9) (C. Frondel, J.W. Frondel, and D. Riska, 1956: U.S. Geol. Surv., Bull., 1036-G).

Northwest Territories

86 L/1 Kasolite was found on a large specimen of pitchblende from LaBine Point, Great Bear Lake. It coated almost every surface of the specimen, and filled minute cracks with a dull sulphur yellow crust (L.I. Cowan, 1962: Can. Mineralogist, 7, p. 331).

Ontario

31 D/16 Specimens from Dyno Mines Limited, conc. VIII, lot 12, Cardiff Township, and from Aumacho River Mines Limited, conc. IX, lot 22, of the same township have been found to contain kasolite (X-ray Laboratory, Geol. Surv. Can.).

31 E/1 Kasolite occurs as a yellow to orange-yellow coating on rocks at the Cudney and Cavendish properties, Monmouth Township, conc. XVI, lots 29 and 30 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 23).

31 F/4 Kasolite has been identified from the property of Faraday Uranium Mines Limited, Faraday Township, conc. XI, lots 16 and 17 (X-ray Laboratory, Geol. Surv. Can.).

Rust coloured fracture fillings at the MacDonald Mine, in the Bancroft area, were found to contain kasolite, pyrite, uranothorite and zircon (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI).

Quebec

22 B/2 An earthy yellowish material coating fracture surfaces in galena from the Gaspé area, has been identified as kasolite. The specimen was obtained from a property located 2 miles east of Cross Point, Bonaventure County, on the south shore of the peninsula (X-ray Laboratory, Geol. Surv. Can.).

Saskatchewan

74 N/8 Kasolite forms orange-yellow crusts on fracture surfaces at the Consolidated Nicholson Mine near Goldfields, on the north shore of Lake Athabasca. It occurs with an unidentified yellow-green mineral near the centre of a radioactive area (D. D. Hogarth, 1951: Am. Mineralogist, 36, p. 412).

KERMESITE

Sb_2S_2O

Kermesite is a cherry red mineral found as an alteration product of stibnite, commonly associated with senarmontite, valentinite and stibiconite.

New Brunswick

21 G/11, 21 G/14 Kermesite occurs with native antimony at the Lake George Mine in York County (G. F. King, 1885: Am. J. Sci, Ser. III, vol. XXX, pp. 275-277).

Nova Scotia

11 E/4 Stibnite and kermesite are found together at the West Gore Mine in Hants County (A. R. C. Selwyn, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 58A). The X-ray powder pattern of kermesite from Hants County has five strongest lines at 5.27 (7), 4.08 (9), 3.14 (9), 2.92 (10), 2.70 (7) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

52 N/4 Cherry red acicular crystals of kermesite have been found in the Cochenour-Willans Mine at Red Lake. They are up to 2 millimetres in length, transparent, and occur in small vugs with senarmonite on quartz and partially leached stibnite. The kermesite was identified by chemical and X-ray methods (M. H. Frohberg, 1960: private communication).

Quebec

21 E/12 Kermesite forms crystalline tuffs in veins cutting argillite on range I, lot 56, South Ham Township, Wolfe County (R.W. Ells, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 80K).

KLOCKMANNITE

Cu Se

Ontario

41 N/2 Bluish black aggregates of klockmannite up to 5 millimetres in diameter occur associated with pitchblende, chalcomenite and secondary uranium minerals on property belonging to Ranwick Uranium Mines Limited. The holdings are located on range XV, township 2, about 2 miles southeast of the mouth of the Montreal River, at the eastern end of Lake Superior (M.H. Frohberg: private communication).

Saskatchewan

74 N/8 Minor amounts of klockmannite are found in shear zones in the Goldfields district (S.C. Robinson and E.J. Brooker, 1952: Am. Mineralogist, 37, p. 542). The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.36 (6), 3.18 (10), 2.87 (9), 1.97 (7) and 1.824 (6) (X-ray Laboratory, Geol. Surv. Can.).

KNOPITE

(See perovskite)

KOBELLITE

$Pb_6FeBi_4Sb_2S_{16}$

Kobellite is a grey, fibrous and radiating, or granular massive sulphosalt of lead, antimony and bismuth. The X-ray powder pattern shows four strongest lines with the following spacings and intensities: 3.51 (10), 3.38 (10), 2.84 (5), 2.13 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 149).

British Columbia

82 F/3 Kobellite occurs in quartz at the Dodger Tungsten Mine near Salmo (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

KORNERUPINE

$(Mg, Fe^{++}, Fe^{+++}, Al)_{40}(Si, B)_{18}O_{86}$

Quebec

31 F/16 Prismatic crystals of kornerupine up to 2 inches in length occur with quartz, orthoclase, biotite, tourmaline, andalusite, almandite, rutile, zircon and dumortierite in schists and gneisses on the southwest bank of the Gatineau River near Hinks Bridge, Aylwin Township, range III, lots 15 and 16. The following is an analysis by H. Boileau of greenish kornerupine from the above locality: SiO_2 30.24, B_2O_3 3.50, Al_2O_3 40.86, Fe_2O_3 0.42, FeO 8.52, MgO 14.87, CaO 0.06, Na_2O 0.08, H_2O^+ 0.97, TiO_2 0.19, P_2O_5 0.09, Cr_2O_3 0.06, MnO tr., total 99.86; S.G. 3.37 $\pm$ 0.01. The four strongest lines on the X-ray powder pattern are: 3.34 (9), 3.00 (10), 2.61 (10), 1.488 (9) (J. P. Girault, 1952: Am. Mineralogist, 37, p. 531).

KRENNERITE

$(Au, Ag)Te_2$

A silver white to brass yellow mineral, krennerite is similar to sylvanite in composition, mode of occurrence, and appearance. It is however somewhat rarer than sylvanite, and is orthorhombic whereas sylvanite is monoclinic. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.05 (10), 2.96 (4), 2.24 (4), 2.11 (5), 1.314 (4) (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 350).

Ontario

42 A/2 Krennerite has been found in the Ashley Mine, Bannockburn Township, where it occurs sparingly in association with altaite (H.C. Rickaby, 1931: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. II, p. 16).

42 E/10 A lath-shaped mineral found in galena at the MacLeod-Cockshutt Mine in Ashmore Township, has been identified as krennerite (E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. V, p. 49).

52 N/4 Krennerite has been reported to occur in the McKenzie-Red Lake Gold Mine on McKenzie Island in Red Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 350).

Quebec

32 D/5 Krennerite is an important ore mineral in parts of the Robb-Montbray Mine in Montbray Township. It occurs with other

32 D/5 tellurides, native gold and sulphides and appears to be most intimately associated with pyrite and chalcopyrite (Ellis Thomson, 1928: Univ. Toronto Stud., Geol. Ser., 27, p. 12).

32 D/6 Short, vertically striated, prismatic crystals and fragments of krennerite are reported to occur in the Horne Mine, 3 miles west of Noranda (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 350).

KUNZITE

(See spodumene)

KYANITE

Al_2SiO_5

Identical in composition with sillimanite and andalusite, kyanite commonly occurs as bladed crystals. It is found in gneissic rocks and mica schists, often in association with garnet, staurolite and corundum. Crystals or blades are commonly blue in the centre with white margins. They may also be green, grey, or black. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.35 (5), 3.18 (10), 1.93 (7), 1.38 (9) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 F/2 Kyanite occurs in a biotite schist on a ridge south of Summit Creek between the Salmo and Kootenay rivers in the Nelson mining division (G.M. Dawson, 1897: Geol. Surv. Can., Ann. Rept., X, p. 30).

83 D/11 Translucent, blue, bladed crystals of kyanite occur embedded in a groundmass of fractured quartz in the Albreda district near Mile 2487, west of Jasper (R.L. Rutherford, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 102).

Chemical analysis of transparent bluish kyanite from North Thompson River by Hoffmann: SiO_2 36.29, Al_2O_3 62.25, Fe_2O_3 0.55, MgO 0.36, CaO 1.06, total 100.51; S.G. 3.600 (G.C. Hoffmann, 1880: Geol. Surv. Can., Rept. Prog. 1878-79).

83 D/14 Kyanite and beryl are found together in a vein located 7 miles south of Tête Jaune Cache in the Cariboo mining division (G.M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 163A).

Manitoba

63 J/13 A specimen of kyanite donated to the National Mineral Collection by W.F. Ferrier was collected at Anderson Lake north of Lake Winnipeg.

Ontario

31 C/11 Kyanite occurs with quartz in mica schist at the Golden Fleece Mine in conc. VI, lot 25, Kaladar Township (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 200).

31 C/14 A kyanite-bearing band of mica schist trends in a northeasterly direction across Clarendon Township about 50 miles northwest of the City of Kingston. The kyanite content is reported to average as high as 12 to 15 per cent (A.V. Haw, 1954: Bull. Can. Inst. Mining Met., vol. 47, No. 501, pp. 27-35).

31 F/5 Blue-bladed kyanite crystals up to 1/4 of an inch across, occur in gneiss on lots 23 and 24, conc. XII, of Carlow Township. Sillimanite, garnet, and biotite are also present in the rocks (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI).

41 I/7 Coarse grains of kyanite with garnet, biotite, quartz, and feldspar comprise a gneissic rock which outcrops in an area 12 miles east of Sudbury. The kyanite occurs as blue, green, or grey, bladed crystals varying from 1/4 of an inch to 4 inches in length (A.V. Haw, 1954: Bull. Can. Inst. Mining Met., vol. 47, No. 501, pp. 27-35).

Kyanite occurs in a pegmatite vein cutting Grenville gneiss in Dryden Township, conc. III, lot 9 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 28R).

Quebec

31 L/7 Specimens of kyanite have been found in gneiss at Snake Creek which flows into the Ottawa River at a point about 10 miles north of the town of Mattawa, Ontario (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 56A; also 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 117A).

Kyanite taken from an outcrop about 1/2 mile north of the mouth of the creek was donated by A.E. Barlow, to the National Mineral Collection in 1894.

32 E/3 Porphyroblasts of kyanite have been found in the wall-rock at the Normetal property in Abitibi-West County (Carl Tolman, 1951: Que. Dept. Mines, Geol. Rept., 34).

LABRADORITE

$NaAlSi_3O_8$-$CaAl_2Si_2O_8$

The name labradorite is applied to those feldspars of the plagioclase series having an anorthite content of between 50 and 70 per cent. Labradorite occurs in igneous rocks, particularly the more basic ones. Its colour varies from light to dark grey and specimens characteristically display iridescence in blues and greens which is often attractive and valued as an ornamental and gem stone.

Manitoba

63 J/13 Labradorite containing 55 per cent anorthite molecule occurs in a quartz gabbro south of Hub Bay, Wekusko Lake. Phenocrysts of labradorite up to 2 inches long, have been found in a porphyrite phase of the rock (J. E. Armstrong: Geol. Surv. Can., File No. 21-A-16, p. 19).

Newfoundland

3 E/4 An iridescent labradorite from Hawks Harbour, Labrador coast, gave the following chemical analysis: SiO_2 55.24, TiO_2 0.07, Al_2O_3 27.61, Fe_2O_3 1.22, CaO 10.70, Na_2O 5.40, K_2O 0.14, H_2O 0.10, total 99.48. Its composition in terms of percentage of feldspar was found to be An 53.10, Ab 45.59, and Or 0.56 (V. B. Meen, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 39).

13 G/11 Labradorite is abundant west of Long Point on the south shore of Melville Lake, Labrador (E. M. Kindle, 1926: Geol. Surv. Can., Mem. 141, p. 77).

14 C/3 Specimens of labradorite suitable for ornamental purposes are reported to occur at Ford Harbour, Pauls Island, and Black Island, Labrador (D. S. M. Field, 1951: Can. Mining J., vol. 72, Pt. 2, p. 73).

14 C/5 Gem quality labradorite occurs in a coarse pegmatitic anorthosite in the Grenfell quarry on the southern side of Tabor Island, south of Nain, Labrador (A. K. Snelgrove, 1953: Nfld. Dept. Mines and Res., Information Circular, No. 4, pp. 139-140).

Ontario

31 C/5, 31 C/12 Large phenocrysts of labradorite may be seen in diabase in Belmont Township, Peterborough County (G. M. Dawson, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 127A).

31 C/15 A coarse-grained diorite on lot 16, conc. III, North Sherbrooke Township, Lanark County, contains white feldspar with a vitreous lustre on cleavage surfaces, some of which display fine parallel

31 C/15 striae. It is translucent except on weathered parts, where it becomes opaque-white. Analysis by G. C. Hoffmann (1876): SiO_2 54.19, Al_2O_3 27.51, Fe_2O_3 0.45, MgO 0.78, CaO 9.39, Na_2O 6.04, K_2O 1.40, H_2O 1.12, total 100.88; S.G. 2.697 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 381).

31 G/7, 31 G/8 Boulders containing labradorite have been reported from Lochiel Township, Glengarry County (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 74A).

42 A/9 Fresh labradorite is reported to make up 75 per cent of a volcanic rock outcropping in conc. VI, lot 1, Beattie Township. Labradorite laths are present in thin sections made from specimens of diabase dyke rock occurring in conc. I, lot 6, of Beattie Township (P.E. Hopkins, 1915: Ont. Dept. Mines, vol. 24, Pt. 4).

Quebec

12 M/12 Large crystals of labradorite are distributed throughout a finer grained groundmass in a rock at a locality east of Rougemont Lake, Saguenay County. The crystals have been bent and fractured and their contacts with the finer material are ragged (J. Claveau, 1949: Que. Dept. Mines, Geol. Rept., 38, p. 19).

21 L/14 Labradorite is reported from Chateau Richer in Montmorency County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 42T).

22 D/13 Labradorite has been found on the Peribonka River, 30 miles above its entrance into Lake St. John (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 46).

22 I/7 Labradorite occurs at Sheldrake in the Seigniory of Mingan, Saguenay County (A.R.C. Selwyn, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 4A).

31 G/16 Occurrences of labradorite have been reported from St. Jerome, Morin, Mille Isle, and Abercrombie in Terrebonne County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 42T).

31 H/13, 31 I/4 Bluish white, granular labradorite occurs at Rawdon in Montcalm County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 42T).

Analysis by T.S. Hunt is as follows: SiO_2 54.45, Al_2O_3 28.05, Fe_2O_3 0.45, CaO 9.68, Na_2O 6.25, K_2O 1.06, volatile 0.55, total 100.49; S.G. 2.69 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, pp. 382, 383).

32 F/11 Labradorite of composition An_{60} forms zoned crystals in an outcrop south of the west end of Baptiste Lake in the Iserhoff River area (J. Claveau, 1951: Que. Dept. Mines, Geol. Rept., 49, p. 25).

LANSFORDITE

$MgCO_3 . 5H_2O$

British Columbia

104 N/11, 104 N/12 Lansfordite occurs lining cavities in hydromagnesite at a locality east of Atlin (E. Poitevin, 1924: Am. Mineralogist, 9, p. 225). The X-ray powder patterns shows the following five strongest lines: 6.42 (7), 5.80 (8), 4.16 (10), 3.85 (10) and 2.90 (6) (Ann P. Sabina and R.J. Traill, 1960: Geol. Surv. Can., Paper 60-4, p. 57).

LAUMONTITE

$CaAl_2Si_4O_{12} . 4H_2O$

Laumontite is a member of the zeolite group of minerals which are capable of undergoing cation exchange, and which may lose part or all of their water content and replace it with other compounds without losing their crystal structure. Zeolites are found in amygdaloidal cavities and other openings in igneous rocks, in metalliferous veins, and in sediments altered by diagenesis. The strongest lines in the X-ray powder pattern are: 6.97 (6), 4.18 (10), 3.67 (4), 3.53 (6), 3.08 (4) and 2.45 (4) (D.S. Coombs, 1952: Am. Mineralogist, 37, p. 812).

British Columbia

82 F/4 Laumontite is reported to occur at the Centre Star Mine in the Rossland area, Trail Creek mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 140).

103 H/13 Laumontite has been found at the Drumlummon Mine on Douglas Channel about 100 miles southeast of Prince Rupert (National Mineral Collection).

Nova Scotia

21 A/12, 21 A/13, 21 A/14, 21 B/8, 21 B/9, 21 H/1, 21 H/2, 21 H/3, 21 H/8 Occurrences of laumontite are prominent along the shore of the Bay of Fundy from Long Point in Kings County to Port Lorne, Annapolis County. From Port Lorne southwesterly along the coast to Freeport it is found as a subordinate mineral. It usually occurs with stibnite. An analysis of a specimen from Margaretsville is as follows: SiO_2 50.96, Al_2O_3 21.60, Fe_2O_3 0.03, CaO 11.27, Na_2O 0.32, K_2O 0.18, H_2O 16.04, total 100.40; S.G. 2.283 (T.L. Walker, 1927: Univ. Toronto Stud., Geol. Ser., 14, p. 54).

21 H/3 An analysis by How of laumontite from Port George, Annapolis County, is as follows: SiO_2 51.43, Al_2O_3 21.64, CaO 12.07, H_2O 15.26, total 100.40 (H. How, 1858: Am. J. Sci., Ser. 2, XXVI, p. 34).

21 H/7 Laumontite is exposed in the rocks at Cape D'Or in Cumberland County (National Mineral Collection).

Quebec

21 M/10 Seams and vugs in the ilmenite-hematite body known as the Furnace deposit, near St. Urbain, in Charlevoix County, are reported to contain laumontite associated with calcite. The presence of the laumontite has been attributed to the alteration of plagioclase (E. R. Rose: private communication).

LAZULITE

$(Mg, Fe)Al_2(PO_4)_2(OH)_2$

This azure blue, brittle mineral occurs as pyramidal crystals or in massive form. It makes an attractive ornamental and gem stone. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 4.72 (7), 3.24 (10), 3.13 (7), 1.57 (7) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

92 H/6 Small, irregular, patches of deep blue lazulite have been found in quartzite boulders discovered in the Fraser River, about 1 mile north of Hope. The lazulite is associated with muscovite and sillimanite (R.M. Thompson, 1960: private communication).

Manitoba

54 L/9 Blue crystals of lazulite, suitable for ornamental purposes, are found near Fort Churchill (A. L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 48). A chemical analysis of lazulite from an occurrence 3/4 of a mile east of the Churchill River, is as follows: P_2O_5 46.388, Al_2O_3 29.140, FeO 2.091, MgO 13.838, CaO 2.829, H_2O 6.468, total 100.754; S.G. 3.0445 (G.C. Hoffmann, 1878-79: Geol. Surv. Can., Rept. Prog., p. 2H).

Quebec

32 I,
32 P Lazulite occurs with quartz at Lake Mistassini (G. C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 66R).

LEAD

Pb

Occurrences of metallic lead in nature are very rare. The spacings and intensities of the three strongest lines in its X-ray powder pattern are: 2.86 (10), 2.49 (7) and 1.495 (9) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 12).

Ontario

52 A/5 Thin stringers of native lead are reported to occur in quartz in the Thunder Bay district at Dog Lake on the Kaministikwia River (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 42T).

Yukon

106 D/4 Native lead has been identified with litharge in a mineral concentrate from Dublin Gulch (X-ray Laboratory, Geol. Surv. Can.).

116 B/3 Native lead from Hunker Creek, near Dawson City, has an X-ray powder pattern with strongest lines at: 2.86 (10), 2.47 (7), 1.745 (5), 1.487 (6) (X-ray Laboratory, Geol. Surv. Can.).

LEDERERITE

(See gmelinite)

LEONHARDTITE

$MgSO_4.4H_2O$

Northwest Territories

120 C/13 Leonhardtite has been identified by means of spectrographic analyses and X-ray powder patterns in samples of efflorescent salts from Lake Hazen, Ellesmere Island. The X-ray powder pattern has the strongest lines at: 5.42 (6), 4.49 (10), 3.94 (6), 2.94 (8) (X-ray Laboratory, Geol. Surv. Can.).

LEPIDOCROCITE

FeO(OH)

Yukon

105 M/14 Lepidocrocite has been identified in a specimen of oxidized ore from the property of Mayo Mines Limited, in the Keno Hill-Sourdough Hill area, Mayo mining district. The X-ray powder pattern has four strongest lines at: 6.23 (10), 3.28 (7), 2.47 (8), 1.93 (5) (X-ray Laboratory, Geol. Surv. Can.).

LEPIDOLITE

$$K(Li, Al)_3(Si, Al)_4O_{10}(F, OH)_2$$

Lepidolite is a lithium-bearing mica occurring in granite pegmatites, usually in association with other lithium minerals such as spodumene and amblygonite. It is also found in some granite gneisses. In physical characteristics it resembles the other micas but its colour is often rather a distinctive rose red, violet, or lilac. It may, however, be yellowish, greyish white, or white. It is used as a source of lithium. The strongest lines in the X-ray powder pattern have the following spacings and intensities: 10.0 (6), 5.0 (5), 4.5 (5), 3.6 (5), 3.32 (10), 2.58 (8) and 1.99 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

82 N/5 Pearly scales of lepidolite occur with calcite and rust-stained quartz on the Gold Hill claim located 10 miles northeast of Illecillewaet, in the West Kootenay district (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 29R).

Manitoba

52 L/5 At Bernic Lake, a lithium ore containing lepidolite along with spodumene and amblygonite has been mined (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 19).

52 L/6 A massive lilac-coloured rock occurring at the Bear claims, lot 17, range 16, township 16, on the Winnipeg River about 3 miles southeast of Lamprey Falls, is composed almost entirely of lepidolite. Associated minerals are quartz and cleavelandite. Chemical analysis of a pure sample of lepidolite by R.J.C. Fabry: Li_2O 3.39, Fe_2O_3 0.24, MnO 0.90, Cs_2O 0.21, F_2 4.30, SiO_2 49.06, Al_2O_3 27.22, CaO 0.44, MgO 0.52, Na_2O 1.92, K_2O 11.03, H_2O 1.95, less O for F 1.81, total 99.37. A purplish, silvery grey lithian mica occurs as veinlets an inch or more wide in albite, and as borders surrounding large spodumene crystals between the spodumene and the enclosing albite. It has a radiating, narrow, fan-shaped structure normal to the vein wall, and the cleavage surfaces show a fine radiating wrinkling parallel to the long direction of the fans. It sometimes occurs as rosettes with fine wrinkling radiating from the centres.

52 L/6 Chemical analysis by R. J. C. Fabry: SiO_2 47.18, Al_2O_3 31.80, Fe_2O_3 0.07, FeO 0.16, MgO 0.28, CaO 0.40, Na_2O 2.94, K_2O 10.50, H_2O 2.40, MnO 2.05, F 2.15, Li_2O 1.06, total 100.99, less O for F 0.89, total 100.10 (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, pp. 155, 156).

63 J/10 The pegmatite dykes, west of Cross Island, Cross Lake area, contain spodumene and lepidolite (C. K. Bell, 1961: Geol. Surv. Can., Paper 61-22, p. 17).

Nova Scotia

21 A/9 Violet coloured lepidolite occurs in an albite pegmatite segregation at New Ross in Lunenberg County. It is associated with durangite, cassiterite, scheelite, wolframite, monazite, and beryl. The following analysis was made by E. W. Todd: SiO_2 49.28, Al_2O_3 24.36, K_2O 11.24, Li_2O 5.36, Fe_2O_3 0.63, MgO 0.73, MnO 0.87, Rb_2O 0.32, Na_2O 0.66, H_2O 0.87, total 99.74; S.G. 2.869 (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 256).

Quebec

31 G/12 Lepidolite is reported to occur near the Lievre River in the County of Papineau (H. S. De Schmid, 1913: J. Can. Mining Inst., pp. 376, 377).

Lepidolite is abundant at the old Leduc Mine on range VII, lot 25, Wakefield Township, where it occurs in a pegmatite as platy masses up to 1 foot across. It was analyzed by R. A. A. Johnston who found that it contained somewhat more iron and manganese than usual. The results of the analysis are as follows: SiO_2 47.89, Al_2O_3 21.16, K_2O 10.73, Li_2O 5.44, MnO 4.19, Fe_2O_3 2.52, Na_2O 1.34, H_2O 1.90, MgO 0.36, F_2 7.41, less O for F 3.12, total 99.82; S.G. 2.86 (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 239).

32 C/5 Lepidolite occurs as irregular masses and disseminations in a pollucite rich zone in a dyke on the Valor property, Lacorne Township (R. W. Mulligan, 1961: Geol. Surv. Can., Paper 61-4, p. 4).

32 D/8 Lepidolite and the spodumene mineral, hiddenite, are found together on lot 36, range II, of Figuery Township, Abitibi-East County. Other minerals present are quartz, microcline, albite, and muscovite (W. W. Weber, 1959: Que. Dept. Mines, Prelim. Rept., 257, p. 15).

LEPIDOMELANE

$K(Fe, Mg)_{4-6}(Si, Al, Fe)_8O_{20}(OH)_4$

Lepidomelane, or iron mica, is a black to brown mica containing a high percentage of ferric iron. It characteristically occurs in iron-rich feldspathic igneous rocks.

Ontario

31 C/12 Lepidomelane has been reported to occur on lot 11, conc. IX, of Marmora Township, Hastings County (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 123A). Two other localities in the same township are lot 14, conc. X, and lot 16, conc. XI. An analysis of a specimen from the first of these was performed by Wait. His results are as follows: SiO_2 32.79, Al_2O_3 14.34, Fe_2O_3 4.52, FeO 26.32, MnO 0.29, CaO 1.45, MgO 4.68, K_2O 7.24, Na_2O 2.00, TiO_2 0.92, H_2O (at 100°) 1.38, H_2O (above 100°) 3.68, total 99.61; S.G. 3.19 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 14R, 15R).

31 D/16 The following results were obtained from an analysis by Egelston of lepidomelane from an essexite body in Monmouth Township: SiO_2 31.48, TiO_2 2.50, Al_2O_3 17.23, Fe_2O_3 5.85, FeO 27.96, MgO 2.99, MnO 1.61, CaO 1.33, K_2O 4.17, Na_2O 1.68, H_2O 3.94, total 99.74; S.G. 3.25 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 21).

31 E/1 Black lepidomelane is present in nepheline syenite on lot 32, conc. XV, Faraday Township, Hastings County. It is associated with apatite, plagioclase, fluorite, magnetite, and pyrite and is rather unusual for its high fluorine and magnesia content. An analysis by Rickaby gave the following results: SiO_2 34.04, TiO_2 1.48, Al_2O_3 15.60, Fe_2O_3 4.22, FeO 23.60, MgO 7.46, MnO 0.99, K_2O 8.89, Na_2O 0.88, H_2O 1.26, F 2.02, total 100.44; S.G. 3.16 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 20).

31 F/4 Large crystals of lepidomelane, nepheline, and albite are found in pegmatite rocks on lot 10, conc. XIII, Dungannon Township (Louis Moyd, 1949: Am. Mineralogist, 34, p. 743). In the same township, lepidomelane and sodalite are reported to occur together. These minerals have been found on lot 25, conc. XIV, and lot 29, conc. XIII (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 15R).

41 I/2 Six-sided lepidomelane crystals occur in a nepheline syenite belt in Bigwood Township. The syenite rock strikes in a northerly direction for about 5 miles from a point on the French River about 4 miles below French River Station. The mica sheets are up to 3 inches in diameter and so darkly coloured that only very thin flakes will transmit light. An analysis by H.C. Rickaby is

41 I/2 as follows: SiO_2 31.64, Ti_2O_3 0.33, Al_2O_3 15.34, Fe_2O_3 8.38, FeO 31.78, MnO 0.28, MgO 0.90, Na_2O 0.67, K_2O 8.70, H_2O 1.93, F 0.13, O for F 0.05, total 100.08; S.G. 3.294 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 8).

41 I/6 Lepidomelane is reported to occur in conc. II, lot 2, of Drury Township (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 15R).

LESSINGITE

$Ca_2Ce_4Si_3O_{13}(OH)_2$

Quebec

31 F/15 Colourless grains of lessingite occur with uranian thorianite and thorite in a calcite-diopside-phlogopite rock on the property of Yates Uranium Mines Limited, range V, lot 20, Huddersfield Township (S.C. Robinson and A.P. Sabina, 1955: Am. Mineralogist, 40, p. 627). The X-ray powder pattern has its strongest lines at: 3.22 (5), 3.12 (5), 2.86 (10), 2.85 (7) and 2.77 (6). The cell dimension of this sample of lessingite are considerably larger than those of 'normal' lessingite (X-ray Laboratory, Geol. Surv. Can.).

LEUCITE

$KAlSi_2O_6$

Leucite is a rather rare mineral occurring only in silica-deficient igneous rocks, usually those of recent volcanic origin. It is never associated with primary quartz and is not found in plutonic rocks. The spacings and intensities of the strongest lines in the X-ray powder pattern are: 5.41 (8), 3.45 (8), 3.27 (10), 2.83 (4), 2.55 (4), 1.80 (4) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

93 A/6 Grey, subtranslucent crystals of leucite occur at the Horsefly Mine on the Horse Fly River, about 7 miles from its entry into Quesnel Lake (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, pp. 13R, 14R).

Yukon

115 O/4, 115 O/5 Leucite has been found on the north fork of Spotted Fawn Creek, a tributary of the Twelvemile River (R. Bell, 1902-03: Geol. Surv. Can., Ann. Rept., XV, p. 40AA).

LEUCOPHOSPHITE

$(K,NH_4)Fe_2(PO_4)_2(OH).2H_2O$

Leucophosphite is a rare mineral found originally in Western Australia as fine-grained chalk-like masses, and apparently formed by the action of solutions derived from bird guano upon serpentine. The three strongest lines in the X-ray powder pattern are reported to be 6.79 (10), 5.99 (7) and 3.06 (7) (ASTM Card No. 9-446).

British Columbia

93 B/16 A single hollow nodule of leucophosphite has been found in a clay bank at the mouth of Narcosli Creek on the west side of the Fraser River. The nodule is about an inch in diameter and consists of a dark brown botryoidal outer crust grading towards the centre into yellowish white crystal groups about a millimetre in diameter (R.M. Thompson, 1960: private communication).

LIMONITE

$Fe_2O_3.nH_2O$

Limonite is the name given to yellow-brown to brown ferric iron oxides, often largely goethite but commonly partly amorphous and of undetermined composition. It is an abundant material always occurring as a secondary product of the alteration of other iron minerals including sulphides, oxides, and ferrous silicates. It is often formed in bogs as bog iron ore, in some sedimentary deposits with limestone, or as a gossan in the weathered zones of metallic mineral deposits. Large tonnages of residual limonite are mined as iron ore, as at Steep Rock Lake, Ontario, and along the Labrador trough. The list of occurrences of limonite presented here is restricted to a very few localities from which good specimens have been obtained.

British Columbia

82 G/6 Pseudomorphs of limonite after pyrite, collected along the Ball River about 6 miles above its confluence with the East Kootenay River, are represented in the National Mineral Collection.

Nova Scotia

11 E/5 Limonite specimens from Acadia Mines near Londonderry, are present in the National Mineral Collection.

11 E/7 Fine specimens of botryoidal and stalactitic limonite, found at Bridgeville, Pictou County, have been donated to the National Mineral Collection.

Ontario

31 C/6 Earthy limonite, or ochre, occurs in the Kane Mine on lot 9, conc. XIV, Huntingdon Township, Hastings County (National Mineral Collection).

41 N/15 Specimens of stalactitic limonite from the Helen Iron Mine in the Michipicoten area, have been presented to the National Mineral Collection.

LINARITE

$(Pb, Cu)_2SO_4(OH)_2$

Linarite is an uncommon constituent of copper-lead deposits. It forms deep blue monoclinic crystals, and is of secondary origin. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 4.48 (4), 3.53 (7), 3.12 (10), 2.16 (4) and 1.79 (6) (L.G. Berry, 1951: Am. Mineralogist, 36, p. 511).

British Columbia

82 N/3 Prismatic and tabular crystals of linarite are associated with anglesite at the Beaver Claim Group in the Slocan mining camp. The two minerals line cavities in a sulphide ore consisting of galena and chalcopyrite (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 123).

An analysis by Johnston of linarite from the above locality is as follows: $PbSO_4$ 75.17, CuO 19.88, H_2O 4.73, total 99.78; S.G. 5.23 (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., pp. 260,261).

104 N/12 An occurrence of linarite has been reported from the Atlin district. The mineral lines a small cavity in a mineralized quartz-calcite vein exposed on a group of two claims located on the southeastern corner of Table Mountain, 3 1/2 miles northwest of Taku Landing. Vein minerals are galena, chalcopyrite, pyrite, malachite, and azurite (D.D. Cairnes, 1913: Geol. Surv. Can., Mem. 37, p. 107).

LINNAEITE

Co_3S_4

Linnaeite is a member of a series of relatively rare sulphides that have a spinel-type structure. Other members of the series are: polydymite, Ni_3S_4; siegenite $(Co, Ni)_3S_4$; carrollite, Co_2CuS_4; and violarite, Ni_2FeS_4. The X-ray powder pattern of linnaeite shows four strongest lines having the following spacings and intensities: 2.83 (10), 2.36 (7), 1.815 (6), 1.670 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 76).

British Columbia

94 C/12 A pinkish cream mineral detected in a polished section of vein material from the Shell property, located 13 miles north of Aiken Lake, has been identified by X-ray diffraction as a linnaeite group member. It occurs with magnetite, pyrite, and chalcopyrite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 435).

New Brunswick

21 P/5 Linnaeite occurs with copper, zinc and lead mineralization at the Captain Yellowknife Mine in Gloucester County (A.L. McAllister, 1959: Can. Inst. Mining Met., Massive Sulphide Deposits).

Ontario

52 L/7 Siegenite, a variety of linnaeite, occurs in a small replacement deposit, together with pyrite, cobaltite and carbonate at the Werner Lake Cobalt Mine near the west end of Werner Lake, north of Kenora. Identification was by X-ray powder diffraction pattern (X-ray Laboratory, Geol. Surv. Can.).

Quebec

21 L/9 Linnaeite has been identified from an X-ray powder pattern of a specimen from the Eastern Metals property in Rolette Township, Montmorency County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

LITHARGE

PbO

Yukon

106 D/4 Litharge has been found with native lead at Dublin Gulch. The spacings and intensities of the three strongest lines in the X-ray powder pattern of synthetic litharge are: 3.12 (10), 2.81 (6) and 1.87 (4) (X-ray Laboratory, Geol. Surv. Can.).

LITHIOPHILITE

$Li(Mn, Fe)PO_4$

Lithiophilite is a manganese-rich orthophosphate of lithium. A small amount of iron is always present and as this quantity increases, a gradation into triphylite occurs. Optical properties vary with the composition. When the Fe content reaches 26.6 per cent the optic sign changes from positive (lithiophilite) to negative (triphylite). Lithiophilite occurs in pegmatites and pegmatitic granites in association with other lithium-bearing minerals.

The X-ray powder pattern has six strongest lines with the following spacings and intensities: 4.26 (7), 3.47 (8), 3.01 (9), 2.53 (10), 1.75 (8) and 1.507 (7) (X-ray Laboratory, Geol. Surv. Can.).

Manitoba

52 L/6 Compact cleavable masses of lithiophilite occur on the Bear claims, 3 miles southeast of Lamprey Falls and 8 miles upstream from Pointe du Bois, on the Winnipeg River. Chemical analysis by Fabry, of this salmon-pink to orange mineral, is as follows: MnO 45.18, P_2O_5 44.47, H_2O 1.39, CaO 1.03, FeO 0.24, Li_2O 6.99, Na_2O 0.50, MgO 0.04, total 99.84 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 156).

Pink to brownish aggregates of lithiophilite are associated with cleavelandite, quartz, and spodumene in pegmatite at the Montgary Mine, at Bernic Lake in the Bird River area (M.H. Frohberg, 1960: private communication).

LÖLLINGITE

$FeAs_2$

Löllingite is found with various sulphides in vein deposits, often in a carbonate gangue. It has been found in cobalt, silver and gold ore deposits. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 2.61 (10), 2.53 (7), 2.33 (9), 1.859 (7) and 1.638 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 97).

Ontario

31 D/15 Löllingite and pyrrhotite occur with quartz on lot 16, conc. XIV, Galway Township, Peterborough County. Chemical analysis of löllingite from this locality, by Johnston: As 70.85, S 0.81, Fe 24.67, Co 2.88, Ni 0.79, total 100.00; S.G. 7.028 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 19R).

31 M/5 Löllingite and safflorite have been found in the Keeley Mine in the Cobalt district. Niccolite, cobaltite, and skutterudite are also present (J.M. Bell and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., 17, pp. 26, 27, 31).

Veins bearing löllingite and a wide variety of other metallic minerals occur at the M.J. O'Brien property, 2 miles southeast of

31 M/5 Cobalt on the shore of Cross Lake (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41).

Löllingite occurs in the La Rose Mine, near Cobalt (T.L. Walker and A.L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 9).

A calcite vein in the Kerr Lake Mine contains löllingite which exhibits a marked fibrous structure, the fibres being roughly perpendicular to the vein walls (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 221).

41 P/8, 41 P/10 Radiating and sheaf-like growths of löllingite are found embedded in calcite at the Castle-Tretheway Mine, near Gowganda (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 67).

41 P/10 Löllingite occurs in comparative abundance with a wide variety of other metallic minerals in the calcite-quartz veins at the Miller Lake O'Brien Mine, near Gowganda (E. Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61).

42 E/10 Minute prisms and dendrites of löllingite are found replacing pyrite, arsenopyrite, pyrrhotite, sphalerite, and chalcopyrite in the MacLeod-Cockshutt Mine in Ashmore Township, Thunder Bay District (H.C. Horwood and E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. V, p. 43).

Löllingite is closely associated with arsenopyrite, pyrrhotite, and pyrite at the Magnet Consolidated property and other localities in the Little Long Lac district (H.S. Armstrong, 1944: Am. Mineralogist, 29, p. 311).

Quebec

22 A/7 Spectrographic and X-ray analyses have identified löllingite in specimens of serpentine rock from conc. XII, south half of lot 28, Port Daniel Township, on the Gaspé Peninsula. The occurrence is on the west bank of the Port Daniel River about 6 miles from its mouth (D.A. Moddle, 1960: private communication).

23 B/14 A mineral of the löllingite-safflorite series has been identified by X-ray diffraction pattern as a constituent of the ore at the Quebec Cobalt property in the Mount Wright area. Other metallic minerals present in the sample examined were bismuth, bismuthinite, and arsenopyrite (X-ray Laboratory, Geol. Surv. Can., samples submitted by S. Duffell, 1956).

LUDWIGITE

$(Mg, Fe)_2FeBO_5$

Ludwigite is isostructural with paigeite, the Fe dominant member of the series. The members of the ludwigite-paigeite series are high temperature minerals found in contact metamorphic deposits.

Yukon

105 B/3 Fine needles of ludwigite are present in a magnetite-pyrrhotite deposit near the eastern bank of the south fork of Swift River and about a mile north of the Source Lakes. The ludwigite occurs in intimate association with magnetite (R.M. Thompson and J.A. Gower, 1954: Am. Mineralogist, 39, p. 522).

The X-ray powder pattern has six strongest lines at: 5.12 (7), 2.56 (10), 2.17 (5), 1.380 (5), 1.020 (5), and 0.998 (5) (X-ray Laboratory, Geol. Surv. Can.).

MAGNESIOCHROMITE

$(Mg, Fe)(Cr, Al)_2O_4$

Magnesiochromite, also known as chrompicotite, is a spinel mineral with theoretical composition $MgCr_2O_4$. All natural magnesiochromites contain considerable iron replacing magnesium, and aluminium replacing chromium.

British Columbia

92 I/14 Magnesiochromite, referred to as chrompicotite, occurs at Scottie Creek, about 20 miles north of Ashcroft. The results of an analysis by Johnston, of a specimen from this locality are as follows: Cr_2O_3 55.90, Al_2O_3 13.83, FeO 14.64, MgO 15.01, SiO_2 0.60, total 99.98; S.G. 4.239 (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, pp. 11R, 12R).

104 N/11 Magnesiochromite has been found at the Doulton property on Ruby Creek in the Atlin district (National Mineral Collection).

Quebec

21 L/3 Magnesiochromite occurs with magnetite at the Caribou pit in Coleraine Township. An analysis of the magnesiochromite is as follows: SiO_2 0.24, TiO_2 0.17, Al_2O_3 14.03, Cr_2O_3 55.51, MgO 14.83, CaO 0.11, Fe_2O_3 3.79, FeO 11.35, MnO 0.14, H_2O^+ 0.07, H_2O^- 0.02, total 100.26 (A.L. Parsons, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 75). The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 2.49 (10), 2.07 (5), 1.593 (6), 1.466 (7), 1.081 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 195).

MAGNESIOCOPIAPITE

(See copiapite)

MAGNESIOHASTINGSITE

(See hornblende)

MAGNESIOSUSSEXITE

(See szájbelyite)

MAGNESITE

$MgCO_3$

Magnesite is a member of the calcite group. It forms a complete series with siderite through substitution of iron for magnesium. Intermediate members of the series have been called breunnerite. Calcium and manganese substitute for magnesium to a small extent only. Magnesite rarely forms sedimentary rocks and is much less common than calcite. It is of commercial value as a source of magnesia and magnesium metal.

The spacings and intensities of the five strongest lines in the X-ray powder pattern of synthetic magnesite are: 2.74 (10), 2.50 (2), 2.10 (4), 1.939 (1) and 1.700 (3) (H.E. Swanson, N.T. Gilfrich and M.I. Cook, 1957: Nat. Bur. Stds., Circ. 539, vol. 7, p. 28).

British Columbia

82 F/6 A bed of high-grade magnesite occurs near Marysville, in the Nelson area. It forms part of the Cranbrook Formation, is from 50 to 100 feet thick, and has been traced for about 4 1/2 miles (H.M.A. Rice, 1937: Geol. Surv. Can., Paper 37-27, p. 17).

92 J/15 Magnesite occurs in association with serpentinized peridotite at the northwest end of Liza Lake, Bridge River map-area, Lillooet district (C.W. Drysdale, 1916: Geol. Surv. Can., Sum. Rept., 1915, pp. 75-85).

Newfoundland

2 C/5 Breunnerite occurs in talc-quartz-carbonate schists on the east side of an ultrabasic belt that extends north from 1/2 mile north of the Trans-Canada Highway in the Terra Nova and Bonavista map-areas (S.E. Jenness, 1965: Geol. Surv. Can., Mem. 327, p. 89).

Nova Scotia

11 E/14 Small crystals of magnesite are associated with anhydrite at Malagash in Cumberland County. They are usually prismatic, although sometimes tabular, and may be grey, brownish, or colourless, either transparent or translucent. An analysis is as follows: MgO 42.52, CaO 3.84, FeO 0.75, CO_2 47.02, SO_3 5.60, SiO_2 0.22, H_2O 0.38, total 100.33; S.G. 3.02 (H.C. Rickaby, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 50).

11 F/14 Euhedral crystals of magnesite, varying from dark brown to almost colourless, occur on a farm on the Point Road near Orangedale, in Inverness County. Colourless rhombohedral crystals of dolomite are associated with the magnesite (L.M. Dobbel, 1923: Am. Mineralogist, 8, p. 223).

Ontario

41 I/10 Breunnerite, an iron-bearing variety of magnesite occurs in a number of quartz veins outcropping on the east shore of Wanapitei Lake or, more specifically, on lot 6, conc. III of Rothburn Township. Similar material is found in considerable quantity on a dump in lot 6, conc. IV, of Scadding Township (L.F. Kindle, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. IV, p. 42).

42 A/6 Veinlets of almost pure magnesite are found in a serpentine-carbonate rock on claim P.P. 57, in the southern part of Deloro Township, Cochrane district (A.G. Burrows, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. II, p. 39).

Quebec

31 G/10 Magnesite occurs with dolomite in two elongated north-south trending zones arranged en échelon in Harrington Township about 10 miles north of Grenville (M.E. Wilson, 1934: Can. Mining J., vol. 55, pp. 239-241).

White, granular, cleavable masses of magnesite are present in lot 18, conc. II, Grenville Township (National Mineral Collection).

31 H/1 Two specimens of magnesite from Bolton Township, conc. IX, lot 17, have been analyzed by Hunt. His results are as follows: I. $MgCO_3$ 59.13, $FeCO_3$ 8.32, insol. 32.20, total 99.65; II. $MgCO_3$ 59.72, $FeCO_3$ 10.31, insol. 29.90, total 99.93 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 457).

31 H/2 Analyses of magnesite from conc. VII, lot 12, Sutton Township are as follows: I. $MgCO_3$ 83.35, $FeCO_3$ 9.02, insol. 8.03, total 99.40; II. $MgCO_3$ 33.00, $FeCO_3$ 19.35, insol. 45.90, Al_2O_3 0.50, total 98.75 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 457).

31 I/16 The magnesium-iron carbonate, breunnerite, has been reported to occur in Montauban Township on range I, lots 33-41 and 312-322, and on range II, lots 38-41 (J. R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 30).

MAGNETITE

Fe_3O_4

Magnetite is a common accessory mineral in igneous rocks. It also occurs as segregated masses formed by magmatic or metamorphic processes. Magnetite is an important ore mineral of iron.

The X-ray powder diffraction pattern is of the spinel type and has four strongest lines with the following spacings and relative intensities (Fe radiation, Mn filter): 2.53 (10), 1.61 (8), 1.48 (9) and 1.09 (8) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 193).

British Columbia

The following occurrences of magnetite in British Columbia have been compiled from G. A. Young and W. L. Uglow, 1962: Geol. Surv. Can., Econ. Geol. Ser. 3.

82 F/2 A bed of very pure magnetite occurs in the sedimentary rocks just west of the Kootenay Lake valley and slightly north of the International Boundary. The magnetite horizon appears to be conformable with the surrounding rocks and is quite extensive.

82 F/4 Magnetite occurs on the Lord Roberts Group between Sullivan and Murphy creeks and about 4 miles from Birchbank.

82 F/6 Near the village of Beasley.

92 C/9 The Conqueror property on Bugaboo Creek, a tributary of the Gordon River, southern Vancouver Island, comprises a magnetite body that forms a bluff over which the creek drops for a distance of about 35 feet. Other magnetite deposits occur along the length of Bugaboo Creek and the Gordon River; and along Harris Creek which flows into the San Juan River, 6 miles above its mouth, on the west coast of Vancouver Island.

92 C/14 The southeastern side of Tzartus or Cooper Island, in Barkley Sound, on the west coast of Vancouver Island.

92 C/15 The south shore of the Sarita River, 1 mile from its mouth, west coast of Vancouver Island.

92 E/8 Both sides of Hesquiat Lake and about 2 miles from its lower end, western Vancouver Island.

92 E/15	In an extensive deposit on a ridge on the southwest side of the valley of Tlupana Arm and about 1 mile from Head Bay.
92 E/16	As isolated vein-like bodies cutting limestone on the northwest side of the Sucwoa River valley on Vancouver Island.
92 F/2	The Defiance deposit near the headwaters of Handy Creek in the Alberni Canal area of Vancouver Island.
	On a mountain top 1 1/2 miles north-northeast of Kildonan on Uchucklesit Harbour, Vancouver Island.
	The Darbey and Joan deposit, 600 yards east of Smiths Landing about 12 miles from Port Alberni.
92 F/3	The property of Brynnor Mines Limited, about 3 miles north of Maggie Lake, near Ucluelet, Vancouver Island. The magnetite deposit is in a belt of andesite, tuff and limestone and is surrounded by quartz diorite intrusions and cut by numerous feldspar porphyry and granitic dykes.
	The southwest side of Henderson Lake; the Sunshine claim group at Cascade Creek on Uchucklesit Harbour; and 3 miles north of the east arm of Kennedy Lake.
92 F/9	Texada Island, 50 miles north of Vancouver.
92 F/12	Iron Hill near Quinsam Lake on the east side of Vancouver Island; 300 feet east of the outlet of Bacon Lake, a small body of water near Upper Campbell Lake, Vancouver Island.
92 F/13	The west side of the Iron River, about 1 1/2 miles from its mouth.
92 H/7	At Lodestone Mountain, 7 miles southwest of Tulameen.
92 I/4	Six miles southeast of Lytton.
92 I/5	Twenty-three miles above Lytton, on the Fraser River.
92 I/6	One-half mile below Thompson on the Thompson River.
92 I/9	Seven miles southwest of Kamloops.
92 I/10	At the Glen Iron Mine, on the south shore of Kamloops Lake and 1/2 mile east of Cherry Creek Station.
92 K/7	On the north side of West Redonda Island near the shore of Pryce Channel.
92 K/11	Near Fanny Bay on Phillips Arm.

92 L/2	In the basin at the head of Fault Creek, a tributary of the Zeballos River, and on the northwest side of the Zeballos River, near the headwaters of Black Creek, 5 miles from tidewater.
92 L/5	At two points along the Ingersol River on the northwestern part of Vancouver Island. One of these is situated on the eastern side about 1/2 mile from its mouth, and the other on the southwest valley slope, 5 miles from the mouth.
92 L/6	The June deposit situated from 4 to 6 miles east of June Landing on the southeast arm of Quatsino Sound, and on the eastern slope above Alice and Victoria lakes, Vancouver Island.
92 L/7	Seven miles up the Nimpkish River from Nimpkish Lake, Vancouver Island.
92 M/2	On the west side of Seymour Inlet, 7 miles from its head, and on a stream entering the east side of Seymour Inlet about 5 miles from its head.
92 P/8	The variety of magnetite known as lodestone has been found on the Windpass claim group near Chu Chua, north of Kamloops. The National Mineral Collection contains specimens donated in 1921 by D. A. Nichols.
93 D/4	At the head of Evans Arm on King Island.
93 D/11	At a mining property from which some ore has been produced, on the northwest shore of Dean Channel.
93 M/11	At a mining property at Rivers Inlet in Kilbella Bay.
103 B/5	At the Jedway Iron Ore property, Harriet Harbour, Moresby Island. The orebody, about 1 1/2 miles from the mine camp, outcrops at an elevation of from 750 to 1,060 feet above sea level.
103 B/6	A mile and a half inland from a bay on the southeast shore of Burnaby Island in the Queen Charlotte Islands and a number of localities in the vicinity of Harriet Harbour on Moresby Island.
	At the Plunger claim near Huston Inlet; on the Thunder Group at Collision Bay; and in the vicinity of Ikeda Bay, Moresby Island.
103 B/12	On the Apex claim group located 1 1/2 miles east of the head of Botany Bay, Moresby Island.
103 B/13	On the south arm of Tasu Harbour.
103 G/4	At the Iron Duke claim on the northern shore of Louise Island.
103 G/16	On the east coast of Pitt Island and near its northern end, associated with schists of sedimentary origin.

103 H/12 On the shore of Kumelon Inlet, 25 miles south of Prince Rupert.

103 I/2 With chalcopyrite, a few miles above the mouth of the Kitimat River.

103 J/1 Outcrops on the eastern shore of Porcher Island, about 17 miles south of Prince Rupert.

New Brunswick

The following occurrences of magnetite in the province were listed in The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick by the New Brunswick Research and Productivity Council (1965).

21 G/2 In schist at Lepreau, and in rhyolite at Lords Cove, Charlotte County.

21 H/12 At Bull Moose Hill, King's County.

21 J/7 Rocky Brook, York County.

21 P/5 Austin Brook, and at the Drummond Iron Mine, in Gloucester County.

21 P/12 At Nicholas Denys (Sturgeon River), and at Millstream Brook (Ellis Iron) in Gloucester County.

Newfoundland

12 B/8 Massive, coarsely crystalline magnetite occurs at the Bishop North deposit on the Bishop claim near the headwaters of Sheep Brook, 9 or 10 miles to the southeast of the Village of St. Georges. Two other magnetite deposits are present on the Bishop property. They are the Bishop South and the Bishop III, deposits located 2,000 feet and 3,700 feet respectively to the southwest of the first occurrence.

A magnetite deposit occurs about 1/2 mile north of Flat Bay Brook and midway between Surveyor Brook and Hells Gulch. It is known as the Hayes prospect.

Magnetite occurs on the Hudson prospect on the south side of Flat Bay Brook. The magnetite is in contact with fine-grained anorthosite and contains a considerable amount of pyrite (D.M. Baird, 1954: Geol. Surv. Can., Bull. 27, pp. 30-39).

12 B/9 A number of magnetite deposits are known in the vicinity of Indian Head on the northwest shore of St. George's Bay about 4 miles west of Stephenville Crossing (A.V. Heyle and J.J. Ronan, 1954: Geol. Surv. Can., Bull. 27, pp. 42-61).

Northwest Territories

33 M/15, 34 D/2 — Magnetite occurs in various parts of the Kipalu Iron Formation on the Belcher Islands in eastern Hudson Bay. Although most of the iron oxide is hematite, magnetite is fairly common in the Fairweather Harbour area (G.D. Jackson, 1960: Geol. Surv. Can., Paper 60-20, p. 9).

36 B/8, 36 B/9 — Magnetite is reported to occur in southern Baffin Island at Chorkbak Inlet (R.B. Blackadar, 1960: Can. Mining J., vol. 81, No. 4, p. 110).

Ontario

31 C/5 — Magnetite is presently being mined from a large open pit situated on the site of a conspicuous magnetic anomaly about a mile southeast of Marmora. The deposit lay beneath about 125 feet of Paleozoic sedimentary rocks which had to be removed before mining could begin. It is lenticular in shape and dips steeply towards the southwest, its presence being controlled by banding, shearing and brecciation in a skarn and possibly by a steeply dipping fold in the metamorphosed sedimentary rocks.

A magnetite zone about 15 feet wide occurs on lot 2, conc. II, of Madoc Township, Hastings County. It is exposed just west of Bankers Lake in the old workings of the Dominion Mine.

Magnetite occurs in three open pits at the Blairton deposit, lots 7 and 8, conc. I, Belmont Township, on the south shore of Crowe Lake.

Diamond drills have intersected magnetite beneath the Paleozoic sedimentary rocks in lots 24, 25, and 26, conc. XIX, Seymour Township, Northumberland County (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 C/9 — Titanium-rich magnetite was mined during the 1850s and 1860s, from the Chaffey property in lot 27, conc. VI of South Crosby Township. The workings are on an island near the northwest shore of Newboro Lake and are now partly flooded. An analysis of the ore indicated 50 per cent iron, 10 per cent titanium, 7 per cent silica, 5 per cent alumina, and 1 per cent sulphur. Traces of vanadium, phosphorus, chromium, and manganese were also detected.

A body of titanium-bearing magnetite occurs at the Mathews deposit, lot 1, conc. VI, North Crosby Township, near the northwestern shore of Newboro Lake (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, p. 12).

31 C/10 — A high-titanium, magnetite deposit known as the Blessington Mine occurs in lots 29 and 30 of the first concession of Hinchinbrooke Township.

31 C/10 Over 50,000 tons of magnetite have been shipped (1958) from the Glendower Mine, lot 6, concs. II and III, Bedford Township. The ore occurs at the contact between crystalline limestone and metamorphic pyroxenite. It is massive and from medium- to coarse-grained. Interstitial hematite and ilmenite are present as are small amounts of pyrite and chalcopyrite. Apatite is fairly abundant.

Magnetite is present in a pit on a hill in lot 3, conc. I, South Sherbrooke Township, Lanark County. An analysis indicated from 59.55 to 62.95 per cent iron, 6.59 per cent insolubles and negligible phosphorus and titanium (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, pp. 29-39).

31 C/12 Magnetite in disseminations, bands, and stringers has been mined at the Mag iron property in lot 20, conc. IV, Lake Township, on the eastern side of Whetstone Lake.

At the Belmont or Ledyard deposit on lot 19, conc. I, of Belmont Township, 1/2 mile to the south of Cordova Mines, magnetite occurs both disseminated in gabbro-diorite rocks and concentrated in lenses at the contact between igneous rocks and crystalline limestone.

Three magnetite deposits are known to occur in the sheared crystalline limestones on conc. I, lot 19, and on conc. II, lots 18 and 19, of Madoc Township. Workings at these localities were known as the Hobson, Nelson, and Knob mines, respectively (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 C/12, 31 C/13 Magnetite occurs in conc. XII, lots 16 and 17 of Lake Township on what is known as the Ricketts property.

Magnetite mixed with dark ferromagnesian minerals is present in the Orton Mine on lots 56 and 57 of Tudor Township, about 20 miles northwest of Madoc.

Magnetite occurs on lots 41, 42, 54, 55, west of the Hastings Road in Tudor Township, and on lot 54 east of the road (J.E. Thompson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III).

31 C/13 Magnetic iron ore has been mined from the Coehill deposit in lots 15 and 16, conc. VIII, of Wollaston Township, west of Coehill Station.

Magnetite occurs at the Jenkins deposit, about a mile west of Coehill, on lots 17 and 18 of Wollaston Township (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, p. 34).

A magnetite deposit occurs at the Emily Mine on lot 7, conc. XIX, Tudor Township.

31 C/13 The magnetite deposit at the St. Charles Mine, conc. XI, lot 19, Tudor Township, is situated at the contact between diorite and crystalline limestone.

The magnetite ore of the Lee Mine, conc. XVIII, lot 22, Tudor Township, occurs along the contact between granite and limestone. It contains a considerable proportion of sulphide.

Fine-grained magnetite containing pyroxene and chlorite gangue was mined at the Baker Mine, just east of Steenburg Lake, in lot 18, conc. XVIII, Tudor Township (J. E. Thompson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III).

31 C/15 A band of magnetite-bearing hornblende gneiss is exposed in a rock-cut on the north side of highway 7, about 2 miles east of Maberly.

Both coarse- and fine-grained magnetite form irregular masses, clots, crystals, and veinlets at the Robertsville and Mary mines on conc. IX, lots 3 and 4, respectively, Palmerston Township (E. R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 C/16 On the southeast shore of Little Silver Lake, in lot 16, conc. IV, South Sherbrooke Township, is a small pit known as the Silver Lake Mine. Some magnetite occurs near it as well as in lots 13, 14, and 15 of the same concession and township.

Magnetite has been mined from a number of pits in lot 14, conc. I, South Sherbrooke Township.

Rock-cuts on the Canadian Pacific railway line on the northern shore of Christie Lake, South Sherbrooke Township, expose several narrow bands of magnetite striking in a northeasterly direction (E. R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 D/15 Two water-filled pits, about 125 feet apart, comprise the workings at the Paxton magnetite deposit in lot 5, conc. VI, of Lutterworth Township. The ore in the larger pit occurs as magnetite-bearing hornblende gneiss in a band 35 feet wide at the contact between granite on the hanging-wall and hornblende gneiss on the footwall.

Magnetite occurs at the Victoria deposit, lot 20, conc. I, Snowdon Township, in a zone at the contact between crystalline limestone and hornblende-feldspar gneiss.

Two shafts were sunk at the Howland Magnetite Mine on lot 26, conc. IV, Snowdon Township. The ore occurs in the contact zone between a band of crystalline limestone and a gneissic gabbro or amphibolite (E. R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 D/16 A number of magnetite-bearing veins cut the pink biotite granite gneiss just north of Stormy Lake, on lot 27, conc. XV, of

31 D/16 Glamorgan Township. Vein material in one of the deposits consists of calcite, feldspar, biotite, and apatite in addition to the magnetite, some of which is lodestone (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, p. 55).

31 E/1 Large crystals of magnetite have been found on lot 30, conc. XV, of Faraday Township (National Mineral Collection).

31 F/2 Lenses of magnetite near the contact between pink granite and crystalline limestone were worked during the early part of this century at the Wilbur Mine on lot 4, concs. XII and XIII, Lavant Township, Lanark County.

Ore at the Yuill deposit, lot 25, conc. V, Darling Township, consists of a fine-grained aggregate of magnetite, with a silica gangue. Pyrrhotite grains are also present as are veinlets of carbonate and silicates. The workings consist of an open-cut about 90 feet long by 30 feet wide, about 1 1/2 miles south of White Lake.

Four magnetite-bearing lenses have been outlined at the Radenhurst and Caldwell workings in lot 22, concs. III and IV, Lavant Township, Lanark County (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 F/4 Magnetite is present in a dump near a test pit in Dungannon Township, lots 48, and 49, conc. XI. A dip needle survey in the immediate vicinity detected an anomaly about 1,200 feet long and 600 feet wide.

Lenses of magnetite in the metamorphosed sedimentary rocks of the Dungannon Formation formed the orebodies of the old Bessemer Mine in Mayo Township, about 2 miles west of Mayo Lake (D.F. Hewitt and W. James, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. VIII, p. 47).

A small magnetite-hornblende zone has been exposed by stripping about a mile west of Boulter, on lot 17, conc. V, Carlow Township, and about 1/2 mile to the north, on conc. VI of the same lot.

On lots 11 and 12, conc. IX, Mayo Township, are three small pits from which magnetite was mined in 1913.

Magnetite has been exposed in a number of excavations west of Bow Lake in lot 21, concs. X and XI, Faraday Township, Hastings County (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45).

Magnetite is present in the workings at the Rankin property, conc. IX, lot 10, and Stevens property, conc. IX, lot 13, Mayo Township.

31 F/4 Magnetite is present in some old mine workings in lot 3, conc. XII, and in lot 21, conc. XI, of Faraday Township (J.E. Thompson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. III).

31 F/6 Magnetite occurs at the Radnor Mine, an abandoned mining operation on lot 16, conc. IX, Grattan Township, Renfrew County, about 8 miles southeast of Eganville. Similar occurrences have been reported from lot 16, conc. VIII and lot 17, conc. X, of the same township (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, pp. 49-50).

31 F/7 Disseminations, stringers, and bands of magnetite occur at the Bluff Point workings on lot 16, concs. X and XI, Bagot Township, just north of Grassy Bay on Calabogie Lake. Ore was produced from three shafts and several pits at around the turn of the century.

A magnetite-bearing skarn zone at the contact between crystalline limestone and diorite-amphibolite occurs at the Williams or Black Bay deposit, 2 miles northwest of Calabogie, on lot 22, conc. XI, Bagot Township.

Magnetite occurs in workings at the Culhane deposit, lot 21, conc. VII, Bagot Township.

Magnetite bodies, known as the Caldwell and Campbell deposits, are located about 1 mile east of the village of Calabogie. From 10 to 15 thousand tons of ore are said to have been shipped from this locality during the last years of the 19th century. Recent drilling has outlined a zone of magnetite about 270 feet thick and 3,000 feet long. Most of the magnetite is in fine stringers but coarse crystals have been found. Hematite and sulphides are also present.

Three miles south of Calabogie on the right-of-way of the Kingston-Pembroke branch of the Canadian Pacific Railway is an exposure of high-titanium magnetite. An analysis showed 40 per cent iron, 3 per cent titanium and traces of phosphorus and sulphur (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45).

31 L/2 Vanadium-bearing magnetite, known as coulsonite, is reported to occur on concs. V and VI, Papineau Township (W.D. Harding, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. VI, p. 48).

31 L/5 Octahedral crystals of magnetite have been found on Iron Island in Lake Nipissing (National Mineral Collection).

41 I/1 Magnetite is mined in the Moose Mountain district about 35 miles north of Sudbury. The magnetite occurs as narrow bands in relatively pure quartzite and in relatively small quantities in non-banded masses with epidote (E.W. Geist and S.A. Mahon, 1962: Bull. Can. Inst. Mining Met., vol. 55, No. 598, p. 109).

43 D/2 Magnetite is the ore mineral at the Anaconda Iron Ore Limited workings at Skibi Lake, 30 miles northwest of Nakina, in northern Ontario. The ore occurs in a host rock of quartz-biotite schist and irregular intrusive pegmatite. It has been highly metamorphosed and recrystallized (Unknown, 1961: Precambrian, vol. 34, No. 10, p. 20).

Quebec

21 E/5 Irregular veins of magnetite occur in chloritic schists at the Belvedere Mine in Ascot Township, range IX, lot 8.

Ore at the Smith Mine in lot 21, range VI, Ascot Township, consists of slaty rocks impregnated with magnetite. An analysis showed 54.074 per cent iron, 0.660 per cent phosphorus and 0.024 per cent sulphur (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, pp. 1, 2).

21 E/12 Serpentines on the north side of Nicolet Lake, in lot 21A, range I, of South Ham Township, are cut by a vein of magnetite varying in width from about 6 to 13 feet (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, pp. 6 and 7).

21 L/3 Magnetite and magnesiochromite occur together at the Caribou pit in Coleraine Township (A. L. Parsons, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 75).

A series of lenticular magnetite layers are found in schistose rocks on range V, lots 7a, 7b, Leeds Township (H.W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, pp. 3, 4).

21 L/7 Magnetite occurs at and near the contact of an acidic tuff and a peridotite intrusion in the Beauceville area, 1,400 feet north of Rivière des Plantes. Cr_2O_3 is present in considerable quantities (B. R. Mackay, 1921: Geol. Surv. Can., Mem. 127, p. 85).

22 D/11 Titaniferous magnetite occurs at the St. Charles Mine on range I, lots 44, 45, Bourget Township, Chicoutimi County. It forms as large segregated masses in anorthosite and is of two types, coarse grained and fine grained. Both have distinctive compositions. Comparative analyses are as follows: coarse-grained material: Fe 48.18, Ti 13.45, P 0.404; fine-grained material: Fe 33.77, Ti 7.44, P 3.85 (H. W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173 (rev.), p. 18).

31 F/9 Magnetite is the main ore mineral at the Hilton Mine in lots 21 and 22, range II, Bristol Township, Pontiac County. It is medium grained, rimmed in places with hematite, and sometimes altered to martite. The host rocks are mainly foliated amphibolites occurring in a steeply inclined shear zone with a northeasterly strike (E. R. Rose, 1958: Geol. Surv. Can., Bull. 45, pp. 27-29).

31 G/5 Irregular discontinuous seams of magnetite occur in a shear zone in crystalline limestone at the Forsythe Mine, also known as Hull Iron Mines. Interstitial hematite is present with the magnetite in the ore. Gangue minerals include amphibole, calcite, talc, chlorite, graphite, pyrite, and quartz. The workings are located on lots 11 and 13 of range VII, Hull Township, on the Mine Road 2 miles west of Ironside and about 4 miles northwest of Hull (E.R. Rose, 1958: Geol. Surv. Can., Bull. 45, p. 35).

In the immediate vicinity of the Forsythe workings are two other long abandoned excavations from which magnetite has been obtained. They are the Baldwin Mine, lot 14, range VI; and the Lawless Mine, lot 14, range VII; both in Hull Township (H.W. McGerrigle, 1943: Que. Dept. Mines, Prelim. Rept., 173 (rev.), p. 31).

31 G/12 Magnetite and specularite are the ore minerals at the Haylock Mine, lots 27, 28, range VI, Templeton Township, Papineau County (H.W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173 (rev.), p. 22).

31 H/13 Titaniferous magnetite occurs 2 1/2 miles west of St. Jerome, north of the road to St. Canut, on the north concession of Rivière-du-Nord Township, lots 461 to 464 (H.W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173 (rev.), p. 16).

31 I/10 Titaniferous magnetite is present in St. Boniface Township, range VII, lots 22 and 23 (H.W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, p. 18).

32 D/15 Magnetite occurs in the area comprising range IV, lots 18 to 20, range V, lots 17 to 24, and range VI, lots 21 to 28, Ligneris Township, Abitibi East County (H.W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, p. 26).

Yukon

105 D/11 Magnetite is present with hematite in a number of the workings in the Whitehorse copper belt near Whitehorse (G.A. Young and W.L. Uglow, 1926: Geol. Surv. Can., Econ. Geol. Ser., 3, p. 15).

115 H/1 Magnetite is present at the property known as Macks copper claim near the Nordenskiöld River about 35 miles west of the Whitehorse-Dawson Road (G.A. Young and W.L. Uglow, 1926: Geol. Surv. Can., Econ. Geol. Ser., 3, p. 14).

115 H/2 A magnetite deposit has been discovered near Giltana Lake (G.A. Young and W.L. Uglow, 1926: Geol. Surv. Can., Econ. Geol. Ser., 3, p. 14).

115 I/6 Several magnetite deposits occur on the sides of Freegold Mountain between Seymour and Stoddard creeks and about 5 miles south of the latter's confluence with Big Creek, a tributary of the Yukon.

They are of contact metamorphic origin and have been mined for gold (H.S. Bostock, 1936: Geol. Surv. Can., Mem. 189, pp. 52, 53).

MALACHITE

$Cu_2CO_3(OH)_2$

A secondary ore mineral of copper, malachite is a common constituent of the oxidation zones of copper deposits. It is a distinctive green colour and usually occurs either in the massive form or as incrustations.

British Columbia

82 E/1, 82 E/2 Malachite is found in the vicinities of Copper and Boundary creeks in the Greenwood mining division. It occurs in crystals and in the massive form with iron and copper minerals in the limestones and porphyritic rocks of the area (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, p. 21R).

82 F/6 Malachite occurs at the Eureka Mine located east of Eagle Creek, in the Kootenay River area west of Nelson (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 151).

92 I/2 Radiating groups of acicular malachite crystals have been observed at Iron Mountain in the Nicola mining division. They are reported to occur with specularite, chalcopyrite, and pyrite in veins cutting volcanic rocks (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 80A).

104 P/3 Malachite and azurite occur with chalcopyrite, pyrite, and hematite at two deposits in the McDame map-area: at a locality about 1 1/2 miles south of the mouth of Nizi Creek on the east side of the trail along Four Mile River; and at the Carlick Group, 2 miles north of McDame (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 113).

Newfoundland

1 M/10 Malachite has been observed with bornite at Blue Cliff on Fortune Bay, and on the Terrenceville road on the opposite side of the valley from Black Duck Brook. The copper mineralization occurs in a fault zone (D.A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 53).

Northwest Territories

78 B/7 Malachite has been found in the volcanic rock of the Shaler Mountains on Victoria Island (R. Thorsteinsson and E. T. Tozer, 1962: Geol. Surv. Can., Mem. 330, p. 77).

85 J/8 Specimens of malachite have been obtained from outcrops of vein material in the Yellowknife Bay area. Limonite and azurite are associated (L. C. Coleman, 1953: Am. Mineralogist, 38, p. 521).

Nova Scotia

11 E Nodules of malachite occur in Pictou County. The mineral is also found in association with plant remains in the Permian sandstones of the same county (H. S. Poole, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 37M).

21 H/1 Malachite is one of the supergene minerals occurring at the Magnet Cove lead-barium-zinc-silver deposit, 2 1/2 miles southwest of Walton (R. W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

21 H/8 Malachite has been noted at Two Islands, Cumberland County (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 151).

Ontario

32 D/4 Malachite has been found on claim L. L. 4868, in Morrisette Township, Timiskaming district (D. G. Wright, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 62).

41 P/9 Malachite has been reported to occur in intermediate volcanic rocks in the northwest part of Bryce Township. It has been noted on conc. II, lot 10, and on conc. III, lots 10 and 11.

A few narrow seams of malachite and calcite occur on the Paragon-Hitchcock property in lot 10, conc. I, of Tudhope Township (W. W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. IV, p. 41).

41 P/12 An occurrence of malachite has been reported from the eastern shore of Mesomikenda Lake, in the Three Ducks Lake area (H. C. Laird, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, p. 27).

Quebec

21 L/3 Malachite occurs in conc. II, lot 4, Inverness Township, Megantic County (National Mineral Collection).

21 L/12 Fibrous masses of malachite are found with drusy calcite at Black River Mines in Lotbinière County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., p. 44T).

Saskatchewan

74 N/8 Malachite, aragonite and uranium oxidation products are found lining vugs and veinlets at the Nicholson Mine, near Goldfields, on the north shore of Lake Athabasca (D.D. Hogarth, 1951: Am. Mineralogist, 36, p. 412).

Yukon

105 D/11 Malachite is widely distributed throughout the Whitehorse copper belt (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 377).

105 M/14 Small amounts of malachite are present in zones of surface oxidation in the Keno Hill-Sourdough Hill area. At the Bellekeno Mine, malachite has been found in oxidized ore 400 feet below the surface (R.W. Boyle, 1955: Geol. Surv. Can., Paper 55-30, p. 51).

The spacings and intensities of the four strongest lines in the X-ray powder pattern of pure malachite from Keno Hill are: 5.77 (6), 5.03 (8), 2.85 (10) and 2.52 (5). Fluorescence analysis and X-ray powder patterns indicate some Keno malachites contain minor amounts of zinc (X-ray Laboratory, Geol. Surv. Can.).

MANGANITE

MnO(OH)

The spacings and intensities (Fe radiation) of the five strongest lines in the X-ray powder pattern of manganite are: 3.40 (10), 2.64 (6), 2.28 (5), 1.708 (4) and 1.636 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 185).

British Columbia

103 K/2 A deposit containing manganite and pyrolusite has been found on Klaskwun Point on the north side of Graham Island. The manganite and pyrolusite are present as cementing material in pods up to 30 feet long in a shear zone breccia (W. Petruk, 1963: Can. Mineralogist, 7, p. 670).

New Brunswick

The following occurrences of manganite have been cited by the New Brunswick Research and Productivity Council in the Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, Record 2, Pt. B, 1965.

21 H/5 Quaco Head, Saint John County.

21 H/10 Albert Village, Albert County.

21 H/11 Upham property, Markhamville, King's County.

21 H/14 Jordan Mountain, King's County, and Gowland Mountain, Albert County.

21 H/15 Turtle Creek and Shepody Mountain, Albert County.

21 P/12 Tetagouche Falls, Gloucester County.

Nova Scotia

11 E/6 Manganite occurs in veins on the east bank of the Shubenacadie River in the Truro area, Colchester County (I. M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 110).

11 E/7 Manganite has been found at Bridgeville in Pictou County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 152).

21 A/9, 21 A/16 The occurrence of manganite near Wollaback Lake, Lunenburg County, has been reported (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 152).

21 H/1 Manganite occurs at Walton, Hants County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 44T).

Ontario

41 K/9 Manganite, quartz, calcite, and fluorite occur in a vein in trap rocks at Batchawana Bay in the Algoma district (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 751).

Quebec

11 N/5, 11 N/11, 11 N/12 Manganite occurs on Amherst and Grindstone islands in the Magdalen Islands (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 44T).

Yukon

105 M/14 A specimen of oxidized ore from Mackeno Mines Limited, in the Galena Hill area, has been found to contain manganite as a supergene mineral (X-ray Laboratory, Geol. Surv. Can.).

MARBLE

(See calcite)

MARCASITE

FeS_2

Marcasite is an orthorhombic polymorph of the more common cubic form of iron sulphide, pyrite. The two minerals are quite similar in appearance. Marcasite appears to form under near-surface conditions and from acidic solutions. It is frequently found as concretions in sedimentary rocks.

British Columbia

103 P/11 Rounded pellets of marcasite occur in a replacement sulphide deposit north of Trout Creek and 1/2 mile from the Kitsault River, 19 miles from Alice Arm, Vancouver Island. Associated minerals are sphalerite, galena, tetrahedrite, pyrite, barite, jasper, calcite and quartz (George Hanson, 1935: Geol. Surv. Can., Mem. 175, p. 58).

104 P/4 Excellent examples of the replacement of pyrrhotite by colloform marcasite occur in a sulphide-bearing vein on the Contact claim group between the headwaters of McDame Creek and the Cottonwood River in the Liard mining division (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 528).

Manitoba

63 B/13 Nodules of marcasite are found in boulders of white sandstone on Pemmican Island in Lake Winnipegosis (J.B. Tyrrell, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 153E).

63 K/6 Marcasite is found in the sulphide ore of the Chisel Lake Mine (A.E. Bence and L.C. Coleman, 1963: Can. Mineralogist, 7, p. 663).

New Brunswick

21 G/7 Marcasite is a constituent mineral of the tin deposits at Mount Pleasant. It is associated with stannite, arsenopyrite, pyrite, and pyrrhotite (K.F.G. Hosking, 1963: Precambrian, vol. 36, No. 4, p. 20).

Newfoundland

12 B Marcasite and pyrite are present in the red, green, and black highly fissile shales of the Humber Arm Group, Stephenville map-area (G.C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 24).

Northwest Territories

85 B/16, 85 G/1 Sphalerite, galena, and marcasite occur as disseminated grains, masses, or veinlets replacing calcite, or dolomite, in the Pine

85 B/16, 85 G/1 — Point area, south of Great Slave Lake. Colloform and stalactitic masses of sulphides are not uncommon (Western Miner & Oil Review, vol. 36, No. 8, 1963: p. 26).

85 H/11, 85 H/12 — Massive and twinned marcasite occurs with pyrite and chalcopyrite in shear zones traversing micaceous quartz on the Outpost Islands in Great Slave Lake (J. E. Hawley, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 63).

The X-ray powder pattern of marcasite from Boothia Peninsula, has five strongest lines with the following spacings and intensities: 3.42 (5), 2.70 (10), 2.41 (3), 2.32 (3) and 1.760 (7) (X-ray Laboratory, Geol. Surv. Can.).

85 J/8 — Marcasite is found in appreciable amounts in the Yellowknife Bay area on the northern shore of Great Slave Lake (L. C. Coleman, 1953: Am. Mineralogist, 38, p. 520).

Ontario

The X-ray Laboratory of the Geological Survey has identified marcasite in specimens from the following mining properties in the Bancroft area.

31 D/16 — Blue Rock Cerium Mines Limited, concs. V and VI, lots 18, 19, and 20, Monmouth Township, Haliburton County.

Dyno Mines Limited, conc. VIII, lot 12, Cardiff Township, Haliburton County.

31 E/1 — The Croft property of Bicroft Uranium Mines Limited, located in Cardiff Township, near the Faraday Township line, about 1 mile northeast of Centre Lake.

Nu-Age Uranium Mines Limited, lot 8, conc. XXI, Cardiff Township, Haliburton County.

Halo Uranium Mines Limited, conc. XVII, lots 4 and 5, Cardiff Township, Haliburton County.

The Centre Lake property of Bicroft Uranium Mines Limited, conc. XI, lots 26 and 27, Cardiff Township, Haliburton County.

Fission Mines Limited, lot 5, conc. XXI, Cardiff Township, Haliburton County.

31 F/4 — The Can-Quirk-Mellish property, conc. I, lot 5, Monteagle Township, Hastings County.

Greyhawk Uranium Mines Limited, lot 10, conc. XII, Faraday Township, Hastings County.

31 F/4 Faraday Uranium Mines Limited, conc. XI, lots 16 and 17, Faraday Township, Hastings County.

31 M/4 Marcasite forms mammillary radiating incrustations on glassy white quartz at the Trout Lake Mine in South Lorrain Township. Specimens from the mine dump are often altered to limonite on the surface but where the mineral occurs in closed cavities unaffected by weathering, it may occur as brilliant brassy crystals (T. L. Walker and A. L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 70).

40 J/1 The Kettle Point Formation, Kettle Point, contains concretions of marcasite now replaced by pyrite. These concretions occur at many horizons distorting the regularity of the laminations. Sizes vary to a maximum diameter of 3 inches. Feather-like aggregations also occur (W. D. MacDonald, 1960: Bul. Can. Inst. Mining Met., vol. 53, No. 583, p. 844).

41 I/6 Marcasite is a relatively minor constituent of the Sudbury ores. It has three modes of occurrences: as an alteration or replacement of nickeliferous pyrrhotite; in offset deposits associated with nickeloan pyrite; in seams or nodular masses in late veins cutting normal sulphide ore or wall-rocks usually associated with nickel-poor pyrite, sphalerite, galena, calcite, and quartz (J. E. Hawley and R. L. Stanton, 1962: Can. Mineralogist, 7, p. 41).

41 I/10 Marcasite has been found in vugs and crustiform masses along a post ore vertical fault at the Falconbridge Mine in the Sudbury district (J. E. Thompson, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. VI, p. 25).

41 J/2 The conglomerates of the Elliot Group in the Blind River area contain some marcasite (P. J. Pienaar, 1963: Geol. Surv. Can., Bull. 83, p. 69).

42 L/6, 42 L/7 Marcasite occurs at Kupfer Lake in the O'Sullivan Lake area, Thunder Bay district (W. W. Moorhouse, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. IV, p. 22).

52 A/5 The Beaver Mine in O'Connor Township, Thunder Bay district, is reported to contain some marcasite (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 153).

52 A/6, 52 A/7 Marcasite has been observed on Silver Islet, in western Lake Superior (W. G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 203).

MARIPOSITE

(See muscovite)

MATILDITE

$AgBiS_2$

The spacings and intensities of the five strongest lines in the X-ray powder pattern of matildite from the Cobalt area are: 3.33 (6), 2.98 (4), 2.85 (10), 1.973 (4) and 1.716 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 142).

British Columbia

93 L/14 Matildite occurs as the second most abundant ore mineral (after tetradymite) at Glacier Gulch. Sphalerite, chalcopyrite, and calaverite are present as subordinate minerals. The ore is found in a white rock containing sericite, carbonates and kaolin, that is believed to be an altered tip of a tongue of granodiorite intruded into argillites (G.M. Pratt, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 55).

Northwest Territories

86 F/12 Specimens from the Camsell River Silver Mines property, How Group, consist of a dolomite-quartz gangue with disseminated galena, chalcopyrite, pyrite, bismuth, and bismuthinite which carries considerable silver. A microscopic feature of this ore is a fairly abundant galena-matildite exsolution intergrowth which exhibits a Widmanstätten texture. Associated with the above are sphalerite, chalcopyrite, traces of tetrahedrite, silver, argentite, marcasite, and minute zoned crystals of an undetermined iron-cobalt-nickel-arsenic sulphide (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 546).

Ontario

31 M/5 Two types of matildite occur at the O'Brien Mine near Cobalt. One is very fine grained, lead grey in colour, and breaks with a conchoidal fracture, while the other is more cleavable and galena grey in colour. Analysis of the first type by E.W. Todd: Bi 33.58, Ag 17.54, Pb 30.65, S 15.82, Fe 0.49, Sb 0.84, Cu 0.92, insol. 0.26, total 100.00; S.G. =7.07. Which corresponds to a mixture of 61.5% matildite, and 34.7% galena with the balance chalcopyrite, silver, and tetrahedrite. This type of matildite occurs as a complex intergrowth with galena.

The second type is more complex and is composed of a galena-matildite intergrowth which has larger masses of galena. Considerable amounts of silver, chalcopyrite, arsenopyrite and tetrahedrite are present. This type of matildite was studied by H.V. Ellsworth (Ont. Bur. Mines, Ann. Rept., 1916, vol. 25, Pt. I, p. 232) whose analysis is as follows: Pb 54.35, Bi 20.26, Ag 10.11, S 14.68, Sb 0.45, Fe 0.20, total 100.05; S.G. 7.201 (Univ. Toronto Stud., Geol. Ser., 12, 1921, p. 70).

MAUCHERITE

$Ni_{3-x}As_2$

The spacings and intensities of the four strongest lines in the X-ray powder pattern of maucherite are: 2.69 (9), 2.01 (10), 1.713 (10), and 1.212 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 42).

Ontario

41 I/6 Maucherite is associated with but less common than niccolite in the nickel deposits of Sudbury. Chemical analysis of maucherite by Peacock, calculated to 100 per cent: Ni 51.75, Cu 0.21, Fe 0.24, As 47.52, and S 0.28. Later analyses have shown minor Co and traces of Sb, Bi, Ag, and Pd. Maucherite has been reported from the Worthington, Frood and Garson mines (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 81).

41 P/9 Maucherite has been identified in material from the Moose Horn Mine, Elk Lake, Timiskaming district (A.S. Dadson, 1936: Univ. Toronto Stud., Geol. Ser., 40, p. 119). The mineral was also known as temiskamite and timiskamite. Chemical analysis by Ellsworth: As 46.34, S 1.03, Ni 49.07, Co 1.73, Fe trace, Bi 0.55, total 98.72; S.G. 7.901 (T.L. Walker, 1914: Am. J. Sci., Ser. IV, vol. 37, p. 170).

41 P/10 A specimen from the Coleroy Mine, Gowganda, consists of a bronze-coloured material resembling niccolite occurring in veins of calcite. The metallic material has faint radiating structure in hand specimen. It was identified in polished section as temiskamite, a synonym for maucherite. Some niccolite occurs along fractures in the temiskamite, and isolated, well-formed crystals of cobaltite and smaltite occur in the niccolite and temiskamite. An analysis by Todd is as follows: Fe 0.62, Ni 40.33, Co 5.77, As 50.33, Sb 0.72, S 1.66, total 99.63 (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 76).

Quebec

31 H/8 Maucherite has been identified by X-ray powder pattern in a specimen from Orford (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Yukon Territory

115 F/15 A stringer of massive maucherite with minor magnetite and millerite, about 5 feet long and 2 inches wide, lies on the lower contact of a serpentinized peridotite dyke. The dyke cuts a series of silicified tuffs and limestones of probable Carboniferous age.

115 F/15 The rocks near the veinlet are brecciated and strongly altered to serpentine and carbonates (V.S. Papezik, 1955: Am. Mineralogist, 40, p. 693).

MELACONITE

(See tenorite)

MELANOCERITE

Melanocerite is a rare fluo-borosilicate-tantalate of calcium and rare earths found originally in Norway. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 4.86 (4), 3.56 (5), 2.93 (6) and 2.87 (10) (Ann P. Sabina and R.J. Traill, 1960: Geol. Surv. Can., Paper 60-4, p. 64).

Ontario

The X-ray powder pattern of melanocerite has been obtained from specimens taken from the following properties (X-ray Laboratory, Geol. Surv. Can.).

31 D/9 Pole Star Mines, conc. XII, lot 25, Burleigh Township, Peterborough County.

31 D/16 Blue Rock Cerium Mines Limited, concs. V and VI, lots 18-20, Monmouth Township, Haliburton County.

Cavendish Uranium and Mining Company, conc. VII, lots 14, 15, Cavendish Township, Peterborough County.

Windover property, conc. III, lot 3, Cavendish Township, Peterborough County.

31 E/1 Centre Lake property, Bicroft Uranium Mines Limited, conc. XI, lots 26, 27, Cardiff Township, Haliburton County.

Croft property, Bicroft Uranium Mines Limited, at the intersection of Cardiff, Herschel and Faraday townships.

Fission Mines Limited, conc. XXI, lot 5, Cardiff Township, Haliburton County.

31 F/4 Carr-Quirk-Mellish property, conc. I, lot 5, Monteagle Township, Hastings County.

Faraday Uranium Mines Limited, conc. XI, lots 16, 17, Faraday Township, Hastings County.

MELANTERITE

$FeSO_4.7H_2O$

Melanterite is a common efflorescence product formed by alteration of iron minerals such as pyrite. The X-ray powder pattern has six strongest lines with the following spacings and intensities (Fe radiation): 5.42 (3), 4.86 (10), 3.74 (5), 3.22 (3), 2.73 (3) and 2.63 (3) (L.F. Keating and L.G. Berry, 1953: Am. Mineralogist, 38, p. 501).

British Columbia

92 O/15 Melanterite is found in a ledge between Big Creek and Chilcotin River (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 154).

Manitoba

62 C/14 Melanterite occurs on township 44, range XXVIII, west of the first meridian (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 154).

63 K/12 Cuprian melanterite, also known as pisanite, occurs as a coarsely crystalline crust up to 1/4 inch thick on sulphide ores beneath the overburden, and also as vugs within the ore and near the bedrock surface, at the Cyprus Mine, 12 miles east of Flin Flon (L.F. Keating and L.G. Berry, 1953: Am. Mineralogist, 38, p. 501).

Nova Scotia

11 J/4 Melanterite has been found in heaps of shale and slack coal at Glace Bay Coal Mines, Cape Breton County (G.C. Hoffmann, 1888: Geol. Surv. Can., Ann. Rept., IV, p. 45T).

Ontario

41 I/6 The National Mineral Collection includes specimens of melanterite from a location 4 miles west of Sudbury Junction of the Canadian Pacific Railway, District of Algoma.

52 J/4 Sulphides in the country rock on lot 32, conc. I, Drayton Township, Kenora district, have been oxidized to form limonite and melanterite (M.E. Hurst, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. VI, p. 30).

Quebec

31 I/1 R.P.D. Graham and J. Riddell have identified melanterite in Utica shale stored in the Redpath Museum, McGill University, for study of associated graptolite fossils. The specimen is from

31 I/1 the south bank of the Bécanour River, about 3 miles downstream from Daveluyville, Arthabasca Township (Mrs. J.S. Stevenson, 1960: private communication).

31 J/4 Melanterite was found in limestone in the neighbourhood of a sphalerite vein on lot 36, range II, Northfield Township. Associated minerals are: galena, pyrite, pyrrhotite, limonite, graphite, diopside, serpentine, apatite, and tremolite (E.A. de la Rue, 1956: Que. Dept. Mines, Geol. Rept., 67, p. 24).

MELILITE

$$(Ca, Na_2)(Mg, Fe^{++}, Fe^{+++}, Al)(Si, Al)_2O_7$$

Quebec

31 H/5 Adams reports an occurrence of a melilite-bearing rock (alnoite) at Ste. Anne de Bellevue, Jacques Cartier County. The alnoite is found as a dyke cutting the Potsdam sandstone at the bottom of the Ottawa River opposite Ste. Anne de Bellevue (F.J. Adams, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 240).

MELONITE

$$NiTe_2$$

The spacings and intensities of the seven strongest lines in the X-ray powder pattern of melonite are: 2.81 (10), 2.63 (3), 2.05 (5), 1.912 (5), 1.586 (2), 1.544 (6) and 1.224 (2) (M.A. Peacock and R.M. Thompson, 1946: Univ. Toronto Stud., Geol. Ser., 50, p. 70).

Ontario

42 A/1 Melonite, altaite, calaverite, coloradoite, and petzite are found at all depths in the Wright-Hargreaves Mine, Teck Township. These tellurides are usually associated with native gold in nests and stringers in gangue and wall-rocks (H. Hopkins, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V, p. 166).

At the Toburn (Tough-Oakes) Mine, melonite is associated with altaite and petzite (R.M. Thompson, 1959: Am. Mineralogist, 34, p. 360).

42 C/4 X-ray powder patterns have served to identify melonite in specimens found at Macassa Creek, Thunder Bay District (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

32 D/6 Melonite is associated with tellurides, sulphides, and free gold in rich ore from the Robb-Montbray Mine, Montbray Township, Abitibi County (M.A. Peacock and R.M. Thompson, 1946: Univ. Toronto Stud., Geol. Ser., 50, p. 63).

MENEGHINITE

$Cu_2S.26PbS.7Sb_2S_3$

The spacings and intensities of the five strongest lines in the X-ray powder pattern of meneghinite are: 3.71 (9), 3.30 (10), 2.92 (8), 2.08 (5) and 1.199 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 132).

British Columbia

82 F/3 Investigation of a specimen of steel grey galena from the Durango Mine showed that it contained blebs of chalcopyrite, lenses of covellite, and a few beaded stringers of a grey anisotropic mineral which proved to be meneghinite. The mine is located near Ymir in the Nelson mining division (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

82 F/4 Meneghinite occurs at the Bluebird-Mayflower workings of Rossland Mines Limited, Trail Creek mining division. The several samples studied consisted of a massive complex of sulphides and sulpho-salts including pyrite, arsenopyrite, pyrrhotite, sphalerite, galena and boulangerite as major constituents, and minor amounts of tetrahedrite, owyheeite, meneghinite, chalcopyrite and gold. The meneghinite occurs as slightly greenish grey, anisotropic laths in galena (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

82 M/1 A sample of a small quartz vein in limestone, from the Mastodon claims, Revelstoke mining division, contained visible sphalerite and calcite. Under the microscope tetrahedrite and meneghinite were observed mixed with bournonite as well as minor amounts of galena, chalcocite, covellite, gold and probably arsenopyrite (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p.75).

93 E/6, 93 E/10 Samples collected from the Silver Bell claim, California Group, Chikamin Mountain, Whitesail Lake, consisted of limonite-stained quartz, and minor siderite with bands of galena, yellow sphalerite, tetrahedrite, and silvery grey needles and prisms of meneghinite up to 1 centimetre in length. Polished sections showed small rounded areas of bournonite in contact with tetrahedrite, and associated with galena, sphalerite, and chalcopyrite, while the meneghinite laths were usually free (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

93 M/5 At the Silver Standard Mine, near New Hazelton in the Omineca mining division, meneghinite occurs as fine laths and fibrous masses in close association with argentiferous tetrahedrite, galena, pyrargyrite, and polybasite. Traces of bournonite are associated with the meneghinite and sphalerite. Pyrite, pyrrhotite marcasite, arsenopyrite, chalcopyrite, covellite, and limonite are also present in the ore (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

Manitoba

63 K/16 Meneghinite occurs in the sulphide ore at Chisel Lake (A.E. Bence and L.C. Coleman, 1963: Can. Mineralogist, 7, p. 663).

Northwest Territories

85 J/8 Meneghinite has been identified in samples from the Yellowknife Bay area containing considerable galena or boulangerite, or both (L.C. Coleman, 1953: Am. Mineralogist, 38, p. 516).

Ontario

31 C/5, 31 C/11, 31 C/12 Meneghinite is reported to occur near South Emmons, Marmora Township, Hastings County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 155).

31 C/14 Massive meneghinite was found in quartz and dolomite at Marble Lake, Barrie Township, Frontenac County. An analysis by Harrington (1882) expressed in atoms per unit cell is as follows: Fe 0.11, Cu 1.90, Ag 0.07, Pb 26.31, Sb 14.11, S 46.52 (L.G. Berry and D.A. Moddle, 1941: Univ. Toronto Stud., Geol. Ser., 46, pp. 5 and 15).

Flattened and somewhat distorted galena-white, columnar masses of meneghinite up to 10 millimetres long and 5 millimetres wide occur embedded in vein quartz on lot 8, conc. II, Anglesea Township, Lennox and Addington counties (L.G. Berry and D.A. Moddle, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 5).

Meneghinite is found with quartz and dolomite on lots 5 and 9, conc. IX, Barrie Township (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 203). An analysis by Harrington is as follows: S 16.81, Sb 19.37, As tr., Pb 61.45, Cu 1.36, Fe 0.07, Ag 0.08, total 99.14; S.G. 6.33 (B.A. Harrington, 1907: Roy. Soc. Can. Trans., vol. I, sec. 3, p. 79).

Yukon Territory

105 M/14 Meneghinite has been identified by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.) associated with galena in a specimen from the vein fault on the Helen fraction, Keno Hill-Sourdough Hill area, Mayo mining division (R.W. Boyle, 1955: Geol. Surv. Can., Paper 55-30).

MERCURY

Hg

Native mercury is a rare mineral, usually associated with cinnabar in volcanic regions. It is liquid under natural conditions and does not give an X-ray powder pattern.

British Columbia

82 L/13 The National Mineral Collection includes a specimen of mercury from Shuswap.

92 C/14 Mercury occurs as minute globules scattered through a thin vein of cinnabar that cuts a greenish felsite at the eastern entrance to Seshart Channel, Barclay Sound, Vancouver Island (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 65R).

92 H/6 Some parts of the silver ore of Silver Peak, near Hope, contain globules of mercury (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 65R).

New Brunswick

21 J/16 Mercury has been found with cinnabar in specimens from Devils Brook, Souchesk Parish, Northumberland County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Ontario

31 M/5 Mercury is found in the silver-cobalt ores at the Nippissing-O'Brien Mine, Coleman Township, Timiskaming district (-, 1911: Eng. & Min. J., XCLI, p. 649).

MESOLITE

$Na_2Ca_2Al_6Si_9O_{30}.8H_2O$

Mesolite is one of the rarer members of the zeolite group. The group is characterized by the ability to undergo cation exchange and to lose water without loss of crystal structure. Mesolite is very similar in appearance and chemical composition to scolecite and natrolite but thermal studies have confirmed that the three are independent species. The spacings and intensities of the four strongest lines in the X-ray powder pattern of mesolite are: 6.44 (4), 5.79 (7), 4.35 (5) and 2.86 (10) (C.J. Peng, 1955: Am. Mineralogist, 40, p. 834).

92 I/3 A specimen of mesolite was obtained from near Zakwaski Mountain in the Nicola River area, Kamloops district.

92 I/15 The National Mineral Collection contains a specimen of mesolite found about 1/4 mile above the mouth of Criss Creek, which flows into Deadmans River in the Ashcroft mining division.

Nova Scotia

21 A/12, 21 A/13, 21 A/14, 21 B/8, 21 B/9, 21 H/1, 21 H/2, 21 H/3 Specimens of mesolite were collected by Walker from Long Point, Kings County, southwest as far as Mink Cove on Digby Neck, Digby County. Mesolite was also found as snow white beach pebbles around Horseshoe Cove, Cape d'Or. Other localities are Cape d'Or, Isle Haute, Blomidon shore opposite Cape Sharp, Scot's Bay, Gates Mountain, Port George and North Mountain. Analyses by How, are as follows: from Cape d'Or - SiO_2 46.01, Al_2O_3 26.66, Fe_2O_3 0.38, CaO 9.88, Na_2O 4.66, K_2O 0.20, H_2O 12.69, total 100.48; S.G. 2.26; from the shore opposite Gates Mountain - SiO_2 46.04, Al_2O_3 26.32, Fe_2O_3 0.02, CaO 9.72, Na_2O 5.32, K_2O 0.40, H_2O 12.48, total 100.30; S.G. 2.257; from Port George - SiO_2 46.84, Al_2O_3 25.92, CaO 9.63, Na_2O 5.21, H_2O 12.11, total 99.71; and from North Mountain - SiO_2 46.48, Al_2O_3 27.04, CaO 9.63, Na_2O 4.45, H_2O 12.40, total 100.00 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 57 and H. How, 1858: Am. J. Sci., Ser. II, vol. XXVI, p. 32).

21 H/3 Mesolite from Cape d'Or, Cumberland County, and from Peter's Point, near Margaretsville, Annapolis County, have been examined by static and differential thermal analysis techniques (C.J. Peng, 1955: Am. Mineralogist, 40, p. 834).

Ontario

41 N/2 Mesolite is found with epidote at Mamainse Harbour, Lake Superior (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 203).

METACINNABARITE

HgS

The spacings and intensities of the four strongest lines in the X-ray powder pattern of metacinnabarite are: 3.39 (10), 2.92 (5), 2.07 (8) and 1.759 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 49).

British Columbia

92 K/3 Metacinnabarite, the cubic polymorph of HgS, is found with cinnabar in cavities in quartz on the west side of Read Island, Nanaimo mining division. The National Mineral Collection includes specimens from this locality (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 66R).

METADOMEYKITE

(See domeykite)

METAZEUNERITE

$Cu(UO_2)_2(AsO_4)_2 \cdot 8H_2O$

This grass green secondary mineral is found in the oxidized zones of some uranium deposits. It fluoresces yellow-green. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 8.93 (10), 3.72 (9), 3.56 (7) and 3.30 (8) (C. Frondel, 1951: Am. Mineralogist, 36, p. 252).

British Columbia

104 N/12 Metazeunerite has been identified by its X-ray powder diffraction pattern in a specimen from Atlin (E. W. Nuffield and D.H. Gorman, 1960: private communication).

Saskatchewan

74 N/8 Metazeunerite is found on the property of Nicholson Mines Limited, on the north shore of Lake Athabasca. It occurs as small green plates up to 1/4 millimetre in diameter in vugs and crevices to the east of the high-grade area in close proximity to sulphides, silver and altered pitchblende (D. D. Hogarth, 1951: Am. Mineralogist, 36, p. 412).

MEYMACITE

(See tungstite)

MICHENERITE

$PdBi_2$

Ontario

41 I/10 This rare palladium bismuthide mineral was detected in mill concentrates from the Frood Mine, Sudbury, and described originally by C. E. Michener, in 1940, in a doctorate thesis submitted to the University of Toronto. It has been redescribed in detail and named michenerite by J. E. Hawley and L. G. Berry. The X-ray powder pattern has seven strongest lines at: 2.99 (10), 2.73 (8), 2.01 (9), 1.79 (7), 1.46 (3), 1.24 (2) and 1.18 (2) (J. E. Hawley and L. G. Berry, 1958: Can. Mineralogist, 6, p. 200).

MICROCLINE

(See potassium feldspar)

MILLERITE

NiS

Millerite commonly occurs as capillary crystals, needle-like to finer than a hair, often in tiny radiating groups and tufted coatings. Similar in colour to pyrite, it has been referred to as nickel pyrites and capillary pyrites.

Ontario

32 D/4 Large tufts of hair-like crystals of millerite up to 50 millimetres long occur on ankerite carbonate at the Kerr-Addison Mine, McGarry Township. The mineral was found in a crushed zone on the upper levels of the mine and yielded a number of large specimens of museum quality (M.H. Frohberg, 1960: private communication).

41 I/6 Millerite occurs in crystalline form at the Copper Cliff Mine, Sudbury district (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 13H).

41 I/7 Millerite is found in close association with violarite at the Vermillion and Levack mines, Sudbury (M.N. Short and E.V. Shannon, 1930: Am. Mineralogist, 15, p. 1).

41 I/16 Millerite occurs at the Timagami Mine, Timagami Lake, Nipissing district as crystals up to 30 millimetres long and 4 millimetres thick, and in massive aggregates weighing several pounds. It is found in quartz veins at the periphery of lenses of massive chalcopyrite, accompanied by gersdorffite and chalcopyrite. It occurs rather rarely and in quantities without economic significance (M.H. Frohberg, 1960: private communication).

41 P/10 Good specimens of millerite were obtained in a prospecting pit 200 feet south of the shaft on the Kell claim, Corkhill Township, Timiskaming district (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 45).

Quebec

21 L/9 Millerite occurs in aggregates of large crystals (up to 2 inches long) showing good cleavage, at the property of Eastern Metals Corporation Limited, Rolette Township, Montmagny County. This occurrence is unusual in that millerite is generally found in slender hair-like crystals or in very small masses replacing other minerals (J. Beland, 1957: Que. Dept. Mines, Geol. Rept., 76, p. 38).

21 L/9 The five strongest lines in the X-ray powder pattern have the following spacings and intensities: 4.77 (8), 2.75 (10), 2.50 (6), 2.22 (6) and 1.859 (10) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 63).

31 H/1, 31 H/2 The National Mineral Collection contains specimens of millerite from Sutton, Brome County.

31 H/8 Millerite, as small grains and prismatic crystals associated with chromiferous garnet, is found disseminated through calcite in a vein on lot 6, range XII, Orford Township, Sherbrooke County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 738).

MIMETITE

$Pb_5(AsO_4)_3Cl$

Mimetite usually occurs in globular, reniform, botryoidal, or wart-like forms. It is structurally similar to apatite and pyromorphite and grades into the latter species with substitution of phosphorus for arsenic.

Ontario

31 M/4, 31 M/5 A specimen of mimetite was found at the Frontier Mine, south Lorrain Township, Timiskaming district (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 69).

Yukon

105 M/14 Mimetite occurs sparsely, associated with cerussite, in a specimen from the No. 9 vein fault, Keno Hill-Sourdough Hill area, Mayo district. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.32 (6), 3.04 (10), 2.98 (9), 2.94 (7) and 2.095 (6) (X-ray Laboratory, Geol. Surv. Can.).

106 D/4 Mimetite was identified by X-ray diffraction pattern as a minor constituent of a gold placer deposit at Dublin Gulch, Mayo district (X-ray Laboratory, Geol. Surv. Can.).

MINNESOTAITE

$Fe_3Si_4O_{10}(OH)_2$

The spacings and intensities of the three strongest lines in the X-ray powder pattern of minnesotaite are: 9.53 (10), 3.177 (5) and 2.524 (2) (J.W. Gruner, 1944: Am. Mineralogist, 29, p. 366).

Quebec

23 J Minnesotaite has been identified from the Knob Lake iron deposits by X-ray powder pattern (X-ray Laboratory, Geol. Surv. Can.); also from Howell's River (E. W. Nuffield and D. H. Gorman, 1960: private communication).

32 I/14 Minnesotaite has been found with stilpnomelane in slate near Trout Point, Lake Albanel area, Mistassini Territory (L. N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 22).

MIRABILITE

$Na_2SO_4 . 10H_2O$

Mirabilite, also known as Glauber salt, occurs as a deposit from saline lakes, playas and springs, and as an efflorescence on alkalic soils and shales. The five strongest lines in the X-ray powder pattern have the following spacings and intensities: 5.49 (10), 4.77 (4), 3.76 (6), 3.21 (7) and 3.11 (6) (X-ray Laboratory, Geol. Surv. Can.).

British Columbia

94 A/2 Mirabilite occurs as an efflorescence with epsomite on cliffs of shale at Fort St. John, Peace River, Omineca mining division (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 47T).

Nova Scotia

21 A/16 Mirabilite was found associated with gypsum at the Clifton gypsum quarry, near Windsor, Hants County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 47T).

21 H/1 Mirabilite occurs with rock salt, calcspar, aragonite, carbonate and iron oxide at the McDonald and Allison quarries at Avondale, Hants County (W. F. Jennison, 1910: Can. Dept. Mines, Mines Br., 84, p. 150).

MOLYBDENITE

MoS_2

Molybdenite is the only primary mineral of molybdenum known in nature and it occurs as an accessory mineral in certain granites, pegmatites, and aplites. It is also common as a vein mineral, associated with scheelite, wolframite, topaz, and fluorite, and in contact metamorphic deposits with lime-silicates, scheelite and chalcopyrite. Molybdenum is widely used in the chemical and metal (chiefly steel) industries, and molybdenite, as its principle ore mineral, is therefore important economically. As molybdenite is widely distributed throughout Canada, only a few typical occurrences are noted here. For a detailed listing of molybdenite occurrences see: F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser. 20.

Two polytypes of MoS_2 are known to occur in nature. They are identical in appearance but have different crystal structures. The common form, molybdenite-2H, has hexagonal symmetry and gives an X-ray powder pattern having six strongest lines at: 6.01 (10), 2.73 (2), 2.27 (8), 1.82 (5), 1.58 (2) and 1.53 (3). The second polytype, molybdenite-3R, having rhombohedral symmetry, was recognized for the first time in specimens from the Con Mine, Yellowknife district, Northwest Territories. This very rare structural form gives an X-ray powder pattern with seven strongest lines at: 6.09 (10), 2.71 (7), 2.63 (6), 2.344 (6), 2.194 (6), 1.581 (7) and 1.529 (7) (R.J. Traill, 1964: Can. Mineralogist, 7, pp. 524-526).

British Columbia

82 F/4 Molybdenite occurs in a fine-grained massive form and as scaly aggregates in masses or veinlets, in the Rossland area (C.W. Drysdale, 1936: Geol. Surv. Can., Paper 36-20, p. 8).

92 I/12 The Index property, west of the north fork of Texas Creek, Ashcroft area, contains high grade molybdenite ore in which molybdenite occurs in clusters up to 1 foot in width; and low grade ore, in which the molybdenite occurs as rosettes and flakes, uniformly distributed throughout a granitic gangue (C.W. Drysdale, 1917: Geol. Surv. Can., Sum. Rept. for 1916, pp. 44-63) (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 267).

93 A/2 Molybdenite in bladed aggregates up to 1/2 inch in diameter is reported at Boss (or Big Timothy) Mountain, Cariboo area. The molybdenite occurs in a series of en echelon quartz veins on the east side of the mountain (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 91) (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 246).

Manitoba

52 E/11, 52 E/12 Molybdenite is found in township 9, range 16, just north of Falcon Lake. It occurs as crystals of varying sizes, up to 2 or 3 inches in diameter in pegmatite dykes, or as small hexagonal plates, in granitic dykes. Large clusters of radiating crystals weighing as much as 20 pounds were cobbed from pegmatites (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 66).

52 L/5 Molybdenite is a minor constituent of the lithium-cesium ore at Bernic Lake (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 25).

New Brunswick

21 G/7 Molybdenite occurs with tin mineralization at Mount Pleasant in Charlotte County (A.A. Ruitenberg, 1963: MSc. thesis, Univ. of New Brunswick).

21 G/8 Wolframite and molybdenite are found together at Square Lake, in Queen's County (J.C. Smith, 1960: New Brunswick Mines Br.).

21 G/14 Molybdenite occurs in quartz veins at Dumfries in York County (W.J. Wright, 1940: New Brunswick Mines Br., Paper 40-2).

21 J/3 Quartz veins containing molybdenite, chalcopyrite, and pyrite outcrop at Springfield in York County (W.L. Goodwin, 1928: Geol. and Minerals, of New Brunswick, 1st ed., Ind. Ed. Pub., Co., Gardenvale, Que.).

21 J/10 Some of the quartz veins in the vicinity of the confluence of Burnthill Brook and the main Southwest Miramichi River (Stanley Parish, York County) contain molybdenite. The molybdenite is foliated and is associated with quartz, muscovite, brown mica, feldspar, topaz, fluorite, wolframite, pyrrhotite, chalcopyrite and cassiterite (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 218).

Molybdenite occurs in quartz veins with wolframite at McKiel Lake; in sedimentary rocks at Sisters Brook; and in quartz monzonite at Rocky Brook; all in York County (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

21 P/12 Flakes and crystals of molybdenite, accompanied by beryl, are disseminated in a pinkish fine-grained Devonian granite at Pigeon (Pabineau) Lake, 9 1/2 miles southwest of Bathurst, Gloucester County (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 215).

Molybdenite occurs with Cu, Pb, and Zn mineralization, at Beresford Mines in Gloucester County (G.S. MacKenzie, 1951: New Brunswick Mines Br., Rept.). It also occurs in a contact zone on the Sturgeon River property at Nicholas Denys in Gloucester County (M. Tauchid, 1964: Geol. Surv. Can., Paper 64-31).

21 P/13 Molybdenite is found in quartz veins at Antinouri Lake, in Restigouche County (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20).

Northwest Territories

85 I Most of the reported occurrences of molybdenite in the Northwest Territories are concentrated in an area northeast of Yellowknife between North Arm and McLeod Bay of Great Slave Lake (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 61).

85 J/8 Molybdenite-3R, a rare polytype of molybdenite has been identified as an accessory mineral in quartz-feldspar porphyry occurring at the Con Mine, Yellowknife district. This was the first reported occurrence of this polytype in nature (R.J. Traill, 1964: Can. Mineralogist, 7, pp. 524-526).

Nova Scotia

11 F/16 A specimen of foliated molybdenite from Cape Breton County, 2 miles west of Mineral Spring Brook has been donated to the National Mineral Collection.

Ontario

31 C/7 A specimen of crystallized molybdenite from Enterprise (village), Camden Township, Lennox and Addington counties, has been donated to the National Mineral Collection.

31 F/6 At the old Jamieson Mine on lot 5, conc. VIII, Lyndoch Township, molybdenite is associated with pyrite and pyrrhotite in pegmatite dykes and along gneiss-limestone contacts (D.F. Hewitt, 1953: Ont. Dept. Mines, Ann. Rept., vol. 62, Pt. V, p. 73) (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 166).

Molybdenite associated with diopside, pyrrhotite, and scapolite occurs in large quantities on lots 30 and 31, conc. IV, Griffith Township. A specimen is included in the National Mineral Collection.

41 H/8 Molybdenite from the Parry Sound district is represented in the National Mineral Collection.

Quebec

31 F/9 Lots 9 and 10, range VII, Onslow Township, is the site of the Moss Mine which was the world's leading producer of molybdenite between 1916 and 1918, but which has not been worked since 1944.

The ore at this mine consists of feldspar and quartz in which pyrite, pyrrhotite, red fluorite, magnetite and molybdenite occur partly in disseminated form and partly in aggregates or zones (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 186).

31 F/9 Scattered flakes, crystals, and pockets of molybdenite disseminated in a matrix of pyroxene, tremolite and phlogopite are to be found on lots 1, 2, and 3, ranges III and IV, Aldfield Township (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 171).

32 C/5, 32 D/8 Numerous molybdenite deposits connected with the Preissac-Lacorne batholith, are to be found in Lacorne, Lamotte, Lapause, Malartic, Preissac, Fiedmont and Vassan townships, Abitibi County. The molybdenite occurs in pegmatitic quartz veins in and around the batholith (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 105).

Saskatchewan

63 L/9 The Moody prospect at Birch Lake, Amisk Lake area, carries pyrite, chalcopyrite, galena, sphalerite, molybdenite and scheelite in a shear zone in a small boss of granite cut by stringers of vein quartz (F.M. Vokes, 1963: Geol. Surv. Can., Econ. Geol. Ser., 20, p. 66).

Yukon

105 C/7 Canol Metal Mines Limited has a molybdenum property at the head of Upper Sheep Creek, 36 miles south southeast of Ross River. The molybdenite showing is at the contact of a large granodiorite stock and limestone and phyllite of probable Middle and Upper Cambrian age (R.S. Skinner, 1961: Geol. Surv. Can., Paper 61-23, p. 41).

MOLYBDOMENITE

$PbSeO_3$

Ontario

41 N/2 Molybdomenite is found as an alteration of clausthalite at the Ranwick Uranium Mine, north of Sault Ste. Marie, near Mile 72 on Highway 17. It occurs as small colourless, blade-like crystals and as pale yellow rounded aggregates of fine radiating fibres. The strongest lines on the X-ray powder pattern are: 4.13 (6), 3.40 (7), 3.31 (9), 3.16 (8), 2.741 (10), 2.071 (5) (J.A. Mandarino, 1965: Can. Mineralogist, 8, p. 149).

MONAZITE

$(Ce, La)PO_4$

In addition to its major content of rare earth elements monazite usually contains about 5 per cent thorium. It is a widespread accessory mineral in granitic rocks and forms commercial concentrations in detrital sands derived from the weathering of such rocks. Monazite recovered from beach sands is the main world source of rare earth elements and thorium. The spacings and intensities of the five strongest lines in the X-ray powder pattern of monazite are: 4.17 (6), 3.31 (7), 3.09 (10), 2.88 (7) and 2.14 (6) (A. Pabst and C.O. Hutton, 1951: Am. Mineralogist, 36, p. 60).

Manitoba

52 L/5, 52 L/6 Monazite from lot 33, range 15, township 16 (Shatford Lake, Lac du Bonnet district) has been identified by the Assay Laboratory of the Ontario Department of Mines (D.A. Moddle, 1960: private communication).

Northwest Territories

75 L/8, 76 D/14 Thorium-rich monazite occurs in slightly radioactive beach placers at Yamba Lake, 190 miles northeast of Yellowknife (C.S. Lord, 1951: Geol. Surv. Can., Mem. 261, p. 58).

Ontario

31 F/6 A wedge-shaped crystal of monazite, about 2 inches square and 1/2 inch thick, and several smaller crystals have been found in reddish microcline on lot 23, conc. XV, Lyndoch Township, Renfrew County (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. III, p. 98).

31 F/12 Monazite occurs on lot 9, conc. 13, Dickens Township, in a dyke of quartz and microcline. The flat, reddish brown crystals have prominent cleavage in all sections, and they are associated with euxenite and samarskite. An analysis by F.A. Genth is as follows: $(La, Di)_2O_3$ 34.63, P_2O_5 27.89, Ce_2O_3 22.63, ThO_2 7.32, SiO_2 1.54, $(Yt, Er)_2O_3$ 4.66, U_3O_8 0.32, PbO 0.33, CaO 0.35, MgO 0.02, Fe_2O_3 0.08, Al_2O_3 0.10, H_2O 0.40, total 100.27; S.G. 5.270 (H.C. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 192 and H.V. Ellsworth, 1932: Am. Mineralogist, 17, p. 19).

An occurrence of monazite in granitic pegmatite has been reported in conc. V, Dickens Township (D.F. Hewitt, 1960: private communication).

41 J/10 Monazite from township 1-A, 1 mile west of Tenfish Lake, Algoma district, has been identified in the Provincial Assay Laboratories. A rock sample from this locality was estimated to contain 75 per cent granular hematite and 5 to 10 per cent granular monazite in a silica matrix (D.A. Moddle, 1960: private communication).

Quebec

31 F/15 Monazite, uranothorite and uranoan thorianite were found in calcite on lots 29 and 30, range VII, Grand Calumet Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 31).

31 G/13 Pegmatite dykes at the Villeneuve Mica Mine, lot 31, range I, Villeneuve Township, Papineau County, contain monazite, with uraninite, mica, tourmaline, spessartite, apatite, zircon, fluorite, beryl, and cerite. An analysis by F.A. Genth is as follows: SiO_2 0.91, Fe_2O_3 1.07, CaO 1.54, ThO_2 12.60, Ce_2O_3 24.80, $(La, Di)_2O_3$ 26.41, $(Yt, Er)_2O_3$ 4.76, P_2O_5 26.86, MgO 0.04, H_2O 0.78, total 99.77 (W.G. Miller and C.W. Knight, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 316) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 244).

Saskatchewan

73 P/1 Monazite occurs at Lac La Ronge, in association with uraninite (R.B. Ford, 1955: Econ. Geol., 50, p. 200).

MONTBRAYITE

Au_2Te_3

Quebec

32 D/16 This telluride mineral occurs at the Robb-Montbray Mine, Montbray Township, in association with altaite, tellurbismuth, frohbergite, melonite, petzite, chalcopyrite, pyrite, marcasite, sphalerite, chalcocite, covellite, and free gold. An analysis by Williams gave the following results: Au 44.32, Ag 0.55, Pb 1.61, Bi 2.81, Sb 0.90, Te 49.80, total 99.99 (M.A. Peacock and R.M. Thompson, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 345). The X-ray powder pattern of material from the Robb-Montbray Mine has three strongest lines with the following spacings and intensities: 2.98 (8), 2.93 (8), and 2.09 (10) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 114).

MONTEBRASITE

(See amblygonite)

MONTMORILLONITE

Montmorillonite is a clay mineral (or group of closely related clay minerals) that is much used in drilling muds, because of the gel-like suspension it forms in water.

The powder pattern of montmorillonite is similar to those of other clay minerals. Identification is, however, generally based on several properties, such as dehydration curves and changes in X-ray powder patterns before and after treatment with chemicals and heating.

British Columbia

92 I/2 Montmorillonite associated with cristobalite occurs in a bentonite which outcrops at Quilchena near Merritt in the Kamloops district. Chemical analysis after sodium saturation: SiO_2 71.60, Al_2O_3 15.75, Fe_2O_3 3.78, TiO_2 0.24, MnO tr., P_2O_5 0.04, CaO 0.07, MgO 0.97, Na_2O 1.88, K_2O 0.09, H_2O 5.34, total 99.76. Soluble SiO_2 29.90, soluble Al_2O_3 0.68. The X-ray powder pattern (Na-saturated, glycerol saturated) showed its strongest lines at: 17.6 (10), 9.01 (6), 4.50 (7), 4.07 (8), 3.58 (5), 2.487 (5) and 1.501 (6) (J.W. Earley, B.B. Osthaus, and I. H. Milne, 1953: Am. Mineralogist, 38, p. 707).

Nova Scotia

11 F/14 Red to green to greenish white montmorillonite occurs in the Blue Mills area of Cape Breton (X-ray Laboratory, Geol. Surv. Can.).

MORDENITE

near $(Na_2, K_2, Ca)Al_2Si_{10}O_{24} \cdot 7H_2O$

The name is after the locality near Morden, Kings County, Nova Scotia, where the mineral was first described. Synonyms include ptilolite, flokite, arduinite and ashtonite. Mordenite has been found in veins and amygdules in igneous rocks; also as a hydration product of volcanic glasses and as an authigenic mineral in sedimentary rock.

British Columbia

82 E/5 Ashtonite (mordenite) occurs as small radiating masses in basalt, near Penticton. Chemical analysis is as follows: SiO_2 63.30, Al_2O_3 11.74, Fe_2O_3 0.50, CaO 9.54, MgO 0.39, Na_2O 3.28, K_2O 0.42, BaO 0.21, H_2O 10.42, total 99.80 (E. Poitevin, 1932: Am. Mineralogist, 17, p. 120).

An X-ray powder pattern of ashtonite showed the following 5 strongest lines: 6.54 (8), 4.52 (7), 3.99 (8), 3.47 (9) and 3.21 (10). The complete pattern is similar to patterns for natural mordenites (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

21 A/12 21 A/13 21 A/14 21 H/1 21 H/2 21 H/3 21 H/8 Mordenite forms radiating masses of fibres with silky lustre at localities near Morden, Kings County, and Margaretsville, Annapolis County, and occurs as beach pebbles and in amygdules in basalt along the Bay of Fundy shore from Harbourville to Chute Cove. An analysis by How of a specimen from Margaretsville is as follows: SiO_2 67.08, Al_2O_3 11.85, Fe_2O_3 0.31, CaO 1.56, Na_2O 4.74, K_2O 2.08, H_2O 12.84, total 100.46, S.G. 2.148. Partial analysis of a specimen collected 1 mile east of Morden: SiO_2 66.70, Al_2O_3 10.25, Fe_2O_3 0.25, CaO 3.36, MgO 0.16, H_2O 10.86, total 91.58, S.G. 2.193 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 59) (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 17).

21 H/2 An analysis by How of mordenite from Morden, Kings County, is as follows: SiO_2 68.40, Al_2O_3 12.77, CaO 3.46, Na_2O 2.35, H_2O 13.02, total 100.00, S.G. 2.08 (H. How, 1864: J. Chem. Soc., 11, p. 100).

Mordenite was found as radiating masses in blocks of reddish basalt in the vicinity of Hall's Harbour, Kings County.

An analysis by E.W. Todd gave the following results: SiO_2 67.18, Al_2O_3 12.36, Fe_2O_3 0.24, CaO 3.42, Na_2O 3.34, K_2O 0.47, H_2O 13.23, total 100.24, S.G. 2.125 (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 10).

21 H/8 Mordenite has been found embedded in red clay in cavities in trap at Cape Split, Kings County (G.C. Hoffmann, 1889-90: Geol. Surv. Can., Ann. Rept., IV, p. 60T).

MORENOSITE

$NiSO_4 \cdot 7H_2O$

This apple green, orthorhombic mineral occurs as efflorescent crusts of indistinct crystals and fibres formed by the oxidation of nickel bearing sulphides. Pure material dehydrates to retgersite ($NiSO_4 \cdot 6H_2O$) but a tetrahydrate may be formed if significant amounts of iron are present in substitution for the nickel.

The X-ray powder pattern of synthetic morenosite has 3 strongest lines at: 4.20 (10), 5.3 (6), 2.85 (2.5) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

41 I/4 Morenosite was observed by Hunt as an efflorescence of minute, acicular, greenish white crystals on the nickel ores at the Wallace Mine, Bay of Islands, Lake Huron (G.C. Hoffmann, 1889-90: Geol. Surv. Can., Ann. Rept., IV, p. 48T).

41 I/6 Morenosite is reported to occur as a greenish white and pale apple green incrustation (a) on associated gersdorffite, niccolite, chalcopyrite, and pyrrhotite at the O'Connor claim on lot 12, conc. III, Denison Township; and (b) on nickeliferous ore at the Worthington Mine on lot 2, conc. II, in Drury Township (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 27R).

Partial analysis of the latter material by G. R. Lachance and J. L. Jambor yielded: FeO 17.3, NiO 13.0, and CoO 0.4, and the X-ray powder pattern of the tetrahydrate (X-ray Laboratory, Geol. Surv. Can.).

42 A/10 Morenosite has been found at the Alexo Mine, located on the township base line between Dundonald and Cochrane townships (M. B. Baker, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 258).

MUSCOVITE

$KAl_3Si_3O_{10}(OH)_2$

Muscovite crystallizes in several polymorphic forms, but by far the most common structure is a two-layered monoclinic cell referred to as the $2M_1$ structure. X-ray data for the various muscovite polymorphs are given by Smith and Yoder, 1956: Mineral. Mag., 31, p. 209. Chromian muscovites are generally called fuchsite or mariposite, and sericite is a term used to describe fine-grained white mica. Other varietal names include: damourite, margarodite, pinite, gilbertite, hydromuscovite and phengite. As muscovite is a rock-forming mineral, individual occurrences are too numerous to record.

British Columbia

82 N/7 Damourite is a variety of muscovite which forms in small scales and fibres, and which is often derived from the alteration of such minerals as kyanite, topaz, and corundum. Folia are not as elastic as those of ordinary muscovite but specimens usually have their pearly lustre.

An analysis by Johnston of damourite found with quartz and dolomite in the Kicking Horse Pass, is as follows: SiO_2 44.28, Al_2O_3 33.60, Fe_2O_3 0.60, MgO 3.03, K_2O 9.87, Na_2O 0.40, F 0.59, Cl 0.51, H_2O 6.25, total 99.13, less O for F 0.36, total 98.77, S.G. 2.657 (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 20R).

82 N/10
82 N/11 Chemical analysis by Johnston of sericite from Waitabit Creek, Golden mining division, is as follows: SiO_2 46.05, Al_2O_3 38.36, Fe_2O_3 0.97, CaO 2.40, MgO 0.47, K_2O 6.19, Na_2O 2.98, Li_2O

82 N/10 82 N/11 0.34, Cs_2O 0.03, H_2O 2.48, total 100.27 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, pp. 21, 22R).

92 O/3 Masses of fine-grained sericite containing disseminated crystals of pyrite and tetrahedrite occur at the Taylor-Windfall Mine, 12 miles west of Taseko Lake on Battlement Creek in the Clinton mining division. This fusible sericite contains minute reddish brown grains and hair-like inclusion of rutile. Average of two analyses: SiO_2 48.37, TiO_2 0.63, Al_2O_3 36.67, MnO tr., FeO and Fe_2O_3 tr., CaO tr., MgO 0.23, K_2O 8.93, Na_2O 0.45, H_2O 4.93, F tr., total 100.21, S.G. =2.803 (J.M. Baker, 1936-37: Univ. Toronto Stud., Geol. Ser., No. 4, p. 103).

92 P/9 Muscovite crystals up to 12 inches in greatest dimension occur in pegmatite dykes on Clearwater Peak in the Lillooet district (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 85).

93 A/11 93 A/13 A specimen of muscovite (var. mariposite) from the Peacock Mineral claim on Duck Creek, 2 1/2 miles from Keithly was donated to the National Mineral Collection in 1927 by J.D. Galloway.

Manitoba

52 L/6 Flakes of fuchsite, a green, chromium-bearing variety of muscovite, were found disseminated through a narrow band of quartzose rock near Lamprey Falls on the Winnipeg River. In some places, notably on the Vernon claims in the southwest part of section B, range 15, township 16, the fuchsite forms bright green schistose lenses from which it has been mined for use in stucco (J.F. Wright, 1932: Geol. Surv. Can., Mem. 169, p. 129).

Muscovite is found in veinlets 1 inch or more in width, and as rosettes up to 2 inches in diameter at the Silver Leaf Mining Syndicates Mine, on range 16, township 16. The mineral is purplish grey in colour, and has a specific gravity of 2.87. Chemical analysis is as follows: SiO_2 47.18, Al_2O_3 31.80, Fe_2O_3 0.07, FeO 0.16, CaO 0.40, MgO 0.28, Li_2O 1.06, Na_2O 2.94, K_2O 10.50, H_2O 2.40, MnO 2.05, F_2 2.15, total 100.99 (E. Poitevin, R.J.C. Fabry, and C.H. Stockwell, 1926-27: Geol. Surv. Can., Unpublished file No. 21-P-2).

Muscovite on the Annie mining claim, 3 miles southeast of Lamprey Falls, is characterized by curved faces that are sometimes almost hemispherical about the c axis. There are two colour varieties - one silvery grey, and the other faint lilac. The two varieties have been analyzed by R.J.C. Fabry with the following results: grey variety - SiO_2 45.36, Al_2O_3 33.21, K_2O 11.14, FeO 2.57, Fe_2O_3 2.20, F_2 1.84, H_2O 1.41, MnO 0.90, Li_2O 0.90, CaO 0.13, MgO 0.13, Na_2O 1.14, less O for F 0.77, total 100.16; lilac variety - SiO_2 46.56, Al_2O_3 29.53, K_2O 11.01, Na_2O 2.65, MnO 2.32, F_2 3.45, H_2O 3.12, Fe_2O_3 0.12, Li_2O 1.80, FeO 0.10, CaO 0.15, MgO 0.29, Cs_2O 0.33, less O for F

52 L/6 1.45, total 99.98 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 155).

Lilac coloured muscovite occurs as a massive rock composed of minute scales on the Bear mineral claim, 3 miles southeast of Lamprey Falls. A chemical analysis by R.J.C. Fabry is as follows: SiO_2 45.58, Al_2O_3 37.45, K_2O 10.90, H_2O 3.16, F_2 0.97, Na_2O 0.93, LiO 0.13, MnO 0.15, MgO 0.13, Fe_2O_3 0.16, CaO 0.28, less O for F 0.41, total 99.43, S.G. 2.85 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 156).

Fuchsite has been described from Point du Bois, Manitoba. The analysis by Whitmore yielded: SiO_2 45.97, Al_2O_3 31.67, Fe_2O_3 2.56, Cr_2O_3 4.81, FeO 0.53, MgO 0.31, CaO 0.15, Na_2O 1.03, K_2O 9.07, H_2O^+ 3.48, H_2O^- 0.51, total 100.09 (D.R.E. Whitmore, 1946: Am. Mineralogist, 31, p. 8).

Nova Scotia

11 K/2 Baddeckite, a reported variety of muscovite, occurs in fine, copper red scales, scaly aggregates, and scaly layers distributed through a plastic clay located 1/2 mile from the town of Baddeck, in Victoria County.

A chemical analysis by Johnston gave the following results: SiO_2 48.96, Al_2O_3 13.85, Fe_2O_3 25.82, CaO 1.17, MgO 2.65, K_2O 3.47, Na_2O 0.22, H_2O 3.78, total 99.92, S.G. 3.252 (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 11R). Max Hey (1955: Chemical Index of Minerals, 2nd ed.) described baddeckite as a mixture of hematite and clay. This was confirmed by the X-ray Laboratory, Geol. Surv. Can., on examination of a specimen from the type locality.

Ontario

31 C/12 An occurrence of damourite has been reported on lot 14, conc. XIV, Methuen Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 83).

Diamond-shaped muscovite crystals occur at Blue Mountain, Methuen Township. Penetration twins with twin axis [310] are common. Chemical analysis by F.A. Gonyer: SiO_2 45.87, Al_2O_3 38.69, MgO 0.10, Na_2O 0.64, K_2O 10.08, H_2O 4.67, total 100.05 (C.S. Hurlbut Jr., 1956: Am. Mineralogist, 41, p. 892).

31 F/2
31 F/3 Large, pseudo-hexagonal crystals of muscovite from lot 4, conc. XI, Miller Township, have been donated to the National Mineral Collection.

31 F/3 Fuchsite from a mica schist in Matawatchan Township, Renfrew County, has been analyzed by Wait with the following results: SiO_2 43.72, Al_2O_3 35.51, Fe_2O_3 2.94, Cr_2O_3 1.26, MnO 0.26,

31 F/3 CaO 4.46, MgO 1.36, K_2O 8.88, Na_2O 0.39, H_2O 3.68, total 102.46, S.G. 2.93 (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 21R).

31 F/4 An interesting occurrence of muscovite was found just east of the Morrison quarry, lot 10, conc. XIII, Dungannon Township. Well formed crystals of nepheline have been altered to twisted aggregates of muscovite but have retained their original outward form (L. Moyd, 1949: Am. Mineralogist, 34, p. 748).

31 L/2 Large crystals of muscovite were found at the Purdy property, lot 6, conc. II, Calvin Township. Sheets of mica measuring 6 feet in diameter have been stripped from the mine, and one crystal was recorded as being 9 1/2 feet by 7 feet and nearly 3 feet thick.

Chemical analysis by Ferguson: SiO_2 45.66, Al_2O_3 31.80, Fe_2O_3 2.69, FeO 1.53, MgO 0.92, TiO_2 0.31, CaO 0.09, Na_2O 0.60, K_2O 10.34, H_2O^+ 5.32, H_2O^- 0.36, F 0.37, total 99.99, S.G. 2.84 (J.C. Browning, 1942: Can. Mining J., 63, p. 658) (R.B. Ferguson, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 31) (R.H. Jahns, 1953: Am. Mineralogist, 38, p. 567).

32 D/4 Muscovite (var. mariposite) from a locality northwest of Fork Lake, Gauthier Township, has been identified by M. J. Buerger. This chrome-bearing, emerald green mica occurs in a rock of ankerite composition (J.E. Thomson, and A.T. Griffis, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. VIII, p. 9).

Bright green fuchsite is present in a siliceous carbonate rock in D, E, and F orebodies at the Kerr-Addison Mine, McGarry Township (J.E. Thomson, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. VII, p. 62).

32 D/5 A green talc-like mineral found in conglomerate in Morrisette Township, east of Nettie Lake, has been identified as fuchsite (D.G.H. Wright, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 43).

41 J/1 An analysis by Cairns of chromiferous mica from Aird Island (North Channel), Algoma district, is as follows: SiO_2 45.49, Al_2O_3 31.08, Fe_2O_3 tr., Cr_2O_3 3.09, CaO 0.51, MgO 3.36, K_2O 9.76, Na_2O 0.90, H_2O 5.85, total 100.04 (A.H. Chester, 1887: Am. J. Sci., 3rd Ser. XXXIII, p. 284).

41 P/14
41 P/15 Pea green mariposite (a variety of muscovite) occurs in streaks in ferruginous dolomite on claims 8457 and 8242, Montrose and Bannockburn townships (C.H. Rickaby, 1931: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. II, p. 21).

42 A/6 A carbonate rock containing scales of chromiferous muscovite outcrops on the United Minerals property, claim M. E20 in

42 A/6 Deloro Township (A.G. Burrows, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. II, p. 54).

42 A/9 Mariposite from Ross Mine, Hislop Township, was analyzed by W.W. Moorhouse: (1) SiO_2 56.0, Al_2O_3 23.52, Fe_2O_3 3.30, FeO .51, TiO_2 --, Cr_2O_3 0.78, MgO 2.12, CaO 0.37, K_2O 7.03, Na_2O 2.72, H_2O 3.52, total 99.87; (2) SiO_2 55.35, Al_2O_3 25.62, Fe_2O_3 0.63, FeO 0.92, TiO_2 0.18, Cr_2O_3 0.18, MgO 3.25, CaO 0.07, K_2O 9.29, Na_2O 0.12, H_2O 4.52, total 100.13 (E.S. Moore, 1936: Ont. Dept. Mines, Ann. Rept., vol. 45, p. 16).

42 C/4 Bands of fuchsite up to 1 foot wide occur near an outcrop of sugary quartz iron-formation on the southeast shore of Michell Lake (P.E. Hopkins, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. I, p. 196).

42 E/5 Green mica crystals found in a medium-grained dyke rock from Josephine-Bartlett iron range near Parks Lake are believed to be fuchsite (E.S. Moore and H.S. Armstrong, 1946: Ont. Dept. Mines, Ann. Rept., vol. 55, Pt. IV, p. 48).

Quebec

21 M/16
22 C/4 Large tabular, twinned crystals of muscovite from Lac Pied des Monts, Charlevoix County, and from Little Bergeronnes, Saguenay County, have been donated to the National Mineral Collection.

31 G/13 The National Mineral Collection contains specimens of muscovite from the Villeneuve Mica Mine, lot 31, range I, Papineau County.

31 H/1 Fuchsite occurs in magnesite in Sutton Township, Brome County (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 232A).

31 H/2 Fuchsite is present in the dolomite rocks of Bolton Township, Brome County (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 231A).

32 C/4
32 C/5 Small amounts of green mica, thought to be mariposite, were found on the property of Siscoe Gold Mines Limited, in Dubuisson and Vassan townships (P.E. Auger, 1947: Que. Dept. Mines, Geol. Rept., 17, p. 35).

32 C/5 Pegmatites in the Fiedmont area, Abitibi County, have quartz cores enclosed by spodumene-rich zones containing quartz and microcline, cleavelandite, lepidolite, and accessory sugary albite, beryl, spessarite, columbite, tantalite, microlite, betafite, bismuthinite, molybdenite and powellite. The spodumene is partly or completely altered to lithium-bearing mica, in the form of rosettes or platy aggregates (E.W. Heinrich and A.A. Levinson, 1953: Am. Mineralogist, 38, p. 35).

Saskatchewan

74 N/7 Rock samples taken from 1.3 miles north of Elliot Point, Milliken Lake, contain fuchsite (X-ray Laboratory, Geol. Surv. Can.).

Yukon

105 F/8 Scaly aggregates and scattered particles of muscovite (var. fuchsite) occur with chromite in the first range of mountains east of Big Salmon, below Big Salmon (formerly Island) Lake (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 15R).

116 B/3 Fuchsite has been found at the junction of Last Chance and Hunker Creek, Klondike area (X-ray Laboratory, Geol. Surv. Can.).

NAGYAGITE

near $Pb_5Au(Te,Sb)_4S_{5-8}$

This rare sulpho-telluride has been found in association with gold, sulphides and carbonates in telluride-bearing ores. The X-ray powder pattern of nagyagite from Nagyag, Transylvania, has 4 strongest lines with the following spacings and intensities: 3.02 (10), 2.81 (6), 2.43 (4), and 1.506 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 29).

British Columbia

82 K/11 Nagyagite occurs associated with gold on the Olive Mabel claim, Gainer Creek, Trout Lake mining division (E. Thomson, 1936: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

Ontario

52 B/10 Nagyagite, associated with sylvanite, hessite, gold, galena, pyrite, chalcopyrite, and sphalerite, is found at the Huronian Mine, Moss Township (E. Thomson, 1936: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

NATROLITE

$Na_2Al_2Si_3O_{10}.2H_2O$

Natrolite occurs in association with other zeolites in cavities in basalts and is sometimes present in igneous rocks as a very late crystallization product, or as an alteration product of nepheline. Like other zeolites it exhibits the property of cation exchange, and may lose its water without loss of crystal structure. Natrolite is very similar in chemical composition and appearance to scolecite and mesolite, but is an independent species. The spacings and intensities of the 5 strongest lines in the X-ray powder pattern are: 6.44 (10), 5.81 (10), 4.32 (10), 3.18 (10) and 2.83 (10) (C.J. Peng, 1955: Am. Mineralogist, 40, p. 845).

British Columbia

82 F/4 Small quantities of natrolite were found at the Josie Mine, Rossland (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 165).

92 I/15 Natrolite was found in the Ashcroft mining district, about 1/4 mile above the mouth of Criss Creek where it joins Deadman River (National Mineral Collection, Donor: W.F. Ferrier, 1918).

Nova Scotia

Natrolite, with other zeolites, is widely distributed in Nova Scotia along the Bay of Fundy shore. Among the more specific localities reported are the following:

21 H/3 Port George, Margaretsville, and Stronach Brook, Annapolis County (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 25L).

Gates Mountain, Annapolis County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 48T).

21 H/7 Cape d'Or, Cumberland County (H. How, 1868: Mineralogy of Nova Scotia, p. 202).

21 H/7
21 H/8 Five Islands, Horse Shoe Cove, Swan Creek, and Two Islands (the Brothers), Cumberland County (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 28L).

21 H/8 Cape Split, Kings County (H. How, 1868: Mineralogy of Nova Scotia, p. 203).

Amethyst Cove, Wasson Bluff and Pinnacle Island, Cumberland County (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 62) (A.L. Parsons, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 35).

Cape Blomidon, Kings County (E. Coste, 1886-87: Geol. Surv. Can., Ann. Rept., III, p. 78S).

An analysis by Marsh of a specimen from Cape Blomidon is as follows: SiO_2 45.74, Al_2O_3 28.38, CaO 0.27, Na_2O 14.23, K_2O 1.16, H_2O 10.11, total 99.89 (J.D. Dana, 1904: System of Mineralogy, 6th ed., p. 603).

Ontario

31 F/4 Pink natrolite occurs in the form of radial aggregates replacing sodalite along joint fissures at the Princess sodalite quarry, lot 25, conc. XIV, Dungannon Township (L. Moyd, 1949: Am. Mineralogist, 34, p. 748).

Quebec

21 L/3 Crystals of natrolite almost 3 feet long by 4 inches in diameter were seen in huge aplite blocks in the dump of the Johnston Asbestos Mine in Thetford Township. A chemical analysis by R.J.C. Fabry gave the following results: SiO_2 46.53, Al_2O_3 26.63, Fe_2O_3 1.34, CaO 0.44, MgO 0.12, Na_2O 15.53, K_2O 0.44, H_2O 9.62, total 100.65; S.G. 2.20 to 2.26 (E. Poitevin, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 57).

The X-ray powder pattern of natrolite from the above locality, collected by E. Poitevin, has 4 strongest lines with the following spacings and intensities: 6.52 (5), 5.85 (8), 4.36 (7) and 2.85 (10) (X-ray Laboratory, Geol. Surv. Can.).

31 H/5
31 H/12 Natrolite, with sodalite and analcite is found in dykes in the Trenton limestone, at the Montreal reservoir extension. The results of an analysis by Harrington is as follows: SiO_2 47.40, Al_2O_3 26.38, CaO 0.48, Na_2O 16.48, K_2O 0.57, H_2O 9.75, total 101.06; S.G. 2.22 (B.J. Harrington, 1874-75: Geol. Surv. Can., Rept. Prog., p. 303) (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., IV, p. 48T).

31 H/12 Natrolite is reported to occur at the Corporation quarry, Outremont, Quebec (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 165).

NATRON

$Na_2CO_3 . 10H_2O$

Natron is found in nature as crystalline, granular or columnar crusts and coatings, and as an efflorescence. It is usually associated with thermonatrite, trona, gaylussite and calcite. The ASTM X-ray powder data file lists 5 strongest lines for synthetic natron as: 5.30 (6), 4.03 (3), 2.89 (10), 2.80 (3) and 2.43 (3).

British Columbia

92 P/4 Crystallized natron has been taken from a soda lake of exceptional purity near Clinton, British Columbia. A chemical analysis by H.C. Rickaby gave the following results: Na_2O 21.23, CO_2 15.46, H_2O 63.59, Cl tr., Mg tr., insol. tr., total 100.28; S.G. 1.34 (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 20).

92 P/5 Natron occurs at Goodenough Lake in the Clinton mining division, where it precipitates on the bottom in winter, sometimes to a thickness of 14 inches. An analysis of this material by Johnston gave the following results: CO_2 (expelled on ignition) 0.29, CO_2 (in ignited residue) 15.17, Na_2O 21.36, H_2O 63.03, NH_3 undetermined, SO_3 0.08, P_2O_5 0.01, B_2O_5 tr., Cl 0.01, SiO_2 0.01, total 99.96 (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, pp. 12, 13R).

NEMALITE

(See brucite)

NEPHELINE

$NaAlSiO_4$

Nepheline is an important constituent of nepheline syenite which is used as a raw material in the manufacture of glass and ceramics. It is usually associated with feldspar, cancrinite, sodalite, biotite, apatite, corundum and zircon; but not with primary quartz. The composition shows considerable variation; excess silica, some potassium and small amounts of calcium, lithium and fluorine have been reported.

British Columbia

82 N/1
82 N/2 Nepheline occurs as a constituent of the nepheline syenites at Ice River and Beaverfoot River, Golden mining division (G.M. Dawson, 1885: Geol. Surv. Can., Ann. Rept., I, p. 123B).

Ontario

31 C/12 Fine- to medium-grained, sugary textured, nepheline syenite, cut by stringers of nepheline pegmatite, occurs on lot 21, conc. VI, and lot 14, conc. IX, Methuen Township (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. II, pp. 78-81).

White, pink (hydronephelite), and green (gieseckite) nepheline as well as natrolite and muscovite occur at the Blue Mountain quarries of the American Nepheline Company in Methuen Township (L. Moyd, 1949: Am. Mineralogist, 34, p. 747).

Chemical analysis of nepheline from biotite nepheline syenite, Blue Mountain, Methuen Township, by J. H. Scoon: SiO_2 42.89, TiO_2 0.00, Al_2O_3 33.99, FeO_3 0.36, MgO 0.00, CaO 0.23, Na_2O 16.27, K_2O 6.57, total 100.31 (C.E. Tilley, 1952: Sir Douglas Mawson Anniv. Vol., Univ. of Adelaide, p. 167).

31 D/16 Nepheline pegmatite containing abundant zircon occurs on lot 32, conc. III, and lot 30, conc. IV, Glamorgan Township.

31 D/16 Nepheline pegmatite is also found on lot 34, conc. IV, Glamorgan Township, along with albite, biotite, green apatite, and zircon. Secondary minerals present include orange cancrinite, blue sodalite, and (pink) hydronephelite.

In Monmouth Township, nepheline is found on lots 11 and 14, conc. VI, and on lots 10 and 11, conc. VIII (J. Satterly, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt. II, pp. 71-77).

Chemical analysis of nepheline from theralitic canadite, Trooper Lake, Glamorgan Township, by J. H. Scoon: SiO_2 44.40, TiO_2 0.00, Al_2O_3 33.14, Fe_2O_3 0.18, MgO 0.05, CaO 0.36, Na_2O 17.17, K_2O 3.72, H_2O^+ 0.94, H_2O^- 0.02, total 99.98.

Chemical analysis of nepheline from nepheline syenite, Monmouth Township, by J. H. Scoon: SiO_2 43.61, TiO_2 0.00, Al_2O_3 33.05, Fe_2O_3 0.85, MgO 0.05, CaO 0.53, Na_2O 16.09, K_2O 4.92, H_2O^+ 0.70, H_2O^- 0.01, total 99.82 (C.E. Tilley and J. Gittins, 1961: J. Petr., 2, p. 38).

31 F/4 An analysis by Harrington of nepheline from the York River area, Dungannon Township is as follows: SiO_2 43.51, Al_2O_3 33.78, Fe_2O_3 0.15, CaO 0.16, MgO tr., K_2O 5.40, Na_2O 16.94, loss (ign.) 0.40, total 100.34; S.G. 2.625 (B.J. Harrington, 1894: Am.J. Sci., XLVIII, p. 17). The X-ray powder pattern has 4 strongest lines with the following spacings and intensities: 4.20 (6), 3.86 (7), 3.29 (5), and 3.00 (10) (X-ray Laboratory, Geol. Surv. Can.).

Nepheline associated with pink sodalite occurs in Dungannon Township. A chemical analysis by H.C. Rickaby gave the following results: SiO_2 41.80, Al_2O_3 35.48, CaO 0.63, MgO 0.13, H_2O 0.42, K_2O 6.28, Na_2O 14.59, CO_2 0.28, total 99.61; S.G. 2.664 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 8).

Excellent crystals of nepheline occur on joint faces in a small working on the top of Davis Hill, lot 25, conc. XIII, Dungannon Township (D.F. Hewitt, 1960: private communication).

Nepheline is a common constituent of gneisses in Carlow and Monteagle townships, Hastings County. A mineralogical analysis by L. Moyd of a gneiss from the Monteagle Minerals property, lots 2 and 3, conc. II, gave results as follows: andesine 40, nepheline 15, potash feldspar 10, scapolite 10, muscovite 10, biotite 10, corundum 5, spinel tr., total 100 (D.F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI, pp. 60-63).

31 F/5
31 F/6 Nepheline is a prominent constituent in some of the gneisses and syenites which outcrop in Brougham, Sebastopol, Lyndoch, Raglan, Brudenell and Radcliffe townships. For a detailed description of occurrences in Renfrew County, see: J. Satterly, 1944: Ont.

31 F/5 31 F/6 Dept. Mines, Ann. Rept., vol. 53, Pt. III, pp. 89-92; and L. Moyd, 1949: Am. Mineralogist, 34, p. 743).

41 I/2 In Bigwood Township, Sudbury district, salmon-coloured nepheline forms the chief constituent in a pegmatite dyke which is exposed on the French River, 4 miles below French River Station on the Canadian Pacific railway line. Analysis by H.C. Rickaby: SiO_2 42.56, Al_2O_3 35.80, CaO 0.05, MgO 0.20, Na_2O 14.86, K_2O 5.75, H_2O 0.67, CO_2 0.35, total 100.24; S.G. 2.610 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 7).

42 D/10 At Pic Island, Lake Superior, nepheline occurs in large, orange-red grains associated with black hornblende in white feldspar boulders (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 480).

Quebec

31 H/5 31 H/7 31 H/11 31 H/12 Nepheline occurs near Montreal, Hochelaga County; at Brome Mountain, Brome County; and at Beloeil Village, Rouville County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 49T).

NEPHRITE

(See actinolite)

NEPTUNITE

$(Na,K)_2(Fe,Mn)TiSi_4O_{12}$

Newfoundland

13 K/5 Neptunite is found in the metasomatic syenite gneisses (fenites) of the Seal Lake region, Labrador. The neptunite is in anhedral grains ranging from 0.1 to 2 millimetres in diameter, and much is associated with pyrochlore and barylite. The X-ray powder pattern has 5 strongest lines with the following spacings and intensities: 3.52 (8), 3.18 (10), 2.93 (8), 2.48 (7) and 2.16 (7) (E.Wm. Heinrich and S.H. Quon, 1963: Can. Mineralogist, 7, p. 650).

NEWBERYITE

$MgHPO_4 \cdot 3H_2O$

Yukon

115 O/14 A mixture of newberyite, struvite and traces of magnesite was found filling interglobular spaces in the ivory of a mammoth tusk. The tusk was found at a depth of some 15 feet in the surface bed of frozen muck on Quartz Creek, a tributary of the Indian River. Analysis by Johnston: P_2O_5 38.53, MgO 21.93, NH_3 1.94, H_2O 37.18, CO_2 0.42, total 100.00 (G.C. Hoffmann, 1889: Geol. Surv. Can., Ann. Rept., XII, pp. 13, 14R).

Material collected in 1899, from the Indian River, by R.G. McConnell gives an X-ray powder pattern with 5 strongest lines at: 5.92 (9), 4.71 (9), 3.45 (10), 3.08,3.04 (10) (X-ray Laboratory, Geol. Surv. Can.).

NICCOLITE

NiAs

Niccolite occurs with pyrrhotite, chalcopyrite, and other nickel sulphides in basic igneous rocks and ore deposits derived from them; also in hydrothermal vein deposits with cobalt and silver minerals.

The 3 strongest lines in the X-ray powder pattern of niccolite have the following spacings and intensities: 2.66 (10), 1.961 (9), 1.811 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 62).

The Commission on New Minerals and Mineral Names, of the International Mineralogical Association, has recommended use of the name nickeline in preference to its synonyms niccolite and nickelite. The name nickeline is practically unheard of in North American literature and therefore the traditional Canadian usage, niccolite, has been retained in this catalogue.

Northwest Territories

75 L/12
85 I/2 Niccolite is found on the Nix property, 10 miles southwest of Taltheilei Narrows on the northwest arm of Great Slave Lake, and near Gros Cap, 2 miles north of Great Slave Lake and 3 miles east of the François River. Specimens from both localities consist of solid, compact, masses of botryoidal niccolite and rammelsbergite cemented by ankerite gangue and partly coated with annabergite (R.M. Thompson, 1951: Am. Mineralogist, 36, pp. 506, 507).

85 I/2
85 I/5 A vein of niccolite was found in augite diorite country rock near the François River, in the Yellowknife area (A.W. Jolliffe, 1936: Geol. Surv. Can., Paper 36-5, p. 6).

86 F/12 Niccolite occurs with cobalt arsenides (skutterudite and safflorite) and pitchblende, in the Great Bear Lake area (J. E. Hawley and Y. Rimsaite, 1953: Am. Mineralogist, 38, p. 467).

Ontario

31 M/5 Niccolite occurs in veins on the M. J. O'Brien Limited property on the shore of Cross Lake, 2 miles southeast of Cobalt. It is associated in different proportions at different levels and parts of the veins, with the following minerals: rammelsbergite, skutterudite, argentite, cobaltite, chloanthite, safflorite, gersdorffite, smaltite, chalcopyrite, tetrahedrite, arsenopyrite, sphalerite, galena, pyrite, pyrargyrite, marcasite, silver, and in some places breithauptite and dyscrasite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41; and 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 33).

Copper-coloured niccolite encloses breithauptite and is in turn enclosed by grey cobaltite at the Hudson Bay Mines property near Cobalt. Analysis of the separated niccolite: Ni 40.64, Co 2.04, Fe tr., As 50.78, Sb 4.95, S 1.47, total 99.88 (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 217).

At the Silver Bar Mine, near Cobalt, niccolite occurs in vein deposit with an abundance of smaltite and in a few cases rammelsbergite. Other minerals present include arsenopyrite, cobaltite, ullmannite, and gersdorffite (T. L. Walker and A. L. Parsons, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 27).

41 I/6 Niccolite is a relatively rare mineral in the nickel ore mined at Sudbury. It shows bright salmon pink colour, high reflectivity and pronounced pleochroism. Anisotropism is very strong. Samples average about 0.1 per cent Co with traces of Sb, Bi, Ag, Au, Pd, Cu, Fe. It occurs massive in interlocking grains, in quartz veins up to 3 centimetres across, or stringers in chalcopyrite (J. E. Hawley and R. L. Stanton, 1962: Can. Mineralogist, 7, p. 41).

Niccolite is found with chalcopyrite, pyrrhotite, and gersdorffite on lot 12, conc. III, Denison Township (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 49T).

41 N/12
41 N/13 Niccolite occurs with domeykite in a vein cutting amygdaloidal trap on Michipicoten Island, Lake Superior (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 49T).

41 P/10 Niccolite is reported to occur on a number of properties in the Timiskaming district. Included here are the Silver Bullion property, Nicol Township, the Haines claim (H.R. 439) in Charters Township, and the Silverade claim (H.S. 693) in Leith Township (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. II, p. 43).

52 A/7 Niccolite occurs in one of the silver-bearing veins at Silver Islet, Sibley Township, in the Thunder Bay district (E. D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 27H).

Quebec

31 F/10 A specimen of niccolite from lot 12, range IX, on Calumet Island, Pontiac County, has been presented to the National Mineral Collection.

Saskatchewan

74 N/8 Niccolite is reported to occur on the Fish Hook Bay Group claims (held by Eldorado Mining and Refining (1944) Limited) at Fish Hook Bay on Lake Athabasca, 3 miles east of Goldfields. Pitchblende is accompanied by major amounts of niccolite and cobalt-nickel arsenides, with minor arsenopyrite, in a small parallel zone along a quartz-dolomite contact about 700 feet west of the south end of the 'B' zone of mineralization (A. H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, pp. 89-90).

NICKEL BLOOM

(See annabergite)

NICKELINE

(See niccolite)

NICKEL-IRON

Ni, Fe

Terrestrial nickel-iron, ranging in composition from 65 to 75 per cent nickel and 25 to 35 per cent iron has been variously referred to as: awaruite, brokovkite, josephinite and souesite. Awaruite was the first name to be applied and probably deserves priority.

The X-ray powder pattern of 'josephinite' from Oregon, taken with Fe/Mn radiation gives five lines having the following spacings and intensities: 2.06 (10), 1.783 (3), 1.259 (2), 1.073 (4) and 1.027 (1) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 13).

British Columbia

92 I/12 Souesite, a variety of nickel-iron was found associated with platinum, iridosmine, gold, magnetite, quartz, and garnet in river gravels about 2 miles below Lillooet on the Fraser River. A

92 I/12 chemical analysis by Wait gave results as follows: Ni 75.50, Fe 22.02, Cu 1.20, insol. 1.16, total 99.88; S.G. 8.215. Centesimal composition of the pure mineral after deducting insoluble matter: Ni 76.48, Fe 22.30, Cu 1.22, total 100.00 (G.C. Hoffmann, 1905: Am. J. Sci., 19, p. 319).

92 J/15 Specimens of awaruite, a variety of nickel-iron, were collected from gravels in the Bridge River (W.S. McCann, 1922: Geol. Surv. Can., Mem. 130, p. 78).

Quebec

21 E/13
21 L/3 Awaruite occurs in serpentinized dunites and peridotites in the Thetford Mines area, particularly at the Jeffrey, Normandie, British Canadian, and Bell Asbestos mines, as well as at the Beaver Mine and the Black Lake Asbestos and Chrome Mine. Chemical analyses of two samples separated from asbestos tailings from the Canadian Johns-Manville mill at Asbestos, are as follows: (1) Fe 25.19, Ni 70.18, Co 4.04, Cu 0.31, insol. 0.66, total 100.38; (2) Fe 23.63, Ni 66.55, Co 2.68, Cu 0.18, insol. 7.17, total 100.21. Analyses after subtraction of the insoluble residue: (1) Fe 25.26, Ni 70.38, Co 4.05, Cu 0.31, total 100.00; (2) Fe 25.40, Ni 71.53, Co 2.88, Cu 0.19, total 100.00; S.G. (sample 2) =7.44; after correction for insoluble content, S.G. of alloy =8.58, S.G. (calc.) =8.57 (E.H. Nickel, 1959: Can. Mineralogist, 6, pp. 307-319).

Yukon

105 F/16 Nickel-iron (var. awaruite) has been observed in the concentrates from alluvial gold washings of Hoole Canyon on the Pelly River. Chemical analysis by Johnston: Ni 74.34, Fe 21.35, Co 1.34, Cu 0.48, P 0.08, S 0.03, insol. 1.72, total 99.34; S.G. =7.746. Centesimal composition of the mineral after deducting insoluble matter: Ni 76.16, Fe 21.87, Co 1.37, Cu 0.49, P 0.08, S 0.03, total 100.00 (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p. 258).

NIOCALITE

$(Ca, Nb)_4Si_2(O, OH, F)_9$

Quebec

31 G/8 Niocalite was described for the first time by Dr. E.H. Nickel of the Mines Branch, Ottawa, in 1956. It occurs on the property of Quebec Columbium Limited at Oka, in a rock consisting essentially of strontian calcite, niocalite, magnetite and apatite. The niocalite is present as randomly oriented, coarse, prismatic crystals up to 1 centimetre in length, with a nearly square cross

31 G/8 section. Chemical analyses by J.A. Maxwell of niocalite from (1) diamond drill core, and (2) open pit, are as follows: (1) CaO 47.50, SiO_2 29.70, Nb_2O_5 16.56, Al_2O_3 1.31, Fe_2O_3 0.54, TiO_2 0.22, P_2O_5 0.60, MgO 0.28, MnO 1.28, Na_2O 0.78, K_2O 0.02, H_2O 0.16, F 1.7, total 100.65, less O for F 0.71, total 99.94; (2) CaO 46.96, SiO_2 29.90, Nb_2O_5 18.86, Al_2O_3 0.16, Fe_2O_3 0.54, TiO_2 0.26, P_2O_5 0.07, MgO 0.70, MnO 0.99, Na_2O 0.55, K_2O 0.00, H_2O 0.18, F 1.73, total 100.90, less O for F 0.73, total 100.17.

The spacings and intensities of the four strongest lines in the X-ray powder pattern (Co/Fe radiation) are: 3.240 (5), 3.012 (10), 2.891 (6) and 2.852 (6) (E.H. Nickel, J.F. Rowland and J.A. Maxwell, 1958: Can. Mineralogist, 6, pp. 264-272).

NITRE

KNO_3

British Columbia

92 O/1 Nitre has been found at Big Bar Creek, on the Fraser River, Clinton mining division (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 161R).

The X-ray powder pattern of this material has four strongest lines at: 3.75 (10), 3.03 (6), 2.65 (8) and 2.19 (5) (X-ray Laboratory, Geol. Surv. Can.).

93 B/13 Nitre occurs as a white granular powder, filling holes and cavities in the travertine of the Nazko River, about 5 miles below the mouth of the Clisbako River in the Quesnel mining division (G.M. Dawson, 1875-76: Geol. Surv. Can., Rept. Prog., pp. 264-265).

NOLANITE

near $3FeO.V_2O_3.3V_2O_4$

Saskatchewan

74 N/7
74 N/8 This iron-vanadium oxide mineral was first discovered in a hand specimen from the 'A' zone of Eldorado Mining and Refining Limited, on the shore of Fish Hook Bay, Lake Athabasca. Nolanite has also been identified from the No. 2 mine of Consolidated Nicholson Mines Ltd., from the Ace Mine, and from the main showing on the Pitche Group of claims on the southwest shore of Beaverlodge Lake. Microanalysis of 25 milligrams hand

74 N/7 picked sample, by Sherwood: V_2O_3 16.5, V_2O_4 59.8, FeO 24.0,
74 N/8 total 100.3. Nolanite is best identified by its X-ray powder pattern which has five strongest lines at: 3.43 (6), 2.64 (5), 2.47 (10), 2.44 (6) and 1.503 (6) (S.C. Robinson, H.T. Evans, Jr., W.T. Schaller, and J.J. Fahey, 1957: Am. Mineralogist, 42, p. 619).

NORBERGITE

$Mg(OH, F)_2 . Mg_2SiO_4$

The humite group minerals, norbergite, chondrodite, humite and clinohumite occur almost exclusively in metamorphosed and metasomatized limestones. Identification of individual minerals of the group is difficult and often impossible without the use of X-ray diffraction techniques. The spacings and intensities of the four strongest lines in the X-ray powder pattern of synthetic norbergite are: 3.06 (10), 2.64 (7), 2.255 (7), 2.23 (8) (H.E. Swanson, *et al.*, 1960: U.S. Nat. Bur. Stds., Circ. 539, vol. 10, p. 39).

Ontario

31 E/1 Norbergite has been identified by X-ray powder pattern in specimens from Wilberforce, in Monmouth Township, and from the Cardiff area, Cardiff Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

OCTAHEDRITE

(See anatase)

OKENITE

$CaSi_2O_5 . 2H_2O$

The spacings and intensities of the three strongest lines in the X-ray powder pattern of okenite are: 8.91 (10), 2.96 (8), and 2.83 (8) (ASTM card 3-0029).

Nova Scotia

21 H/2 Okenite was collected from the trap rock, 1/2 mile east of Morden, Kings County, as part of a concretion about 2 1/2 inches in diameter. Apart from a very narrow margin, okenite filled the whole cavity. Chemical analyses are as follows: I. SiO_2 56.02, Al_2O_3 0.26, Fe_2O_3 0.12, CaO 26.46, MgO 0.24, Na_2O 0.28, K_2O 2.24, H_2O 13.25, CO_2 1.58, total 100.45; S.G. 2.388; II. SiO_2 55.08, Al_2O_3 0.26, Fe_2O_3 0.20, CaO 26.57, MgO 0.12, Na_2O 0.76, K_2O 0.60, H_2O 16.31, CO_2 0.32, total 100.22; S.G. 2.333 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 65).

OLIGOCLASE

$NaAlSi_3O_8$-$CaAl_2Si_2O_8$

Oligoclase is a member of the plagioclase feldspar series and is a common rock-forming mineral found characteristically in monzonites and granodiorites. The plagioclases form a continuous series from pure albite, $NaAlSi_3O_8$ (Ab) to pure anorthite $CaAl_2Si_2O_8$ (An). Oligoclase by definition, contains between 70 and 90 per cent of the Ab molecule.

British Columbia

92 I/15
92 I/16 Unzoned, subhedral phenocrysts of oligoclase occur in a rhyodacite on the Tranquille Plateau, 25 miles northwest of Kamloops on an old wagon road from Tranquille to Red Lakes and Copper Creek (L.S. Stevenson, 1939: Am. Mineralogist, 24, p. 446).

Ontario

31 C/15 Chemical analysis of oligoclase from the Fournier Mine, lot 14, conc. I, South Sherbrooke Township: SiO_2 58.58, Al_2O_3 24.78, Fe_2O_3 tr., CaO 4.84, MgO 0.20, Na_2O 6.63, K_2O 2.15, H_2O 1.85, total 99.03; S.G. 2.63-2.64 (B.J. Harrington, 1873-74: Geol. Surv. Can., Rept. Prog., p. 198).

31 F/4 A chemical analysis of oligoclase from Monteagle Valley, Hastings County, gave results as follows: SiO_2 64.92, Al_2O_3 22.20, CaO 2.64, Na_2O 9.72, K_2O 0.68, H_2O 0.09, total 100.25; S.G. 2.637. Percentages of feldspars: Or 3.89, Ab 81.72, and An 13.07 (V.B. Meen, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 39).

Oligoclase is associated with zircon, quartz, microcline, calcite, titanite, pyrrhotite, chalcopyrite and ellsworthite in a pegmatite deposit on lot 18, conc. VII, Monteagle Township (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 18).

Quebec

31 G/12 Almost perfect crystals of oligoclase have been found on lot 12, range XVI, Hull Township, Gatineau County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 169).

31 H/6 Oligoclase occurs with hornblende in the intrusive diorite on Mount Johnson, Iberville County. Chemical analysis by Hunt: SiO_2 62.05, Al_2O_3 22.60, Fe_2O_3 0.75, CaO 3.96, Na_2O 7.95, K_2O 1.80, H_2O 0.80, total 99.91; S.G. 2.631 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 50T).

OLIVINE

$(Mg, Fe)_2SiO_4$

Olivine is a series name for a continuous solid solution of two major components, forsterite, Mg_2SiO_4, and fayalite, Fe_2SiO_4. It is a constituent of many basic igneous rocks such as basalt, gabbro, dunite and peridotite, and is a common mineral in meteorites. Forsterite is also found as a metamorphic mineral in crystalline limestone.

X-ray powder patterns show considerable variation in spacings and intensities. The spacings and intensities of the three strongest lines in the X-ray powder patterns of the pure end-members are: 3.881 (95), 2.510 (<100), 2.456 (>100) for forsterite; and 3.555 (75), 2.829 (100), 2.500 (80) for fayalite (H.S. Yoder and Th.G. Sahama, 1957: Am. Mineralogist, 42, pp. 475-491).

British Columbia

92 P/14 Peridot, a synonym for olivine, occurs in irregularly shaped masses in hypersthene peridotite on the summit of Timothy Mountain in the Cariboo district. The olivine crystals vary in colour from pale yellow to dark green, and in sizes from 1/50 to 1/4 inch (L. Reinecke, 1920: Geol. Surv. Can., Mem. 118, p. 81).

93 G/1 Gem quality peridot has been found at Lightning Creek at the headwaters of the Gamsby River (1958: Canadian Rockhound, vol. 2, No. 2).

Quebec

31 H/5 At Ste. Anne, Jacques Cartier County, angular masses of olivine occasionally more than an inch in diameter occur in a fine-grained groundmass which also contains large plates of mica and irregular masses or occasional bright crystals of augite. The olivine colours the rock a bright red. It has the usual fissured or cracked appearance. Along some of the cracks alteration to serpentine has taken place, whereas along others a little red oxide of iron is visible and gives the olivine its red colour. Chemical analysis by B.J. Harrington (1879): SiO_2 38.56, Fe_2O_3 1.36, FeO 12.65, MgO 44.37, H_2O 2.91, MnO 0.11, total 99.96 (J.A. Maxwell, et al., 1965: Geol. Surv. Can., Bull. 115, p. 336).

31 H/11 Olivine occurs in a granite dolorite at Montarville, Chambly County. It is the predominant mineral and occurs as olive or amber coloured imperfect crystals up to 1/2 inch in diameter, forming 45 per cent of the rock. It is serpentinized along cracks and partings. Chemical analyses of two different parts of the olivine are: (a) SiO_2 37.13, FeO 22.57, MgO 39.36, total 99.06; (b) SiO_2 37.17, FeO 39.68, MgO 22.54, total 99.39 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 336).

31 J/4 Crystals of olivine collected from lot 52, range V, Labelle County, have been donated to the National Mineral Collection.

OPAL

$SiO_2.nH_2O$

Opal is deposited at low temperatures from silica-bearing waters and can occur in fissures and cavities in any rock type. It is the form of silica secreted by sponges, radiolaria, and diatoms and is an example of a solidified colloidal gel. Opal is essentially amorphous, although X-ray powder photographs indicate cristobalite-like groupings.

British Columbia

82 E/2 Common opal occurs at the Mother Lode Mine at Deadwood (National Mineral Collection: donor, P.E. Crane, 1916).

82 F/14 Common opal is reported to occur at Fourmile (or Silverton) Creek, in the Slocan mining division (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 29R).

92 H/8 Specimens of semi-opal, a variety of opal, were found on Agate Mountain, southeast of Princeton, in the Similkameen mining division (C. Camsell, 1911: Can. Mining Inst. J., XIV, p. 606).

92 I/8 Hyalite, a variety of opal, occurs at Stump Lake, Droppingwater Creek, in the Kamloops mining division (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 110R).

92 I/10 White, pale greenish white, and apple green opal occur in the Tertiary agglomerate on Savona Mountain, Ashcroft mining division (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 16R).

92 P/3 Good specimens of hyalite are found in dark grey foliated basalt along the Bonaparte River near Hihium Lake, in the Clinton mining division (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 28R).

The National Mineral Collection contains specimens of opal from the head of Loon Lake.

93 A/6 Finely-laminated massive opal occurs with Tertiary argillite and sandstone at the Horse Fly Mine, located on the Horse Fly River about 7 miles above its entry into Quesnel Lake (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 14R).

Nova Scotia

21 A/9
21 A/10 Two varieties of opal, girasol and common opal, have been found in granite located between New Ross and Lake Ramsay, Lunenburg County (H. Piers, 1909-10: Trans. Nova Scotia, Inst. of Sci., XII, p. 446).

21 A/14 Opal (var. cacholong) from the North Mountains, Annapolis County, has been donated to the National Mineral Collection.

21 H/8 Cacholong (opal) occurs at Cape Split and Cape Blomidon, Kings County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 25T).

Nodules of opal, the colour of beeswax, were found on Partridge Island, Cumberland County (D. S. M. Field, 1952: Can. Mining J., 73, Pt. 2, p. 86).

21 H/16 A specimen of tripolite from Fountain Lake, near Amherst, Cumberland County, has been donated to the National Mineral Collection.

ORTHITE

(See allanite)

ORTHOCLASE

(See potassium feldspar)

OSMIRIDIUM

Ir, Os

In modern usage, the name osmiridium is recommended for the iridium-rich (over 68 per cent) cubic phase in the natural Ir-Os alloy system. Earlier writers used the name simply for Ir-rich members of the system.

British Columbia

92 H/7
92 H/8 Osmiridium has been found with platinum on the Tulameen and Upper Similkameen rivers (G. M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 104R).

93 A/12
93 B/9
93 B/16 Small amounts of osmiridium have been found with platinum in the Quesnel River area (E. D. Ingall, 1902-03: Geol. Surv. Can., Ann. Rept., XV, p. 190S).

Quebec

21 E/15 21 E/16 21 L/1 21 L/2 Osmiridium has been mentioned by Hunt as occurring with platinum on the Rivière Linière (formerly Rivière-du-Loup), a branch of the Chaudière River in Beauce County (G. C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, p. 5T).

Yukon

115 O 116 A 116 B The presence of osmiridium with gold from the Klondike River, has been detected (R. G. McConnell, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 64B).

OTTRELITE

(See chloritoid)

OWYHEEITE

$Pb_5Ag_2Sb_6S_{15}$

British Columbia

82 F/4 Specimens from the Bluebird-Mayflower workings of Rossland Mines Limited, at Gopher Creek, consisted of a massive complex of sulphides and sulfo-salts. Major constituents included pyrite, arsenopyrite, pyrrhotite, sphalerite, galena, and boulangerite, with minor amounts of tetrahedrite, owyheeite, meneghinite, chalcopyrite and gold. Owyheeite, which appears to carry the main silver values, is intergrown with a fibrous, radiating, or interlacing mosaic of boulangerite crystals which form the groundmass of much of the ore (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 547).

82 F/14 The Alamo Lode, near the head of Howson Creek, Slocan mining division carries galena, sphalerite, tetrahedrite, pyrargyrite, pyrite and chalcopyrite in a gangue of quartz, with some calcite and siderite. A specimen resembling tetrahedrite gave the X-ray pattern of owyheeite (H. V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 85).

Specimens from the Alma property and Rambler Mine, Slocan camp, gave X-ray powder patterns indentical to type material from Owyhee County, Idaho. The spacings and intensities of the six strongest lines are: 3.49 (7), 3.25 (10), 2.90 (5), 2.84 (6), 2.23 (5) and 2.05 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 139).

92 F/5 Samples from the area about the headwaters of Drinkwater Creek, Alberni mining division, show some vuggy quartz with bands of dark sphalerite and minor amounts of disseminated galena, tetrahedrite, and needles of arsenopyrite. The vugs are occupied by a capillary mineral, owyheeite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 453).

OZOCERITE

(See hydrocarbons)

PARAGONITE

$NaAl_3Si_3O_{10}(OH)_2$

The X-ray powder pattern is similar in d-spacings and intensities to that of muscovite, but paragonite has smaller cell dimensions.

Quebec

32 F/9 Paragonite, serpentine, chlorite, kaolinite and epidote are present as alteration products in a gabbro dyke composed originally of about 65 per cent labradorite, 25 per cent augite and 10 per cent magnetite. The dyke is located east of Barbie Lake, in the Bachelor Lake area, Abitibi Territory (W.W. Longely, 1951: Que. Dept. Mines, Geol. Rept., 47, p. 20).

32 G/13 Paragonite is present in small amounts in the Capisisit Lake granite, near the western boundary of the Branssat-Daine area, Abitibi-East County (J.E. Gilbert, 1955: Que. Dept. Mines, Geol. Rept., 64, p. 21).

PARARAMMELSBERGITE

$NiAs_2$

The specimens described below were originally identified as rammelsbergite by Walker and Parsons, 1921; Walker, 1925; and Thomson, 1930. Subsequent comparison with type specimens of rammelsbergite from Schneeberg, Saxony, showed the Canadian mineral to be a distinct species. It was named pararammelsbergite by Peacock in 1939; the name alludes to the fact that the composition is the same as rammelsbergite. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 2.54 (8), 2.51 (10), 2.36 (6), 1.817 (5) and 1.731 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 107).

Ontario

31 M/3
31 M/4 Pararammelsbergite, a replacement mineral which can grow at the expense of chloanthite or niccolite, occurs with gersdorffite, chloanthite, rammelsbergite and niccolite at the Keeley, the Camagas, and the Silver Bar mines, near Cobalt. Chemical analysis by Rickaby: Ni 17.46, Co 11.24, Fe 0.73, As 66.61, S 3.30, SiO_2 0.84, total 100.18; S.G. =6.73 (P. Ramdohr, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 9) (M.A. Peacock and A.S. Dadson, 1940: Am. Mineralogist, 25, p. 572).

31 M/5 Pararammelsbergite is also found at the Hudson Bay Mine, near Cobalt. Chemical analysis by Todd: Ni 27.08, Co 1.94, Cu 0.16, Fe 0.56, As 65.78, Sb 0.91, S 3.05, total 99.48; S.G. =7.02 (M.A. Peacock and A.S. Dadson, 1940: Am. Mineralogist, 25, p. 572).

41 P/9
41 P/10 A chemical analysis by Rogers of pararammelsbergite from the Moose Horn Mine, at Elk Lake, in the Gowganda district, gave the following results: Ni 28.1, Co 0.4, As 68.5, S 2.6, total 99.6; S.G. =7.14 (M.A. Peacock and A.S. Dadson, 1940: Am. Mineralogist, 25, p. 573).

PARISITE

$(Ce, La)_2Ca(CO_3)_3F_2$

This fluo-carbonate mineral was originally found in emerald deposits which occur in intensely folded carbonaceous shales in the Muzo district, north of Bogota, Colombia. Subsequent reported occurrences have been in alkaline rocks.

Ontario

31 F/8
42 D/9 Parisite and bastnaesite have been found in syenite pegmatite near Marathon. The parisite replaces long (up to 20 millimetres) crystals of bastnaesite. In most cases only a thin core of bastnaesite remains surrounded by numerous small parisite crystals. The strongest lines of the X-ray pattern are: 4.71 (8), 3.58 (10), 2.850 (10), 2.066 (9), 1.964 (8), 1.891 (8) and 1.671 (7) (J.A. Mandarino and W.M. Tovell, 1963: Can. Mineralogist, 7, p. 819).

PARKERITE

$Ni_3(Bi, Pb)_2S_2$

Northwest Territories

85 I/2 Specimens from the Gros Cap area, 2 miles north of Great Slave Lake and 3 miles east of the François River, consisted of closely spaced compact masses of botryoidal niccolite and rammelsbergite, cemented by a carbonate gangue and covered with much earthy annabergite. In polished section, the niccolite was seen to contain a series of bluish grey dots of parkerite (0.01 millimetre) along an arc parallel to its outer botryoidal surface, as well as a few larger areas (0.02 millimetre) which showed distinct multiple twinning (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

Ontario

41 I/6 Parkerite has been identified in the nickel ore at Sudbury. It is recognized by its pale cream colour and striking lamellar twinning revealed both by pleochroism and double refraction. It occurs as irregular equidimensional, rounded and subhedral particles varying in size from 0.1 to 3 millimetres. A less common occurence is in veinlets or stringers 2.0-3.0 millimetres long and .1 to .2 millimetre wide near contacts of massive ores. Most occur in galena associated with hessite, tetradymite, native bismuth and native gold (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 41).

The spacings and intensities of the five strongest lines in the X-ray powder pattern of parkerite from the Frood Mine are: 4.02 (7), 2.86 (10), 2.34 (9), 1.807 (6) and 1.650 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Surv. Can., Mem. 85, p. 114).

PEARCEITE

$(Ag, Cu)_{16}(As, Sb)_2S_{11}$

Pearceite and polybasite have been considered to be the As and Sb dominant members of a single solid solution series. Peacock and Berry (1947) showed that these minerals are not isostructural because the cell dimensions of polybasite are doubled as compared to those of pearceite. Frondel (1963) has shown that the antimony analogue of pearceite and the arsenic analogue of polybasite occur in nature and he has named these antimonpearceite and arsenopolybasite, respectively. Thus, pearceite-antimonpearceite and arsenopolybasite-polybasite probably form two complete solid solution isodimorphous series having the same composition range, $(Ag, Cu)_{16}(As, Sb)_2S_{11}$-$(Ag, Cu)_{16}(Sb, As)_2S_{11}$. The members of both series are monoclinic but the cell dimensions of the polybasite-arsenopolybasite series are all double those of the pearceite-antimonpearceite series (M.A. Peacock and L.G. Berry, 1947: Mineral. Mag., 28, pp. 1-13) (C. Frondel, 1963: Am. Mineralogist, 48, p. 565).

Quebec

32 C/4 Material from the unique, high grade ore shoot at Golden Manitou Mines, in Bourlamaque Township, Abitibi County, was found to contain pearceite. The mineral was identified by X-ray powder pattern by R.M. Thompson and by E.W. Nuffield and D.H. Gorman in solid, compact, masses of sulphide ore associated with galena, tetrahedrite, chalcopyrite, sphalerite, arsenopyrite, pyrite and native silver (M.H. Frohberg: personal communication).

The X-ray powder pattern of pearceite from Golden Manitou Mines has five strongest lines with the following spacings and intensities: 3.11 (5), 3.00 (10), 2.84 (9), 2.35 (5) and 1.852 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 120).

PECTOLITE

$NaCa_2Si_3O_8OH$

Pectolite occurs typically with zeolites in cavities and fissures in basic igneous rocks. It generally forms close aggregates of acicular, brittle, sharp-pointed crystals that must be handled carefully to avoid cutting the hands.

Newfoundland

12 G/8
12 H/5 Fine-grained aggregations of prehnite, pectolite, phlogopite and xonotlite are exposed in four places along the walls of a stream draining into the North Arm in the Bay of Islands, in western Newfoundland. The largest body is 55 feet by 10 feet (C.H. Smith, 1954: Am. Mineralogist, 39, p. 531).

Ontario

52 A/3 Pectolite occurs as radiating fibrous aggregations at McKellar Point, Crooks Township, in the Thunder Bay district (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 51T).

The X-ray powder pattern of material from this locality has three strongest lines at: 3.28 (7), 3.07 (8), 2.90 (10) (X-ray Laboratory, Geol. Surv. Can.).

52 H/8 Pectolite, prehnite, analcite and scapolite occur as fillings in crevices in olivine diabase, in railway cuts between Orient Bay station and Fairclough in the Lake Nipigon region. The pectolite crystals are bladed and radiating and their maximum length is about 1 inch. Chemical analysis by H.C. Rickaby: SiO_2 53.28, Al_2O_3 0.16, Fe_2O_3 0.48, MnO 0.33, CaO 33.41, MgO 0.26,

52 H/8 Na_2O 9.14, K_2O 0.25, H_2O 2.70, total 100.01; S.G. 2.857 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 17).

Quebec

21 L/3 Pectolite occurs as acicular crystals and in massive forms at the King Mine, on lot 26, range V, Thetford Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 173).

Pectolite is found at Thetford Mines in intimate association with apophyllite in cavities in a granite or aplite rock in the serpentine deposits. Analysis by E.W. Todd: SiO_2 54.18, Fe_2O_3 0.18, FeO 0.42, CaO 33.36, Na_2O 8.72, K_2O 0.88, H_2O 2.74, total 100.48; S.G. =2.834 (A.L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 55).

22 B/5 Masses of white, compact-fibrous pectolite are common in the serpentine on lot 5, range III, and lots 11 and 12, range IV, in Awantjish Township, Matapedia County (E. Aubert de la Rue, 1941: Que. Dept. Mines, Geol. Rept., 9, p. 22).

PENNINITE

(See chlorite)

PENTLANDITE

$(Fe, Ni)_9S_8$

Pentlandite is found in basic igneous rocks, closely associated with pyrrhotite, where it probably formed by a process of magmatic segregation. It closely resembles pyrrhotite in hand specimen but may be distinguished from it by prominent octahedral parting. Pentlandite is the most important world source of nickel, and about two-thirds of the world production comes from Canadian pentlandite-pyrrhotite ores.

The X-ray powder pattern of pentlandite has three strongest lines with the following spacings and intensities: 3.04 (6), 1.781 (10), and 1.027 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 64).

British Columbia

92 H/6 Thirteen orebodies of various sizes outcrop on the surface at the British Columbia Nickel Mines property, 7 miles by road up Stulkawhits Creek from Choate on the Canadian Pacific railway. The main minerals are pyrrhotite, chalcopyrite, pentlandite, pyrite, chromite, and magnetite (H.C. Horwood, 1936: Geol. Surv. Can., Paper 36-4, p. 6).

Manitoba

63 K/13
63 O/13 Pentlandite is a constituent of the nickel ores of the Thompson Moak Lake belt. It occurs finely disseminated in serpentinized peridotite or mixed with schist and gneiss fragments which are penetrated and partly replaced (H. D. B. Wilson and W.C. Brisbin, 1961: Can. Inst. Mining Met., Bull. 54, p. 820).

New Brunswick

21 G/3 Pentlandite occurs in gabbro with pyrrhotite and chalcopyrite at Woodward Farm property, Dennis Stream, and at the Saint Croix River, in Charlotte County; in nickeliferous pyrrhotite and pyrite in gabbro at Milltown Reservoir, and at Crocker Island, in Charlotte County (G.S. MacKenzie, 1940: New Brunswick Mines Br., Paper 40-6).

The ore at the Atlantic Nickel Company property at Rogers Farm consists of pentlandite, nickeliferous pyrrhotite, chalcopyrite and pyrite bodies in gabbro (New Brunswick Mines Br., files).

21 J/6 Pentlandite occurs in diorite and gabbro at Becaquimec Lake, York County, with chalcopyrite, chalcocite, pyrite and pyrrhotite (F.D. Anderson, et al., 1959: Geol. Surv. Can., Map 37-1959).

21 O/8 Pentlandite occurs in gabbro at Goodwin Lake, in Northumberland County (New Brunswick Mines Br., files).

Northwest Territories

55 K/16 A deposit of pyrrhotite carrying pentlandite and chalcopyrite is mined for nickel on the holdings of North Rankin Nickel Mines Limited, Rankin Inlet, situated on the west side of Hudson Bay, in the Keewatin district. The host rock of the ore is ultrabasic, the ore lying along the lower contact of a convoluted sill (G.J.R. Hannah, 1961: Precambrian, vol. 34, No. 1, p. 14).

Ontario

41 I/6 Pentlandite is common in the Sudbury district and occurs in particular at the following localities:

Evans Mine, lot 1, conc. I, Snider Township. Analyses by Browne: (1) S 35.43, Fe 29.95, Ni 34.12, total 99.50; (2) S 33.35, Fe 29.60, Ni 34.90, total 98.05.

Copper Cliff Mine, lot 12, conc. II, McKim Township. Analyses by Browne: (1) S 34.35, Fe 29.80, Ni 35.05, total 99.20; (2) S 33.50, Fe 30.30, Ni 35.00, total 98.80 (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94H) (D.H. Browne, 1893: Eng. & Mining J., LVI, p. 566).

41 I/6 Creighton Mine, lot 10, conc. I, Snider Township. Analysis by Dickson: S 32.90, Fe 30.00, Ni 34.82, Co 0.84, total 98.56 (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94H) (C.W. Dickson, 1903: Trans. Am. Inst. Mining Eng., XXXIV, p. 1) (A.D. Pearson and M.J. Buerger, 1956: Am. Mineralogist, 41, p. 804).

Worthington Mine, lot 2, conc. II, Drury Township. Analysis by Dickson: S 32.30, Fe 29.17, Ni 33.70, Co 0.78, total 95.95. Chief mineral is pentlandite with pyrrhotite, chalcopyrite, millerite and violarite (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94H) (C.W. Dickson, 1903: Trans. Am. Inst. Mining Eng., XXXIV, p. 1) (M.N. Short and E.V. Shannon, 1930: Am. Mineralogist, 15, p. 1).

Vermilion Mine, lot 6, conc. IV, Denison Township (M.N. Short and E.V. Shannon, 1930: Am. Mineralogist, 15, p. 1).

Lots 1 and 2, conc. II, Drury Township; and lot 12, conc. III, Denison Township are reported to have occurrences of folgerite (a synonym of pentlandite) (S.H. Emmens, 1892: J. Am. Chem., Sec. XIV, p. 7).

41 I/7 The pentlandite of the Sudbury area is without crystal forms but has a characteristic octahedral cleavage (A.P. Coleman, 1916: Can. Mining J., 36, p. 389).

A chemical analysis of pentlandite from the Sudbury district gave the following results: S 33.42, Fe 30.25, Ni 34.23, Co 0.85, insol. 0.67, total 99.42; S.G. 4.94 (S.L. Penfield, 1893: Am. J. Sci., Ser. 3, XLV, p. 493).

41 I/10 A chemical analysis by Browne of pentlandite from the Stobie Mine, lot 5, conc. I, Blezard Township, gave the following results: S 33.90, Fe 29.90, Ni 34.70, total 98.50 (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94H) (D.H. Browne, 1893: Eng. & Mining J., LVI, p. 566).

Pentlandite occurs at the Falconbridge Nickel Mines and the Nardeena Mines Limited properties in Falconbridge Township (J.E. Thompson, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. VI, p. 33).

41 I/11 Pentlandite is the chief nickel mineral at the Levack Mine, lot 2, conc. IV, Levack Township (M.N. Short and E.V. Shannon, 1930: Am. Mineralogist, 15, p. 1).

An analysis by Dickson of pentlandite from the Frood Mine, lot 6, conc. VI, McKim Township, gave the following results: S 33.30, Fe 30.04, Ni 34.98, Co 0.85, total 99.17 (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 94H) (C.W. Dickson, 1903: Trans. Am. Inst. Mining Eng., XXXIV, p. 1).

52 F/5 52 F/12 The ore at the property of Kenbridge Nickel Mines Limited, at Kathleen Lake, in the Kenora district, is made up of disseminated and massive pyrite, pyrrhotite, pentlandite, and chalcopyrite (J. C. Davies and S.N. Watowich, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. IV, p. 20).

52 F/13 Sulphide minerals including pentlandite occur in large quantities on the Eastern Mining & Smelting Corporation Limited property in the Gordon Lake area, District of Kenora (H.D. Carlson, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. IV, pp. 22-24).

PERIDOT

(See olivine)

PERISTERITE

(See albite)

PEROVSKITE

$CaTiO_3$

Perovskite was originally found as fine pseudocubic crystals in chlorite schist, and later in talc schist. More characteristically, it occurs as an accessory or late deuteric mineral in basic and alkalic igneous rocks, especially rocks containing melilite, nepheline, or leucite, and as a metamorphic product in crystalline limestone in contact with alkalic or basic intrusives. Dysanalyte and loparite are synonyms for niobian perovskite, and knopite is a synonym for cerian perovskite.

The X-ray powder pattern has four strongest lines with the following spacings and intensities: 2.72 (10), 1.926 (6), 1.570 (5) and 0.907 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 201).

British Columbia

82 N/1 Knopite (cerian perovskite) occurs in small bunches, up to 2 to 3 inches in diameter, in a fairly coarse pegmatite composed essentially of hornblende, biotite, and magnetite, on Moose Creek, about 26 miles by trail southeast of Leanchoil. The pegmatite is a lenticular body, 30 feet wide, intruding alkaline rocks at an elevation of 8,500 feet on the ridge between Moose Creek and the west branch of the Vermilion River. Chemical analysis by H.V. Ellsworth: SiO_2 2.17, TiO_2 54.49, Al_2O_3 0.68, Fe_2O_3 2.85, CaO 35.10, MgO 0.21, MnO 0.08, K_2O 0.07, Na_2O 0.46, SnO_2 0.04, ThO_2 0.06, $(Ce, La, Di)_2O_3$ 2.33, $(Yt, Er)_2O_3$ 0.05,

82 N/1 H_2O 0.68, total 99.27 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, pp. 138, 262).

Quebec

31 G/8 Perovskite occurs with pyrochlore and niocalite in a niobium ore deposit in the Oka district east of Montreal. The ore deposit is in a complex of carbonate and alkaline rocks (R. Guimond, 1963: Precambrian, vol. 36, No. 5, p. 14).

32 F/9 Kimberlite forms small bodies intruding the rocks near Bachelor Lake in Lesueur Township, Abitibi Territory. The kimberlite has porphyritic and panidiomorphic textures, and consists of olivine, phlogopite, calcite, augite, perovskite, magnetite, ilmenite, apatite, and chlorite (K.D. Watson, 1955: Am. Mineralogist, 40, p. 565).

PERTHITE

(See potassium feldspar)

PETALITE

$LiAlSi_4O_{10}$

Manitoba

52 L/5 Petalite occurs in the lithium-rich pegmatite on the Chemalloy property, Bernic Lake (R.W. Mulligan, 1961: Geol. Surv. Can., Paper 61-4, p. 3).

52 L/6 Petalite has been identified at the Montgary deposit and the Peg and Coe claims at Bernic Lake, Manitoba (M.H. Frohberg, 1962: private communication).

The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.72 (10), 3.65 (8), 3.51 (3) and 2.64 (3) (X-ray Laboratory, Geol. Surv. Can.).

Ontario

30 M/11 Petalite was found with tremolite in a large boulder on the shore of Lake Ontario at Toronto, York County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 481).

PETZITE

$(Ag, Au)_2Te$

Petzite occurs with other tellurides, especially hessite, and gold in vein deposits. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 2.78 (10), 2.12 (5) and 2.03 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 38).

British Columbia

82 E/2 Petzite occurs with hessite, native copper, and other minerals at the Enterprise claim on the south side of Long (Jewel) Lake, in the Greenwood mining division (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 12R).

82 E/4 Petzite occurs with hessite, native gold, and other minerals in a vein on the Calumet claim, Kruger Mountain, on the western shore of Osoyoos Lake in the Yale district (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 12R).

82 E/4
82 E/5 X-ray powder photographs have confirmed the occurrence of petzite, associated with altaite and hessite, at the Hedley Monarch Gold Mines Limited property near Olalla in the Osoyoos mining division (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 351).

Manitoba

52 M/4 A specimen of quartz from the San Antonio Mine at Bissett, contained small areas of calcite containing abundant gold and small grains of petzite (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 351).

Ontario

31 M/13
32 D/4 Petzite occurs associated with calaverite, tetradymite, pyrite, gold, chalcopyrite, and sphalerite, at Boston Creek, Pacaud Township, in the Timiskaming district (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 99).

32 D/4 Petzite has been identified by X-ray powder diffraction in a specimen from the Bidgood Mine, Lebel Township, Timiskaming district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quartz containing native gold and telluride minerals, including petzite, is found at the Miller Independence Mine, lot 1, conc. VI, Pacaud Township (K.D. Lawton, 1957: Ont. Dept. Mines, Ann. Rept., vol. 66, Pt. V, p. 47).

At the Upper Canada Mine in Gauthier Township, petzite occurs as small areas in contact with calaverite, associated with altaite, 32 D/4 chalcopyrite, pyrite, and gold (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 352).

42 A/1 Petzite, associated with other tellurides, sulphides and gold, occurs at the Sylvanite and the Toburn mines in the Kirkland Lake area (J.E. Hawley, 1948: Ont. Dept. Mines, Ann. Rept., vol. 57, Pt. V, p. 111). A chemical analysis by Rickaby of petzite from the Sylvanite Mine gave the following results: Au 21.56, Ag 34.86, Hg 6.90, Pb 0.24, Fe 0.56, Te 33.40, insol. 0.80, total 98.32.

Petzite occurs as disseminations in quartz porphyry and is associated with chalcopyrite and gold at the Lake Shore Mine, Kirkland Lake (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 351). Petzite has also been reported from the Wright-Hargreaves Mine in the same district.

At the Tough Oakes Burnside Mine, Kirkland Lake, petzite is found in a vertical fault vein. The petzite is associated with altaite, coloradoite, calaverite, melonite, and sulphides (A.G. Burrows, 1923: Ont. Dept. Mines, Ann. Rept., vol. 32, Pt. IV, p. 24) (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 99).

Petzite is associated with native gold in quartz gangue on the Labine-Smith claims, lot 9, conc. II, Maisonville Township, in the Timiskaming district (E. Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 98).

42 A/6 Petzite is sometimes intimately associated with ankerite at the 800 foot level of the Hollinger Mine at Timmins. It occurs as films in cleavage cracks and, more rarely, as masses up to 1/2 inch in diameter. Analysis by H.C. Rickaby: Ag 49.57, Au 11.10, Fe 0.76, Co 0.76, Te 33.62, As 1.20, insol. 2.38, S tr., Sb tr., Ni tr., total 99.39; S.G. =7.53 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 39).

42 A/8 In the Swastika area, petzite occurs on the south half of lot 9, conc. II, Benoit Township (E. Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 98).

52 B/10 Petzite, hessite, pyrite, chalcopyrite, nagyagite, and native gold occur in a quartz and carbonate gangue at the Huronian Mine (formerly the Moss or Ardeen Mine) in Moss Township, Thunder Bay district. On one surface of vein quartz the petzite occurs with hessite, as a massive black crust 5 millimetres thick. Analysis by Smith (1890): Au 23.691, Ag 41.062, Pb 0.071, Fe tr., Te 32.007, insol. 0.097, total 96.928 (E. Thomson, 1922 and 1931: Univ. Toronto Stud., Geol. Ser., 14, p. 92, and 30, p. 52) (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 351).

52 E/9 The chief metallic minerals in the Bigstone Bay area, Lake of the Woods, are tetradymite, calaverite, petzite, and pyrite, with lesser amounts of gold, chalcopyrite, and hessite (E. Thomson, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 48).

Quebec

31 M/7 Petzite has been identified by X-ray powder pattern in specimens from the Belleterre Mine, Guillet Township, Témiskamingue County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Petzite is common in Abitibi County, Quebec, and occurs in particular at the following localities:

32 C/3 Bevcon (formerly Bevcourt) Mine in Louvicourt Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 352).

32 C/4 Siscoe Gold Mines property, Dubuisson-Vasson Township (P.E. Auger, 1940: Que. Dept. Mines, Prelim. Rept., 149, p. 8) (P.E. Auger, 1949: Que. Dept. Mines, Geol. Rept., 17, p. 21).

Lamaque Mine, Bourlamaque Township, and Sullivan Consolidated Mines in Dubuisson-Vasson Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 352).

32 D/1 Canadian Malartic Mine, Fourniere Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 352).

32 D/3 Home Mine and Stadacona Mine, Rouyn Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 352).

32 D/6 Robb-Montbray property, Montbray Township (E. Thomson, 1928: Univ. Toronto Stud., Geol. Ser., 27, p. 12).

Yukon

105 D/6 Petzite occurs on the Gold Reef claim, on Gold Hill in the Wheaton River district, associated with sylvanite, hessite, telluric ochre, pyrite and gold (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

PHARMACOSIDERITE

$Fe_3(AsO_4)_2(OH)_3 . 5H_2O$

Yukon

105 M/14 Pharmacosiderite has been identified by X-ray diffraction pattern in a specimen taken from the Comstock Mine adit in the

105 M/14 Keno Hill-Sourdough Hill area, where it occurs as a yellow, botryoidal encrustation on arsenopyrite.

The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 7.90 (10), 3.26 (6) and 2.82 (4) (X-ray Laboratory, Geol. Surv. Can.).

PHENAKITE

Be_2SiO_4

This comparatively rare orthosilicate mineral has been found most commonly as a pneumatolytic mineral in pegmatites. The X-ray powder pattern shows five strongest lines with the following spacings and intensities: 3.66 (8), 3.12 (10), 2.52 (7), 2.36 (7), 2.19 (6) (H.E. Swanson *et al.*, 1959: U.S. Nat. Bur. Stds., Circ. 539, vol. 8, pp. 11-13).

Quebec

32 D/8 Phenakite is reported to occur in small quantities associated with beryl, fluorite and molybdenite in pegmatite on the Height of Land Mining Company property in Preissac Township, Témiskamingue County. The mineral was collected in 1911 by J.A. Bancroft and examined and identified by R.P.D. Graham (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 178).

PHLOGOPITE

$K(Mg, Fe)_3Si_3AlO_{10}(OH, F)_2$

Phlogopite is an important member of the trioctahedral mica group. It forms a complete solid solution series with biotite and is arbitrarily defined as having a ratio of magnesium to iron atoms greater than two to one. In hand specimen, brown and reddish brown micas are commonly called phlogopite, and black micas are called biotite. The main occurrences of phlogopite are in metamorphosed limestones and in ultrabasic rocks.

Ontario

31 C/8 A crystal of phlogopite measuring 14 feet in diameter and 33 feet long was found at the Lacey Mine, Loughborough Township, Frontenac County (R.H. Jahns, 1953: Am. Mineralogist, 38, p. 567).

31 C/9
31 C/10 Zoned phlogopite occurs on lots 10 and 27, conc. XI, Bedford Township, Frontenac County (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 18).

31 C/10 Phlogopite with a marked zonal arrangement also occurs on lot 13, conc. XII, Loughborough Township (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 18).

31 C/16 Large, tabular, twinned crystals of phlogopite occur with apatite at the Adams Mine, lot 6, conc. VIII, North Burgess Township. Specimens from this locality have been donated to the National Mineral Collection.

Quebec

31 G/12 The National Mineral Collection contains specimens from the following localities in Gatineau County: lot 10, range XII, Hull Township; lot 7, range I; lot 9, range II; and lot 7, range I, all in Wakefield Township.

Phlogopite of exceptional quality, was a product of the Wallingford Mine, 1 1/2 miles west of Perkin's Mills, Quebec. The mine is located on the west half of lot 16, range VIII, in Templeton Township, and samples from this mine won first prize at several international expositions (K.K. Landes, 1938: Am. Mineralogist, 23, p. 367).

31 G/12
31 G/13 The National Mineral Collection contains specimens of phlogopite from lot 30, range V, Portland Township, and from the Villeneuve Mine, Villeneuve Township, Papineau County.

31 G/15 Phlogopite is found associated with magnesite, dolomite, limestone, serpentine, diopside and asbestos at Kilmar, Argenteuil County, in the underground workings of a mine operated by Canadian Refractories Limited. The phlogopite possesses the peculiar property that when it is split along the cleavage in complete darkness, it exhibits a bluish white luminescence extending along the length of the split, and lasting only as long as the splitting is taking place (V.B. Meen, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 33).

Phlogopite crystals 4 to 8 inches in diameter occur in lenses and irregular veins in pyroxenite at a number of localities in Gatineau and Labelle counties. The best known occurrences of the area are as follows:

	Lot(s)	Range	Township
31 J/12	7, 13, 14, 20	B	Aumond
31 J/12	3, 5	III	Aumond
31 J/5	38, 39	I	Bouchette
31 J/5	50, 51	III	Cameron
31 J/5	47	VII	Cameron
31 J/12	46	B	Egan
31 J/5	15	I	Egan
31 J/5	28	II	Egan

	Lot(s)	Range	Township
31 J/5	44, 45	I	Kensington
31 J/5	3, 16	VI	Kensington
31 K/8	20, 21	E. of Maniwaki Rd.	Maniwaki

(E.A. de la Rue, 1944: Que. Dept. Mines, Prelim. Rept., 183, p. 17).

PHOSPHURANYLITE

$$Ca(UO_2)_4(PO_4)_2(OH)_4.7(?)H_2O$$

Phosphuranylite is a secondary mineral found typically in weathered zones of uraniferous granite pegmatite. The X-ray pattern has five strongest lines at: 7.91 (10), 3.96 (6), 3.15 (6), 3.10 (6), 2.88 (6) (D.D. Hogarth and E.W. Nuffield, 1954: Am. Mineralogist, 39, pp. 444-447).

Saskatchewan

74 P/4
74 P/5 Phosphuranylite has been identified by its X-ray powder pattern in a specimen from Stony Rapids, Middle Lake (E.W. Nuffield and D.H. Gorman, 1960: private communication).

PICKERINGITE

$$MgAl_2(SO_4)_4.22H_2O$$

Pickeringite, or magnesia alum, forms a complete solid solution series with the analogous iron alum, halotrichite. The names pickeringite and halotrichite are applied to the halves of the series with Mg>Fe and Fe>Mg, respectively. These minerals commonly form as weathering products of pyritic and aluminous rocks and occur as colourless, white or lightly tinted aggregates of acicular, often hair-like crystals. The minerals are completely soluble in water, giving a bitter astringent taste. The spacings and intensities of the three strongest lines in the X-ray powder pattern of pickeringite are: 4.82 (10), 4.32 (4) and 3.51 (9) (ASTM card 12-299).

Alberta

83 N/12 Salts occur as thin veins and incrustations, mixed with clay, along the banks of a stream valley in township 77, range 24, at the junction of the two main branches of the Smoky River. A chemical analysis and optical examination of this material proved the main mineral to be pickeringite. Chemical analysis of pickeringite: SO_3 39.92, Al_2O_3 11.90, MgO 6.32, H_2O 41.35, Fe_2O_3 0.40, SiO_2 0.53, total 100.42 (R.L. Rutherford, 1932: Am. Mineralogist, 17, p. 401).

Nova Scotia

21 H/1 Pickeringite is found as an efflorescence on the shale of a sheltered cliff on the banks of the Meander River near Newport, Hants County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 52T).

Chemical analysis of pickeringite from Hants County, by How: SO_3 36.33, Al_2O_3 10.64, FeO 0.13, MnO 0.45, NiO 0.14, CoO 0.06, CuO 0.02, MgO 4.79, K_2O 0.23, H_2O 46.06, insol. 0.72, total 99.57 (H. How, 1863: J. Chem. Soc., Nova Scotia, I, p. 200).

PICROLITE

(See serpentine)

PIGEONITE

$(Mg, Fe, Ca)(Mg, Fe)Si_2O_6$

Pigeonites are calcium-poor monoclinic pyroxenes that are distinguished optically from the other members of the pyroxene group by low optic axial angles, invariably less than 30 degrees and generally less than 25 degrees. Pigeonite is commonly found in quickly chilled lavas and minor intrusions, and is unknown in metamorphic rocks. Pigeonite formed under conditions of plutonic crystallization has invariably inverted to orthorhombic pyroxene. Such inverted pigeonites are recognized by the presence of abundant augite lamellae located along the (001) planes of the original pigeonite. In twinned crystals the augite lamellae display a herring-bone pattern. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.21 (8), 3.02 (10), 2.91 (8) and 2.90 (10) (ASTM card 13-421).

Ontario

42 C/8 Pigeonite occurs in a gabbro-wehrlite at the northwest end of Dog Lake, 1 1/2 miles southeast of Lochalsh, township 47, District of Algoma. The primary constituents of the rock include olivine, bytownite, augite, biotite, pigeonite, chromite, magnetite and apatite; while the secondary minerals present are: serpentine, talc, chlorite, hornblende, iddingsite, carbonate, and magnetite (M. H. Frohberg, 1944: Am. Mineralogist, 29, p. 302).

Quebec

22 A/13 Rare occurrences of pigeonite are found with fine-grained recrystallized quartz of a white to light blue colour, at Needle Mountain, Holland Township, Gaspé-North County (J. E. Riddell, 1952: Que. Dept. Mines, Prelim. Rept., 269, p. 2).

32 F/5 Pigeonite was recognized in a thin section of diabase from the Taibi Lake area, south of Indienne River, Abitibi East County (R. Beland, 1950: Que. Dept. Mines, Geol. Rept., 40, p. 13).

32 F/11 Pigeonite constitutes more than 50 per cent of the olivine gabbro found south of the west end of Baptiste Lake, in the Iserhoff River area, Abitibi East County (J. Claveau, 1951: Que. Dept. Mines, Geol. Rept., 49, p. 25).

PISANITE

(See melanterite)

PITCHBLENDE

(See uraninite)

PLATINUM

Pt

Native platinum is most commonly found in placer deposits, usually as grains or scales, occasionally as nuggets or lumps up to 20 pounds in weight. It is malleable and ductile, and whitish steel grey in colour. Native platinum is usually very impure and may contain enough iron to be almost black in colour. Platinum originates by magmatic differentiation in basic and ultrabasic rocks.

The X-ray powder pattern has 5 strongest lines with the following spacings and intensities: 2.23 (8), 1.168 (10), 0.890 (8), 0.868 (8) and 0.792 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 12).

Alberta

83 H/11
83 H/12 Native platinum has been found in association with gold on sand bars in the North Saskatchewan River, in the neighbourhood of Edmonton (A.R.C. Selwyn, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 66A).

British Columbia

82 E/3 Platinum occurs with gold, magnetite, quartz, and pyrite in the sands of Rock Creek, a tributary of the Kettle River in the Greenwood mining division (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 14R).

82 E
92 H Nuggets of platinum, many containing grains of chromite and magnetite have been found in the Similkameen and Tulameen

82 E
92 H
rivers, in the Princeton map-area. The presence of palladium, rhodium, iridium, copper, iron, and osmium was revealed in an analysis by G. C. Hoffmann (H. M. A. Rice, 1947: Geol. Surv. Can., Mem. 243, p. 59).

82 K/11
Platinum has been found in sands near Ferguson, in the Lardeau mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 181).

92 H/7
Analyses of platinum from Granite Creek, Similkameen mining division by G. C. Hoffmann, are as follows: (1) Nonmagnetic platinum: Pt 68.19, Pd 0.26, Rh 3.10, Ir 1.21, Cu 3.09, Fe 7.87, Os 14.62, gangue (embedded chromite) 1.95, total 100.29; S. G. 17.017; (2) Magnetic platinum: Pt 78.43, Pd 0.09, Rh 1.70, Ir 1.04, Cu 3.89, Fe 9.78, Os 3.77, gangue (embedded chromite) 1.27, total 99.97; S. G. 16.095 (G. C. Hoffmann, 1887: Trans. Roy. Soc. Can., V, Sec. 3, p. 17) (G. C. Hoffmann, 1886: Geol. Surv. Can., Ann. Rept., II, pp. 6, 7T).

92 H/7
92 H/10
Platinum is found as grains and nuggets in Cedar, Granite, and Slate (now called Olivine) creeks, all of which flow into the Tulameen River, in the Similkameen mining division (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 52T).

92 H/10
Platinum has been observed as fine grains in the peridotites of Olivine Mountain, Similkameen mining division (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p. 263).

92 I/4
The black sand of the Fraser River near Lytton is composed of the following minerals in order of their abundance: magnetite (67 per cent by weight), garnet, ilmenite, zircon, rutile, olivine, platinum, gold, quartz, epidote, thorianite, chromite, feldspar, cinnabar, muscovite, calcite, scheelite and sperrylite (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

92 H
92 I
92 O
93 B
93 G
Fine scales of platinum and gold are found along the Fraser and Tranquille rivers, in the Kamloops mining division (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 52T).

93 A/6
The National Mineral Collection contains specimens of platinum from the Horsefly Mine on the Horsefly River, Cariboo district, donated by G.M. Dawson, in 1894.

93 A/11
93 A/12
93 B/9
93 B/16
Black sand along the Quesnel River, in the Quesnel mining division, was found to contain platinum (R. A. A. Johnston, 1908: Geol. Surv. Can., Sum. Rept., p. 169).

104 J/15
104 J/16
Finely divided platinum is found in some abundance in the black sands of Thibert Creek on the headwaters of Dease River, Liard mining division (J. Cartmel, 1912: British Columbia Dept. Mines, Ann. Rept., pp. 63, 78).

Quebec

21 E/15
21 E/16
21 L/2
21 L/7
Platinum has been observed in association with iridosmine in gold washings from Riviere-du-Loup, Rivière Linière, and Rivière des Plantes, Beauce County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 52T).

POLLUCITE

$(Cs, Na)AlSi_2O_6.nH_2O$

Pollucite is the principle primary mineral of caesium and contains about 27 per cent Cs_2O. It is colourless to white or greyish, generally massive with a vitreous lustre, and may closely resemble quartz. It occurs in pegmatites that are rich in lithium minerals.

Manitoba

52 L/5
52 L/6
At the Chemalloy (formerly called "Montgary") property at Bernic Lake, pollucite occurs in a lenticular mass nearly 500 feet long and up to 60 feet thick. The mass consists of nearly pure pollucite. It is bounded for the most part by spodumene-rich assemblages, and together with quartz-amblygonite forms a core unit of the pegmatite. Other minerals in the pegmatite include cleavelandite, lepidolite, petalite, and beryl (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 19) (R. Mulligan, 1961: Geol. Surv. Can., Paper 61-4) (R. Brinsmead, 1963: Geol. Soc. Am., Bull., 74, No. 7, p. 919).

The spacings and intensities of the 4 strongest lines in the X-ray powder pattern of pollucite from Bernic Lake are: 3.65 (7), 3.41 (10), 2.91 (6), and 2.41 (5) (X-ray Laboratory, Geol. Surv. Can.).

Quebec

32 C/5
Pollucite has been identified by X-ray powder pattern as occurring at the Valor property, range 8, lot 22, Lacorne Township. The mineral occurs as masses up to 5 feet in maximum dimension in the core of a complex pegmatite. Quartz, cleavelandite and spodumene are the most abundant minerals in the core zone; lepidolite and beryl are present in lesser amounts (R. Mulligan, 1961: Geol. Surv. Can., Paper 61-4).

POLYBASITE

$(Ag,Cu)_{16}(Sb,As)_2S_{11}$

Polybasite and pearceite have been considered to be the Sb and As dominant members of a single solid solution series. Peacock and Berry (1947) showed that these minerals are not isostructural because the cell dimensions of polybasite are doubled as compared to those of pearceite. Frondel (1963) has shown that the arsenic analogue of polybasite and the antimony analogue of pearceite occur in nature and has named these arsenopolybasite and antimonpearceite, respectively. Thus, polybasite-arsenopolybasite and antimonpearceite-pearceite probably form two complete solid solution isodimorphous series having the same composition range, $(Ag,Cu)_{16}(Sb,As)_2S_{11}$-$(Ag,Cu)_{16}(As,Sb)_2S_{11}$. The members of both series are monoclinic but the cell dimensions of the polybasite-arsenopolybasite series are all double those of the antimonpearceite-pearceite series (M. A. Peacock and L.G. Berry, 1947: Mineral. Mag., 28, pp. 1-13) (C. Frondel, 1963: Am. Mineralogist, 48, p. 565).

The X-ray powder pattern of polybasite from the Highland Bell Mine (82 E/6) and Keeley Mine (31 M/3) has 5 strong lines with the following spacings and intensities: 3.19 (9), 3.00 (10), 2.88 (8), 2.70 (5) and 2.53 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 119).

British Columbia

82 E/6 Polybasite occurs at the Highland Bell Mine at Wallace Mountain, 23 miles east of Penticton in the Greenwood mining division. It is found as stringers and veinlets, as crystals in vugs and cavities, and also as a coating. Chemical analyses by R.N. Williams: (1) Ag 69.72, Cu 3.90, Sb 10.15, As 0.63, S 15.68, total 100.08; S.G. 6.26±0.03; from veinlets; (2) Ag 67.13, Cu 2.23, Bi 0.80, Sb 9.50, As 0.78, S 16.94, Zn tr., Fe 0.31, Pb 2.41, total 100.10; S.G. 6.33±0.03; crystal fragments; (3) Ag 69.80, Cu 4.25, Sb 10.72, As 0.58, S 15.57, total 100.92; S.G. 6.28±0.05; thin coatings (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 30).

82 L/1 Polished sections of ore from the Silver Horde Mine on Bromide Mountain, 47 miles east of Vernon, show polybasite in microscopic amounts in galena, and associated with chalcopyrite, sphalerite, tetrahedrite, silver, pyrite, and magnetite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 453).

93 M/5 Polybasite occurs at the Silver Standard Mine, Glen Mountain, Omenica mining division, in close association with argentiferous tetrahedrite, galena, pyrargyrite, and meneghinite. Sphalerite, pyrite, pyrrhotite, marcasite, arsenopyrite, chalcopyrite, covellite, and limonite are also present (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

103 P/12 Polished sections of silver ore from the Torbrit (Toric) Silver Mine show pyrargyrite as disseminated grains and tiny veinlets with polybasite.

The mine is located on the east bank of the Kitsault River, 17 miles by road from Alice Arm in the Portland mining district (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

Samples from the Dolly Varden Mine, Alice Arm, Skeena mining division, consist of rather glassy, bluish black, vuggy quartz containing pyrite and argentite. Ore minerals present in order of their abundance are: pyrite, argentite, galena, sphalerite, pyrargyrite, silver, chalcopyrite, tetrahedrite, polybasite, and argyrodite (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 545).

Ontario

31 M/3 Polybasite from the Keeley Mine, Silver Centre, Timiskaming district, has been identified by the X-ray powder diffraction method (E.W. Nuffield and D.H. Gorman, 1960: private commication).

31 M/5 Polybasite occurs at the O'Brien Mine, Cobalt area, as minute, brilliant, tabular crystals up to 2 millimetres in diameter. The crystals are always firmly attached to argentite. A chemical analysis gave results as follows: Ag 74 to 75, Cu 2, Sb 6^+, S 12^+, total 95 per cent (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 233).

Shiny black, pseudo-hexagonal, platy crystals of polybasite up to 5 millimetres in diameter occur in vugs at the Silver Miller Mine, Brady Lake property, near Cobalt.

The crystals, identified crystallographically, by polished section (Frohberg), and by X-ray powder pattern (M. A. Peacock) are associated with stephanite, pyrargyrite, and breithauptite (M. H. Frohberg, 1960: private communication).

42 L/7 Polybasite occurs with other sulphides, and two ages of quartz, at Kupfer Lake, O'Sullivan Lake area (W.W. Moorhouse, 1955: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. IV, p. 22).

Quebec

32 F/9 Polybasite occurs at the Coniagas Mine, 3 miles southwest of Bachelor Lake, Lesueur Township, with native silver and pyrargyrite, and closely associated with chalcopyrite and galena (K.D. Watson, 1957: Can. Mineralogist, 6, Pt. I, p. 26).

POLYDYMITE

Ni_3S_4

Polydymite is a relatively rare nickel sulphide mineral with a spinel type structure. The spacings and intensities of the 4 strongest lines in the X-ray powder pattern are listed as: 2.87 (10), 2.37 (6), 1.825 (5) and 1.678 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 78).

Ontario

41 I/6 Polydymite occurs at the Vermilion Mine, lots 5 and 6, conc. IV, Denison Township, with chalcopyrite, some pyrite, and minor quartz. Chemical analysis by Browne: S 38.43, Ni 36.85, Fe 18.70, Cu 4.47, total 98.45; by Clarke and Catlett: S 40.80, Ni 4.96, Fe 15.57, Cu 0.62, SiO_2 1.02, total 99.97; S.G. =4.541 (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 11H) (D.H. Browne, 1893: Eng. & Mining J., LVI, p. 566) (F.W. Clarke and C. Catlett, 1889: Am. J. Sci., Ser. 3, XXXVII, p. 373).

POTASSIUM FELDSPAR

$KALSi_3O_8$

Feldspars are the most abundant of all minerals. Although closely related in chemical composition and physical properties they are classified into two groups: the potassium feldspars which are monoclinic or nearly so, and the sodium and calcium feldspars, or plagioclases, which are definitely triclinic. The potassium feldspars occur in several distinct forms. Microcline the triclinic modification is the most abundant form and is the main feldspar of commerce. A distinctive green variety of microcline, amazonite or amazon stone, is cut and polished as a gem and ornamental stone. Orthoclase in the proper sense refers to a monoclinic potassium feldspar formed at intermediate to low temperatures. The name has been loosely used in the literature for potassium feldspar, thus much of the reported orthoclase is in fact microcline or microcline perthite. Sanidine, a high temperature monoclinic form is characteristic of eruptive rocks, especially rhyolite, trachyite, and phonolite. The name andularia is given to an apparently metastable potassium feldspar with a distinctive habit, found in low temperature hydrothermal veins. It frequently shows opalescence, is then termed moonstone, and is used for gem purposes. The alkali feldspars of common rocks frequently consist of lamellar intergrowths of potassium and sodium feldspars. Such an intergrowth is called perthite if potassium feldspar is the dominant or host feldspar, and antiperthite if the reverse is true. The name hyalophane is used for potassium feldspar containing minor amounts of barium. As rock-forming minerals, the feldspars are too widely-distributed to list all occurrences.

Alberta

82 G/10 Orthoclase is the most prevalent mineral in the Crow's Nest Volcanics, the only igneous rocks occurring in the foothills and front ranges of the Rocky Mountains of Alberta. Orthoclase phenocrysts have in some places weathered out of the porphyry and can be easily collected from outcrops between the railway and highway, about 1 1/4 miles west of the railway station at Coleman (R. L. Rutherford, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 67)..

British Columbia

82 E/5 A quartz porphyry located southwest of Penticton contains good crystals of orthoclase varying from less than 1/4 ounce to more than a pound in weight. Chemical analyses by W. L. Swanson: (1) SiO_2 63.52, Al_2O_3 20.94, Fe_2O_3 0.14, MgO 0.24, K_2O 11.22, Na_2O 3.03, ignition 0.45, total 99.54; S.G. =2.54; (2) SiO_2 62.84, Al_2O_3 21.28, Fe_2O_3 0.14, MgO 0.13, K_2O 12.57, Na_2O 2.26, total 99.22; S.G. =2.52 (T. L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 46).

92 I/15 Sanidine phenocrysts occur in a rhyodacite on the Tranquille Plateau, 25 miles northwest of Kamloops, on an old wagon road from Tranquille to Red Lakes. Phenocrysts of oligoclase, quartz and biotite are also present, but the sanidine is a conspicuous feature, making up 49 per cent of the rock. Twinning is present, but untwinned euhedra and subhedra are more common (L. S. Stevenson, 1939: Am. Mineralogist, 24, p. 446).

Newfoundland

13 O/2 Amazonite, a variety of microcline is the major constituent of an unusual aplite dyke found on the south shore of Northern Adlavik Island, 1 mile east of Maconit Bay, Labrador. Albite and quartz are associated with the amazonite; mica, topaz, fluorite, apatite and magnetic yellow sulphide are present in minor amounts (E. P. Wheeler, 1935: Am. Mineralogist, 20, p. 44).

Ontario

31 C/4 Pale flesh pink microcline forms the major part of the feldspar on lot 18, conc. VII, of Monteagle Township (T. L. Walker and A. L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 18).

31 C/7 What has been described as a fetid feldspar occurs on lot 3, conc. XI, of Loughborough Township. It is a white to bluish white

31 C/7 microcline showing microperthitic intergrowths and emitting a peculiar fetid odour when broken. This has been attributed to hydrogen selenide. An analysis by W.K. McNeill is as follows: SiO_2 65.72, Al_2O_3 18.98, Fe_2O_3 0.63, CaO 0.62, Na_2O 3.68, K_2O 9.61, H_2O 0.14, CO_2 0.53, total 99.91. Associated minerals are quartz, diopside, titanite and pyrite. The perthitic plagioclase is albite (F.L. Sine, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 25).

31 C/10 A chemical analysis of microcline from lot 1, conc. II, Bedford Township, gave the following results: SiO_2 65.87, Al_2O_3 19.10, CaO 0.20, K_2O 12.24, Na_2O 2.56, H_2O 0.64, total 100.61 (E.T. Corkill, 1911: Ont. Bur. Mines, Ann. Rept., vol. 20, p. 107).

31 C/12 Harrington's analysis of orthoclase from Dungannon Township, is as follows: SiO_2 63.00, Al_2O_3 18.93, Fe_2O_3 0.59, CaO 0.08, MgO 0.09, K_2O 12.08, Na_2O 3.67, H_2O (ign.) 1.00, total 99.44; S.G. =2.558 (B.J. Harrington, 1894: Am. J. Sci., Ser. 3, XLVIII, p. 18).

31 C/16 The National Mineral Collection contains specimens of perthite from lot 4, conc. VI, North Burgess Township. A chemical analysis by Hunt of perthite from the same area is as follows: SiO_2 66.44, Al_2O_3 18.35, Fe_2O_3 1.00, CaO 0.67, MgO 0.24, K_2O 6.37, Na_2O 5.56, vol. 0.40, total 99.03; S.G. 2.57-2.58 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, pp. 474-476).

Perthite occurs at Perth, Drummond Township. Chemical analysis by C.H. Warren: SiO_2 66.50, Al_2O_3 18.40, Fe_2O_3 1.05, MnO tr., MgO 0.07, CaO 0.30, Na_2O 5.40, K_2O 8.77, H_2O^+ H_2O^- 0.20, total 100.69; S.G. =2.597 (S.S. Goldich and J.H. Kinser, 1939: Am. Mineralogist, 24, p. 417).

31 D/16 An unusually well-developed perthite intergrowth of microcline and albite in pegmatite masses occurs in syenite at Tory Hill, Monmouth Township. Striking features of this perthite are the uniformity in orientation and size of the blebs of albite, and the high precentage of the albite. Chemical analysis by S.S. Goldich: SiO_2 66.56, Al_2O_3 19.04, Fe_2O_3 0.41, FeO 0.18, MgO 0.00, CaO 0.01, BaO 0.02, Na_2O 6.77, K_2O 7.09, H_2O^+ 0.10, H_2O^- 0.02, total 100.20; S.G. =2.593 (S.S. Goldich and J.H. Kinser, 1939: Am. Mineralogist, 24, p. 417).

31 E/9 The variety of microcline known as sunstone, with a golden iridescence apparently due to oriented inclusions on cleavage planes, was found at the John G. Gole feldspar mine, lot 14, conc. IV, Murchison Township (D.F. Hewitt, 1960: private communication).

31 F/4 High quality pink feldspar from the MacDonald Mine, lot 18, conc. VII, of Monteagle Township, has been analyzed by H.S. Spence. The results are as follows: (1) SiO_2 64.60, Al_2O_3 19.30, Fe_2O_3

31 F/4 0.09, CaO 0.00, MgO 0.72, K_2O 12.35, Na_2O 2.67, total 99.73; (2) SiO_2 64.60, Al_2O_3 19.14, Fe_2O_3 0.06, CaO 0.00, MgO 0.00, K_2O 13.02, Na_2O 2.96, total 99.78. The feldspar occurs in a pegmatite dyke, with large masses of quartz (J.E. Thompson, 1943: Ont. Dept. Mines, Ann. Rept., vol. 52, Pt.III, p. 26).

A specimen of amazonite from the Woodcox Mine, near Hybla, Monteagle Township, was donated to the National Mineral Collection by H.V. Ellsworth in 1923.

Large pink crystals of orthoclase occur at No. 13 Hastings Road East, in Monteagle Township (National Mineral Collection, Donor: A.T. McKinnon, 1918).

31 F/5 Large, pink orthoclase crystals, showing Carlsbad twinning, occur on lot 2, conc. III, Wicklow Township, Hastings County (National Mineral Collection, Donor: A.E. Barlow, 1897).

31 F/6 The National Mineral Collection contains specimens of pink to brown orthoclase from lot 32, conc. XII, Sebastopol Township.

Pink microcline perthite occurs in a pegmatite in Lyndoch Township, conc. XV, lot 30. One crystal from the locality measured 20 by 6 feet and contained about 80 tons of material (D.F. Hewitt, 1953: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. V, p. 67).

Amazonite occurs at the Smart Mine, lot 31, conc. X, Sebastopol Township (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 7L).

31 F/7 A specimen of microcline (var. amazonstone) from lot 23, conc. XV, Renfrew Township, has been donated to the National Mineral Collection.

31 G/5 Massive, white microcline occurs on the south half of lot 10, conc. I, March Township. A specimen of this material is present in the National Mineral Collection.

31 L/1
31 L/2 The National Mineral Collection contains specimens of amazonite from lot 6, conc. A, and lot 7, conc. B, of Cameron Township, District of Nipissing (A.E. Barlow, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 32AA).

31 L/2 Perthite occurs on lot 19, conc. IX, Calvin Township, Ontario (National Mineral Collection, Donor: C.W. Willimott, 1897).

31 L/7 Pale green and deep green amazonite occur in a small pit on a farm owned by Mr. McMeekin. The farm is about 5 miles east of Mattawa and 1 mile west of a small schoolhouse along highway 17 (B.B. Woods: private communication).

Quebec

31 G/5 A specimen of microcline from lot 14, range III, of Templeton Township, Papineau County, has been donated to the National Mineral Collection.

31 G/10
31 G/15 An analysis of orthoclase from Riviere Rouge, Argenteuil County, by Hunt, is as follows: SiO_2 65.75, Al_2O_3 19.40, CaO 0.45, K_2O 13.60, Na_2O 0.69, H_2O (ign.) 0.25, total 100.14; S.G. 2.56 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 474).

31 G/12 Amazonite occurs on lots 6, 13, and 14-A, in range XII, Hull Township, Gatineau County. A sample of this material is present in the National Mineral Collection (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 12).

Chemical analyses of orthoclase from lot 27, range VI, Buckingham Township: (1) SiO_2 64.140, Al_2O_3 18.620, Fe_2O_3 0.374, MnO tr., CaO 0.740, MgO 0.065, K_2O 14.868, Na_2O 1.766, H_2O (ign.) 0.406, total 100.979; S.G. 2.5364; (2) SiO_2 63.460, Al_2O_3 18.780, Fe_2O_3 0.394, MnO tr., CaO 1.280, MgO 0.216, K_2O 13.923, Na_2O 2.173, H_2O (ign.) 0.466, total 100.692; S.G. 2.578 (G.C. Hoffmann, 1876-77: Geol. Surv. Can., Rept. Prog., pp. 511, 512).

31 G/13 The National Mineral Collection contains specimens of amazonite from lot 31, range I, Villeneuve Township, Papineau County.

31 H/1 Chemical analysis by Hunt of perthite from Brome Mountain, Brome Township: SiO_2 65.70, Al_2O_3 20.80, CaO 0.84, K_2O 6.43, Na_2O 6.52, volatiles 0.50, total 100.79; S.G. 2.575. Chemical analysis by Hunt of perthite from Shefford Mountain, Shefford Township: SiO_2 65.15, Al_2O_3 20.55, CaO 0.73, K_2O 6.39, Na_2O 6.67, volatiles 0.50, total 99.99; S.G. 2.56 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, pp. 474-476).

31 L/16 Fine specimens of deep bluish green amazonite have been obtained from a small island in Lac Sairs, about 27 miles east of Kipawa (B.B. Woods: private communication).

Saskatchewan

74 O/13 Hyalophane occurs in the Nisikkatch and Northwest Lakes region, located between 35 and 40 miles northeast of Uranium City. It is characteristic of a feldspar zone in apatite-rich vein material (D.D. Hogarth, 1957: Can. Mineralogist, 6, pp. 140-150).

POWELLITE

$CaMoO_4$

Powellite occurs as minute tetragonal pyramids in crusts and powders, and in massive form. It is yellow with a greenish or bluish green tinge and has a resinous to greasy lustre. It may be mistaken for scheelite because of its similar yellowish fluorescence. The spacings and intensities of the 5 strongest lines in the X-ray powder pattern are: 4.80 (6), 3.11 (10), 1.937 (9), 1.593 (8) and 1.256 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 226).

Northwest Territories

85 H/11
85 H/12 Powellite is found on the Outpost Islands, Great Slave Lake, in shear zones in micaceous quartzites. It is associated with chalcopyrite, pyrite, marcasite, ferberite, magnetite, specular hematite, ilmenite, bornite, chalcocite, covellite, chlorite, sericite and gold (J.E. Hawley, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 64).

Quebec

32 C/5 Pegmatites in the Fiedmont area, Abitibi County, have quartz cores enclosed in spodumene-rich units which also contain accessory sugary albite, bismuthinite, molybdenite and powellite (E.W. Heinrich and A.A. Levinson, 1953: Am. Mineralogist, 38, p. 35).

PRASE

(See quartz)

PREHNITE

$Ca_2Al_2Si_3O_{10}(OH)_2$

Prehnite occurs characteristically as pale green globular masses. It is found in veins and cavities in basic igneous rocks and as an alteration product of calcic feldspar. Common associates are zeolite, datolite, calcite, and epidote.

British Columbia

82 F/4 Translucent olive green prehnite with a coralloid structure occurs in the Rossland area. Tiny cubic crystals of pyrite are disseminated on the prehnite (C.W. Drysdale, 1915: Geol. Surv. Can., Mem. 77, p. 82).

82 F/4 Green prehnite occurs at the Le Roi Mine, Rossland, in the Trail Creek mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 75, p. 182).

92 I/14 Fissures of prehnite 3 to 4 inches in width and 2 to 3 feet in length occur in one of the large peridotite bodies on the east side of the Bonaparte River valley, north of Ferguson Creek, in the Ashcroft district. The crystals are colourless, translucent, and 5 millimetres in greatest dimension, with pseudocubic appearance. Chemical analysis by E. W. Nuffield: SiO_2 41.67, Al_2O_3 24.44, Fe_2O_3 1.03, FeO 0.32, TiO_2 0.12, MgO 0.25, CaO 27.25, Na_2O 0.18, K_2O 0.18, H_2O^+ 4.44, total 99.88; S.G. 2.915. The X-ray powder pattern shows the following spacings and intensities for the five strongest lines: 3.47 (9), 3.27 (6), 3.07 (10), 2.54 (10) and 1.766 (7) (E.W. Nuffield, 1943: Univ. Toronto Stud., Geol. Ser., 48, p. 49).

92 J/15 A steeply dipping albite dyke, 25 feet wide, is exposed in a quarry about 1/2 mile west of Gold Bridge, in the Lillooet district. Prehnite has replaced part of the dyke, especially its footwall, and formed a conspicuous white irregular layer averaging 5 feet in width (K. D. Watson, 1953: Am. Mineralogist, 38, p. 197).

92 K/3 The pillow breccias of Quadra Island, contain chlorite, epidote, pumpellyite, tremolite, quartz, chalcedony, calcite, prehnite, and zeolites as alteration products and amygdule fillings (D. Carlisle, 1963: J. of Geol., vol. 71, No. 1, p. 52).

New Brunswick

22 B/1 Prehnite is reported to occur near Dalhousie, in Restigouche County (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 182).

Newfoundland

12 G/1 Four separate bodies composed of prehnite, pectolite, phlogopite, and xonotlite, are exposed in the valley walls of a stream draining into the North Arm, Bay of Islands. The largest body is 55 feet by 10 feet (C. H. Smith, 1954: Am. Mineralogist, 39, p. 531).

12 H/16 A zoisite-prehnite rock containing about 15 per cent prehnite occurs 2 miles northeast of the Terra Nova Mine, and about 3/4 of a mile from the mouth of Rattling Brook on Baie Verde. The rock is white to faintly greenish in colour, due to the presence of actinolite, and varies in grain size from extremely fine to fairly coarse (K.D. Watson, 1942: Am. Mineralogist, 27, p. 640).

Northwest Territories

48 B/15
48 B/16 A fine green prehnite accompanied by quartz and calcite occurs in veins traversing intrusives at Adams Sound, Admiralty Inlet,

48 B/15 Baffin Island. Analysis of prehnite by Johnston: SiO_2 44.35,
48 B/16 Al_2O_3 19.44, Fe_2O_3 6.58, CaO 25.50, H_2O 4.00, total 99.87; S.G. 2.924. Centesimal composition after deducting an excess of 4.38 admixed quartz: SiO_2 41.86, Al_2O_3 20.36, Fe_2O_3 6.89, CaO 26.70, H_2O 4.19, total 100.00 (R.A.A. Johnston, 1913: Geol. Surv. Can., Museum Bull., 1, pp. 94-97).

86 N/8 Prehnite occurs with native copper in trap in the Coppermine
86 O/5 Mountains (G.M. Dawson, 1886: Geol. Surv. Can., Ann. Rept., II, p. 25R).

87 H/2 Specimens of a white mineral occurring as radiating clusters of crystals in vugs in basalt were collected by R.L. Christie along a tributary of the Minto River, Victoria Island, at approximately 71°15'N, 113°30'W. The mineral was identified as prehnite by its X-ray powder pattern (X-ray Laboratory, Geol. Surv. Can.).

Nova Scotia

11 E/6 Prehnite is reported to occur at Clifton, Hants County (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 77S).

21 H/2 Prehnite occurs at Black Rock, Kings County, and at Clark Head,
21 H/8 Cumberland County (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 775).

Ontario

42 D/13 A cabochon of prehnite, 22 x 15 x 6 millimetres, showing inclusions of native copper was made from a specimen collected at Simpson Island, in Lake Superior (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

42 D/14 Prehnite occurs in trap with native copper along the Slate and
52 A/6 Kaministikwia rivers, at St. Ignace, and elsewhere along the north shore of Lake Superior (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 53T).

An analysis by Chapman of prehnite from the Slate River is as follows: SiO_2 43.41, Al_2O_3 23.80, Fe_2O_3 1.26, Mn_2O_3 0.53, CaO 26.62, H_2O 4.14, total 99.76; S.G. 2.882 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 183).

52 H/8 Creamy yellow to bluish green prehnite is associated with pectolite in railway cuts between Orient Bay and Fairloch Lake, Nipigon region. It occurs as radiating, spherical masses. The radiating crystals reach a maximum length of 1 1/2 inches. Chemical analysis by H.C. Rickaby: SiO_2 42.78, Al_2O_3 25.37, Fe_2O_3 0.87, CaO 26.95, MgO tr., Na_2O 0.30, K_2O tr., H_2O 4.18, total 100.45; S.G. 2.900 (T.L. Walker and A.L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 18).

52 H/9 Light green prehnite occurs with analcime in railway cuts southwest of Warneford Station in the Thunder Bay district (A.G. Burrows, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 246).

Quebec

21 L/3 The following chemical analyses of prehnite were made by R.J.C. Fabry on specimens collected from asbestos deposits in Megantic County by E. Poitevin: (1) Jacobs Asbestos Mine, SiO_2 42.40, Al_2O_3 25.02, Fe_2O_3 0.51, MgO 0.20, CaO 27.18, H_2O 4.57, total 99.88; (2) Jacobs Asbestos Mine, SiO_2 42.88, Al_2O_3 25.85, Fe_2O_3 0.57, MgO 0.20, CaO 30.03, H_2O 1.06, MnO nil, total 100.59; (3) King Asbestos Mine, SiO_2 43.36, Al_2O_3 24.75, Fe_2O_3 0.85, MgO 0.20, CaO 26.86, H_2O 4.46, total 100.48 (J.A. Maxwell *et al.*, 1965: Geol. Surv. Can., Bull. 115, p. 344).

31 G/12 Prehnite is found on lot 23, range XIII, of Templeton Township (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 118, p. 291).

The National Mineral Collection contains a specimen of prehnite from lot 28, range 6, of Buckingham Township, donated by Mr. Brummell, in 1925.

An analysis by Harrington of prehnite from a cavity on lot 16, range XII, Templeton Township, is as follows: SiO_2 42.82, Al_2O_3 23.86, Fe_2O_3 1.42, MnO 0.10, CaO 27.64, MgO 0.09, H_2O 4.82, total 100.75; S.G. 2.891 (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 34G).

31 G/13 Prehnite occurs at the High Rock Mine, lot 7, range VIII, Portland West Township, Papineau County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 183).

Yukon

105 D/14 Veinlets of vesuvianite, prehnite, and carbonate traverse an aggregate of an irregular, birefringent mineral found at the contact of an inclusion and a serpentinite body west of Lake Laberge (J.O. Wheeler, 1961: Geol. Surv. Can., Mem. 312, p. 91).

PROUSTITE

Ag_3AsS_3

Proustite and the isostructural mineral pyrargyrite, Ag_3SbS_3, are commonly called ruby silver ores because of their scarlet-vermilion to deep red colour and commercial importance as ore minerals of silver. They are found late in the sequence of crystallization of low temperature silver-bearing veins, and may also form by secondary enrichment. Other silver minerals, galena and calcite are usually associated.

The spacings and intensities of the five strongest lines in the X-ray powder pattern of proustite from Cobalt, Ontario are: 3.28 (8), 3.18 (8), 2.76 (10), 2.56 (8) and 2.48 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 124).

British Columbia

82 E/4 Proustite occurs at the Elkhorn Mine, near Greenwood in the Greenwood mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 184).

82 F/14 Proustite has been found on Tenmile Creek (also known as Enterprise Creek) in the Slocan mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 184).

Newfoundland

1 M Specimens of proustite were found near Fortune Bay by a small local company that was working on a deposit of galena (G.N. Tricoche, 1935: Can. Mining J., 56, p. 148).

Nova Scotia

21 H/1 Proustite is a constituent mineral of the barium-lead-zinc-silver deposit at Magnet Cove, 2 1/2 miles southwest of Walton. The deposit, a pipe-like body in the breccia between two faults, is mainly composed of sulphides and sulphates. The proustite is distributed throughout the sulphide body being generally associated with galena or occurring as small irregular masses in a matrix of siderite, barite, galena and sphalerite (R.W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Ontario

31 M/3 Crystallized proustite is found associated with xanthoconite and stephanite at the Keeley Mine, South Lorrain Township. It also occurs with xanthoconite at the Castle-Trethewey Mine, at Gowganda (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 69).

31 M/5 Proustite is found associated with stephanite and dyscrasite at the Penn Canadian Mine, Cobalt (A.L. Parsons, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 69) (and 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 89).

Crystals of proustite are found in the Cobalt area at the O'Brien and the University mines. At the O'Brien Mine, crystals are less than 2 millimetres in length, and rarely exceed 1 millimetre in diameter. They are light ruby red in colour and exceedingly brilliant. A small amount of pyargyrite was found associated with the

31 M/5 proustite. Analysis is as follows: Ag 64.12, As 15.90, S 19.28, Sb 0.08, Fe 0.25, Co (with trace of Ni) 0.12, insol. in HNO 0.38, total 100.13 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 223).

PSILOMELANE

$(Ba, H_2O)_2Mn_5O_{10}$

Psilomelane has been used in the past as a group name for several hard manganese oxides that can not be distinguished by simple tests. X-ray and chemical studies now permit identification of the separate species. The name psilomelane is now more properly used for the hard hydrated manganese oxide in which Ba predominates.

The X-ray powder pattern of psilomelane has three strongest lines with the following spacings and intensities (Fe radiation): 2.17 (10), 1.559 (6) and 1.402 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 199).

British Columbia

93 C/11
93 C/14 Psilomelane has been identified in specimens from quadrangle 29, range 3, submitted to the X-ray Laboratory, Geol. Surv. Can., the specimens were collected in the west branch of a box canyon in the Ilgachuz Mountains, 21 miles north of the town of Anakim Lake.

Northwest Territories

86 K/4 Psilomelane in botryoidal form is found as a minor constituent in two sections on the B.E.A.R. Company property at Labine Bay, Great Bear Lake. It is intimately associated with fibrous pyrolusite (E. Thomson, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 27).

New Brunswick

The following occurrences of psilomelane have been reported by the New Brunswick Research and Productivity Council in The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, Record 2, Part B, 1965.

21 H/5 In a shear zone at Quaco Head, Saint John County.

21 H/10 Veins in sandstone at Waterside, Albert County.

21 H/11 Lenses in limestone at the Upham property, Markhamville, King's County.

21 H/14 In a shear zone on Jordan Mountain, King's County, and in granite on Gowland Mountain, Albert County.

21 H/15 In limestone at Turtle Creek, and in conglomerate at the Memel Mine, Albert County.

Nova Scotia

11 E/4
21 H/1 Psilomelane is found with pyrolusite at Douglas, Hants County, 15 miles south of Tennycape (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 53T).

11 E/6 Pyrolusite and psilomelane occur at Onslow, in Colchester County (E. D. Ingall, 1897: Geol. Surv. Can., Ann. Rept., X, p. 157S).

21 H/1 Psilomelane is a supergene mineral occurring at the Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton (R. W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Quebec

31 H/1 Psilomelane is found in the Memphremagog area, in meadows north of South Bolton, in Brome County (T. H. Clark: Geol. Surv. Can., Unpub. File 21-C-6, p. 108).

32 I/12
32 I/13
32 I/14
32 P/3 Crystalline dolomite containing small vugs filled with psilomelane occurs on the Central Islands, Mistassini Lake, Mistassini Territory (J. N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 16).

Yukon

105 M/14 Hydrous manganese oxides occur as supergene minerals in many of the vein faults of the Keno Hill-Sourdough Hill area, Mayo mining district. Psilomelane has been identified by X-ray diffraction pattern in a specimen from Mayo Mines Limited (X-ray Laboratory, Geol. Surv. Can.).

PUMPELLYITE

$$Ca_4(Al, Fe, Mg)_6Si_6O_{23}(OH)_3 . 2H_2O$$

Pumpellyite was discovered in 1925 in amygdaloidal cavities in the copper-bearing lavas of the Lake Superior region. It has since been recognized in numerous other similar occurrences and in rocks of much different composition and environment. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.79 (5), 2.90 (10), 2.74 (5) and 2.452 (4) (D. S. Coombs, 1953: Mineral. Mag., 30, p. 121).

British Columbia

92 K/3 The pillow breccias of Quadra Island, contain chlorite, epidote, pumpellyite, tremolite, quartz, chalcedony, calcite, prehnite, and zeolites as alteration products and amygdule fillings (D. Carlisle, 1963: J. Geol., vol. 71, No. 1, p. 52).

Ontario

41 N/12
41 N/13 Pumpellyite has been found on Michipicoten Island, in the Manitoulin district (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 78S).

PYRALLOLITE

This poorly defined hydrous magnesium silicate, near $MgSiO_3 . 1/2H_2O$ in composition, is reported to occur in massive form and as a 'steatitic' alteration of pyroxene. The descriptions and chemical analyses of Canadian pyrallolites suggest that these materials are steatite (soapstone) with talc as the main mineral.

Ontario

31 B/12
31 C/9 An analysis by Hunt of pyrallolite from Charleston Lake, Grenville County, is as follows: SiO_2 61.90, FeO 1.45, MgO 30.42, H_2O 6.54, total 100.31; S.G. 2.644 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 470). A specimen of the original sample, from the National Mineral Collection labelled "Charleston Lake 600 paces northeast from head of Peninsula Bay", was checked and found to give the X-ray pattern of talc (X-ray Laboratory, Geol. Surv. Can.).

31 C/5
31 C/6 Pyrallolite is reported to occur in Rawdon Township, Hastings County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 470).

31 F/1 Pyrallolite occurs in beds of limestone on lot 8, conc. VI, of Ramsay Township, Lanark County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 798).

Quebec

31 F/9
31 F/10 Pyrallolite is reported to occur in Clarendon Township, Pontiac County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 53T).

31 F/10 A chemical analysis by Harrington of pyrallolite from Portage du Fort, Pontiac County, gave the following results: SiO_2 61.33, FeO 0.67, CaO tr., MgO 31.78, H_2O 5.85, total 99.63; S.G. 2.743 (B.J. Harrington, 1876-77: Geol. Surv. Can., Rept. Prog., p. 484).

31 G/10 31 G/15 Pyrallolite occurs in beds in crystalline limestone in Grenville Township, Argenteuil County. An analysis by Hunt is as follows: SiO_2 61.60, FeO 1.53, MgO 31.06, H_2O 5.60, total 99.79; S.G. 2.757 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 470).

PYRARGYRITE

Ag_3SbS_3

Pyrargyrite and the isostructural mineral proustite, Ag_3AsS_3, are commonly called ruby silver ores because of their deep red to scarlet-vermilion colour and commercial importance as ore minerals of silver. They are formed late in the sequence of crystallization of low-temperature silver veins, and may also form by secondary enrichment. Other silver minerals, galena and calcite are usually associated.

The spacings and intensities of the five strongest lines in the X-ray powder pattern of pyrargyrite from Beaverdell, British Columbia, are: 3.35 (5), 3.21 (8), 2.79 (10), 2.58 (5) and 2.54 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 123).

British Columbia

82 E/2 Pyrargyrite is found in small quantities in a metalliferous quartz vein at the Providence Mine, near Greenwood (R. Bell, 1902-03: Geol. Surv. Can., Ann. Rept., XV, p. 130A).

82 E/6 At the Highland Bell Mine, near Beaverdell, 23 miles east of Penticton, pyrargyrite occurs in grains of 10-200 microns disseminated in galena and (more rarely) in sphalerite, freibergite, pyrite, and quartz. It is also found in massive form in lenses and stringers, and in crystalline form in vugs and irregular cavities. Analyses by R.N. Williams: I. (massive), Ag 58.15, Sb 21.70, As 0.52, S 18.15, Zn tr., Fe tr., Pb 0.10, insol. 0.75, total 99.37; S.G. 5.63 ± 0.03; II. (crystal fragments), Ag 59.85, Sb 20.51, As 1.75, S 17.67, Zn 0.15, total 99.93; S.G. 5.82 ± 0.02 (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 29).

82 E/9 Pyrargyrite occurs at the Union Mine, Franklin Mountain, near Lower Arrow Lake, in the Grand Forks mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 185).

82 F/14 Beautiful crystals and crystal groups of pyrargyrite occur at the Hewitt Mine, near Silverton in the Slocan mining division (R.A.A. Johnston, 1911: Geol. Surv. Can., Sum. Rept., p. 362).

82 K/3 Pyrargyrite was observed in small aggregations disseminated through galena on the Dardenelles claim, 5 miles south of Bear Lake, Slocan mining division (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 27R).

93 M/5 At the Silver Standard Mine, on the west side of Glen Mountain, Omenica mining division, pyrargyrite occurs in close association with argentiferous tetrahedrite, galena, meneghinite, and polybasite. Sphalerite, pyrite, pyrrhotite, marcasite, arsenopyrite, chalcopyrite, covellite and limonite are also present (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

94 C/10
94 C/11 Polished sections of specimens from the Ferguson property, Ingenika River, Cassiar district, have been found to contain pyrargyrite associated with galena and sphalerite (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 83).

103 P/5
103 P/6 Pyrargyrite, pyrite, and quartz are found together at Red Bluff and Alice Arm, Observatory Inlet, Skeena mining division (R.G. McConnell, 1911: Geol. Surv. Can., Sum. Rept., pp. 49, 50).

103 P/12 The ore minerals seen under the microscope in polished sections from the Dolly Varden Mine, near the headwaters of the Kitsault River, Skeena mining division are: pyrite, argentite, galena, sphalerite, pyrargyrite, silver, chalcopyrite, tetrahedrite, polybasite and argyrodite (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 545).

Ontario

31 M/5 Pyrargyrite is reported to occur at the O'Brien Mine and other mines in the Cobalt area, Coleman Township (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 185).

Quebec

32 F/9 Pyrargyrite has been identified, partly on the basis of spectrographic analysis, as occurring with native silver and polybasite at the Coniagas Mine, 3 miles southwest of Bachelor Lake, in Lesueur Township. It is closely associated with chalcopyrite, and galena, and was deposited somewhat later than sphalerite, pyrite, and pyrrhotite (K.D. Watson, 1957: Can. Mineralogist, 6, p. 26).

Yukon

105 M/13 Galena, zinc blende and freibergite in a siderite gangue, comprise the mineralization in the vein at the Silver King Mine, west of Galena Hill, in the Duncan Creek mining division. Pyrargyrite is common in the upper workings, and a specimen of this material

105 M/13 has been donated to the National Mineral Collection by D.D. Cairnes (H. S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 614).

105 M/14 Pyrargyrite has been identified by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.) in specimens from the Sadie-Friendship, Lucky Queen, Calumet-Hector, and Silver King mines, in the Keno, Sourdough, and Galena Hill areas, of the Mayo mining district. The pyrargyrite is a supergene mineral associated with native silver, acanthite, calcite, sphalerite, and galena in vugs, breccia zones, and late faults. For a description of the geology and geochemistry of the area, see: Geol. Surv. Can., Paper 55-30, Keno and Sourdough hills, and Geol. Surv. Can., Paper 57-1, Galena Hill, by R. W. Boyle.

PYRITE

FeS_2

Pyrite is an extremely common sulphide mineral and is distributed widely throughout Canada. Accordingly, no attempt is made here to catalogue all of the known occurrences. The spacings and intensities of the five strongest lines in the X-ray powder pattern of pyrite are: 2.70 (7), 2.42 (6), 1.632 (10), 1.044 (8), and 1.007 (6) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 87).

British Columbia

92 G/11 Massive pyrite occurs with sphalerite at Britannia Beach, on the east side of Howe Sound, 20 miles north of Vancouver (N. Campbell and W. T. Irvine, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

103 H/13 Pyrite occurs with sphalerite, chalcopyrite, pyrrhotite, galena, gold, and silver at Ecstall River, 41 miles southeast of Prince Rupert (N. Campbell and W. T. Irvine, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

103 P/13
104 A/4 The ore at the Porter Idaho claim group on the east slope of the mountain between Portland Canal and Kate Ryan Creek in the Cassiar district comprises pyrite, galena, sphalerite, tetrahedrite, and ruby silver (pyrargyrite) (G. Hanson, 1929: Geol. Surv. Can., Mem. 159, p. 61).

104 K/12 Pyrite, chalcopyrite and sphalerite are constituents of the Tulsequah orebody, located about 40 miles east of Juneau, Alaska (N. Campbell and W. T. Irvine, 1960: Can. Inst. Mining Met., Bull., vol. 153, No. 575, p. 153).

New Brunswick

21 O/8 21 P/5 21 P/12 Pyrite is a common constituent of the massive sulphide deposits of the Bathurst area. Pyrrhotite, galena, sphalerite, and chalcopyrite, are commonly associated with the pyrite, as well as tetrahedrite and arsenopyrite (A. L. McAllister, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 574, p. 88).

Newfoundland

1 M/10 Pyrite cubes are common in the crystal-lithic tuff in the Grande Le Pierre Harbour region (D. A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 18).

Northwest Territories

48 C/2 Massive, deeply weathered pyrite associated with galena and sphalerite is found on northwest Baffin Island, near Arctic Bay (R. G. Blackadar, 1960: Can. Mining J., vol. 81, No. 4, p. 108).

Nova Scotia

11 E/5 Chemical analysis of pyrite from Londonderry by G.C. Hoffmann, 1876: SiO_2 0.52, Al_2O_3 0.51, FeO 0.18, MgO 0.18, CaO 0.43, S 52.43, Fe 45.19, Co 0.81, Ni 0.14, total 100.39 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 301).

21 H/8 The National Mineral Collection contains striated cubic and pyritohedral crystals of pyrite, from the area west of Swan Creek, Cumberland County.

Ontario

31 B/12 31 B/13 Large, octahedral crystals of pyrite from Elizabethtown Township, Leeds County, have been presented to the National Mineral Collection.

31 C/12 Cubic crystals of pyrite occur in steatite schist at the Eldorado Talc Mine, Madoc Township. A specimen of this material was presented to the National Mineral Collection in 1922, by Mr. A. T. McKinnon.

41 I/6 Pyrite is a minor constituent of the Sudbury ores but is of interest because of its diversity of habit, occurrence, and relationships. Varieties include: early pyrite, reaction pyrite, hypogene replacement pyrite, nickeloan pyrite, and late hypogene or supergene pyrite (J. E. Hawley, 1962: Can. Mineralogist, 7, p. 66).

Whartonite (nickeliferous pyrite) is found on lots 1 and 2, conc. II, Drury Township, and lot 12, conc. III, Denison Township, in the Sudbury district. The whartonite at the Denison Mine has a

41 I/6 slightly violet tinge and is associated with gersdorffite and chalcopyrite, as well as nickel-poor pyrite having the true pyrite colour.

Analysis by Allen: Fe 38.54, Ni 6.50, Cu nil, S 51.39, insol. 3.80, total 100.23; S.G. 4.81 (S.H. Emmons, 1892: J. Am. Chem. Soc., XIV, pp. 205-211) (A.E. Barlow, 1901: Geol. Surv. Can., Ann. Rept., XIV, p. 97H) (E. Thomson, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 73) (E. Thomson and J.S. Allen, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 135) (M.A. Peacock and F.G. Smith, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 116).

41 I/16
42 C/7 Pyrite is a constituent of the massive sulphide deposits at Lake Timagami, Nipissing district, and at Goudreau, in the Algoma district of Ontario (J.E. Thompson, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

42 E/10 Pyrite occurs with arsenopyrite, quartz, pyrrhotite, sphalerite, chalcopyrite, and gold, at the MacLeod-Cockshutt and the Hard Rock Gold Mines, in Ashmore Township, District of Thunder Bay (J.E. Thompson, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

42 F/4 The sulphide deposits of the Manitouwadge area, Thunder Bay district, contain appreciable amounts of pyrite, as well as pyrrhotite, sphalerite, chalcopyrite, and galena (J.E. Thompson, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

Quebec

21 E/5
21 E/11
21 E/14 Pyrite is a constituent of the sulphide deposits in Ascot Township, Sherbrooke County, and in Weedon and Stratford townships, Wolfe County, Quebec (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 128).

21 L/14 The National Mineral Collection contains crystals of pyrite, from the St. Foy road, in Quebec County.

24 K/4
24 K/5
25 D/15 Pyrite is a constituent of the massive sulphide deposits in the Ungava area of New Quebec (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 128).

31 G/12 Cubo-octahedral crystals of pyrite occur at the Maṙsolais Apatite Mine, Perkins Mills. Specimens from this locality have been donated to the National Mineral Collection by T. Lavictoire.

31 K/7 A pyrite-graphite association was observed in finely laminated paragneiss east of Billot, in the Percho-Portou area, of Pontiac County (R.A. Marleau, 1959: Que. Dept. Mines, Prelim. Rept., p. 383).

31 K/7 Pyrite occurs at the following massive sulphide deposits in Abitibi County and territory.

32 C/4 Golden Manitou Mines Limited, Bourlamaque Township; East Sullivan Mines Limited, Bourlamaque Township.

32 C/10
32 C/11 Atlas Sulphur & Iron Company Limited, Lévy Township.

32 C/15 Opemiska Copper Mines (Que.) Limited, Lévy Township.

32 D/3 West Wasa Mines Limited, Beauchastel Township; Noranda Mines Limited (Horne Mine), Rouyn Township.

32 D/6 Waite Amulet Mines Limited, Duprat and Dufresnay townships; Lake Dufault Mines Limited, Dufresnay Township.

32 D/6
32 D/7 Quemont Mining Corporation Limited, Rouyn Township.

32 D/7 Mobrun Copper Limited, Dufresnay Township; West McDonald Mines Limited, Dufresnay Township.

32 D/14 Normetal Mining Corporation, Desmeloizes Township.

32 F/12 Mattagami Lake Mines Limited, Galinee Township.

32 F/13 New Hosco Mines Limited, Daniel Township.

32 G/12 Opawica Explorers Limited, L'Espérance Township.

32 G/14 Pichamobi marcasite zone, Guettard Township.

32 G/15 Opemiska Explorers Limited, Lévy Township.

32 G/16 Copper Rand Chibougamau Mines Limited, Eaton Bay deposit, McKenzie Township (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 128).

PYROAURITE

$$Mg_6Fe_2CO_3(OH)_{16}\cdot 4H_2O$$

Pyroaurite is a rhombohedral mineral, isostructural with stichtite (Cr for Fe) and hydrotalcite (Al for Fe). Sjogrenite is the hexagonal polymorph of pyroaurite.

Ontario

31 L/7 Small green transparent crystals of pyroaurite have been found in small cavities in dolomite located 3 1/2 miles east of Rutherglen,

31 L/7 lot 27, conc. X, Calvin Township. Semi-micro chemical analysis by Ellsworth: MgO 35.84, MnO 0.01, Fe_2O_3 23.37, CO_2 7.30, H_2O 33.66, total 100.18. A detailed study by Frondel showed the mineral to be homogeneous and fresh, and truly rhombohedral. The morphology, optical properties and X-ray powder pattern were found to be identical to those of pyroaurite described originally from Langban, Sweden (H. V. Ellsworth, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 33) (C. Frondel, 1941: Am. Mineralogist, 26, p. 295).

The spacings and intensities (Fe radiation) of the five strongest lines in the X-ray powder pattern of pyroaurite from near Rutherglen (original material examined by H. V. Ellsworth) are: 7.78 (10), 3.91 (8), 2.63 (6), 2.33 (6) and 1.98 (7) (X-ray Laboratory, Geol. Surv. Can.).

PYROCHLORE GROUP

Minerals of the pyrochlore group have the generalized composition $A_{16-x}B_{16}(O,OH)_{48}(F,OH)_8$ where: A = Na,K,Ca,Mn,Mg,Fe^{+2}, rare earths, U,Th,Pb,Sr,Ba,Bi, B = Nb,Ta,Ti,Zr,Sn,Fe^{+3}, W. A pyrochlore-microlite series has long been recognized, in which the dominant B ion in pyrochlore is Nb, and in microlite is Ta. Because at least eleven oxides in amounts exceeding 5 per cent may be present in the composition of minerals of this group it is not surprising that many nonessential varietal names appear in the literature. Thus hatchettolite and ellsworthite are uranian pyrochlore. Betafite, long regarded as a separate species, has been shown by D. D. Hogarth to be uranian pyrochlore with a generally higher content of uranium (over 15 per cent metal) than hatchettolite or ellsworthite.

The pyrochlore minerals give a cubic X-ray powder pattern; however, most uranian pyrochlore is metamict and must be heated to produce a pattern. Spacings and intensities of the three strongest lines are as follows: (a) pyrochlore from Blue River, British Columbia, unheated, 3.00 (10), 1.838 (6) and 1.568 (5); (b) uranian pyrochlore (betafite) from the Basin property, Bancroft area, Ontario, ignited in argon, 2.96 (10), 1.814 (5) and 1.546 (4) (D. D. Hogarth, 1961: Can. Mineralogist, 6, p. 628).

British Columbia

82 K/9
82 K/15 Amber-coloured grains of pyrochlore have been identified in a sample of black sand from a placer deposit in Bugaboo Creek. Associated minerals included: euxenite-polycrase, uraninite, allanite, andalusite, apatite, epidote, fluorite, garnet, hematite, ilmenite, magnetite, pyrite, sphene and zircon. The creek is located about 45 miles south of the town of Golden (X-ray Laboratory, Geol. Surv. Can.) (R. B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 28).

83 D/6 Reddish brown crystals of pyrochlore occur with calcite and dolomite in layered carbonate rock at the Verity property located near Mile 109, Albreda Subdivision, Canadian National Railways, 23 miles north of the village of Blue River. Chemical analysis of hand-picked crystals by Ledoux and Company and Geological Survey of Canada: Na_2O 6.80, K_2O 0.1, CaO 13.76, MnO tr., FeO 0.47, MgO tr., R.E. oxides 0.2, ThO_2 0.07, U_3O_8 3.51, PbO tr., SrO 0.83, BaO tr., Nb_2O_5 60.90, Ta_2O_5 6.55, ZrO_2 tr., TiO_2 2.07, F 3.75, H_2O^+ 0.10, total 99.1, less O for F 1.6, total 97.5; S.G. 4.48 (D.D. Hogarth, 1961: Can. Mineralogist, 6, pp. 610-633).

93 N/9 Uranian pyrochlore has been reported as occurring in a calcite-soda pyroxene rock at the Lonnie deposit, located about 5 miles east of the settlement of Manson Creek (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 30).

Ontario

31 C/13 Pyrochlore occurs as grains in a hornblende syenite pegmatite on the north half of lot 14, conc. III, Faraday Township. Selected material heated in air gave an X-ray diffraction pattern similar to that of pyrochlore (D.A. Moddle, 1960: private communication).

Pyrochlore-microlite was found in specimens from the property of Bonville Gold Mines Limited, on lots 21-24, conc. A, Faraday Township (D.F. Hewitt, 1960: private communication).

31 C/14 Crystals of ellsworthite occur with black mica and apatite in a calcite vein on lot 10, conc. XII and XIII, Cardiff Township. A yellowish brown alteration product coats most of the ellsworthite. An analysis by H.V. Ellsworth is as follows: TiO_2 15.06, Nb_2O_5 23.44, UO_3 20.46, CaO 8.94, Ta_2O_5 9.97, SiO_2 2.49, Fe_2O_3 2.74, PbO 1.73, UO_2 1.56, $(Ce, La, Di)_2O_3$ 1.49, H_2O 11.20, Al_2O_3 0.12, BeO 0.02, FeO 0.22, MgO 0.08, MnO 0.04, SnO_2 0.06, ThO_2 0.10, $(Yt, Er)_2O_3$ 0.12, insol. 0.21, ignition loss 11.54, total 100.05; S.G. 3.705 (H.V. Ellsworth, 1927: Am. Mineralogist, 12, p. 48) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 227).

Pyrochlore-betafite has been identified by the X-ray Laboratory, Geol. Surv. Can., in specimens from the property of Greyhawk Uranium Mines Limited, lot 10, conc. XII, Faraday Township.

31 D/9 Betafite occurs in granite pegmatite at the Cromwell property on the north half of lot 14, conc. V, Cavendish Township. A spectrographic analysis of the betafite by W.O. Taylor, gave the following results: Na_2O 2.7, CaO 4.2, MnO 0.3, PbO 1.8, MgO 0.2, Y_2O_3 13, Er_2O_3 1.9, Yb_2O_5 2.5, Ce_2O_3 0.7, Dy_2O_3 1.7, U_3O_8 10, ZrO_2 0.3, SnO_2 0.2, ThO_2 2.7, SiO_2 1.9, Al_2O_3 0.2, Fe_2O_3 2.0, TiO_2 22, Nb_2O_5 30, Ta_2O_5 2.1, total 100.4 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 20).

31 D/16 Pyrochlore-microlite occurs in calcite veinlets on the property of Canada Radium Mines Limited, lot 10, conc. XII, Cardiff Township; and in marble, on the property of Canadian All Metals Exploration Limited, on the north half of lot 7, conc. IX, Monmouth Township, Haliburton County (D. F. Hewitt, 1960: private communication).

Betafite is found on the property of Canadian All Metals Exploration Limited, lot 6, conc. IX, Monmouth Township. Spectrographic analysis by W. O. Taylor is as follows: Na_2O 0.2, CaO 6.7, MnO 0.4, PbO 2.5, MgO 2.2, La_2O_3 0.1, U_3O_8 13, ZrO_2 0.1, SnO_2 0.2, ThO_2 0.6, SiO_2 5.1, Al_2O_3 0.6, Fe_2O_3 5.3, TiO_2 12, Nb_2O_5 36, total 85.0 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 20).

31 E/1 Betafite occurs in calcite veins on the Halo Uranium Limited property on the north half of lot 6, conc. XV, Cardiff Township (D. F. Hewitt, 1960: private communication).

Crystals from this property, formerly known as the Hogan property, have been analyzed by Ledoux and Company and Geological Survey of Canada: Na_2O 0.64, K_2O nil, CaO 10.64, MnO 0.52, FeO 3.15, MgO 0.32, $(Ce, La, Di)_2O_3$ tr., $(Yt, Er)_2O_3$ tr., ThO_2 0.2, U_3O_8 22.24, PbO 1.49, SrO 0.42, BaO tr., Nb_2O_5 32.44, Ta_2O_5 0.25, ZrO_2 tr., TiO_2 16.93, SnO_2 tr., F 1.23, H_2O^+ 3.47, total 99.3, less O for F 0.5, total 93.4; S.G. 4.03 (D.D. Hogarth, 1961: Can. Mineralogist, 6, p. 615).

Pyrochlore-betafite has been identified by the X-ray Laboratory, Geological Survey of Canada, in specimens from the following properties: (1) lot 31, conc. XV, Faraday Township, Hastings County (Silver Crater Mines Limited); (2) lot 5, conc. XXI, Cardiff Township, Haliburton County (Fission Mines Limited); (3) lots 26 and 27, conc. XI, Cardiff Township (Bicroft Uranium Mines Limited, Centre Lake property); (4) lots 4 and 5, conc. XVIII, Cardiff Township (Halo Uranium Mines Limited).

Betafite occurs as small grains and cubo-octahedral crystals on the property of Peter-Rock Mining Limited, lot 39, conc. VIII, Herschel Township, Hastings County. The crystals are black to reddish brown changing by alteration (hydration) to yellow or greenish brown. Spectrographic analysis by W. O. Taylor: Na_2O 0.3, CaO 2.3, MnO 0.7, PbO 0.4, MgO 0.5, Y_2O_3 3.6, Er_2O_3 0.2, Yb_2O_3 0.5, Ce_2O_3 1.7, Dy_2O_3 0.3, La_2O_3 1.2, U_3O_8 17, ZrO_2 0.03, SnO_2 0.4, ThO_2 2.5, SiO_2 5.0, Al_2O_3 0.4, Fe_2O_3 3.1, TiO_2 11, Nb_2O_5 46, Ta_2O_5 3.4, total 100.5 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 20). D. F. Hewitt (private communication) reports pyrochlore-microlite from the same property as above (lot 39) and also from lot 40, conc. VIII, Herschel Township.

31 E/1 Pyrochlore-microlite is reported to occur in zoned granite pegmatite on lot 30, conc. I, Herschel Township, and in pegmatite on lot 31, conc. XVI, Faraday Township (D.F. Hewitt, 1960: private communication).

Betafite occurs on lot 31, conc. XV, Faraday Township, Hastings County (Silver Crater Mines Limited, Basin property). Spectrographic analysis by W.O. Taylor: Na_2O 0.2, CaO 5.2, MnO 0.6, PbO 2.9, MgO 0.4, Y_2O_3 1.0, Er_2O_3 0.4, Yb_2O_3 0.3, Ce_2O_3 0.4, Dy_2O_3 0.2, La_2O_3 0.8, U_3O_8 19, ZrO_2 0.1, SnO_2 0.2, ThO_2 1.8, SiO_2 2.6, Al_2O_3 0.3, Fe_2O_3 2.6, TiO_2 12, Nb_2O_5 34, Ta_2O_5 3.3, total 88.3 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 20).

Chemical analysis by Ledoux and Company and Geological Survey of Canada: Na_2O 0.33, K_2O nil, CaO 10.94, MnO_2 0.62, FeO 3.44, MgO tr., $(Ce, La, Di)_2O_3$ 0.2, $(Yt, Er)_2O_3$ tr., ThO_2 0.2, U_3O_8 22.79, PbO 1.43, SrO 0.21, BaO tr., Nb_2O_5 31.06, Ta_2O_5 3.33, ZrO_2 tr., TiO_2 17.50, SnO_2 tr., F 1.35, H_2O^+ 5.88, total 99.3, less O for F 0.6, total 98.7; S.G. 4.15 (D.D. Hogarth, 1961: Can. Mineralogist, 6, p. 615).

31 E/6 Pyrochlore-microlite is reported to occur in granite pegmatite near the Melissa Post Office, on lot 23, conc. V, Chaffey Township, District of Muskoka (D.F. Hewitt, 1960: private communication).

31 E/11 A mineral of the pyrochlore-microlite series is reported to occur in association with fergusonite and eschynite-priorite in granitic pegmatite on lot 5, conc. IX, Butt Township (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 91).

31 E/12 Pyrochlore-microlite has been reported on the Raney property, lot 3, conc. VIII, Chapman Township (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 92).

31 F/3 A zoned granite pegmatite on lot 15, of the southwesterly range of Miller Township, contains pyrochlore as elongate rounded, or irregular masses from 1/4 to 2 inches across, and associated with or occurring in muscovite.

The Provincial Assay Laboratory, Ontario Department of Mines, obtained a clear and distinct X-ray diffraction pattern after heating specimens in air. Chemical analysis gave 12.25 per cent U_3O_8 (D.A. Moddle, 1960: private communication).

Spectrographic analysis of specimens of pyrochlore from this property by W.O. Taylor gave the following results: Na_2O 0.9, CaO 4.2, MnO 0.2, PbO 0.5, MgO 2.8, Y_2O_3 4.6, Er_2O_3 0.7, Yb_2O_3 1.0, Ce_2O_3 1.8, Dy_2O_3 1.0, La_2O_3 0.4, U_3O_8 13, ZrO_2 0.3, SnO_2 0.2, ThO_2 2.0, SiO_2 4.2, Al_2O_3 1.6, Fe_2O_3 2.2, TiO_2

31 F/3 3.9, Nb_2O_5 50, Ta_2O_5 5.0, total 100.0 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 20).

31 F/4 Ellsworthite is abundant at the McDonald Mine in Monteagle Township, where it occurs as nodular masses in calcite and quartz. The grains are often surrounded by radial shatter patterns characteristic of radioactive minerals. Two varieties occur, one being amber yellow and the other dark brown. The yellow material appears to be an altered form of the darker variety. Chemical analyses by Todd: (1) light type, SiO_2 2.54, TiO_2 10.47, Al_2O_3 0.42, Fe_2O_3 4.10, CaO 11.73, MnO 0.43, SnO 0.10, Ta_2O_5 4.32, Nb_2O_5 34.22, PbO 0.24, UO_3 18.50, RE 0.21, H_2O 12.22, F_2 0.22, total 99.72; S.G. 3.608; (2) dark type, SiO_2 2.68, TiO_2 9.79, Fe_2O_3 3.80, CaO 13.62, MnO 0.22, SnO_2 0.25, Ta_2O_5 4.27, Nb_2O_5 34.27, PbO 0.41, UO_2 8.42, UO_3 10.68, H_2O 11.42, F_2 0.49, total 100.32; S.G. 3.758.

The mine, originally worked for feldspar, is in pegmatite on lots 18 and 19, conc. VII, and has long been abandoned. It is now well known as the type locality for ellsworthite, and for its unusual assemblage of minerals (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 204) (T.L. Walker and A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 16, p. 13).

Hatchettolite occurs as small nodular masses intimately intergrown with titanite and associated with cyrtolite at the MacDonald Mine, an abandoned quarry in Monteagle Township, Hastings County (H.S. Spence, 1930: Am. Mineralogist, 15, p. 443).

Two different varieties of hatchettolite occur in the old workings of the Woodcox Mine, lot 17, conc. VIII, Monteagle Township. One of these is black and the other an amber colour. The latter appears to be secondary after the dark material. Associated minerals are: reddish feldspar, cyrtolite, and calciosamarskite. Chemical analyses by E.W. Todd of hatchettolite from this locality are as follows: (1) black type, SiO_2 1.57, TiO_2 11.37, Fe_2O_3 3.46, CaO 13.25, MgO 0.36, MnO 0.51, ZrO_2 4.12, SnO_2 1.44, Nb_2O_5 31.33, Ta_2O_5 10.29, PbO 0.54, UO_2 11.40, UO_3 4.41, ThO_2 0.52, $(Ce, La, Di)_2O_3$ 0.12, $(Yt, Er)_2O_3$ 0.62, H_2O 4.29, total 99.60; S.G. 4.509; (2) amber type, SiO_2 1.56, TiO_2 8.82, Fe_2O_3 3.63, CaO 13.62, MgO 0.20, MnO 0.43, ZrO_2 5.90, SnO_2 1.46, Nb_2O_5 31.70, Ta_2O_5 15.28, PbO 0.24, UO_2 5.72, UO_3 5.08, ThO_2 0.42, $(Ce, La, Di)_2O_3$ 0.50, $(Yt, Er)_2O_3$ 0.62, H_2O 5.05, total 100.23; S.G. 4.417 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, pp. 210, 262).

Pyrochlore-microlite is reported to occur in zoned granite pegmatite on the following properties in Monteagle Township, Hastings County: lot 20, conc. VI; lots 18 and 19, conc. VII; lots 14, 16 and 17, conc. VIII (D.F. Hewitt, 1960: private communication).

31 F/4 Betafite occurs in a calcite vein in granite pegmatite and hornblende gneiss on lot 6, conc. XV, Faraday Township, Hastings County. The betafite is present as brown crystals up to 1 inch across, found either singly in the calcite vein material or in the aggregates of mica books which occur in the vein (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 170).

31 F/12 Ellsworthite, euxenite, and monazite occur in a pegmatite sill on lot 27, conc. V, Dickens Township (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 142). D.F. Hewitt (private communication, 1960) reports the occurrence of pyrochlore-microlite in granite pegmatite on the same property.

31 L/5 Uraninite and uranian pyrochlore occur on the property of Nova Beaucage Mines Limited on Newman Island, 7 miles west of North Bay. The uranian pyrochlore is in the form of disseminated, euhedral to subhedral crystals, ranging in size from 0.008 to 3.54 millimetres in diameter (R.B. Rowe, 1954: Geol. Surv. Can., Paper 54-5, pp. 5, 7).

31 L/7 Pyrochlore-bearing pegmatite dykes extend along a northeasterly line from lot 17, through lot 16, into lot 15, all in conc. II, Calvin Township, just east of the Amable du Fond River. The pyrochlore is a deep clove-brown colour (E.Wm. Heinrich, 1962: Can. Mineralogist, 7, p. 314).

41 I/7 Uranian pyrochlore occurs in granite pegmatite on the property of Cubar Uranium Mines Limited, in the north half of lot 2, conc. II, Dill Township, Sudbury district (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 93).

41 N/7 Pyrochlore has been identified by X-ray powder pattern in specimens from the Dolan Group and the McCombe property on the shore of Lake Superior near MacGregor Cove, in the Sault Ste. Marie district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

31 F/10
31 F/15 X-ray powder photographs have confirmed the identification of pyrochlore in specimens from Calumet Island (E.W. Nuffield and D.H. Gorman, 1960: private communication).

31 G/8 Deposits that are potential large-tonnage sources of niobium occur in the Oka complex of carbonate and alkaline rocks in the Oka region, Two Mountains County, about 20 miles west of Montreal. Thorian and cerian pyrochlore have been identified as the most abundant niobium minerals, and niocalite and niobian perovskite are also found (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, pp. 65-88).

Chemical analyses by Ledoux and Company and Geological Survey of Canada: thorian pyrochlore from the Manny zone, Quebec

31 G/8 Columbium Mines Limited - Na_2O 2.88, K_2O nil, CaO 17.11, MnO 1.17, FeO 1.80, MgO nil, $(Ce, La, Di)_2O_3$ 2.2, $(Yt, Er)_2O_3$ 0.2, ThO_2 7.23, U_3O_8 1.83, PbO 0.1, SrO 0.65, BaO tr., Nb_2O_5 40.53, Ta_2O_5 3.08, ZrO_2 1.45, TiO_2 10.42, SnO_2 nil, F 2.17, H_2O^+ 7.5, total 100.3, less O for F 0.9, total 99.4; cerian pyrochlore from the Bond zone, Quebec Columbium Mines Limited - Na_2O 1.46, K_2O nil, CaO 20.32, MnO 0.09, FeO 2.06, MgO tr., $(Ce, La, Di)_2O_3$ 8.87, $(Yt, Er)_2O_3$ 0.1, ThO_2 1.08, U_3O_8 0.59, PbO 0.06, SrO 0.67, BaO tr., Nb_2O_5 48.04, Ta_2O_5 2.77, ZrO_2 1.99, TiO_2 8.64, SnO_2 nil, F 2.30, H_2O^+ 0.87, total 99.9, less O for F 1.0, total 98.9; S.G. 4.33 (D.D. Hogarth, 1961: Can. Mineralogist, 6, p. 615).

31 G/12 Octahedral crystals of uranian pyrochlore (betafite) are found in amphibole-rich veins and breccia zones within a granite-syenite batholith 20 miles long and up to 10 miles wide in the Meach Lake-Camp Fortune area of Hull Township. Chemical analyses by Ledoux and Company and Geological Survey of Canada, are as follows: (1) brown uranian pyrochlore from biotite-apatite breccia, lot 22, north half of range IX - Na_2O 0.31, K_2O nil, CaO 10.59, MnO 0.1, FeO 2.41, $(Ce, La, Di)_2O_3$ 0.3, $(Yt, Er)_2O_3$ tr., ThO_2 0.1, U_3O_8 23.11, PbO 2.0, SrO 2.01, BaO nil, Nb_2O_5 33.34, Ta_2O_5 1.26, ZrO_2 tr., TiO_2 15.85, SnO_2 nil, F 1.91, H_2O^+ 5.60, total 98.9, less O for F 0.8, total 98.1; S.G. 4.06; (2) black uranian pyrochlore from calcite vein, lot 27, north half of range XI - Na_2O 4.04, K_2O nil, CaO 9.1, MnO 0.17, FeO 2.15, MgO tr., R.E. oxides tr., ThO_2 0.1, U_3O_8 18.95, PbO 3.23, SrO 0.72, BaO tr., Nb_2O_5 50.06, Ta_2O_5 0.72, ZrO_2 tr., TiO_2 6.77, SnO_2 nil, F 2.18, H_2O^+ 1.61, total 99.8, less O for F 0.9, total 98.9; S.G. 4.60; (3) yellowish brown uranian pyrochlore from amphibole vein, lot 27, north half of range X - Na_2O 0.58, K_2O nil, CaO 8.70, MnO 0.28, FeO 1.67, MgO tr., R.E. oxides tr., ThO_2 0.2, U_3O_8 22.10, PbO 2.61, SrO 0.70, BaO tr., Nb_2O_5 41.24, Ta_2O_5 0.54, ZrO_2 tr., TiO_2 13.18, SnO_2 nil, F 3.06, H_2O^+ 5.85, total 100.7, less O for F 1.3, total 99.4; S.G. 3.94 (D.D. Hogarth, 1961: Can. Mineralogist, 6, p. 615).

31 J/13 Uranian pyrochlore is reported to occur in calcite rock on lot 30, range II, Baskatong Township (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 97).

31 L/16 Uranian pyrochlore has been found at the Lariviere and Cunningham property in Villedeau Township, near Lake Sairs (R.B. Rowe, 1958: Geol. Surv. Can., Econ. Geol. Ser., 18, p. 98).

32 C/5 Spodumene-rich dykes outcrop in Lacorne Township, lots 52 and 53, range IX, about 1,400 feet south of the south shore of Lake Lortie. Microlite and betafite have been identified in these dykes (L.P. Tremblay, 1950: Geol. Surv. Can., Mem. 253, p. 76).

Saskatchewan

74 N/9 Grey-green to brownish black pyrochlore (betafite) occurs in rounded masses up to 4 centimetres in greatest dimension in a complex, radioactive, pegmatite dyke on the west side of Viking Lake in the Goldfields area. Accessory minerals in addition to pyrochlore are: magnetite, titanite, uranothorite, uraninite, cyrtolite, meta-allanite and pyrite (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31, p. 35).

Chemical analysis of dark brown pyrochlore by Ledoux and Company and Geological Survey of Canada: Na_2O 0.42, K_2O nil, CaO 4.44, MnO 0.26, FeO 7.88, MgO 0.5, $(Ce, La, Di)_2O_3$ 0.2, $(Yt, Er)_2O_3$ 2.4, ThO_2 0.5, U_3O_8 21.10, PbO 0.75, SrO 0.21, BaO 2.77, Nb_2O_5 18.99, Ta_2O_5 3.64, ZrO_2 tr., TiO_2 20.65, SnO_2 nil, F 0.46, H_2O^+ 4.70, SiO_2 4.04, Al_2O_3 0.72, total 94.6, less O for F 0.2, total 94.4; S.G. 3.98 (D.D. Hogarth, 1961: Can. Mineralogist, 6, p. 615).

PYROLUSITE

MnO_2

Pyrolusite is the most important ore mineral of manganese. It occurs as soft fibrous crystals or powdery crusts that soil the fingers, and is often intimately mixed with the harder oxide minerals cryptomelane and psilomelane. The spacings and intensities of the three strongest lines in the X-ray powder pattern of pyrolusite are: 3.11 (10), 2.40 (5) and 1.623 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 178).

British Columbia

93 K/1
93 K/2 Pyrolusite and psilomelane occur with thin seams of sandy, yellow clay at a point 1 1/4 miles due north of the second canyon on Nechako River, below Fraser Lake. The deposit forms a small lens having a maximum width of 4 feet and a length of 10 feet (J.G. Gray, 1938: Geol. Surv. Can., Paper 38-14, p. 6).

103 K/2 A deposit containing pyrolusite associated with manganite has been found on Klashwun Point on the north side of Graham Island. The manganite and pyrolusite are present as cementing material in pods up to 30 feet long in a shear zone breccia (W. Petruk, 1963: Can. Mineralogist, 7, p. 670).

New Brunswick

The following occurrences of pyrolusite have been recorded by the New Brunswick Research and Productivity Council in The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick, Record 2, Part B, 1965.

21 H/5 In a shear zone at Quaco Head, Saint John County.

21 H/10 In limestone at Albert Village, Albert County.

21 H/11 Mineralized lenses in limestone at the Upham property, Markhamville, King's County. Also at the Glebe Mine.

21 H/14 In limestone at the Davis Farm property, Hillsgrove, Westmorland County.

Mineralized veins in granite on Gowland Mountain, Albert County.

21 H/15 In clay and limestone at Shepody Mountain, and in conglomerate at the Memel Mine, Albert County.

21 P/12 In quartz veins at Tetagouche Falls, Gloucester County.

Nova Scotia

11 E/5 Specimens of pyrolusite from Tennycape, Hants County, are present in the National Mineral Collection.

11 E/6 Manganese-bearing limestone is found in Colchester County, 6 miles northeast of Truro. The deposit extends for about 1 mile, and consists of pyrolusite with minor manganite and possibly psilomelane. The manganese minerals occur as compact masses of small interlocking prisms, or as veinlets of fine acicular crystals up to 1 inch in length, along bedding and joint planes in the limestone (I.M. Stevenson, 1958: Geol. Surv. Can., Mem. 297, p. 108) (S.M. Bancroft, 1942: Can. Mining J., 63, pp. 361-363).

21 H/1 Pyrolusite occurs as a supergene mineral at the Magnet Cove barium-lead-zinc-silver deposit, 2 1/2 miles southwest of Walton (R.W. Boyle, 1962: Can. Mining J., vol. 83, No. 4, p. 104).

Quebec

23 J/15 Pyrolusite has been identified by X-ray diffraction pattern in specimens submitted by G.A. Gross, from the Ruth Lake Mine, in the Knob Lake area (X-ray Laboratory, Geol. Surv. Can.).

PYROMORPHITE

$$Pb_5(PO_4, AsO_4)_3Cl$$

Phosphorus and arsenic substitute mutually in the pyromorphite series and a complete solid solution series exists. The name pyromorphite is given to the phosphorus dominant members; and the arsenic dominant members are called mimetite. These minerals are found as secondary minerals in the oxidized zone of lead deposits. They are structurally similar to apatite and are classified as members of the apatite group. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 2.99 (8), 2.96 (10), 2.90 (6) and 2.07 (7) (ASTM card 12-704).

British Columbia

82 G/5 A yellow and a green variety of pyromorphite occur as fine crystals with galena and cerussite in fracture zones on the Society Girl claim, 2 miles east of Moyie, in the Fort Steele mining division. Analyses by O. Bowles: (1) yellow - P_2O_5 16.12, As_2O_5 0.41, Cl 2.52, PbO 80.20, CaO 0.59, FeO 0.86, CaF_2 tr., insol. 0.08, total 100.78, less O for Cl 0.57, total 100.21, S.G. 7.031; (2) green - P_2O_5 15.65, As_2O_5 0.90, Cl 2.59, PbO 80.13, CaO 0.56, FeO 0.46, insol. 0.05, total 100.34, less O for Cl 0.59, total 99.75; S.G. 7.051 (O. Bowles, 1909: Am. J. Sci., Ser. 4, XXVIII, pp. 40-44).

Yukon

105 M/14 Pyromorphite has been identified by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.) in specimens from the Onek Mine, and from the Shamrock vein in the Keno Hill-Sourdough Hill area, of the Mayo mining district. For location of properties, see: R.W. Boyle, 1955: Geol. Surv. Can., Paper 55-30.

PYROPHYLLITE

$Al_2Si_4O_{10}(OH)_2$

Pyrophyllite, a hydrous aluminum silicate, physically similar to talc, is found in metamorphic rocks throughout the world. Originally used as a building stone or tombstone, it is now used in pencils or crayons, ceramics, refractories, fillers, paints, wallboard, soap, textiles, cosmetics, rubber, composition battery boxes, welding rod coatings and insecticides. The spacings and intensities of the five strongest lines in the X-ray powder pattern of pyrophyllite are: 8.97 (3), 4.53 (4), 3.037 (8), 2.400 (3) and 1.828 (3) (Rustum Roy and E.F. Osborn, 1954: Am. Mineralogist, 39, p. 862).

British Columbia

92 L Two deposits of pyrophyllite occur on the peninsula between Kokshittle Arm, and Easy Creek, Kyuquot Sound, Vancouver Island (C.H. Clapp, 1914: Geol. Surv. Can., Sum. Rept., 1913, p. 123).

Newfoundland

1 N/10 Pyrophyllite occurs in large replacement lenses in schists south of Long Pond, near Manuels, in the Torbay area (J.S. Vhay, 1938: Am. Mineralogist, 23, p. 180) (E.R. Rose, 1952: Geol. Surv. Can., Mem. 265, p. 55).

PYRRHOTITE

$Fe_{1-x}S$

Pyrrhotite occurs principally in basic igneous rocks either disseminated as minute flecks and blebs or segregated in large masses, as at Sudbury, Ontario. Frequently nickeliferous, often by admixture of pentlandite, it is an important ore mineral of nickel, and a by-product source of sulphur. Pyrrhotite is widely distributed throughout Canada and therefore no attempt will be made here to catalogue all of the known occurrences.

The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 3.00 (4), 2.65 (6), 2.08 (10), 1.728 (5), 1.328 (4), 1.105 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 60).

British Columbia

82 F/4 Auriferous pyrrhotite usually of low grade, occurs in the Rossland area in both massive and granular form. Analysis of specimens from the Monte Cristo property gave NiO 0.13, Co trace; while specimens from the Evening Star property gave NiO 0.67, Co 1.58 (C.W. Drysdale, 1917: Geol. Surv. Can., Mem. 77, p. 75).

82 L/15 Pyrrhotite in massive form occurs with pyrite and quartz near Malakwa, in the Kamloops mining division. Samples of this material were presented to the National Mineral Collection in 1919, by H.J. Blurton.

92 B/5 The copper ore mined at the Sunro property near River Jordan on the south end of Vancouver Island, contains pyrrhotite with chalcopyrite and pyrite. The pyrrhotite may contain some nickel (--, 1962: Western Miner & Oil Review, vol. 35, No. 3, p. 24).

92 B/6 The National Mineral Collection contains specimens of pyrrhotite in granular form from section 26, in the Lake Hill district, west of Cordova Bay. The specimens were donated by Mr. J. Richard.

92 H/6 A pale nickeliferous variety of pyrrhotite forms a coarse-grained mosaic with irregular grains of pentlandite and chalcopyrite in ultrabasic rocks at Giant Nickel Mines Limited, Hope (--, 1960: Western Miner & Oil Review, vol. 33, No. 11, p. 39).

94 F/4 Massive sulphides, including pyrrhotite, chalcopyrite, sphalerite and galena, associated with quartz and siderite, are found 60 miles northwest of the Ingenika River, along the Russell range (E. Bronlund, 1959: Can. Inst. Mining Met., Bull., vol. 52, No. 565, p. 333).

Manitoba

62 N/12 Pyrrhotite occurs with pentlandite, chalcopyrite, pyrite and sphalerite at Bird Lake (J.F. Davies, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 141).

63 K/9
63 K/16 Nickeliferous pyrrhotite deposits are found west and north of Morton Lake, and west and southwest of File Lake, in the File-Tramping Lake area (J.M. Harrison, 1949: Geol. Surv. Can., Mem. 250, p. 47).

63 K/16
63 J/13 Pyrrhotite, pentlandite, chalcopyrite, pyrite, sphalerite, and galena occur in the massive sulphide deposits at Snow Lake and Herb Lake (J.F. Davies, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 141).

63 N/3 Massive sulphide deposits are found in the impure quartzite members of the Sherridan Group, in the Sherridan area. The East West orebodies at the Sherritt Gordon Mine, are among the largest sulphide deposits in the world. Pyrrhotite, with some chalcopyrite and sphalerite constitutes the ore in this area (J.D. Bateman, 1945: Geol. Surv. Can., Paper 45-15).

63 O
63 P
64 A/2 Pyrrhotite associated with pentlandite is found along the Burntwood River (J.F. Davies, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 141).

64 C/4 The El orebody at Lynn Lake, consists of pyrrhotite, pentlandite, chalcopyrite, and pyrite (J.F. Davies, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 141).

New Brunswick

21 G/2 Nickeliferous pyrrhotite occurs at the Woodward Mine, in Charlotte County (G.S. MacKenzie, 1940: New Brunswick Mines Br., Paper 40-6).

21 G/3 A sample of massive pyrrhotite from the St. Stephen area has been donated to the National Mineral Collection.

21 O/8
21 P/5
21 P/12 Massive sulphide deposits occur in the Bathurst area. The ore consists of pyrite, pyrrhotite, galena, sphalerite and chalcopyrite, as well as tetrahedrite and arsenopyrite (A.L. McAllister, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 574, p. 88).

Northwest Territories

55 K/16 Pyrrhotite, pentlandite, chalcopyrite, minor violarite and marcasite, as well as platinum and palladium occur at lat. 62°49'N, long. 92°05'W, on Rankin Inlet 320 miles north of Churchill, Manitoba (W.W. Weber and S.S. Teal, 1959: Can. Inst. Mining Met., Bull., vol. 52, No. 567, p. 462).

Ontario

31 B/12 Pyrrhotite is found on lot 19, conc. II, Elizabethtown Township, Leeds County. Twinned crystals have been described. Analysis by Harrington: S 39.02, Fe 60.56, Co 0.11, Ni 0.11, Mn 0.06, Cu 0.15, total 100.01; S.G. 4.622. Analysis by Smith: SiO_2 1.01 (gangue), S 39.24, Fe 59.88, total 100.13; S.G. 4.642 (B.J. Harrington and J.L. Smith, 1874-75: Geol. Surv. Can., Rept. Prog., p. 306).

41 I The massive sulphide deposits of the Sudbury area contain pyrrhotite with lesser amounts of pentlandite, chalcopyrite, cubanite, and arsenides such as niccolite (J.E. Thompson, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 136) (A.D. Coleman, 1916: Can. Mining J., 36, pp. 388, 389).

An analysis by MacKenzie of pyrrhotite from Sudbury, is as follows: S 38.91, Fe 56.39, Ni 4.66, total 99.96; S.G. 4.51 (E.S. Dana, 1906: System of Mineralogy, 6th ed., p. 74).

41 J/7 Well developed crystals of pyrrhotite from 2 to 20 millimetres in length occur at the Stanleigh Mine, at Elliot Lake. Chemical analysis by D.H. Rose: Fe 60.52, S 37.20, total 97.72; S.G. 4.63 (J.A. Mandarino and R.S. Mitchell, 1960: Can. Mineralogist, 6, p. 546).

41 J/10 Pyrite and pyrrhotite constitute the mineralization in the Samreid Lake sulphide deposit, 28 miles north-northeast of Blind River, in township 157, of the Sault Ste. Marie mining division. Magnetite is intergrown with the sulphide, and minor amounts of chalcopyrite and cubanite are also present (G.M. Freidman, 1959: Econ. Geol., 54, p. 268).

42 A/5 Pyrrhotite, chalcopyrite, pyrite, and sphalerite occur in a copper ore-deposit mined in Robb Township, west of Timmins. The mineralization is in a shear zone in Precambrian lavas and fragmentals (W. Hogg, 1962: Western Miner and Oil Review, vol. 35, No. 8, p. 18).

42 A/9 Pyrrhotite is found at the contact of pillow lava and serpentine in conc. III, Beatty Township, along the border of Beatty and Munro townships. A pyrrhotite sample from this locality assayed 1 per cent nickel, no gold or platinum (J. Satterly and H.S. Armstrong, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. VII, p. 31).

42 F/4 Pyrrhotite is a constituent mineral of the lead-silver-copper sulphide ore mined at Manitouwadge (R.C.E. Bray, 1964: Can. Inst. Mining Met., Bull., vol. 57, No. 623, p. 269).

52 A/4 Pyrrhotite, pyrite, pentlandite, and chalcopyrite, constitute the mineralization on claim T.B. 3340, lot 13, conc. VIII, of Pardee Township (T.L. Tanton, 1937: Precambrian, vol. 10, May, p. 18).

52 F/13 Pyrrhotite is a constituent of the sulphide ore on the Eastern Mining & Smelting Corporation property at Gordon Lake, 55 miles northwest of Kenora (J.E. Thomson, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 153).

Quebec

31 F/10 Pyrrhotite containing 1.48 per cent nickel occurs on lot 11, range IX, on Calumet Island in Pontiac County (H.V. Ellsworth, 1930: Can. Mining J., 51, pp. 886-888).

32 G/16 A lenticular sulphide deposit (the Merrill ore zone) on the property of Campbell Chibougamau Mines Limited, in Obalski Township, contains pyrrhotite, pyrite, chalcopyrite, sphalerite, magnetite and galena.

The Bear Bay sulphide zone, in Roy Township, also has pyrrhotite, as well as pyrite and chalcopyrite (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 128).

Saskatchewan

73 P/8
73 P/10 Pyrrhotite is a constituent of the sulphide deposits in the Amisk Lake-Waddy Lake-Lac la Ronge areas (A.R. Byers, 1960: Can. Inst. Mining Met., Bull., vol. 53, No. 575, p. 145).

74 A/7 Pyrrhotite is the most abundant mineral in the sulphide deposits on the shore of Rottenstone Lake (J.B. Mawdsley, 1946: Geol. Surv. Can., Paper 46-24).

74 O/7 Pyrrhotite occurs on a large island lying south of Channel Island, in Lake Athabasca (J.B. Mawdsley, 1949: Geol. Surv. Can., Paper 49-27, p. 43).

74 O/12 A sulphide deposit at Dinty Lake, 24 miles due northeast of Goldfields Village, consists almost entirely of pyrrhotite. Minor amounts of chalcopyrite, sphalerite, and cubanite are present (H.C. Cooke, 1937: Geol. Surv. Can., Paper 37-3).

QUARTZ

SiO_2

Several polymorphs of silica occur as minerals. Quartz is the most common of these compounds and is one of the major constituents of the Earth's crust. Quartz crystals and many fine-grained and coloured varieties have been used as gemstones since early Egyptian times. Varietal names run into the hundreds, most of which are neither necessary nor desirable. Volume III of the System of Mineralogy (Dana) rewritten and enlarged by Clifford Frondel is devoted to Silica Minerals.

The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 4.25 (6), 3.34 (10), 1.817 (5) and 1.379 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 231).

Alberta

72 E/16 Silicified wood, defined by M. Hey, as wood fossilized by opal or chalcedony (Chem. Index. of Minerals, 1950, p. 549) occurs at Ross Coulee (Creek), near the town of Irvine, in the Medicine Hat district. A specimen of this material has been donated to the National Mineral Collection (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, No. 204, p. 53T).

72 L/1
72 L/2 Silicified wood is found in the vicinity of the Elbow of the South Saskatchewan River (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, No. 204, p. 53T).

72 L/13 The National Mineral Collection contains a specimen of quartz and opal from a locality 4 miles east of Steveville, on the Red Deer River.

82 P/7 C.H. Sternberg in 1912, donated a specimen of drusy quartz to the National Mineral Collection. The specimen was obtained from the banks of the Red Deer River above the Canadian National Railway bridge in the Drumheller area.

82 P/15 Silicified wood (opal) is found at a point 5 miles west and 3 miles south of Rumsey, on the Red Deer River (National Mineral Collection, Donor: C.H. Sternberg).

British Columbia

92 Agate, and chalcedony are found to a small extent on Vancouver Island, in the metavolcanics of the Vancouver eruptive series (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 6).

92 A/6 Quartz and calcite crystals may be found just east of the Canadian Pacific Railway line, about 3 miles northwest of Princeton (--, 1956: Canadian Rockhound, vol. 1, No. 1).

92 B/5 Agate is found with jasper and stray pieces of petrified wood near Sooke (J.S. Marshall, 1957: The Mineralogist, Feb., p. 55).

92 B/6 A considerable quantity of jasper, an impure opaque variety of quartz, is available at the beach at the foot of Dallas road, Victoria. A local green and white variety has been termed 'dallasite' and polishes well (J.S. Marshall, 1957: The Mineralogist, Feb., p. 55).

92 B/13 Good quality red jasper is found 8 miles north of Mill Bay on Vancouver Island (J.S. Marshall, 1957: The Mineralogist, Feb., p. 55).

92 G/2 Jasper, principally brown or yellow in colour, is found in small quantities at Crescent Beach, located 30 miles south of Vancouver near the International Boundary. Good quality agate is found associated with the jasper (J.S. Marshall, 1957: The Mineralogist, Feb., p. 55).

92 G/4 The National Mineral Collection contains a specimen of radiated quartz with bornite from Valdes Island, near Seymour Narrows.

92 H/8 Silicified wood occurs at Agate Mountain, in the Similkameen mining division (R.A.A. Johnston, 1907-08: Geol. Surv. Can., Sum. Rept., 1907, p. 98).

92 H/15 Handsome specimens of chalcedony have been found, sometimes in quite large masses, at the Aspen Grove camp, southeast of the headwaters of Voglet Creek in the Nicola mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 6).

92 I/3 The National Mineral Collection contains specimens of agate and prase (a variety of chalcedony) from Zakwaski Mountain at the head of Nicoamen River.

92 I/4 Considerable quantities of good quality jasper and agate, including some excellent fortification varieties are found in the Fraser River valley, around Lytton (J.S. Marshall, 1957: The Mineralogist, Feb., p. 55).

92 I/6 Well-banded but pale coloured agates can be found in the amygdaloidal basaltic rocks of the Nicoamen Plateau, in the Kamloops mining division. The zeolite minerals stilbite and heulandite are associated with the agates (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, pp. 185, 186B).

92 I/9
92 I/10 A few fine specimens of chalcedony have been found along the shores of Kamloops Lake. Chalcedony has also been noted as a gangue mineral in the Iron Mask Copper Mine, near Kamloops (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 6). Agate and chalcedony also occur on Savona Mountain and on

92 I/9
92 I/10 Dufferin Hill, near Kamloops (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 374B).

92 I/16 The National Mineral Collection contains a specimen of chalcedony from Scottie Creek near Bonaparte River in the Lillooet district.

92 K/3 The pillow breccias of Quadra Island, contain chlorite, epidote, pumpellyite, tremolite, quartz, chalcedony, calcite, prehnite, and zeolites as alteration products and amygdule fillings (--, 1963: J. of Geology, vol. 71, No. 1, p. 52).

92 O/1
92 P/5 A specimen of agate-jasper from Big Bar Creek, a tributary of the Fraser River, is present in the National Mineral Collection.

93 E/15
93 F/12 Agate and chalcedony occur at Ootsa Lake, in the Omineca mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 6).

103 F
103 G
103 J
103 K Agate and chalcedony are found as rolled pebbles along the shores and rivers of the northern part of Queen Charlotte Island. Considerable quantities of gem agate of good colour and pattern are available on the island, between Masset and Skidegate. The Tertiary volcanic rocks on Graham Island, Queen Charlotte mining division, also contain agate and chalcedony (G.M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 110R) (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 6) (J.S. Marshall, 1957: The Mineralogist, Feb., p. 56).

104 N Rounded jasper pebbles have been found at Atlin Lake (J.C. Gwillim, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 14B).

Manitoba

62 J/10 Concretions consisting of quartz crystals radiating from a single centre, or groups grown together with many such radiating groups serving as nuclei, varying in size from minute bodies to large masses about 18 inches in diameter, occur in the gypsum, anhydrite, and limestone on the property of Western Gypsum Products at Amaranth (G.M. Brownell, 1942: Univ. Toronto Stud., Geol. Ser., 47, p. 7).

New Brunswick

21 B/1 Agate and chalcedony occur at Dalhousie in Restigouche County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st edition, Industrial and Educational Pub., Co., Gardenvale, Que.).

21 B/10
21 B/15 Amethyst, and red and yellow jasper, have been reported to occur in Grand Manan Island, Charlotte County (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 72S) (L.W. Bailey, 1897: Geol. Surv. Can., Ann. Rept., X, p. 126M).

21 G/9
21 H/13 Red and yellow jasper, agate and carnelian are found along the Washademoak River, in Queen's County (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, pp. 71, 72S).

21 H/5
21 H/12 Agate and chalcedony of gem quality occur at Darling Lake and Hammond, King's County (W. L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st edition, Industrial and Educational Pub., Co., Gardenvale, Que.).

21 H/4
21 H/5
21 H/12 Red and yellow varieties of jasper are reported to occur at Red Head, St. John County; and at Darling Lake, Belleisle Bay, and Hampton, in King's County. Carnelian occurs with the jasper at Darling Lake, and at Hampton (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, pp. 71, 72S).

21 J/13
21 J/14 A number of varieties of quartz, including agate, chalcedony, jasper, and carnelian are reported to occur on the Tobique River, in Victoria County (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, pp. 71, 72S).

21 O/10 Amethyst is found in trap rocks about 7 miles above the forks on the Upsalquitch River, Restigouche County (R. W. Ells, 1879-81: Geol. Surv. Can., Rept. Prog., p. 39D).

22 B/1 Amethyst, agate, and chalcedony occur near Dalhousie (R.W. Ells, 1879-81: Geol. Surv. Can., Rept. Prog., p. 39D) (E. Coste, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 71S).

Newfoundland

1 M/10 Amygdaloidal pillowed basalt from a ridge 1 mile west of the Paradise River bridge and 1/4 mile south of the Terenceville road contains amygdules up to 5 millimetres in diameter filled with red jasper, epidote, and chlorite (D. A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 24).

Northwest Territories

34 C/2 Agate and olive green coloured chalcedony are found on Belanger Island, at the entrance to Richmond Gulf, on the east coast of Hudson Bay (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 27T).

48 C/3 Quartz crystals several inches long and stained with hematite are present in vugs in the Society Cliffs dolomite. These vugs are most abundant near a basic dyke that cuts strata on King George V Mountain (R. R. H. Lemon and R. G. Blackadar, 1963: Geol. Surv. Can., Mem. 328, p. 78).

59 B/14 Jasper is reported to occur on Princess Royal Island (G. M. Dawson, 1886: Geol. Surv. Can., Ann. Rept., II, p. 46R).

65 K
65 L
65 M
65 N
Amethyst is found in trap rocks in the Dubawnt Lake area (G. M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 41A).

75 L Jasper occurs in the Kahochella Formation in the northeast arm of Great Slave Lake (G. M. Dawson, 1886: Geol. Surv. Can., Ann. Rept., II, p. 16R) (J. C. Brown, 1950: Geol. Surv. Can., Paper 50-21, p. 5).

Nova Scotia

11 D/12 Amethyst is found in granite near Sixmile Lake, on St. Margaret's Bay road, Halifax County (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 14).

21 A/12
21 A/13
21 A/14
The basaltic trap rock along the north (Bay of Fundy) shore of Nova Scotia, from Scots Bay and Cape Blomidon west to Brier Island, contains numerous veins of both quartz and zeolites. Agate, amethyst, carnelian and jasper are among the varieties of quartz found in the area. Some of the better localities include the following: Amethyst and agate at Cape Blomidon, Kings County. Jasper at Margaretsville, Woodworth Cove, Gulliver Cove, Trout Cove, and Brier Island. Agate at Sandy Cove up to the head of St. Mary's Bay. Amethyst at Digby Neck and at Sandy Cove (G. F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 65S) (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 15T, 41T) (L. W. Bailey, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 21Q) (A. L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 15) (D. S. M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 81-83).

21 A/9 Red jasper occurs as cement in a dyke of fragmentary white quartzose rock located 1/2 mile east of New Ross, Lunenburg County (E. R. Faribault, 1902-03: Geol. Surv. Can., Ann. Rept., XV, p. 186AA).

The National Mineral Collection contains specimens of large, smoky, prismatic, quartz crystals from New Ross, Lunenburg County.

21 A/12 Large blocks of impure banded, red and yellow jasper have been found near the head of St. Mary's Bay in Digby County (G.F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 72S).

21 A/14 Large smoky quartz crystals weighing up to 100 pounds occur at Lawrencetown, Bridgetown, and Paradise, in Annapolis County (D. S. M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 81-83).

Carnelian, a red translucent variety of chalcedony, is found at Granville, and heliotrope occurs in small nodules or fragments at the base of Chute Cove, Annapolis County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 26T, 37T).

21 B/9 Carnelian, agate, and chalcedony can be seen at Trout Cove, Digby Neck, Digby County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 26, 27T).

21 H/1 Red jasper has been reported on Long Island, Kings County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 41T).

The arenaceous limestone along the north shore of North Mountain and just east of the mouth of Woodworth Creek contains numerous jasper concretions up to 1 foot wide and 2 feet long (D.G. Crosby, 1962: Geol. Surv. Can., Mem. 325, p. 48).

Heulandite, stilbite, clear quartz, amethyst, agate and jasper are common as amygdules and coatings in large vesicles in basalts, in the Wolfville area (D.G. Crosby, 1962: Geol. Surv. Can., Mem. 325, p. 47).

21 H/2 Gem quality crystals of deep purple amethyst on massive magnetite occur 2 miles southeast of Berwick, Kings County (G.G. Thompson, 1958: private communication).

Other amethyst occurrences in the same county are at (the town of) Canada Creek, and at Harbourville (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 14).

21 H/7 The National Mineral Collection contains specimens of agate from Horseshoe Cove, Cape D'Or, in Cumberland County.

21 H/8 Red jasper is found on Partridge Island, Cumberland County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 41T).

Fine amethysts occur in bands, veins and geodes at Partridge Island and Cape Sharp, Cumberland County (G.F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 70S).

Amethyst, agate, and chalcedony occur at Amethyst Cove, and other localities along the shoreline between Cape Blomidon and Cape Split, Kings County (G.F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 71S) (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 17T) (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., p. 15).

A few small, but good quality crystals of gem type quartz, have been found at Five Islands, Cumberland County (A.L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 45).

Agate and chalcedony, including the variety heliotrope, occur at Two Islands (The Brothers), Cumberland County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 37T) (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 7).

21 H/8 The National Mineral Collection contains specimens of agate from Scott's Bay, Kings County. They were donated by C.W. Willimott in 1883.

Ontario

31 C/6 A specimen of drusy quartz crystals from lot 1, conc. IV, Madoc Township, has been donated to the National Mineral Collection.

31 C/8
31 C/9 Quartz crystals have been mined commercially on a small scale in wartime at two deposits in Leeds County, one at Marble Rock and the other at Black Rapids (J. M. Harrison and Y. O. Fortier, 1944: Geol. Surv. Can., Paper 44-8).

31 F/3
31 F/6 Rose quartz is found in large masses in pegmatite dykes in Lyndoch Township, Renfrew County (A. L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 16) (G. G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

32 D/4 Jasper, magnetite and hematite occur in the Keewatin Formation on claim C. E. 25, south of Pancake Lake, in the Larder Lake area (P. E. Hopkins, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. III, p. 5).

41 J
41 K Jasper conglomerate is found in the country north of Bruce Mines; along a ridge 1/2 mile from the northern extremity of Goulais Bay, Lake Superior; on the St. Marys River at a point 4 miles west of Campement d'Ours Island; on the east shore of Lake George; and on Lake Huron. The conglomerate has a white quartzite matrix, containing pebbles of red, yellow, green and black jasper (G. F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 72S).

41 K/15
41 K/16 Narrow bands of jasper may be seen with ellipsoidal greenstone and rhyolite at the Vulcan and Mammoth locations on the north side of the north boundary of Palmer Township in township 28, range XIII, Algoma district. This locality is part of the Batchawana iron-formation (E. S. Moore, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. II, p. 79).

41 N/12 Carnelian, varying widely in depth of colour and translucency occurs at the west end of Michipicoten Island, in Lake Superior. Large amounts of high quality agate are also present (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 76).

41 O/15 The westerly belt of the Woman River iron range, which crosses the southern boundary of Heenan Township, Sudbury district, is essentially red jaspillite, slightly fractured and cemented by minute grains of pyrite and quartz. Jasper bands up to 2 inches in width, alternate with dark cherty bands containing some specular hematite.

Bands of chert and jasper are found in an iron-formation in a medium-grained nonporphyritic rock in the southwest part of

41 O/15 Swayze Township, Sudbury district (G.D. Furse, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, p. 40).

41 P/15 Large fragments of jasper are found in glassy dark quartz on the Leliever claims (9170-9178) located east of Dora Lake in the Bannockburn area (H.C. Rickaby, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. II, p. 21).

41 P/16 Jasper occurs in an iron-formation on the north boundary of Bryce Township, Timiskaming district. A bed of banded cherty quartz, magnetite, jasper, and hematite, is discontinuous and apparently faulted, and is associated with a coarse gabbroic flow (W.W. Moorhouse, 1941: Ont. Dept. Mines, Ann. Rept., vol. 50, Pt. IV, p. 7).

42 A/1 Jasper is found in the Kirkland Lake area, in the fragments of iron-formation found in many of the Timiskaming series of rocks (A.G. Burrows, 1923: Ont. Dept. Mines, revised ed., Ann. Rept., vol. 32, Pt. IV, p. 24).

42 D/13 Agate can be found on a number of beaches on Simpson Island, in Lake Superior (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 76).

42 D/14 Quartz veins at the southern end of a granite-syenite body about 7 miles east of Schreiber in the Duck Lake area, contain chalcedony (P.E. Hopkins, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. IV, p. 6).

42 E/1
52 A/5
52 A/6
52 A/12
Jasper and chert are found in rocks of the Animiki Formation in the Thunder Bay district. These rocks have been found on the Whitefish and Kaministikwia rivers, and east of Lake Nipigon (E.D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., p. 24H) (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 137).

52 A/6
52 A/7
52 A/10
52 A/11
The most notable occurrences of agate and chalcedony in Ontario are located along the north shore of Lake Superior and on the islands adjacent thereto. The agate occurs as beach pebbles and as nodules in basaltic trap rock, which in certain areas also contains veins of amethyst (G.F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, pp. 69, 71S) (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 15) (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 76) (D.S.M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 71-83).

52 A/10 Amethyst occurs at Amethyst Harbour and at the mouth of the MacKenzie River, in veins which have yielded specimens several feet across covered with rich purple crystals from 1/4 inch to 5 inches long (G.F. Kunz, 1887-88: Geol. Surv. Can., Rept., III, p. 69S) (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 17T) (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 15).

52 A/10 Specimens of amethyst from a locality 1/4 mile west of the mouth of the MacKenzie River are present in the National Mineral Collection.

52 B/1 Jasper occurs in an iron-formation north of the west end of Whitefish Lake, and midway between Whitefish and Round (now Roundtable) lakes, Hunter Island area (A. L. Parsons, 1916: Ont. Dept. Mines, Ann. Rept., vol. 25, Pt. I, p. 185).

52 B/2 Jasper occurs in trap rock intimately associated with bodies of iron ore at Gunflint Lake, in the Hunter Island area (A.L. Parsons, 1916: Ont. Dept. Mines, Ann. Rept., vol. 25, Pt. I, p. 185).

52 B/3 Jasper occurs with hematite in an iron-formation at Emerald Lake, and at Jasper Lake, in the Hunter Island area (A. L. Parsons, 1916: Ont. Dept. Mines, Ann. Rept., vol. 25, Pt. I, p. 185) (W. H. C. Smith, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 63G).

52 B/13 The National Mineral Collection contains specimens of transparent, prismatic crystals of quartz, from the Seine River, and from Steep Rock Lake in Freeborn Township, Rainy River district.

52 F/16 A band of iron-formation outcrops on some of the islands near the west shore of Sandybeach Lake, in the Sioux Lookout area. This iron bearing horizon consists of highly contorted bands of jasper, chert, magnetite, and slate (M. E. Hurst, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. VI, p. 27).

52 K/14 Jasper occurs in iron-formation on the western shore of Little shallow Lake, now known as Little Pakwash Lake, or Bruce Lake, in the Upper English River valley area (E. L. Bruce, 1924· Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. IV, p. 7).

Quebec

11 N/5 A specimen of jasper from Grindstone Island, one of the Magdalen Islands, in the Gulf of St. Lawrence, has been donated to the National Mineral Collection.

21 E/5 Red jasper which is often finely clouded, occurs near Sherbrooke in Sherbrooke County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 41T).

21 E/15 Specimens of drusy, transparent crystals of quartz, from lot 1, range VII, Marlow Township, Frontenac County, were donated to the National Mineral Collection in 1891 by W. F. Ferrier.

21 N/5 Banded dark green and reddish brown jasper occurs with white chalcedony on the River Ouelle, Kamouraska County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 27T, 41T).

22 A Agate pebbles, known to collectors as Gaspe Pebbles, are found in the conglomerate of the Bonaventure Formation at Chaleur Bay in Gaspe County (G. F. Kunz, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 71S).

22 A/7 Jasper is found with hematite in veins or beds on lots 69-72, range I, Pabos Seigniory. A band of conglomerate containing jasper occurs 3/4 of a mile east of the wharf of L'Anse a l'Ilot. A jasper vein is located 200 feet northwest of the railway and 1 mile from the Pabos Centre crossing; there are two outcrops on lot 70, 500 feet from the shore (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 10) (H. W. McGerrigle and H. Girard, 1950: Que. Dept. Mines, Prelim. Rept., 173, revised ed., p. 6).

23 I/4
23 I/5 Jasper is found in the iron-formation along the Hamilton River.

23 J/7
23 J/8 This formation is especially well developed on the Ashuanipi branch, between the outlet of Menihek Lakes and Birch Lake (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 46).

24 C/14 Jasper is found interbedded with magnetite and hematite in iron-formation on the Koksoak River from below Shale Chute or Falls to a point about 2 miles below the mouth of the Swampybay River, and also at about 6 miles below the mouth of the Swampybay River (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 44).

31 G/5 Loose blocks of bright red to chocolate brown jasper are common on lot 14, range VIII, Hull Township, Gatineau County. Some of the jasper exhibits yellow mottling (C. W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 16L).

31 G/12 A bed of bright red to chocolate brown jasper, some of which is mottled with yellow, is exposed at Scott's Mine on lot 15, range X, Hull Township, Gatineau County (C. W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 16L).

Specimens of smoky quartz from the Nellis Mine, lot 10, range XI, Hull Township, Gatineau County, have been donated to the National Mineral Collection.

31 H/1 Large prismatic quartz crystals occur on lot 12, range XIII, of Bolton Township, Brome County. A specimen of this material has been presented to the National Mineral Collection.

31 J/2 Well-developed quartz crystals of varying sizes are found at the Canadian Kaolin Silica Products quarry at St. Remi d'Amherst, Quebec. The crystals appear chalky due to inclusions of kaolin in the outer layers, while the central portion of the crystals

31 J/2 consist of limpid rock crystal (A. L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 46).

31 J/5 Transparent, prismatic crystals of quartz occur on lot 15, range I, Egan Township, Gatineau County. Specimens of this material have been donated to the National Mineral Collection.

33 O/13 The National Mineral Collection contains a specimen of chalcedony obtained from a locality north of Little Whale River in the Hudson Bay area of Quebec.

34 C/1
34 C/8 A few small crystals of gem type quartz of good quality have been found at Richmond Gulf, on the east side of Hudson Bay (A. L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 45).

34 C/2
34 C/7
34 C/10
34 C/15
34 F/2
34 F/7 Abundant jasper occurs with hematite in iron ores consisting of hematite, magnetite and ankerite throughout the Nastapoka Islands on the east coast of Hudson Bay (H. W. McGerrigle, 1942: Que. Dept. Mines, Prelim. Rept., 173, p. 39).

Yukon

105 D/2 Jasper occurs on Patterson Mountain, 3.5 miles east of Windy Arm of Tagish Lake (G. C. Gwillim, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 31B).

105 D/5 Breccias overlooking Watson Valley about 4 miles north of Mount Skukum contain fragments of deep orange and vermilion jasper (J. O. Wheeler, 1961: Geol. Surv. Can., Mem. 312, p. 79).

106 E/15 Iron ore consisting of magnetite and hematite, associated with red jasper, occurs as float in the wash of the Bonnet Plume and Snake rivers (C. Camsell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 46cc).

115 P/12
115 P/13
115 P/14 Specimens of drusy smoky quartz from the Clear Creek Mountains have been donated to the National Mineral Collection.

QUERCYITE

Calcium phosphate

British Columbia

93 K/4 Quercyite is reported to occur in a vein located 1,000 feet from a farmhouse 2 miles northwest from the ferry landing on the north side of François Lake. The vein is from 4 to 12 inches

93 K/4 wide consists of botryoidal layers of collinsite and quercyite about andesite fragments, associated with some asphalt. Chemical analysis by E. A. Thompson: SiO_2 0.19, Al_2O_3 0.60, Fe_2O_3 0.12, FeO 1.90, MgO 0.62, CaO 50.22, H_2O 4.20, P_2O_5 34.96, Mn_2O_3 0.12, CO_2 5.45, F 1.83, organic 0.82, total 101.03, less O for F 0.77, total 100.26; S.G. 3.04 (E. Poitevin, 1927: Geol. Surv. Can., Bull. 46, p. 9).

RAMMELSBERGITE

$NiAs_2$

Rammelsbergite is an orthorhombic form of nickel diarsenide that is closely related in crystal structure to marcasite. It is readily mistaken for pararammelsbergite in polished section and may be positively distinguished only by its X-ray powder pattern which shows five strongest lines with the following spacings and intensities: 2.84 (5), 2.56 (10), 2.49 (8), 1.877 (7) and 1.698 (3) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 101).

Northwest Territories

75 L/12 Specimens from the Nix property, 10 miles southwest of Taltheilei Narrows, on the northeast arm of Great Slave Lake consist of solid compact masses of niccolite and rammelsbergite in a minor amount of ankeritic gangue, and partially coated with annabergite (R. M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

85 I/2 Rammelsbergite occurs near Gros Cap at a point 2 miles north of Great Slave Lake, and 3 miles east of François River. Specimens from this locality consist of compact masses of botryoidal niccolite, and rammelsbergite cemented by a carbonate gangue and covered with much earthy annabergite (R. M. Thompson, 1951: Am. Mineralogist, 36, p. 506).

86 L/1 The rammelsbergite at the Eldorado Mine, Great Bear Lake, is generally in a massive aggregate of crystals of prismatic habit which are associated with skutterudite, smaltite, and chloanthite. A few isolated crystals of rammelsbergite are also found associated with metallic minerals such as uraninite, chalcopyrite, native silver, and tetrahedrite. The gangue consists of quartz and carbonate with some chloritic mica (E. Thomson, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 46).

Ontario

Much of the so-called rammelsbergite from the Cobalt camp, reported below, may really be pararammelsbergite, a mineral having the same composition but different crystal structure (see: M. A. Peacock and A. S. Dadson, 1940: Am. Mineral., 25, p. 561).

31 M/5 Rammelsbergite showing a fibrous structure and prismatic cleavage, occurs at the University Mine, in the Cobalt area. Analysis of the ore gave the following results: Ni 27.84, Co 1.80, Fe tr., As 67.32, S 2.03, Sb 0.83, total 99.82 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 228).

At the M.J. O'Brien Mine at Cross Lake, 2 miles southeast of Cobalt, rammelsbergite occurs in veins in volcanics and sediments of Keewatin age and in diabase of Nipissing age. It is associated in different proportions at different levels and parts of the veins with skutterudite, argentite, cobaltite, chloanthite, safflorite, gersdorffite, smaltite, niccolite, chalcopyrite, tetrahedrite, arsenopyrite, sphalerite, galena, pyrite, pyrargyrite, marcasite, silver, and a little breithaupite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41; and 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 33).

Rammelsbergite at the Silver Bar Mine, near Cobalt, shows a radiating structure and is found with arsenopyrite, cobaltite and ullmanite. Niccolite and gersdorffite are also present. Chemical analysis of rammelsbergite, by E.W. Todd: Ni 26.21, Co 2.70, Fe 0.66, As 66.60, Sb 0.85, S 2.97, SiO_2 0.21, total 100.20; S.G. 6.999.

Recalculation of the analysis showed the following minerals: arsenopyrite 1.95%, gersdorffite 5.12%, cobaltite 7.35%, niccolite 2.81%, ullmanite 1.25%, rammelsbergite 81.7%.

Rammelsbergite is also found at the Hudson Bay Mine, and the Timiskaming Mine, in the Cobalt area. Chemical analysis by E.W. Todd, of rammelsbergite from the Hudson Bay Mine: Ni 27.08, Co 1.94, Fe 0.56, Cu 0.16, As 65.78, S 3.05, Sb 0.91, total 99.48; S.G. 7.02 (T.L. Walker and A.L. Parsons, 1921: Univ. Toronto Stud., Geol. Ser., 12, pp. 27-31).

41 P/9 Compact, fine-grained, tin-white masses of rammelsbergite occur at the Moose Horn Mine, in James Township. Chemical analysis by G.W. Rogers: Ni 28.1, Co 0.4, As 68.5, S 2.6, total 99.6; S.G. 7.12 (M.A. Peacock and C.E. Michener, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 95).

41 P/10 Veins in the O'Brien Mine at Miller Lake, Gowganda district, contain the following minerals (in order of abundance): silver, loellingite, skutterudite, safflorite, rammelsbergite, tetrahedrite, smaltite, chloanthite, arsenopyrite, cobaltite, galena, niccolite, breithauptite, chalcopyrite, and sphalerite. Calcite and quartz are the main gangue minerals (E. Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61).

Saskatchewan

74 N/8 Rammelsbergite is found in the Number 4 vein of the Nicholson Group claims, on the north shore of Lake Athabasca, 2 miles

74 N/8 east of Goldfields. It occurs with hematite, pitchblende, and other cobalt-nickel arsenides, as well as thucholite, chalcopyrite, arsenopyrite, galena pyrite and sphalerite, in a carbonate and quartz gangue (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 96).

RAMSDELLITE

MnO_2

The X-ray powder pattern of this relatively rare mineral is similar to artificial γ-MnO_2. The pattern, taken using Fe radiation, shows eleven strongest lines with the following spacings and relative intensities: 2.56 (10), 2.44 (8), 2.35 (8), 2.32 (8), 2.15 (8), 2.07 (8), 1.911 (8), 1.661 (8), 1.622 (8), 1.474 (8) and 1.362 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 188).

Nova Scotia

11 E/7
11 E/8
11 E/10 The only occurrence of this manganese oxide mineral thus far reported in Canada is in Pictou County, Nova Scotia, along the East River (M. Fleischer and W.E. Richmond, 1943: Am. Mineralogist, 28, p. 615; and 1943: Econ. Geol., 38, pp. 269-286).

REALGAR

AsS

Realgar occurs commonly as a minor constituent of certain ore veins associated with orpiment and other arsenic minerals, with stibnite, and with lead, silver, and gold ores. On exposure to light it alters to orpiment and arsenolite.

The X-ray powder pattern shows five strongest lines having the following spacings and intensities: 5.40 (10), 3.19 (9), 2.94 (8), 2.73 (8) and 1.859 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, pp. 69, 70).

British Columbia

92 L/2 Realgar is found in a calcite vein on the Good Hope claim near Wolfe Lake, west of the headquarters of the Comox Logging Company (12 miles from Courtenay) (National Mineral Collection, donor: M.E. Hurst, 1919).

92 O/1 Realgar, associated with native arsenic is found in small quantities along Watson Bar Creek, a tributary of the Fraser River (R.A.A. Johnston, 1909: Geol. Surv. Can., Sum. Rept., p. 250).

Ontario

31 F/4 Very small quantities of bright red realgar associated with orpiment and mispickel occur on conc. IX, Faraday Township. The property is 7 miles due west of L'Amable Station (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, p. 211).

52 K/13 Realgar was found in the form of coatings and small irregular aggregates in highly silicified ore at the Madson Mine, in the Red Lake area, Baird Township (M.H. Frohberg, 1960: private communication).

Yukon

105 D/2 The National Mineral Collection contains a specimen of realgar from Windy Arm, Tagish Lake. Quartz, arsenopyrite, and orpiment are also present. The specimen was donated to the collection by D.D. Cairnes in 1916.

115 F/15 Realgar is found in small quantities distributed through an andesite dyke on Pan Creek, a tributary of the Upper White River (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem.74, p.193).

RHODOCHROSITE

$MnCO_3$

Rhodochrosite is a member of the calcite group and commonly contains some Fe and Ca in solid solution. It is found as a gangue mineral in moderately low temperature hydrothermal ore veins; also in relatively high temperature metasomatic deposits and as a secondary mineral in sedimentary manganese oxide deposits.

The spacings and intensities of the five strongest lines in the X-ray powder pattern of synthetic rhodochrosite are: 3.66 (4), 2.84 (10), 2.172 (3), 1.770 (3) and 1.763 (3) (H.E. Swanson et al., 1957: Nat. Bur. Stds., Circ. 539, vol. 7, p. 33).

British Columbia

82 E/5 Rhodochrosite is found with other manganese minerals in a bedded deposit of manganiferous chert on the Iron King prospect, which is on the south side of the ridge separating the north and middle forks of Olalla Creek, 3 1/2 miles by trail from the highway at Olalla (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

Manitoba

52 L/5 Rhodochrosite is present in small amounts in the lithium-cesium ore mined at Bernic Lake (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 25).

New Brunswick

21 J/4 The mineral rhodochrosite is a constituent of the manganese ore at a deposit 5 miles west-northwest of Woodstock and about 8 miles east of Houlton, Maine. The orebody lies on the south side of the Meduxnekeag River (E.W. Heinrich, 1962: Can. Mineralogist, 7, p. 291).

Manganiferous hematite and silicified shales constitute the most important manganese-bearing units of the manganese ores at Woodstock in Carleton County. The hematite is locally cut by narrow quartz stringers and veinlets of rhodochrosite. The primary ore mineral, braunite, occurs with minor amounts of piedmontite and axinite (G.C. Monture, 1957: Can. Mining J., 78, Pt. 1, pp. 117-120).

21 J/7 Rhodochrosite occurs in dolomite in the Napadogan area (X-ray Laboratory, Geol. Surv. Can.).

21 J/10 Rhodochrosite is found in Northumberland County on the east bank of the Southwest Miramichi River, about 11 miles above Boiestown and 6,000 feet below the mouth of Trout Brook. The mineral was identified by X-ray diffraction pattern at the X-ray Laboratory of the Geological Survey of Canada.

Rhodochrosite occurs at Fall Brook in York County (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

Ontario

52 A/3
52 A/7 Rhodochrosite is reported to occur on Silver Islet, and on McKellar Island, in Lake Superior (E.D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 27H).

Quebec

34 C/1
34 C/8 Rhodochrosite is a constituent of the lead-zinc sulphide deposits on the properties of the Labrador Mining & Exploration Company, and of the Hollinger North Shore Exploration Company. These properties are located near Richmond Gulf, on the east shore of Hudson Bay (J.E. Gilbert, 1953: Que. Dept. Mines, Geol. Rept., 56, p. 19).

RHODONITE

$MnSiO_3$

The composition of rhodonite is somewhat variable and Mn may be replaced by Ca and Fe to a considerable extent. Rhodonite has a characteristic rose-red colour resembling rhodochrosite but is distinguished by its superior hardness. It is valued as a gem and ornamental stone. The spacings and intensities of the four strongest lines in the X-ray powder pattern of rhodonite are: 3.14 (3), 2.98 (6), 2.92 (6) and 2.77 (10) (ASTM card 13-138).

British Columbia

82 E/5 A bedded deposit of manganiferous chert on the Iron King prospect is traversed by a network of minute veins containing rhodonite which merge laterally into zones of hard black manganese ore (braunite) containing small irregular masses of rhodonite and chert.

The property is located on the south side of a ridge separating the north and middle forks of Olalla Creek, 3 1/2 miles by trail from the highway at Olalla (R.M. Thompson, 1951: Am. Mineralogist, p. 505).

82 F/15 The National Mineral Collection contains specimens of rhodonite from Kaslo.

Rhodonite, formed by metamorphism of rhodochrosite in crystalline limestone, is found in massive, deep pink bunches or lens-like masses in calcareous footwall rocks of a vein in the Harp Group. The property is near Zwicky, in the Slocan mining district (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 127).

92 C/9 Near Cowichan Lake, on Vancouver Island, beautiful rhodonite can be found at the site of an old manganese mine. The mine is at the summit of a mountain about 2,000 feet above sea level and about 5 miles east of Lake Cowichan (--, 1957: Canadian Rockhound, vol. 1, No. 5).

92 P/8
92 P/9 Rhodonite occurs near Boulder Creek (Joseph Creek), a tributary of the North Thompson River. A specimen is included in the National Mineral Collection: donor, M.F. Bancroft, 1917.

93 K/13 A rhodonite vein occurs on Tsitsutl Mountain in the Fort St. James area in Cache Creek sedimentary rocks. The vein consists of 70% rhodonite, 2-3% arsenopyrite, and calcite, garnet (spessartite) and ilmenite (J.E. Armstrong, 1949: Geol. Surv. Can., Mem. 252, p. 134).

New Brunswick

21 J/4 Rhodonite is one of the minerals comprising the Plymouth orebody on the south side of the Meduxnekeag River, 5 miles west-northwest of Woodstock (E.W. Heinrich, 1962: Can. Mineralogist, 7, p. 291).

21 J/10 Rhodonite occurs in breccia at Fall Brook, and in slate on Lower Birch Island, in York County (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

21 P/12 Rhodonite occurs in quartz veins at Tetagouche Falls in Gloucester County (K. O. J. Sidwell, 1952: New Brunswick Res., Dev. Bd., Fredericton).

Quebec

23 C/1 Rhodonite has been identified in a specimen from the Mount Reed property, 52°05'N, 68°05'W, in the Mount Wright area (X-ray Laboratory, Geol. Surv. Can., specimen submitted by S. Duffell, 1956).

RICKARDITE

$Cu_{4-x}Te_2$

The crystal structure of this rare telluride has been shown by S. A. Forman and M. A. Peacock (Am. Mineralogist, 34, p. 441, 1949) to be similar to Cu_2Sb. The structure is deficient in Cu, with $x = 1.2$. The four strongest lines in the X-ray powder pattern have the following spacings and relative intensities: 3.36 (6), 2.55 (4), 2.07 (10) and 1.989 (4) (L. G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 42).

British Columbia

103 I/9 Rickardite is present in traces at the Grotto Group on Hardscrabble Creek, 1 1/2 miles from Pitman, and 1 mile west of the Canadian National Railway tracks in the Skeena mining division. The rickardite was observed on a small cleavage mass of tellurium adjacent to an area of chalcopyrite, in a quartz vein containing values in copper, silver and gold. Pyrite, specularite and empressite were also present (R. M. Thompson, 1954: Am. Mineralogist, 39, p. 527).

Quebec

32 D/3 Rickardite has been listed among the telluride minerals occurring at the Horne Mine, at Noranda (R. M. Thompson, 1959: Am. Mineralogist, 34, p. 359).

RIEBECKITE

$Na_2Fe^{+2}{}_3Fe^{+3}{}_2Si_8O_{22}(OH)_2$

This blue alkali amphibole, together with glaucophane, forms a subgroup that is characterized by substitution of bivalent magnesium for ferrous iron, and aluminium for ferric iron. Glaucophane is known only as a metamorphic mineral occurring in schists, whereas riebeckite is best known as a constituent of acid igneous rocks. Riebeckite also occurs as a blue fibrous (asbestiform) mineral which is known as crocidolite or blue asbestos.

The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 8.42 (10), 3.43 (6), 3.09 (8) and 2.72 (10) (ASTM card 14-230).

British Columbia

104 O/3
104 O/6 Several alkali rhyolite dykes, generally displaying spherulitic structure, and containing riebeckite, acmite, or decomposition products of riebeckite, occur in the Atsutla Range of northern British Columbia (W.H. Mathews and K.D. Watson, 1953: Am. Mineralogist, 38, pp. 432-447).

Newfoundland

1 M/10 Blue riebeckite was observed in the micro-crystalline groundmass of a specimen of felsite from Sugarloaf Hill, southeast of Bay L'Argent (D.A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 12).

2 D/10 Riebeckite granite forms a small group of relatively high hills just east of the village of Traytown in the Bonavista map-area (S.E. Jenness, 1963: Geol. Surv. Can., Mem. 327, p. 97).

13 K/5 Riebeckite occurs with beryllium mineralization in alkali syenite at Seal Lake, Labrador. Most of the mafic minerals are in clusters, vein-like aggregates or disseminated microlites. Riebeckite replaces aegirine (E.W. Heinrich and R.W. Deane, 1960: Am. Mineralogist, vol. 47, Nos. 5, 6, p. 758).

Ontario

41 N/15 Riebeckite occurs in the Michipicoten area as greyish blue and lavender to deep blue, earthy to radiating aggregates. It has formed as a hydrothermal alteration product accompanying lamprophyre dykes and was locally introduced into quartz veins. The riebeckite was observed quite frequently in small quantities at the Darwin Mine and at the Parkhill Mine (M.H. Frohberg, 1960: private communication) and has also been reported to occur at other mines in the area (M.H. Frohberg, 1939: Am. Mineralogist, 24, p. 382) (J.E. Hawley, 1937: Am. Mineralogist, 22, p. 1099).

41 O/11 Riebeckite occurs about 1 1/2 miles northeast of the village on the Mountbatten Indian Reserve in Mountbatten Township, Sudbury mining division. The mineral was identified by X-ray diffraction pattern and optical properties by the X-ray Laboratory of the Geological Survey of Canada, from hand specimens submitted by Mr. R.C. Johnston, Superintendent, Chapleau Indian Agency. The specimens consisted mainly of riebeckite, associated with quartz and magnetite.

42 C/7
42 C/8 Riebeckite was observed in and near a lamprophyre dyke which cuts the gold veins of the Edwards Mine, in the Goudreau-Lochalsh area, District of Algoma (M. H. Frohberg, 1939: Am. Mineralogist, 24, p. 386).

RIPIDOLITE

(See chlorite)

RUBY SILVER

(See proustite, pyrargyrite)

RUTILE

TiO_2

Titanium dioxide occurs in nature in three polymorphous forms, rutile, anatase and brookite. Rutile is the most common form and an economic source of titanium. It is isostructural with oxides of manganese, tin and lead but little or no mutual substitution of these elements takes place. Rutile is regarded as a high temperature mineral. The spacings and intensities of the four strongest lines in the X-ray pattern are: 3.24 (10), 2.49 (5), 1.687 (7) and 1.354 (4) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 177).

Nova Scotia

21 H/8 Rutile (var. sagenite) occurs in the form of needles in quartz at Scots Bay, in Kings County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 56T).

Ontario

31 C/6 Small crystals of rutile from lot 9, conc. XIV, Huntingdon Township, Hastings County, were presented to the National Mineral Collection by A. T. McKinnon in 1919.

Quebec

31 G/12 The National Mineral Collection contains specimens of prismatic, vertically striated crystals of rutile collected from lot 13, range XIII, Templeton Township, Papineau County, Quebec.

Yukon

115 O/3 Specimens of rutile from Thistle Creek are present in the National Mineral Collection.

SABUGALITE

$HAl(UO_2)_2(PO_4)_4 \cdot 16H_2O$

British Columbia

93 F/15 This mineral is reported to have been found in a dyke on Nithi Mountain, Nithi River. The sabugalite occurs sparingly as aggregates of small plates lining vugs, coating quartz crystals, and on joint surfaces in a partly brecciated, pyritic, devitrified vitrophyre dyke, which is said to occur in granite. Earthy meta-torbernite is an associated mineral. The four strongest lines in the X-ray powder pattern are: 9.67 (10), 4.90 (8), 3.49 (8), and 2.19 (4), in fair agreement with type material from Portugal (R.M. Thompson, 1960: private communication).

SAFFLORITE

$(Co, Fe)As_2$

Safflorite is a common constituent of Co-Ni-Ag vein deposits throughout the world. It is found associated with smaltite, rammelsbergite, niccolite, loellingite, silver and bismuth. The mineral has a variable and usually considerable iron content. Berry and Thompson (1962) list the spacings and intensities of the strongest lines for five slightly different safflorite X-ray patterns as follows: (I) 2.60 (10), 2.35 (9), 1.865 (8), 1.642 (7), 1.061 (6); (II) 2.65 (8), 2.56 (9), 2.41 (10), 1.870 (7), 1.050 (6); (III) 2.60 (10), 2.57 (10), 2.38 (10), 1.862 (7), 1.654 (7); (IV) 2.58 (10), 2.37 (8), 1.862 (7), 1.110 (6), 1.064 (7); (V) 2.66 (10), 2.53 (10), 2.42 (10), 1.859 (10), 1.656 (7) (Geol. Soc. Am., Mem. 85, pp. 97-100).

British Columbia

92 H/8 Mineralization on the Oregon property, between Sixteen Mile and Eighteen Mile creeks, about 3 miles east of Hedley, consists of massive garnet, hedenbergite, wollastonite, calcite, and minor quartz, with sparsely disseminated sulphides. Hedleyite and joseite B are seen together in polished sections as rounded grains with smooth boundaries. Native bismuth, molybdenite, and gold are closely associated with the tellurides, while bornite, chalcopyrite, cobaltite, and safflorite occur apart and are locally abundant (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

93 M/4 Safflorite occurs with chalcopyrite, and variable amounts of magnetite, pyrrhotite, arsenopyrite, pyrite, tetrahedrite, and molybdenite at the Rocher Deboule Mine near Hazelton. The gangue consists of hornblende, actinolite and quartz with subordinate amounts of calcite and siderite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 42).

Northwest Territories

86 E/8 Zoned grains and rosettes of safflorite-rammelsbergite, often with niccolite nuclei, occur in the pink dolomite of the central filling of the silver ore at the Camsell Silver Mine, 9 miles from the mouth of the Camsell River, in the District of Mackenzie (D. F. Kidd, 1936: Geol. Surv. Can., Mem. 187, p. 32).

Ontario

31 M/3 A hand specimen from the Wood's vein of the Keeley Mine, South Lorrain Township, consisted chiefly of safflorite and loellingite with minor amounts of cobaltite and skutterudite. Niccolite was seen in small amounts (J. M. Bell and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 26).

31 M/5 Safflorite occurs with loellingite at the Kerr Lake Mine, near Cobalt (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 223).

Safflorite occurs in veins at the M. J. O'Brien Limited Mine on the shore of Cross Lake, 2 miles southeast of Cobalt. The safflorite is associated in different proportions at different levels and parts of the veins with rammelsbergite, skutterudite, argentite, niccolite, cobaltite, chloanthite, gersdorffite, smaltite, chalcopyrite, tetrahedrite, arsenopyrite, sphalerite, galena, pyrite, pyrargyrite, marcasite, silver and in some places breithauptite and dyscrasite (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41; and 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 33).

31 M/12 Safflorite is found in small amounts in dark coloured calcite along with arsenopyrite, argentite, and native silver, at the Casey Mine, lot 5, conc. I, Casey Township, District of Timiskaming. The property is owned by the Langis Silver and Cobalt Mining Company (D. A. Moddle, 1960: private communication).

41 P/10 Safflorite also occurs at a number of mines in the Gowganda area. At the O'Brien Mine at Miller Lake, safflorite is associated with (in order of abundance) the following minerals: silver, loellingite, skutterudite, rammelsbergite, tetrahedrite, smaltite, chloanthite, arsenopyrite, cobaltite, galena, niccolite, breithauptite, chalcopyrite and sphalerite. The ore is found in veins varying in width from 1 to 14 inches, average 3 inches, which traverse diabase country rock. The gangue in the veins consists of calcite with minor quartz (E. Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61) (E. W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 67).

Quebec

23 B/11 Safflorite has been identified by X-ray powder diffraction in specimens from Mount Wright, near Hesse Lake, Labrador (E.W. Nuffield and D.H. Gorman, 1960: private communication).

SAL-AMMONIAC

NH_4Cl

The spacings and intensities of the three strongest lines in the X-ray powder pattern of sal-ammoniac are: 3.87 (2), 2.74 (10) and 1.58 (2) (ASTM card 7-7).

Alberta

84 C/3 Sal-ammoniac occurs with native sulphur as a deposit from the 'Bocannes' or smokes of the Smoky Hills, in the Peace River area. The smokes are thought to be due to burning coal or lignite and the resulting surface deposits are found along the Smoky River up to 14 miles from its confluence with the Peace River. The colour of the sal-ammoniac varies from canary yellow to red to white, and an analysis of the material gave the following results: S (native) 46.517, NH_4Cl 50.422, $(NH_4)_2SO_4$ 1.807, K_2SO_4 0.035, Na_2SO_4 0.274, $CaSO_4$ 0.146, $FeSO_4$ and $MgSO_4$ 0.014, extraneous matter 0.922, total 100.137 (G.C. Hoffmann, 1875-76: Geol. Surv. Can., Rept. Prog., pp. 58, 420).

SAMARSKITE

The composition of this mineral is probably AB_2O_6 where A = Y, Er, Ce, La, U, Ca, Fe^{+2}, Pb, Th; and B = Nb, Ta, Ti, Sn, W, Zr(?).

Samarskite is normally metamict. When heated at 700°C in air for 3 hours it gives a cubic X-ray pattern with four strongest lines at 2.95 (10), 2.56 (4), 1.82 (8) and 1.55 (8) (J. Lima de Faria, 1964: Jun. de Invest. do Ultra., Est. Ens. e Doc. 112).

Ontario

31 E/4 Samarskite is reported to occur in granite pegmatite on lots 9 and 10, conc. IX, Conger Township, Parry Sound district (D.F. Hewitt, 1960: private communication).

31 F/4 A zoned granite pegmatite on lots 16 and 17, conc. VIII, Monteagle Township, is reported to contain samarskite (D.F. Hewitt, 1960: private communication).

31 F/6 Samarskite is reported to occur on lot 23, conc. XV, Lyndoch Township, Renfrew County (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 196).

Quebec

21 M/16 Samarskite occurs in the Lac Pied des Monts area of Charlevoix County (J. Obalski, 1906: Mining Operations in Que., p. 42).

31 J/16 Samarskite occurs in a pegmatite dyke at the Maisonneuve Mine on lots 1 and 2, range II, Maisonneuve Township, Berthier County. The mineral is abundant in portions of the dyke, and is found in the form of small masses varying from a few grains to 1 pound or more. Muscovite, biotite, tourmaline, beryl, fergusonite and euxenite are also present in the dyke (W.G. Miller and C.W. Knight, 1917: Que. Dept. Mines, 26, p. 316) (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 248) (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 153).

An analysis of samarskite from Maisonneuve Township by G.C. Hoffmann (1882) gave the following results: $Nb_2O_3 + Ta_2O_3$ 55.41, SnO_2 0.10, Y_2O_3 14.34, Ce_2O_3 4.78, UO_3 10.75, MnO 0.51, FeO 4.83, CaO 5.38, MgO 0.11, K_2O 0.39, Na_2O 0.23, F tr., H_2O 2.21, total 99.04; S.G. 4.9478.

SAMSONITE

$Ag_4MnSb_2S_6$

The spacings and intensities of the five strongest lines in the X-ray powder pattern of samsonite are: 3.20 (10), 3.01 (9), 2.86 (5), 2.59 (6) and 2.43 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 128).

Ontario

31 M/5 Samsonite was identified by crystallographic measurements and X-ray diffraction by Dr. P. Ramdohr, in a specimen from the Brady Lake property of the Silver Miller Mine near Cobalt. The specimen is a semi-transparent, prismatic crystal, about 3 millimetres long, and similar to pyrargyrite, in appearance, having been taken as such by M.H. Frohberg who submitted the mineral for identification. Positive identification of samsonite has been made only in this one specimen, which is now in the Heidelberg collection (M.H. Frohberg, 1960: private communication).

SANIDINE

(See potassium feldspar)

SAPONITE

A number of occurrences of clay-like material, believed to be an aluminosilicate of magnesium were reported in the early literature as saponite. These may be unrelated to the particular species and group of clay minerals to which the name has been applied in recent years.

Ontario

52 A/5 Saponite is reported to occur in the Thunder Bay district at the Beaver Mine, and at other mines in the Port Arthur Group (E.D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., III, pp. 126, 127H).

Prince Edward Island

11 L/12 Saponite is reported to occur on the northeast coast of Hog Island, in Richmond Bay, north coast of Prince Edward Island (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 56T).

Saponite occurs in cavities in trap on George Island in Malpeque Bay, Prince County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 56T). Analysis of saponite from George Island by B.J. Harrington: SiO_2 43.91, Al_2O_3 6.47, Fe_2O_3 1.23, CaO 0.59, MgO 27.18, H_2O 19.64, total 99.02; S.G. 2.23-2.27 (B.J. Harrington, 1875: Can. Nat., Ser. 2, VII, p. 179).

Quebec

31 K/8
31 K/9 Saponite occurs as an alteration of amphibole in Egan Township, Gatineau County. An analysis of this material by Johnston gave the following results: SiO_2 42.76, Al_2O_3 4.32, Fe_2O_3 2.57, CaO 1.92, MgO 25.30, H_2O 23.13, total 100.00; S.G. 2.162 (R.A.A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., 1910, p. 259).

SAPPHIRINE

near $Mg_4Al_{10}Si_2O_{23}$

Sapphirine is a comparatively rare, high-temperature metamorphic mineral, found associated with spinel, corundum, calcic plagioclase, biotite, sillimanite, cordierite, anthophyllite, kornerupine, and hypersthene, in rocks relatively high in Al and Mg and low in Si. The spacings and intensities of the five strongest lines in the X-ray powder pattern of sapphirine are: 2.97 (7), 2.44 (6), 2.01 (10), 1.44 (9) and 1.42 (6) (ASTM card 11-607).

Quebec

21 M/10 Sapphirine is intimately associated with plagioclase, rutile and ilmenite at St. Urbain in Charlevoix County. Chemical analysis: SiO_2 13.44, Al_2O_3 62.98, FeO 9.08, MgO 15.28, total 100.78; S.G. 3.5 (C.H. Warren, 1912: Am. J. Sci., Ser., 4, vol. XXXIII, p. 267).

31 I/15 Bluish grey sapphirine occurs as lenses up to 1/4 inch thick in garnetiferous biotite schist in Mekinac Township, Laviolette County, off of highway 19, about 3.5 miles west of the bridge on the Mekinac River, on the first important road cut opposite the curve.

Identification has been confirmed by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.).

SCAPOLITE

Scapolite occurs typically in metamorphosed limestones and calcareous rocks especially around intrusive igneous rocks. The general formula for the scapolite group may be written $W_4Z_{12}O_{24}R$, where: W is mainly Ca, Na and K; Z is Si and Al; and R is (1) CO_3, SO_4, $(OH)_2$, Cl_2 or F_2 for meionite, and (2) Cl, F, HCO_3, HSO_4 or OH for marialite. Composition varieties are: marialite (Ma) Me_0-Me_{20}, dipyre Me_{20}-Me_{50}, mizzonite Me_{50}-Me_{80}, and meionite (Me) Me_{80}-Me_{100}. The name wernerite was proposed at about the same time and has been used in the same sense as scapolite (D.M. Shaw, 1960: J. Petr., vol. 1, pp. 218-260).

The four strongest lines in the X-ray powder pattern of scapolite have the following spacings and intensities: 3.434 (10), 3.051 (8), 3.013 (4) and 2.675 (7) (B.J. Burley, E.B. Freeman, and D.M. Shaw, 1961: Can. Mineralogist, 6, p. 674).

Ontario

31 C/9 Scapolite has been found at the Glendower Iron Mine, Bedford Township (B.J. Burley, E.B. Freeman, and D.M. Shaw, 1961: Can. Mineralogist, 6, p. 670).

31 C/10 Scapolite was noted at Eel Lake in Bedford Township, Frontenac County (G.O. Smith, 1894: Johns Hopkins Circular, Map #112).

Scapolite occurs at the Bobs Lake Mine, conc. VI, lot 30, and in conc. VIII, lot 6, Bedford Township, Frontenac County (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 118, pp. 296, 297).

31 C/16 Analysis of scapolite from Perth, Drummond Township, Lanark County yielded: SiO_2 46.30, Al_2O_3 26.20, FeO 0.60, CaO 12.88,

31 C/16 MgO 3.63, K_2O 2.88, Na_2O 4.30, H_2O 2.80, total 99.59; S.G. 2.640-2.667 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 474).

Scapolite was noted in Bathurst Township, Lanark County, conc. IX, lot 20 (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 156).

Scapolite occurs in North Burgess Township, Lanark County, at the Baby Mine, conc. VIII, lot 1, and also in conc. V, lot 13 (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 118, p. 296).

31 D/9 Scapolite occurs in Burleigh Township, Peterborough County, in conc. V, lot 12 (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, p. 212).

31 D/15 Scapolite was noted in the southeast part of Lutterworth Township at the Paxton Iron Mine (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, pp. 211, 212).

31 D/16 Blue-grey granular and pegmatitic scapolite was found in Haliburton County, Glamorgan Township, along highway 500, 2.4 miles east of Gooderham. Chemical analysis: SiO_2 57.89, Al_2O_3 21.62, TiO_2 0.01, Fe_2O_3 0.07, MgO 0.03, MnO 0.01, CaO 4.81, Na_2O 10.50, K_2O 1.16, H_2O^+ 0.44, H_2O^- 0.06, CO_2 1.11, Cl 2.96, SO_3 0.03, F 0.00, less O for Cl, F 0.67, total 100.03; S.G. 2.619. Me content 19.4 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

Scapolite was noted in Glamorgan Township, Haliburton County, conc. V, lot 7, east of Maxwells crossing, south side of Burnt (Irondale?) River (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, pp. 211, 212).

31 E/1 A yellow-white granular aggregate of scapolite occurs in Monmouth Township, Haliburton County, conc. XVI, lot 13. Chemical analysis: SiO_2 54.73, Al_2O_3 22.85, TiO_2 0.01, Fe_2O_3 0.08, MgO 0.03, MnO 0.00, CaO 8.29, Na_2O 8.55, K_2O 1.08, H_2O^+ 0.13, H_2O^- 0.00, CO_2 1.69, Cl 2.19, SO_3 0.39, F 0.00, less O for Cl, F 0.49, total 99.53; S.G. 2.660. Me content 33.5 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

A pale yellow scapolite of gem quality was found at Drag Lake in Dudley Township, Haliburton County (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

Scapolite was noted in Monmouth Township, lot 28, conc. XIV (F.D. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, pp. 211, 212).

Scapolite has been identified at the X-ray Laboratory, Geological Survey of Canada in specimens from the following mining properties: Burma Shore Uranium Mines Limited, Cardiff Township, 31 E/1 conc. XX, lot 7; Cardiff Uranium Mines Limited, Cardiff Township, concs. XVII, XVIII, and XIX, lots 1, 2, and 3; Centre Lake property (Bicroft Uranium Mines Limited), Cardiff Township, Haliburton County, conc. XI, lots 26 and 27; Croft property (Bicroft Uranium Mines Limited), Herschel and Faraday townships, Haliburton and Hastings counties at intersection of Cardiff Township; Halo Uranium Mines Limited, Cardiff Township, Haliburton County, conc. XVII, lots 4 and 5; Nu-Age Uranium Mines Limited, Cardiff Township, Haliburton County, conc. XXI, lot 8.

31 F/2 Scapolite occurs on lot 34, conc. VIII, Brudenell Township (B. J. Burley, E. B. Freeman, and D. M. Shaw, 1961: Can. Mineralogist, 6, p. 670).

31 F/4 Good crystals of scapolite have been found in Monteagle Township, Hastings County, conc. VI, lots 24 and 25 (G. M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 98A).

The ore of the Monteagle nepheline-corundum-mica deposit, Hastings County, contains about 7 per cent scapolite. The prismatic cleavage of the scapolite distinguishes it from nepheline and andesine feldspar in the outcrops. The scapolite, yellow when freshly broken, turns light blue upon exposure to the sunlight for a few months (L. Moyd, P. Moyd, and H. L. Noblitt, 1962: Can. Inst. Mining Met., Bull., vol. 55, No. 604, p. 567).

31 F/6 Scapolite was found in Sebastopol Township, Renfrew County, on Twiner Island in Lake Clear (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 65T).

Scapolite, from Rockingham Mines Limited, Brudenell Township, Renfrew County, conc. X, lot 24, has been identified by X-ray diffraction (X-ray Laboratory, Geol. Surv. Can.).

A single gem-quality crystal was found at the 'Old Spain Mine' in Griffith Township, Renfrew County (G. G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

31 F/10 Scapolite was noted in Ross Township, Renfrew County, conc. I, lot 7; conc. VI, lot 13; and conc. IX, lot 7 (C. W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., pp. 5, 6, 8L).

52 H/7 White scapolite was found in a recent fall of fresh trap on the main shore of Lake Nipigon, south of Gros Cap (T. L. Walker and A. L. Parsons, 1926: Univ. Toronto Stud., Geol. Ser., 22, p. 19).

Quebec

31 F/15 Chemical analysis of yellow-brown granular aggregate of scapolite from range V, lots 16 and 17, Huddersfield Township: SiO_2 52.10, Al_2O_3 23.79, TiO_2 0.02, Fe_2O_3 0.23, MgO 0.18, MnO

31 F/15 tr., CaO 11.13, Na_2O 6.86, K_2O 0.87, H_2O^+ 0.07, H_2O^- 0.10, CO_2 2.14, Cl 1.85, SO_3 0.80, F 0.11, less O for Cl, F 0.46, total 99.79; S.G. 2.689; Me content 46.2 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

Chemical analysis of white granular aggregate of scapolite from Huddersfield Township, lot 22, range V: SiO_2 51.83, Al_2O_3 24.29, TiO_2 0.03, Fe_2O_3 0.07, MgO 0.02, MnO tr., CaO 11.66, Na_2O 6.40, K_2O 1.16, H_2O^+ 0.22, H_2O^- 0.04, CO_2 2.28, Cl 1.66, SO_3 0.72, F 0.02, less O for Cl, F 0.38, total 100.02 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

A dead white bladed aggregate of scapolite was found in Huddersfield Township, range IV, lot 26. Chemical analysis: SiO_2 47.17, Al_2O_3 26.29, TiO_2 0.03, Fe_2O_3 0.15, MgO 1.00, MnO 0.01, CaO 14.31, Na_2O 3.82, K_2O 1.01, H_2O^+ 0.93, H_2O^- 0.50, CO_2 2.66, Cl 0.56, SO_3 1.42, F 0.04, less O for Cl, F 0.14, total 99.76; S.G. 2.705; Me content 66.2 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

31 F/10
31 F/15 A lilac coloured scapolite was found on Calumet Island Pontiac County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 65T).

31 F/15 Fairly large white prismatic crystals of scapolite, somewhat resembling feldspar, were found at the Yates Uranium Mine, Huddersfield Township, Pontiac County, range V, lots 19, 20 (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 40).

The rocks of lot 31, range VI, Grand Calumet Township, contain scapolite (B.J. Burley, E.B. Freeman, and D.M. Shaw, 1961: Can. Mineralogist, 6, p. 670).

31 F/16 Scapolite was found in Low Township, Gatineau County, range IX, lot 31 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 65T).

31 G/10 A large yellow single-crystal of scapolite was collected at Grenville. Chemical analysis: SiO_2 45.91, Al_2O_3 28.19, TiO_2 0.07, Fe_2O_3 0.11, MgO 0.46, MnO 0.01, CaO 15.76, Na_2O 2.44, K_2O 2.21, H_2O^+ 1.12, H_2O^- 0.03, CO_2 2.86, Cl 0.05, SO_3 0.94, F 0.01, less O for Cl, F 0.02, total 100.75; S.G. 2.703; Me content 70.1 (D.M. Shaw, 1960: J. Petrol., 1, pp. 218-260).

31 G/11 Scapolite was found in Ripon Township, Papineau County, range VIII, lot 13 (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 32G).

Chemical analysis by Adams of scapolite from Ripon Township: SiO_2 54.859, Al_2O_3 22.448, Fe_2O_3 0.486, CaO 9.092, MgO tr., K_2O 1.127, Na_2O 8.365, Cl 2.411, SO_3 0.796, H_2O^+ 0.141, H_2O^-

31 G/11 0.722, total 100.447; less O for Cl 0.59, total 99.857; S.G. 2.605-2.654 (F.D. Adams, 1879: Am. J. Sci., Ser. 3, vol. XVII, pp. 315-320).

31 G/12 Scapolite was found in Templeton Township, Papineau County, range XII, lots 14, 21 (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 31G).

Scapolite collected at Portland West, Labelle County, range III, lot 14, is included in the National Mineral Collection.

Scapolite crystals, along with some well-formed pyroxene crystals and a few well-developed pyrite crystals were found in Templeton Township, Papineau County, range VIII, lot 21. The crystals were remarkably well developed and enormous in size. The largest crystal weighed 75 pounds (A.L. Parsons, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 27).

Glassy blue scapolite occurs at the King Edward Mine in the north part of Templeton Township, lot 8, west shore of Rheaume Lake.

Exceptionally coarse and abundant fragments of scapolite were found in the Nellie and Blanche Mine, Hull Township, Gatineau County, range X, lot 10, 2 miles southwest of Cantley Village (K.K. Landes, 1938: Am. Mineralogist, 23, p. 379).

Scapolite was found in Hull Township, Gatineau County, range XI, lot 10, Nellie and Blanche Mine; and at range XVI, lot 6, Horseshoe Mine (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 118, p. 296).

Abundant scapolite can be found in the contact zone between microclinic pegmatite and pyroxenite at the Dacey Mine in Hull Township, Gatineau County, range XV, lot 12A, 1 1/2 miles southwest of Wilson Corners (K.K. Landes, 1938: Am. Mineralogist, 23, p. 379).

Scapolite was found in Templeton Township, Papineau County, range XII, lot 13 (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 118, p. 296).

31 G/15 Chemical analyses by R.J.C. Fabry of scapolites from Harrington Township, Argenteuil County: (1) lot 3, range III, greenish grey, SiO_2 44.16, Al_2O_3 29.91, Fe_2O_3 1.21, MgO 0.40, CaO 18.89, Na_2O 2.17, K_2O 0.98, H_2O 1.31, CO_2 0.99, Cl tr., total 100.02; (2) lot 3, range III, lemon-yellow, SiO_2 42.88, Al_2O_3 29.58, Fe_2O_3 0.76, MgO 0.36, CaO 22.11, Na_2O 1.33, K_2O 0.36, H_2O 0.93, CO_2 1.62, Cl 1.04, total 100.97, less O for Cl 0.23, total 100.74; (3) north quarter of lot 18, range II, greenish yellow, SiO_2 44.20, Al_2O_3 28.87, Fe_2O_3 0.96, MgO 0.18, CaO 21.52, Na_2O 2.03, K_2O 0.73, H_2O 0.28, CO_2 nil, Cl 1.91, total 100.68, less O for Cl 0.43, total 100.25 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, pp. 389-391).

31 I/16 Scapolite occurs as euhedral crystals up to 2 inches long and also as a replacement of anorthite in Portneuf County, Montauban-les-Mines, Tetreault Mine (J. J. O'Neill and F. F. Osborne, 1938: Que. Dept. Mines, Prelim. Rept., 136, p. 17).

Scapolite was found in Montauban Township, Portneuf County, range I, lots 33-36, 37-41; range II, lots 38-41; and range I, lots 312-322 (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65, p. 30).

31 J/11 Yellow scapolite occurs in crystalline limestone in Campbell Township, Labelle County, range I, lot 19, near Clement Station (E. Aubert de la Rue, 1948: Que. Dept. Mines, Geol. Rept., 23, p. 56).

31 K/1 Scapolite was found at the Chaibee Mine, Wright Township, Gatineau County, range A, lot 6 (H.S. de Schmid, 1912: Can. Dept. Mines, Mines Br., 18, p. 296).

Saskatchewan

74 O/13 Green, yellow and red scapolite occurs in apatite-rich veins associated with hyalophane feldspar, tremolite, anthophyllite, garnet, and epidote in the Nisikkatch and Norwest Lakes region, 35 and 40 miles northwest of Uranium City (D.D. Hogarth, 1957: Can. Mineralogist, 6, pp. 140-150).

SCHEELITE

$CaWO_4$

Scheelite, an important ore mineral of tungsten, occurs in a variety of geological environments including high and moderate temperature hydrothermal veins, pegmatites, and contact metamorphic deposits. It is characterized by a bright bluish white fluorescence under short ultraviolet radiation.

The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 3.09 (10), 1.929 (9), 1.595 (9), 1.252 (8), 0.797 (8), 0.795 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 225).

British Columbia

82 F/3 Scheelite occurs with tungstite and wolframite at Sheep Creek in the Nelson mining division (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, pp. 37-39).

Coarse crystals of scheelite occur in a quartz mass with abundant sericite mica, some molybdenite and minor pyrite, about 3 feet above a flat-lying granite contact at the Dodger Tungsten

82 F/3 Mine, near Salmo in the Nelson mining division (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

Scheelite occurs with tungstite and wolframite at the Kootenay Belle Mine in the Nelson mining division (T. L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, pp. 37-39).

A scheelite orebody occurs in skarn a few hundred feet below ground at the Emerald Mine, Salmo map-area. The scheelite occurs with altered limestone in a trough that plunges gently southward, flanked on the east by a fine-grained granite stock (H.V. Little, 1950: Geol. Surv. Can., Paper 50-19, p. 41).

82 F/6 Scheelite occurs with tungstite and wolframite at the Granite-Poorman Mines in the Nelson mining division (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, pp. 37-39).

82 F/14 Scheelite was found at Meteor Mines, Slocan City mining division, Springer Creek (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 39).

92 I/8 Scheelite occurs in quartz veins at Stump Lake, an expansion of Stump Lake Creek, northeast of Nicola, Kamloops district. The scheelite content of the veins in low but small pockets of plentiful amounts have been found (W.E. Cockfield, 1942: Geol. Surv. Can., unpublished file 21-C-18).

92 O/2 Scheelite occurs in an epithermal vein about 2 inches wide, at Tyaughton Creek valley, 14 miles north of Minto City, Bridge River district. The nearly pure white scheelite exhibits a well defined comb structure that results from pyramidal shaped crystals arranged normal to the walls of the vein fissure, and is associated with stibnite, quartz, and carbonate. A partial analysis yielded: WO_3 79.7, CaO 19.3, MoO_3 trace, total 99.0 (J.S. Stevenson, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 95).

93 A/14 Scheelite occurs in a narrow quartz vein that is exposed for a length of about 18 feet in the Taylor scheelite prospect, Cariboo district, 30 miles southwest from Wells, southwest rim of Snowshoe Plateau. It is associated with stolzite, tungstite, and cube pyrite. The resin-coloured scheelite is massive to crysstalline, and well-shaped tetragonal crystals (1/4 to 3/4 inch in diameter) are common. Much of it has oxidized to yellow tungstite. The scheelite fluoresces brilliantly and is seen either to be laced by a network of nonfluorescent tungstite veinlets, or to be more completely replaced by large irregular patches of tungstite (J.S. Stevenson, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 137).

A chemical analysis of scheelite from Nugget Gulch, Cariboo district, yielded: WO_3 76.79, MoO_3 1.06, CaO 18.90, total 96.75 (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 42).

93 A/14 93 H/3 Scheelite has been found in placer deposits in Antler Creek at Nugget Gulch; and at Chinaman Creek claims extending from the junction of Wolf and Antler creeks south and parallel to Antler Creek towards Sawmill Flat, Cariboo mining division (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 42).

93 M/5 A scheelite deposit occurring as a shear zone in diorite is located at the Red Rose Mine near Hazelton, 177 miles northeast of Prince Rupert. The lenticular form, coarse to pegmatitic texture, and mineralogy of the scheelite vein imply formation at high pressure and temperature. All workings are on one main zone which is mineralized with hornblende, quartz, biotite, pyrite, chalcopyrite, pyrrhotite, arsenopyrite, wolframite, and ferberite (A.H. Lang, 1952: Geol. Surv. Can., Geol. Ser., 16, p. 42) (J.S. Stevenson, 1947: Am. Mineralogist, 32, p. 209).

93 N/1 A deposit of disseminated scheelite, powellite, molybdenite and chalcopyrite occurs at a fracture zone at the contact of a granite stock and silicified andesite, 9 miles south of the east end of Chuchi Lake, Cassiar and Coast districts (J.E. Armstrong, 1949: Geol. Surv. Can., Mem. 252, p. 134).

103 I/9 Scheelite occurs with tungstite at Hardscrabble Creek, Cariboo mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 348A).

Analysis of a scheelite sample from Hardscrabble Creek in the Cariboo mining division: WO_3 73.68, MoO_3 0.66, CaO 20.00, total 94.34 (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 41).

104 P/3 Galena, sphalerite, chalcopyrite, scheelite and hydrozincite occur in a shear zone in limestone at the McDame Belle property, on McDame Creek about 1 mile east of Centerville (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

104 P/4 Quartz veins in porphyritic granite north of Cassiar contain scheelite, molybdenite and bismuthinite (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 109).

Manitoba

52 E/11 Scheelite deposits are associated with shear zones and minor folds in pillow lavas near their contact with pink porphyritic granodiorite, 6 miles north of Barren Lake in the Falcon Lake area (G.P. Springer, 1952: Man. Dept. Mines, Mines Br., Publ., 50-6, p. 17).

A belt of schist containing scheelite and molybdenite deposits is located northwest of Shoal Lake near the Ontario boundary in the Falcon Lake district. Epidote and garnet are associated with the scheelite deposits (J.S. Delury, 1918: Can. Mining J., vol. 39, pp. 186-188).

New Brunswick

21 G/7 Scheelite occurs with tin mineralization at Mount Pleasant in Charlotte County (A.A. Ruitenberg, 1963· M. Sci. thesis, Univ. of New Brunswick).

21 P/12 Scheelite occurs in a contact zone on the Sturgeon River property at Nicholas Denys, in Gloucester County (M. Tauchid, 1964: Geol. Surv. Can., Paper 64-31).

Northwest Territories

85 F/11 A skarn-type replacement deposit of scheelite ore occurs on the Flat River property of Canadian Tungsten Mining Corporation Limited (--, 1960: Can. Mining J., vol. 81, No. 12, p. 122).

85 I/7 Scheelite occurs at Gilmour Lake (62°29'N, 112°55'W) chiefly in quartz veins which contain large amounts of calcite and minor amounts of zoisite and grossularite. The veins which are a few inches to several feet wide follow bedding planes in greywacke and arkose sediments (S.W. Walker, 1942: Can. Mining J., vol. 63, March, pp. 145-149).

Nova Scotia

11 D/13
11 D/15 Quartz veins containing abundant scheelite outcrop near Moose River Gold Mines, Waverley, Halifax County (E.R. Faribault, 1911: Geol. Surv. Can., Sum. Rept., p. 334).

11 D/15 The National Mineral Collection includes a specimen of scheelite found at the Touquoy Mine, 3 miles east of McCallum's, Moose River, Halifax County.

Scheelite was found near Stillwater Brook which runs into the Fish River, Halifax County (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 25).

21 A/2
21 A/7 Scheelite was found near Fifteenmile Brook in Queens County (E.R. Faribault, 1911: Geol. Surv. Can., Sum. Rept., p. 334).

21 A/7 A quartz vein carrying scheelite, arsenopyrite and pyrite intersects the main auriferous vein at the Balboa or Old American Mine at Molega, Queens County (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 14R).

Chemical analysis of scheelite from Molega, Queens County, by Johnston: WO_3 79.01, CO_2 0.71, CaO 19.8, insol. 0.11, total 99.63; S.G. 6.002 (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 9R).

Scheelite was found at Huey Lake, near Baker settlement, in Lunenburg County (E.R. Faribault, 1911: Geol. Surv. Can., Sum. Rept., p. 339).

21 A/9 21 A/16 Scheelite occurs with cassiterite, chalcopyrite and sphalerite in quartz porphyry near Wallaback Stream, New Ross, Lunenburg County (E.R. Faribault, 1908: Geol. Surv. Can., Sum. Rept., p. 154).

Ontario

41 I/6 Small grains of scheelite, sometimes translucent, having a vitreous lustre are found at the Victoria Mine, Denison Township, Sudbury district; concs. II, III, IV, lot 8 (T.L. Walker, 1908: J. Can. Mining Inst., XI, p. 370).

Analysis of scheelite from the Victoria Mine, Sudbury district yielded: WO_3 79.36, CaO 19.96, total 99.32 (T.L. Walker, 1909: Can. Dept. Mines, Mines Br., Rept. 25, p. 34).

42 A/6 Reddish brown scheelite occurs with ore at the Hollinger and Dome mines, Porcupine area. It is found in small masses with quartz as a very early constituent; generally fractured with quartz or calcite veinlets, and associated with cassiterite, topaz, and wolframite (A.D. Burrows, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. II, p. 54).

42 E/10 Scheelite occurs in quartz veins at Little Long Lac Mine, Errington Township.

Scheelite fills fractures in earlier quartz veins (second generation) at Hard Rock and McLeod-Cockshutt mines, Ashmore Township. The scheelite itself is fractured and cemented by tourmaline, a mineral introduced during the third stage in the mineralization sequence (H.C. Horwood and E.G. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. V, p. 44).

Scheelite occurs as small bunches and segments in quartz veinlets at Little Long Lac and Tomhill mines, Little Long Lac area (H.S. Armstrong, 1944: Am. Mineralogist, 29, p. 314).

Quebec

21 E/15 Scheelite is found in quartz veins cutting Cambrian slates in Marlow Township, Beauce County, range VII, lot 1 (A.R.C. Selwyn, 1890: Geol. Surv. Can., Ann. Rept., V, p. 74A).

Chemical analysis of scheelite from Marlow Township, Beauce County, range VII, lot 1: WO_3 79.90, CaO 19.37, FeO 0.70, insol. 0.27, total 100.26; S.G. 6.059 (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., Pt. II, p. 21R).

32 C/3 32 C/4 Scheelite was found in a quartz vein associated with pyrite, chalcopyrite, and tellurbismuth at Buffadison Gold Mines, Louvicourt Township, Abitibi County (J. Claveau, W.N. Ingham, and W.R. Robinson, 1957: Que. Dept. Mines, Prelim. Rept., 256, p. 44).

Saskatchewan

63 K/12 Scheelite-bearing quartz veins lie along and near the contact of granite and greenstone at the south end of Phantom Lake (L.S. Beck, 1959: Can. Dept. Mines, Mines Br., Rept. 36).

Yukon

105 H/16 A deposit of scheelite with chalcopyrite in pyrrhotite-bearing skarn is located at lat. 61°50'N, long. 128°03'W (R. Skinner, 1961: Geol. Surv. Can., Paper 61-23, p. 46).

105 J/5 Chalcopyrite and scheelite are disseminated in pyrrhotite-bearing skarn zones on the south shore of Dragon Lake (R. Skinner, 1961: Geol. Surv. Can., Paper 61-23, p. 43).

105 I/7 A scheelite-bearing skarn zone about 100 feet wide is located in the Nahanni map-area, District of Mackenzie (R. Skinner, 1961: Geol. Surv. Can., Paper 61-23, p. 47).

105 M/11 Scheelite is found in the gold washings of Highet Creek, Duncan Creek mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 340A).

105 M/12
105 M/13 Scheelite is found in the gold washings at Haggart Creek, Minto Creek, Mayo River and Stewart River, Duncan Creek mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 340A).

106 D/4 Scheelite occurs in important amounts in the stream gravels along Dublin Gulch and some of its tributaries, and also in lode deposits (H.W. Little, 1959: Geol. Surv. Can., Econ. Geol. Ser., p. 17).

115 F/9
115 F/16
115 G/12
115 G/13 Crystals of scheelite occur with garnet and other contact silicate minerals in places where granitic intrusions are in contact with limestone, in the northwest Shakwak Valley directly north of the Alaska Highway between Kluane and Donjek rivers (H.S. Bostock, 1952: Geol. Surv. Can., Mem. 267, p. 42).

115 P Scheelite is found in the gold washings of the McQuesten River, Duncan Creek mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 340A).

SCHOEPITE

near $4UO_3 \cdot 9H_2O$

Schoepite is a secondary mineral formed by alteration of uraninite. The four strongest lines in the X-ray powder pattern have the following spacings and intensities: 7.49 (10), 3.64 (8), 3.26 (9) and 2.60 (7) (C. Frondel, 1958: U.S. Geol. Surv. Bull., 1064, p. 78).

Northwest Territories

86 D
86 E Schoepite was observed as a yellow crust on a specimen of massive uraninite from the Hottah Lake district (C. Frondel, 1956: Am. Mineralogist, 41, p. 556).

SCHORLOMITE

(See andradite)

SCOLECITE

$CaAl_2Si_3O_{10}.3H_2O$

Scolecite is a mineral of the zeolite group and a member of the natrolite (fibrous zeolite) subgroup. The spacings and intensities of the five strongest lines in the X-ray pattern are: 6.53 (3), 5.81 (4), 4.69 (3), 4.37 (5) and 2.86 (10) (C.J. Peng, 1955: Am. Mineralogist, 40, p. 834).

Nova Scotia

21 A/12 Scolecite is found below high tide level in the form of cream-white radiating masses several inches in diameter. Analysis of a sample from the east side of Digby Gut, Annapolis County, yielded: SiO_2 45.78, Al_2O_3 26.23, Fe_2O_3 0.07, CaO 13.66, Na_2O .70, K_2O 0.11, H_2O 13.44, total 99.99; S.G. 2.252 (T.L. Walker, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 67).

21 H/7
21 H/8 Scolecite has been noted at Cape D'Or and Two Islands, Cumberland County (E. Gilpin, 1881: Nova Scotia, Inst. Nat. Sci., vol., V, p. 293).

Quebec

21 L/3 Scolecite was found at Black Lake, Coleraine and Ireland townships, Megantic County (A.R.C. Selwyn, 1890: Geol. Surv. Can., Ann. Rept., V, p. 68A).

Scolecite occurs as crystals with diopside at the Jacob Asbestos Mine, Thetford, Megantic County (E. Poitevin, 1916: National Mineral Collection).

SCORODITE

$FeAsO_4.2H_2O$

Scorodite is a secondary mineral formed in gossans by the oxidation of arsenopyrite or other arsenic-bearing minerals. An isomorphous series appears to exist between scorodite and the aluminium analogue, mansfieldite. The X-ray powder pattern is characterized by three strong lines having the following spacings and intensities: 5.56 (10), 4.44 (10), and 3.16 (10) (V.T. Allen, J.J. Fahey and J.M. Axelrod, 1948: Am. Mineralogist, 33, p. 132).

New Brunswick

21 G/7 Scorodite occurs as an oxidation product in tin ore at Mount Pleasant (K.F.G. Hosking, 1963: Precambrian, vol. 36, No. 4, p. 20).

Ontario

31 E/1 Scorodite has been identified in a specimen from the property of Nu-Age Uranium Mines Limited, Cardiff Township, Haliburton County, conc. XXI, lot 8 (X-ray Laboratory, Geol. Surv. Can.).

31 F/4 A deep green scorodite is found associated with quartz, arsenopyrite, and realgar, 7 miles west of L'Amable Station on the Central Ontario Railway, conc. IX, Faraday Township, Hastings County (F.D. Adams and H.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, p. 205).

31 M/5 Scorodite occurs in very minute crystals associated with erythrite at the Nipissing Mine (vein 49), Cobalt area, Timiskaming district. Chemical analysis of scorodite gave: As_2O_5 41.09, Fe 21.55, NiO 8.87, CaO 4.57, H_2O by diff. 23.92, total 100.00 (R.P.D. Graham, 1913: Trans. Roy. Soc. Can., vol. VII, Ser. 4, p. 7).

Earthy incrustations of scorodite occur on oxidized smaltite at the Timiskaming and Hudson Bay mines in the Cobalt area. Chemical analysis of a yellowish pink sample which contained a very large amount of ferric iron: Fe_2O_3 8.73, CaO 21.43, NiO 3.95, As_2O_5 38.45, H_2O 24.22, CuO tr., As_2O_3 tr., insol. 290, S tr., total 99.68 (H.V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 240).

Yukon

105 M/14 Scorodite has been identified by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.) in specimens from the Silver Basin and Comstock properties and the Cream vein in the Mayo mining district, Keno, Sourdough and Galena Hill areas. The scorodite occurs as earthy greyish green coatings and crusts in the oxidized parts of vein faults (R.W. Boyle, 1956: Geol. Surv. Can., Paper 55-30) (R.W. Boyle, 1957: Geol. Surv. Can., Paper 57-1).

106 D/4 Scorodite is found coating a quartz ledge, between the heads of two small streams known as Twenty Pup and Forty Pup, which

106 D/4 flow into Dublin Gulch, a tributary of Haggart Creek, Duncan Creek mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, pp. 38, 39A).

SELENITE

(See gypsum)

SELENIUM

Se

Ontario

41 N/2 Selenium was identified by X-ray powder pattern in a sample from Consolidated Ranwick Uranium Mines Limited, Sault Ste. Marie district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

The X-ray powder pattern has six strongest lines with the following spacings and relative intensities: 3.83 (8), 3.04 (10), 2.08 (6), 2.01 (6), 1.774 (7) and 1.439 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 21).

SENARMONTITE

Sb_2O_3

Senarmontite is a secondary mineral formed by the oxidation of antimony-bearing minerals. It is dimorphous with valentinite. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.218 (10), 2.788 (4), 1.972 (4) and 1.681 (3) (H.E. Swanson *et al.*, 1954: Nat. Bur. Stds., Circ. 539, vol. III, p. 32).

Ontario

52 N/4 Transparent, colourless to white, octahedral crystals of senarmontite, up to 1 millimetre in size, were found together with kermesite on quartz and on partly leached stibnite at the Cochenour Willans Mine, Red Lake area. The senarmontite was identified by chemical texts and X-ray diffraction (M.H. Frohberg, 1960: private communication).

Quebec

21 E/12
21 E/13 Senarmontite occurs with native antimony, stibnite, valentinite and kermesite in South Ham Township, Wolfe County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 57T).

Yukon

106 D/4 Senarmontite was identified by X-ray diffraction pattern in a mineral concentrate from a gold placer deposit from Dublin Gulch, Mayo mining district (X-ray Laboratory, Geol. Surv. Can.).

SERICITE

(See muscovite)

SERPENTINE

$H_4Mg_3Si_2O_9$

The structures of the serpentine minerals consist of interlayered tetrahedral Si_2O_5 sheets and octahedral brucite sheets. Variations of the arrangement of these sheets give rise to several polymorphs, notably: clino-, ortho- and para-chrysotile; antigorite; lizardite; and 6-layer ortho-serpentine. Most fibrous serpentine (asbestos) is clino-chrysotile. Platy serpentine is commonly antigorite, and massive serpentine is often lizardite.

The spacings and intensities of the three strongest lines in the X-ray patterns are: 7.36 (vs), 3.66 (vs), and 2.50 (s) for chrysotile and lizardite; and 7.30 (vs), 3.63 (s) and 2.53 (vs) for antigorite (E.J.W. Whittaker and J. Zussman, 1956: Mineral. Mag., 33, p. 107).

British Columbia

92 H Serpentine deposits occur along or near fracture or shear zones in the greenstone underlying the Ladner series; Cache Creek Group; Coquihalla River, Yale district.

The pure serpentine has a beautifully bladed structure and blue birefringence. It is intersected by talc and calcite veinlets. A few grains of magnetite are present. The texture is minutely fibrous and bladed and seems to have resulted from gradual but complete replacement of both the feldspathic and the mafic minerals of the greenstone. Analysis by M.F. Connor: SiO_2 38.84, Al_2O_3 0.10, Fe_2O_3 6.49, FeO 3.60, MgO 36.90, CaO traces, Na_2O+K_2O 0.13, H_2O^+ 13.03, H_2O^- 0.27, MnO 0.14, CO_2 0.23, Cr_2O_3 0.37, NiO 0.16, total 100.26 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 372).

93 G Four occurrences of asbestos-carrying peridotite bodies are known in the west half of the Prince George map-area: (1) Sinkut Mountain, in a road cut 1/2 mile from the British Columbia forestry lookout; (2) on Bobtail Mountain, between elevations 3,700 and 4,200 feet on the extreme southwest ridge, 1 1/2 miles from the south end of Naltesby Lake (fibre lengths 1/4 to 1/2 inch); (3)

93 G on the west side of Telegraph Range from a point 6 1/2 miles on bearing 110 degrees from Tagai Lake (fibre 1/4 inch); (4) at a point 6 miles on a bearing 280 degrees from Baldy Hughes Mountain, 25 miles southwest of Prince George (fibre 1/16 inch) (--, 1961: Can. Mining J., vol. 82, No. 4, p. 156).

104 P/5 The Cassiar Asbestos property, on the northwest flank of Mount McDame about 3 miles north of Cassiar, contains chrysotile asbestos, in a serpentine body intrusive into argillite, chert, quartzite and greenstone (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 123).

Chemical analysis by J. A. Maxwell (1955) of typical fibrous asbestos from cross fibre veinlets up to 2 inches wide: SiO_2 42.24, Al_2O_3 0.48, Fe_2O_3 1.37, FeO 0.16, MgO 41.88, CaO nil, Na_2O nil, K_2O nil, H_2O^+ 12.49, H_2O^- 0.90, TiO_2 nil, P_2O_5 nil, MnO 0.05, CO_2 0.06, Cr_2O_3 0.16, NiO 0.17, total 99.96 (J. A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 374).

Newfoundland

12 B/15 Asbestos occurs in cross-fibre veins up to 1 inch wide in serpentinized rock in the Lewis Brook and Mine Cove regions of the Stephenville map-area (G. C. Riley, 1962: Geol. Surv. Can., Mem. 323, p. 55).

12 G/1
12 G/8 Asbestos occurs along the northeast side of Blow Me Down Mountain, northwest and southeast of Blow Me Down Brook, and in small ultrabasic layers in the gabbro that extends along the coast from Chimney Cove to north of Trout River, Bay of Islands area (C. H. Smith, 1958: Geol. Surv. Can., Mem. 290, p. 93).

12 H/16 A commercially developed asbestos orebody occurs in the Baie Verte region of Burlington Peninsula (Can. Mining J., vol. 81, No. 11, p. 135).

Ontario

31 C/15 Light grey asbestos, a fraction of an inch in width, occurs in thin lenses of greenish serpentine in limestone, in the Olden-Bedford area, Oso Township, conc. V, lot 11, Frontenac County (W. D. Harding, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. VI, p. 40).

31 F/7 Slip-fibre asbestos forms veins from paper thin to 3 inches in width in Blithfield Township, conc. IV, lot 22. The workings are 650 feet northwest of the Black Donald-Calabogie road (J. Satterly, 1944: Ont. Dept. Mines, Ann. Rept., vol. 53, Pt. VI, p. 19).

31 F/10 Chrysotile asbestos occurs in serpentinized limestone, 1/2 mile eastof Foresters Falls in lot 8, conc. IX, Ross Township (C. W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., Pt. L, p. 14).

32 D/4 Asbestos is found in the serpentinite sill that trends diagonally across the southwest corner of McElroy Township into Boston Township. Some veinlets are of good quality cross-fibre asbestos (E.M. Abraham, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. VI, p. 37).

32 D/11
32 D/12
32 D/13 Chemical analysis of serpentine from Abitibi Lake, Timiskaming district, by Harrington: SiO_2 38.48, Al_2O_3 4.15, FeO 9.24, NiO 0.28, MgO 35.73, H_2O 11.60, chromic iron 0.51, total 99.99; S.G. 2.77 (B.J. Harrington, 1872-73: Geol. Surv. Can., Rept. Prog., pp. 299, 300).

41 P/14
41 P/15 Asbestos stringers in highly serpentinized peridotite, lying at right angles to one another and confined to a band 6 feet in width have been found at claim TR 1,930 on the north shore of Lloyd Lake in Midlothian Township (H.J. Marshall, 1947: Ont. Dept. Mines, Ann. Rept., vol. 56, Pt. V, p. 21).

41 P/15 Veinlets of asbestos up to 1/4 inch wide have been found in a lenticular body of peridotite on the south shore of Rahn Lake in the Bannockburn area (C.H. Rickaby, 1941: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. II, p. 12).

42 A/6 Portions of serpentinite carry as much as 12 per cent asbestos veins at Campsell claim HR 968 in the Cochrane district, Deloro Township (M.B. Baker, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 274).

Serpentinite carrying 12 per cent asbestos veins was found at Slade-Forbes claim HR 368 in Deloro Township in the Cochrane district. The fibre is 2 inches in length and of good quality (H.G. Burrows, L.W. Knight, P.E. Hopkins, and A.L. Parsons, 1919: Ont. Dept. Mines, Ann. Rept., vol. 28, Pt. II, p. 66).

42 A/9 Asbestos deposits of varying quality occur on the property of Normalloy Explorations Limited, 25 miles east of Matheson (--, 1962: Can. Mining J., vol. 83, No. 1, p. 89).

Asbestos stringers, some of which are 1/2 inch in width, occupy an area of 50 feet by 300 feet in serpentinite at Abitibi-Night Hawk, Warden Township, conc. I, lots 6 and 7 (L.W. Knight, P.E. Hopkins, A.L. Parsons, and H.G. Burrows, 1919: Ont. Dept. Mines, Ann. Rept., vol. 28, Pt. II, p. 66).

Veinlets of chrysotile are exposed in an old pit on claims L.40537 and L.40538 in Harker Township about 700 feet south of its north boundary. The asbestos occurs in serpentinized dunite and has been estimated to constitute about 1 per cent of the rock (J. Satterly, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VII, pp. 34-24).

42 A/9 Chrysotile is present in serpentinized peridotite and dunite in McCool Township, conc. II, lot 4; and conc. IV, lots 2 and 10 (J. Satterly, 1952: Ont. Dept. Mines, Ann. Rept., vol. 61, Pt. V, pp. 14-23).

Asbestos was found in Munro Township, Cochrane district, at the following localities: conc. IV, lots 2, 3, 6; Strongford Asbestos Company Limited, conc. IV, lot 10, and conc. V, lot 1; Quebec Asbestos Corporation, conc. V, lots 5, 6, 7; and Flagro Mines Limited, conc. VI, lot 1 (J. Satterly, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VIII, p. 39).

Cross-fibre veins of asbestos ranging in width from 1/32 inch to 9/16 inch, and from harsh to semi-harsh variety occur at Orebody A, in Munro Township, Cochrane district, conc. II, lot 10 (J. Satterly, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VIII, p. 39).

Veinlets of picrolite cut serpentinized black peridotite and poikilitic pyroxene in McCool Township, conc. III, lots 1 and 3, and conc. IV, lots 2, 3, 4 (J. Satterly, 1952: Ont. Dept. Mines, Ann. Rept., vol. 61, Pt. V, p. 14).

Serpentinite containing asbestos fibres 1 inch in length occurs in the Abitibi-Night Hawk area, McCool Township, conc. IV, lots 8 and 10; and in Munro Township, conc. II, lot 8 (A.G. Burrows, L.W. Knight, P.E. Hopkins, and A.L. Parsons, 1919: Ont. Dept. Mines, Ann. Rept., vol. 28, Pt. II, pp. 26-66).

42 A/10 Veinlets of chrysotile up to 1/4 inch in width are present in the intensely crushed and fractured peridotite and dunite in lot 7, conc. V, Munro Township. Chrysotile at the Munro Mine property, Munro and Beattie townships, has been partly replaced by carbonates where the veins cut a talc-carbonate rock. The fibrous form however is retained (J. Satterly, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VIII, pp. 35, 37).

42 B/1 Asbestos of the picrolite variety occurs in a large outcrop of serpentinite at Dulama Gold Mines Limited, in the Keith-Muskego area, southwest corner of Keith Township, Sudbury district (V.K. Prest, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. VII, p. 39).

42 D/14 Veinlets of asbestos are found in a dyke of serpentine in the Schreiber-Duck Lake area, on the south shore of Bear Lake (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 6).

52 M/1
52 N/4 Serpentine asbestos occurs in veinlets or stringers with some carbonate at the Basin of Red Lake, between Trout Lake and Pipestone Bay (E.L. Bruce, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. IV, p. 18).

53 C/13 Narrow veinlets of chrysotile have been observed in greenstone in the Favourable-Sandy Lake area between Rathouse Bay and North Trout Lake (M.E. Hurst, 1925: Ont. Dept. Mines, Ann. Rept., vol. 38, Pt. II, p. 69).

Quebec

What are probably the largest deposits of asbestos in the world occur in a narrow band in the Eastern Townships. Producing mines are located mainly in the vicinities of Asbestos (21 E/13) Thetford Mines, Black Lake and East Broughton (21 L/3). The Jeffrey Mine at Asbestos is the world's largest asbestos mine.

Chemical analysis of coarse-fibre asbestos from Vimy Ridge, Megantic County, by R.J.C. Fabry: SiO_2 42.43, Al_2O_3 0.90, Fe_2O_3 0.90, FeO 1.56, MgO 40.69, CaO 0.13, H_2O 13.86, TiO_2 nil, MnO 0.11, total 100.58.

Chemical analysis of fine-fibre asbestos from Thetford by R.J.C. Fabry: SiO_2 39.99, Al_2O_3 1.19, Fe_2O_3 1.10, FeO 1.15, MgO 42.11, CaO trace, H_2O 14.52, TiO_2 nil, MnO 0.05, total 100.11.

Chemical analysis of an asbestos vein about an inch wide from the Bell pit, Thetford Mines, by R.J.C. Fabry: SiO_2 36.53, $Al_2O_3+Fe_2O_3$ 8.71, FeO 6.00, MgO 37.93, CaO 0.05, H_2O^+ 10.25, H_2O^- 0.32, CO_2 nil, total 99.79.

Chemical analysis of an asbestos vein from Lake Station, Ireland Township, by M.F. Connor: SiO_2 39.62, Al_2O_3 0.81, Fe_2O_3 4.52, FeO 1.90, MgO 39.73, CaO trace, H_2O^+ 13.32, H_2O^- 0.43, total 100.33.

Chemical analysis of serpentine from a vein about 1 inch wide, Lambly Mine, near Coleraine Village, by R.J.C. Fabry: SiO_2 36.61, Al_2O_3 nil, Fe_2O_3 12.63, FeO 3.29, MgO 36.69, CaO 0.07, H_2O^+ 10.33, H_2O^- 0.65, CO_2 0.10, NiO tr., total 100.37.

Chemical analysis of white serpentine from lower pit, Megantic Lambly Mine, Ireland Township, by R.J.C. Fabry: SiO_2 45.23, Al_2O_3 0.56, Fe_2O_3 0.44, FeO 0.08, MgO 40.28, CaO 1.07, H_2O^+ 12.19, H_2O^- 1.29, TiO_2 nil, MnO nil, CO_2 nil, S 0.14, total 101.28 less O for S 0.06, total 101.22 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, pp. 372-376).

21 E/12
21 E/13 Chemical analysis of serpentine from South Ham, Wolfe County, by Hunt: SiO_2 43.40, FeO 3.60, MgO 40.00, H_2O 13.00, total 100.00; S.G. 2.546 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 472).

21 L/3 Chemical analysis by E.A. Thompson, of commercial slip fibre from Quebec Asbestos Corporation at East Broughton: SiO_2 38.45, Al_2O_3 0.14, Fe_2O_3 3.15, FeO 0.86, CaO 0.00, MgO

21 L/3 41.18, H_2O^+ 11.86, H_2O^- 0.00, CO_2 4.45, total 100.09 (H.C. Cooke, 1937: Geol. Surv. Can., Mem. 211, p. 90).

21 L/9 Veinlets of cross-fibre asbestos in serpentinized peridotite have been found in the St. Magloire area, Talon Township, Montmagny County, range V, in the southeast half of lot 21 (J. Beland, 1952: Que. Dept. Mines, Prelim. Rept., 279, p. 11).

22 B/5 Picrolite, a fibrous, brittle variety of serpentine occurs along slip planes in the massive rock in Awantjish Township, Matapédia County, range IV, lots 10 and 11 (E. Aubert de la Rue, 1941: Que. Dept. Mines, Geol. Rept., 9, p. 30).

22 B/16 Chrysotile is present in the rocks of the Shickshock Mountain at Mont Albert, Gaspé (National Mineral Collection).

31 F/10 An analysis by Hunt, of chrysotile from Calumet Island, Pontiac County is as follows: SiO_2 41.20, MgO 43.52, Fe_2O_3 0.80, H_2O 15.40, total 100.92; S.G. 2.36-2.38 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 471).

31 G/10 An analysis by Hunt of chrysotile from Grenville Township, Argenteuil County is as follows: SiO_2 39.34, MgO 43.02, Fe_2O_3 1.80, H_2O 15.09, total 99.25; S.G. 2.47-2.52 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 471).

Chemical analysis of honey-yellow grains of serpentine separated from white lamellar dolomite, Grenville Township, by T.S. Hunt, 1857: SiO_2 44.10, Fe_2O_3 1.15, MgO 40.05, H_2O 14.70, total 100.00 (J.A. Maxwell *et al.*, 1965: Geol. Surv. Can., Bull. 115, p. 373).

31 G/15 A somewhat mottled green to yellow serpentine which has been used for paper weights was found associated with magnesite at underground workings of Canadian Refractories Limited, at Kilmar, Argenteuil County (A.L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 47).

31 H/1
31 H/8 Analysis of picrolite from Bolton, Brome County, by Hunt, yielded: SiO_2 43.70, MgO 40.68, FeO 3.51, NiO undet., Cr_2O_3 undet., H_2O 12.45, total 100.34; S.G. 2.607.

Analyses of serpentine from Orford Township, Sherbrooke County, range XVIII, lot 10, by Hunt: (1) SiO_2 40.30, FeO 7.02, NiO 0.26, Cr_2O_3 tr., MgO 39.07, H_2O 13.35, total 100.00; S.G. 2.597; (2) SiO_2 42.90, FeO 7.47, NiO 0.15, Cr_2O_3 0.25, MgO 36.28, H_2O 13.14, total 100.19 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 472).

Yukon

105 C/6 Cross-fibre veins of chrysotile asbestos up to 1 inch in width have been found on Hayes Peak, Teslin map-area (R. Mulligan, 1963: Geol. Surv. Can., Mem. 326, p. 78).

115 A/13 The Kathleen River asbestos deposit lies 6 1/2 miles east-southeast of Haines Junction, and about 1 mile west of Kathleen River. Asbestos veins are up to 7 inches wide, but are commonly less than 1/2 inch (R. Skinner, 1962: Geol. Surv. Can., Paper 62-27, p. 35).

SHERIDANITE

(See chlorite)

SIDERITE

$FeCO_3$

Siderite is widespread as a bedded deposit in sedimentary rocks, associated with clay, shale, or coal seams. It also occurs in hydrothermal veins and replacement deposits. A complete solid solution series exists between magnesite and siderite through substitution of Mg for Fe. Some substitution of Mn, Co and Ca for Fe may also take place.

The X-ray powder pattern of siderite has three strongest lines at: 3.60 (4), 2.80 (10) and 1.737 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 218).

British Columbia

93 A/3 Siderite occurs as massive globular concretions filling amygdaloidal cavities in basalt on Mussel Creek, a branch of Moffat Creek, which flows into the Horsefly River (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, pp. 14, 15R).

New Brunswick

21 J/7 Siderite occurs as float at Rocky Brook in York County (W.H. Poole, 1958: Geol. Surv. Can., Map 11-1958).

21 P/5 Lenses of siderite occur in sedimentary and volcanic rocks at the Drummond Iron Mine, in Gloucester County (New Brunswick Mines Branch, files).

Northwest Territories

34 C/2 Analysis of siderite from Flint Island (56°04'N, 76°49'W) by Harrington: Fe CO_3 52.70, Mn CO_3 24.64, Ca CO_3 tr.,

34 C/2 Mg CO_3 11.81, insol. 10.94, total 100.09 (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 47G).

Nova Scotia

11 E/5 Siderite occurs in masses and intersecting veins with ankerite at West Mines, Londonderry, Colchester County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 58T).

Specimens of brown siderite from New Mines, Acadia Mine, Londonderry, Colchester County, are in the National Mineral Collection.

Specimens of small dark brown rhombohedral crystals of siderite from Ferrona, Pictou County are preserved in the National Mineral Collection.

11 F/5 Specimens of brown siderite from Copper Lake, Antigonish County are present in the National Mineral Collection.

21 H/8
21 H/9 Siderite occurs at the Ankerite quarry in the Cobequid Mountains. Analysis by H. Louis: Fe CO_3 67.96, Mn CO_3 2.19, Mg CO_3 27.87, Ca CO_3 1.03, insol. 0.43, total 99.48; S.G. 3.523 (H. Louis, 1879: Nova Scotia Inst. Nat. Sci., vol. V, p. 50).

Ontario

41 N/15
42 C/2
42 C/8 A range of siderite lies along the crest and northern side of a broad high ridge in the Michipicoten iron ranges. The dense light grey or pink siderite contains some pyrite grains (W.H. Collins, T.T. Quirke, and E. Thomson, 1926: Geol. Surv. Can., Mem. 147, p. 83).

42 C/2 Brown, compact siderite with subconchoidal fracture, from the Magpie Mine at Michipicoten in the Algoma district, is included in the National Mineral Collection.

SIEGENITE

(See linnaeite)

SILLIMANITE

Al_2SiO_5

Sillimanite is one of three polymorphs of Al_2SiO_5, the others being andalusite and kyanite. It is found in high-grade thermally metamorphosed pelitic rocks. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.41 (9), 3.36 (10), 2.53 (9), 2.20 (10) and 1.52 (9) (ASTM card 10-369).

Manitoba

53 O/13
63 K/13
The nickel ore of the Thompson-Moak Lake belt contains sillimanite. The mineral assemblage is typical of the almandine-amphibolite facies, sillimanite-almandine-orthoclase subfacies (H. D. B. Wilson and W. C. Brisbin, 1961: Can. Inst. Mining Met., Bull., vol. 54, No. 594, p. 821).

Northwest Territories

26 B/15 Sillimanite-bearing gneisses, containing massive euhedral to subhedral, medium-to fine-grained, bladed or tabular crystals of sillimanite are prominent in the Chidliak Fiord area, Baffin Island (G. C. Riley, 1960: Geol. Surv. Can., Bull. 61, p. 47).

Nova Scotia

21 A/2 Sillimanite from the seashore of Eastern Head, Liverpool Bay, Queens County, was donated to the National Mineral Collection by E. R. Faribault in 1912.

Ontario

31 F/4 A band of sillimanite-rich paragneiss, striking east-west and dipping steeply south, is found in Dungannon Township, Hastings County, conc. X, lot 22 (D. F. Hewitt and W. James, 1955: Ont. Dept. Mines, Ann. Rept., 64, Pt. VIII, p. 59).

31 F/5 Sillimanite in fine needle-like aggregates can be found in zones up to 10 feet wide in interbanded amphibolite and sillimanite-garnet-biotite paragneiss in Carlow Township, Hastings County, on the border of concs. XI and XII, lot 21 (D. F. Hewitt, 1954: Ont. Dept. Mines, Ann. Rept., vol. 63, Pt. VI).

31 F/6 Fine-grained, fibrous, radiating aggregates of sillimanite, which make up 20 to 30 per cent of the rock, form narrow bands in amphibolite in Lyndoch Township, conc. XV, lot 34 (D.F. Hewitt, 1953: Ont. Dept. Mines, Ann. Rept., vol. 62, Pt. V, p. 85).

41 H/14 Sillimanite occurs as stick-like crystals up to 2 1/2 inches long and 1/4 inch in diameter on an island in the centre of the northern part of Beaverstone Bay near Collins Inlet on Georgian Bay. The crystals weather into relief which can be seen from distances of 40 or 50 feet. Garnet and graphite occur with the sillimanite (T. T. Quirke and W. H. Collins, 1930: Geol. Surv. Can., Mem. 160, pp. 77, 78).

41 I/7 Fibrous sillimanite can be found in Dryden Township at the first cutting east of Wanapitei; and in conc. II, lot 9 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 206).

Quebec

12 L/8 Sillimanite occurs as long, slender, glossy, colourless crystals up to 1/2 inch in length on an island opposite Romaine, near the confluence of the Romaine River and the St. Lawrence River. Chemical analysis by E.W. Todd: SiO_2 36.70, Al_2O_5 62.73, Fe_2O_3 0.63, total 100.06; S.G. 3.209 (T.L. Walker and A.L. Parsons, 1923: Univ. Toronto Stud., Geol. Ser., 16, p. 36).

12 M/5
12 M/12 Tabular crystals of sillimanite are found in the paragneiss of the Upper Romaine River area in Saguenay County, between the Petite Romaine and Touladis rivers (J. Claveau, 1949: Que. Dept. Mines, Geol. Rept., 38, p. 14).

22 J/9 Sillimanite is found in quartzite with feldspar, biotite and large garnet porphyroblasts, 7 miles south of Irene Lake in the Nipissis River area, Saguenay County (P.E. Grenier, 1952: Que. Dept. Mines, Prelim. Rept., 272, p. 5).

31 G/15 A sillimanite paragneiss, containing about 2 to 5 per cent sillimanite can be found near the roadside, at the south end of Papineau Lake, Papineau County, in the Simon Lake area (C. Faessler, 1948: Que. Dept. Mines, Geol. Rept., 33, p. 23).

31 I/16 Sillimanite is rare in the ore zone at Montauban-les-Mines and Tetrault Mines, Portneuf County, but it is an essential mineral of the paragneisses and an accessory of the migmatites (J.J. O'Neill and F.F. Osborne, 1938: Que. Dept. Mines, Prelim. Rept., 138, p. 18).

SILVER

Ag

Native silver is found in the primary zones of hydrothermal deposits and to a lesser extent in oxidized zones of ore deposits. Silver forms a complete solid solution series with Au; it may contain large amounts of Hg and, less commonly, Cu, As, Sb, Bi and Pt. Mercurian silver is called amalgam or arquerite.

The five strongest lines in the X-ray powder pattern of silver have the following spacings and intensities: 2.34 (10), 1.228 (8), 0.936 (7), 0.934 (8), and 0.786 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 11).

British Columbia

82 E/4 Native silver occurs in a quartz vein, 3 feet wide and several hundred feet long, at the Horn Silver Mine, near Richter Mountain in the west half of the Kettle River area (C.E. Cairnes, 1937: Geol. Surv. Can., Paper 37-21).

82 F/10 Native silver occurs as plates in fractures at the Silver Hoard Mine in the Ainsworth mining division (S. T. Schofield, 1920: Geol. Surv. Can., Mem. 117, p. 32).

82 G/12 Specimens of native silver were collected in 1935 by H. M. A. Rice from a placer deposit on Wildhorse Creek in the west half of the Fernie map-area (X-ray Laboratory, Geol. Surv. Can.).

93 N/11 Arquerite has been found with gold as scales and nuggets at Vital and Silver creeks in the Omineca mining division (G. M. Dawson, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 42R). Chemical analysis of arquerite from Vital Creek by Riotte and Leckhardt: Ag 83.30, Hg 11.00, Pb 0.40, Cu 0.20, Au, Pt, Fe trace, total 94.90 (G.M. Dawson, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 26R).

93 N/15 A nugget of mercurian silver, about 8 millimetres in greatest dimension was found in a placer deposit near Germansen Landing in the Omineca mining district. The specimen, which contained 80.2 per cent silver gave an X-ray diffraction pattern with the following strongest lines: 2.39 (10), 2.07 (8), 1.455 (6) and 1.240 (7) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 11).

Northwest Territories

86 E/9 Native silver occurs in a vein in fractured diabase, 9 miles from the mouth of the Camsell River in the Mackenzie district (D. F. Kidd, 1936: Geol. Surv. Can., Mem. 187, p. 30).

86 F/13 The ore zone at the Contact Lake Mine near Port Radium in the Great Bear Lake region consists of veins of quartz and carbonate minerals, containing shoots of native silver, hematite, pyrite, chalcopyrite, magnetite, bornite, pitchblende, arsenopyrite, chalcocite, tetrahedrite, cobaltite, niccolite, sphalerite, galena, native bismuth, argentite, malachite, azurite and erythrite (A. H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 18).

Ontario

31 M/5 Native silver was discovered at Cobalt in 1903 and the findings soon spread to the surrounding districts of Gowganda and South Lorrain and the townships of Casey, James, Maple Mountain, Speight and Whitson. The silver occurred in films, flakes, wires and flattened masses, and was usually accompanied by argentite and native bismuth. The famous 'silver sidewalk' of the La Rose Mine was reported to have been almost solid native silver for a length of 100 feet and to have yielded 658,000 ounces of silver. The high-grade veins contained a great variety of minerals, of which the chief were calcite, smaltite, niccolite and native silver. Pyrargyrite, proustite, argentite, millerite, chalcopyrite, sphalerite and galena were also abundant (C. H. Stockwell et al., 1957: Geol. Surv. Can., Econ. Geol. Ser., No. 1, p. 67).

31 M/5 Antimonial silver, which is harder and tougher than pure silver and has a yellowish bronze colour, has been found at the Timiskaming Mine at Cobalt. Chemical analysis by E. W. Todd: Ag 92.19, Sb 6.78, As 0.45, total 99.42; S.G. 10.01 (M. A. Peacock, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 42) (M. A. Peacock and L. G. Berry, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 52).

41 I/6 Native silver has been found in galena- parkerite-rich ore and also in bornite-bearing ore from the lower levels of the Frood Mine, Sudbury (J. E. Hawley and R. J. Stanton, 1962: Can. Mineralogist, 7, p. 41).

41 I/11 Native silver, smaltite, niccolite and chalcopyrite occur in a gangue of calcite and quartz at Gowganda in the Onaping area, Sudbury district (W. H. Collins, 1917: Geol. Surv. Can., Mem. 95, p. 119).

41 P/9 Filiform native silver from Downey Lake, James Township, Timiskaming district has been donated to the National Mineral Collection by A. E. Barlow.

Specimens of native silver found at the Tucky Godbrey Mine, James Township, and the Elk Lake Albanie Mine at Elk Lake are part of the National Mineral Collection.

41 P/10 Dendritic silver occurs in a greenish black diabase at the O'Brien Mine on Miller Lake in the Gowganda area. The central skeletal cores of pale yellow native silver are surrounded by relatively thick crusts of a succession of cobalt-nickel arsenides (A. Montgomery, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 23).

Quebec

31 F/10 The National Mineral Collection includes native silver from range IV, lot 10, Calumet Township, Pontiac County.

Yukon

105 M/14 Native silver occurs as thin films on galena and wiry forms in vugs and small openings in vein faults at Keno, Sourdough and Galena Hill areas, Mayo mining district. It has also been observed in ice lenses (R. W. Boyle, 1956, 1957: Geol. Surv. Can., Papers 55-30 and 57-1).

115 G/6 Small amounts of mercurian silver have been recovered from Burwash Creek, Kluane River district (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 30).

SKUTTERUDITE

$(Co, Ni)As_3$

The name skutterudite has been used as a general name for the cobalt-nickel arsenide solid solution series comprising the minerals skutterudite, smaltite and chloanthite. It has also been used for the Co-rich and As-high member of the series to distinguish it from Co-rich As-deficient smaltite and the Ni-rich As-deficient chloanthite. Iron is commonly present in substitution for Co and Ni in amounts up to about 12 per cent. The X-ray powder pattern of skutterudite (also smaltite and chloanthite) shows four strongest lines with the following spacings and relative intensities: 2.61 (10), 2.20 (8), 1.841 (9) and 1.616 (9) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 117).

British Columbia

93 M/4 Skutterudite shows cubic outlines on massive areas and appears to replace both arsenopyrite and löllingite in polished specimens from the Hazelton View Mine. The mine is located between 5,100 feet and 6,025 feet on the north slope of Rocher Déboulé Mountain, 4 miles south of South Hazelton in the Omineca mining district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 453).

Northwest Territories

86 K/4 Skutterudite is present as a minor constituent in the form of long skeleton crystals sparsely scattered through quartz gangue, in claims on the north shore of Contact Lake, on the property of Bear Exploration and Radium Company, Limited (E. Thomson, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 27).

86 L/1 Skutterudite occurs at the Eldorado Mine at Great Bear Lake as isolated remnants of crystals of cubic habit associated chiefly with the common metallic minerals, and as zoned crystals of variable composition. In the latter form of occurrence the mineral may appear in a fairly massive aggregate of crystals or as individual crystals associated with native bismuth (E. Thomson, 1923: Univ. Toronto Stud., Geol. Ser., 32, p. 43).

Ontario

31 M/3 Skutterudite is found in association with chloanthite and löllingite at the Keeley Mine in the South Lorrain section of the Cobalt district (J.M. Bell and E. Thomson, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 27).

31 M/5 Small brilliant crystals of skutterudite imbedded in fragments of soft chloritic or micaceous rock can be found at the Timiskaming Mine, Cobalt (T.L. Walker, 1921: Am. Mineralogist, 6, p. 54).

31 M/5 Skutterudite occurs with löllingite and in places is the major constituent of the ore veins at the La Rose Mine, Cobalt (T.L. Walker and A. L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 9).

Skutterudite occurs 2 miles southeast of Cobalt on the shore of Cross Lake on the property of M. J. O'Brien Limited. It is associated with a variety of other sulphides (E. Thomson, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 41).

Skutterudite is associated with silver and löllingite in veins at the O'Brien Mine on Miller Lake, Gowganda. Calcite is the common gangue mineral (E. Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61).

41 P/10 Skutterudite forms rims around radiating intergrowths of löllingite and safflorite and is also present as cubic grains in specimens from No. 4 crosscut, Castle Trethewey Mine, in the Gowganda area (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 67).

SMALTITE

$(Co, Ni)As_{3-x}$

Smaltite is the Co-rich As-deficient member of the skutterudite series. X-ray powder diffraction data are listed under skutterudite.

Ontario

31 C/5 Smaltite has been noted in the iron ore at the Dominion Mine, Madoc Township, Hastings County, conc. II, lot 2 (G.M. Dawson, 1895: Geol. Surv. Can., Ann. Rept., VIII, pp. 129, 129A).

31 M/5 Smaltite crystals embedded in dolomitic gangue occur at the Foster Mine in the Cobalt area. The crystals are slightly distorted cubes with small octahedral and still smaller rhombic dodecahedral faces. Some of the cubes reach a size of 5 millimetres (H. V. Ellsworth, 1916: Ont. Bur. Mines, Ann. Rept., vol. 25, Pt. I, p. 209).

41 P/10 Massive smaltite is reported from an open cut in a calcite vein at No. 1 shaft, Hudson Bay Mine, Leith Township, Gowganda area (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 42).

Isolated, well-formed, isometric crystals of smaltite occur in niccolite and timiskamite, at the Coleroy Mine, Gowganda area (E.W. Todd, 1926: Ont. Dept. Mines, Ann. Rept., vol. 35, Pt. III, p. 76).

41 P/10 Calcite veins varying in width from 1 to 4 inches, containing smaltite and sulphides, occur at the O'Brien Mine, Miller Lake, Gowganda area (E. Thomson, 1933: Univ. Toronto Stud., Geol. Ser., 35, p. 61).

Aggregations of smaltite were encountered in calcite veins at the 30-foot level of the Silver Bullion Mine, Nicol Township, Gowganda area (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 34).

41 P/15 Smaltite, associated with massive bornite and native silver can be found in veins of calcite varying in width up to 6 inches at claim L.O. 305, Morel Township, in the Gowganda area (A.G. Burrows, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. III, p. 44).

Quebec

31 M/3 Small veins of smaltite have been reported at Fabre, near Lake Timiskaming, Timiskaming County (J. Obalski, 1907: Mining Operations in Quebec, p. 57).

SMITHSONITE

$ZnCO_3$

Smithsonite is a secondary mineral found chiefly in the oxidized zone of ore deposits, or as a replacement of calcareous rocks adjacent theréto, and derived by the alteration of primary zinc minerals. The five strongest lines in the X-ray powder pattern have the following spacings and relative intensities: 3.55 (5), 2.750 (10), 2.327 (3), 1.946 (3) and 1.703 (4) (H.E. Swanson et al., 1959: Nat. Bur. Stds., Circ. 539, vol. 8, p. 69).

British Columbia

82 K/10 Smithsonite was found accompanying sphalerite, galena, siderite, tetrahedrite, pyrite, and pyrargyrite in a gangue composed of crushed and brecciated slate, calcite and quartz in the Alamo Mine, at the head of Hauser Creek, Slocan mining division (G.C. Hoffmann, 1895: Geol. Surv. Can., Ann. Rept., VIII, p. 14R).

SOAPSTONE

(See talc)

SODALITE

$Na_4Al_3Si_3O_{12}Cl$

Sodalite is a member of the feldspathoid group of alkali aluminosilicates that form in place of feldspars in alkali-rich, silica-deficient rocks. It commonly has an attractive blue colour and may be cut and polished as an ornamental stone or gemstone. The spacings and intensities of the four strongest lines in the X-ray powder pattern of sodalite are: 6.30 (2), 3.63 (10), 2.37 (2) and 2.08 (3) (ASTM card 3-338).

British Columbia

82 N/1 A light corn-flower blue sodalite of great beauty is found in some abundance in the vicinity of Ice River, a tributary of the Beaverfoot River in the Golden mining division (D.S.M. Field, 1951: Can. Mining J., vol. 72, Pt. 2, Sept., pp. 82, 83).

Chemical analysis of sodalite from Ice River: SiO_2 37.50, Al_2O_3 31.82, Fe_2O_3 0.01, Na_2O 19.34, K_2O 0.27, Na 4.61, Cl 7.12, total 100.67; S.G. 2.293 (B.J. Harrington, 1886: Trans. Roy. Soc. Can., Ser. 1, vol. IV, Sec. III, p. 81).

Ontario

31 F/4 Sodalite occurs in Dungannon Township, Hastings County, conc. XIII, lot 29, and conc. XIV, lot 25 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 208).

Chemical analysis of sodalite from Dungannon, Hastings County, by Harrington: SiO_2 36.58, Al_2O_3 31.05, FeO 0.20, Na_2O 24.81, K_2O 0.79, Cl 6.88, SO_3 0.12, H_2O 0.27, insol. 0.80, total 101.50, less O for Cl 1.55, total 99.95 (B.J. Harrington, 1894: Am. J. Sci., Ser. 3, vol. 48, p. 17).

Sodalite-bearing nepheline rock occurs in tongues which are in immediate contact with impure crystalline limestone, Dungannon Township, Hastings County, near Bancroft. Chemical analysis by H.C. Rickaby yielded: SiO_2 37.08, Al_2O_3 32.58, CaO 0.50, MgO 0.03, MnO tr., Na_2O 22.26, K_2O 0.53, H_2O 0.67, CO_2 0.32, Cl 6.82, total 100.79 (A.L. Parsons, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 18) (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 6).

Nuggets of blue translucent flawless sodalite occur northeast of Bancroft on the York River, Dungannon Township, Hastings County (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 79).

Hackmanite, a variety of sodalite which undergoes a remarkable colour intensification following brief exposure to ultraviolet light, 31 F/4 occurs near Bancroft, Dungannon Township, Hastings County (D. L. Lee, 1936: Am. Mineralogist, 21, p. 714) (R. D. Kirk, 1955: Am. Mineralogist, 40, p. 22).

Quebec

31 H/2 Sodalite occurs in the nepheline syenite at Brome, Brome County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 58T).

31 H/5
31 H/12 Chemical analysis of sodalite from Montreal, Hochelaga County: SiO_2 37.52, Al_2O_3 31.38, Fe_2O_3 tr., CaO 0.35, MgO tr., Na_2O 19.12, K_2O 0.78, Na 4.48, Cl 6.91, total 100.54; S.G. 2.220 (B. J. Harrington, 1886: Trans. Roy. Soc. Can., Ser. 1, vol. IV, sec. III, p. 81).

31 H/11 Sodalite occurs at Beloeil, Rouville County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 58T).

SOLUBLE ANHYDRITE

(See bassanite)

SOUESITE

(See nickel-iron)

SPENCERITE

$Zn_4(PO_4)_2(OH)_2 \cdot 3H_2O$

British Columbia

82 F/6 This rare mineral was found at the Hudson Bay Mine about five miles east of Salmo, near Nelson, in the West Kootenay district. The mineral forms the central portions of stalactitic growths, being surrounded by a shell of hemimorphite. Chemical analyses by Walker: ZnO 60.18, 60.18; P_2O_5 26.14, 26.23; H_2O (at 160°) 9.79, 9.83; H_2O (at 200°) 3.53, 3.47; total 99.64, 99.71. Chemical analysis by Widdowson: ZnO 60.05, P_2O_5 26.74, H_2O 13.70, MnO 0.41, SiO_2 0.40, total 101.30; S.G. 3.14 (T. L. Walker, 1916: Mineral. Mag., 18, pp. 76-81).

The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 9.0 (8), 4.6 (8), 3.49 (10), 2.34 (6) and 1.529 (8) (Ann P. Sabina and R. J. Traill, 1960: Geol. Surv. Can., Paper 60-4, p. 96).

SPENCITE

$(Ca, Fe)_2(Y, La)_3(Si, B, Al)_8(O, OH, F, Cl)_{20}$

Ontario

31 F/4 This new borate-silicate of calcium and yttrium was named after the Canadian mineralogist Hugh S. Spence, who collected the mineral in 1934 from a prospect pit in Cardiff Township, lot 7, conc. XX, Haliburton County. It occurred as dark reddish brown masses in a narrow pegmatite stringer in a vuggy pyroxenite, associated with calcite, apatite, diopside, fluorite and wernerite. X-ray diffraction data could not be obtained because the mineral is metamict and decomposes on heating before it recrystallizes. Chemical analysis by C.O. Ingamells: Na_2O 0.11, K_2O 0.01, MgO 0.50, CaO 7.81, SrO 0.05, Fe_2O_3 3.22, FeO 0.00, MnO 0.60, Y_2O_3 17.77, La_2O_3 0.73, CeO_2 2.49, Pr_6O_{11} 0.54, Nd_2O_3 1.84, Sm_2O_3 1.07, Eu_2O_3 0.14, Gd_2O_3 1.61, Tb_4O_7 0.34, Dy_2O_3 1.92, Ho_2O_3 0.50, Er_2O_3 1.99, Tm_2O_3 0.31, Yb_2O_3 2.88, Lu_2O_3 0.27, ThO_2 1.84, Al_2O_3 3.87, TiO_2 0.27, B_2O_3 10.04, SiO_2 24.89, P_2O_5 0.02, Cl 0.45, F 0.44, H_2O^+ 9.82, H_2O^- 1.93, total 100.27, less O for F, Cl 0.28, total 99.99 (C. Frondel, 1961: Can. Mineralogist, 6, pp. 576-581) (O.I. Joensuu and C.O. Ingamells, 1966: Can. Mineralogist, 8, pp. 647, 648).

SPERRYLITE

$PtAs_2$

This rare precious metal mineral was first described in 1889 and named after F.L. Sperry, a chemist of Sudbury, Ontario, who first found the mineral in the gossan of the Vermilion Mine.

The X-ray powder pattern has five strongest lines with the following spacings and relative intensities: 2.98 (6), 1.801 (10), 1.148 (7), 0.798 (6) and 0.777 (9) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 89).

British Columbia

92 I/4 Sperrylite has been found in the black sand of the Fraser River, near Lytton. One highly modified cubic crystal and several hard tin-white rounded grains were identified by X-ray powder pattern (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

Ontario

41 I/6 Chemical analysis of sperrylite, by Wells, from the Vermilion Mine, conc. IV, lot 6, Denison Township, Sudbury district

41 I/6 yielded: As 40.98, Sb 0.50, Pt 52.57, Rh 0.72, Pd tr., Fe 0.07, SnO_2 4.62, total 99.46; S.G. 10.602 (H.L. Wells, 1889: Am. J. Sci., Ser., 3, vol. XXXVIII, pp. 67-73).

SPESSARTINE

$Mn_3Al_2(SiO_4)_3$

The name spessartine (or spessartite) is applied to the dominantly manganese-aluminium compositional variety of the garnet group. Lesser amounts of ferrous iron, magnesium and calcium are commonly present in the mineral. Spessartine is dark red to black in colour and less common than most of the other garnet species. It has been found in skarn deposits, metamorphosed sedimentary rocks and granitic pegmatites. The spacings and intensities of the four strongest lines in the X-ray powder pattern of spessartine are: 2.60 (10), 1.61 (6), 1.55 (8) and 1.08 (7) (ASTM card 2-992).

Quebec

31 G/13 Chemical analysis of spessartine from the Villeneuve Mica Mine, Villeneuve Township, range I, lot 31, yielded: SiO_2 36.30, Al_2O_3 19.20, FeO 10.66, MnO 30.06, CaO 3.07, MgO 0.43, loss on ign. 0.31, total 100.03 (B.J. Harrington, 1890-91: Can. Rec. Sci., IV, p. 226).

32 C/5 Spessartine occurs as bright yellow to orange-yellow grains, uniformly distributed throughout a spodumene pegmatite, south of Lake Lortie, Lacorne Township, Abitibi County. Chemical analysis by H.V. Ellsworth: SiO_2 38.2, Al_2O_3 20.8, Fe_2O_3 + FeO 2.2, MgO 0.4, CaO 0.4, MnO 38.0, total 100.0; S.G. 4.279 (L.P. Tremblay, 1950: Geol. Surv. Can., Mem. 253, p. 47).

32 D/8
32 D/9 Spessartite is associated with spodumene in an essentially quartz-muscovite-albite-microcline assemblage in Figuery Township, Abitibi-East County, range II, lot 36 (W.W. Weber, 1959: Que. Dept. Mines, Prelim. Rept., 257, p. 15).

SPHALERITE

ZnS

Sphalerite is the most common zinc mineral and principal economic source of zinc. It occurs in an unusual variety of colours for a sulphide mineral, ranging from white, almost colourless (cleiophane), to black (black jack). Sphalerite often contains considerable iron (marmatite) and lesser amounts of cadmium (pribramite) and manganese. Because of the very large number of reported occurrences of sphalerite in Canada (the New Brunswick Research and Productivity Council lists more than 100 localities in that province alone) only a few representative occurrences are noted here. The alternative name, blende, is widely used, especially in Europe.

The spacings and intensities of the three strongest lines in the X-ray powder pattern of sphalerite are: 3.12 (10), 1.910 (8) and 1.631 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 48).

British Columbia

82 E/6 Sphalerite, varying in colour from light amber to black, occurs at the Highland Bell Mine on Wallace Mountain, near Beaverdell, 23 miles east of Penticton, in the Greenwood mining division. Chemical analysis by R.N. Williams: Zn 58.30, Cd 0.55, Fe 7.15, Mn 0.09, Cu 1.20, S 32.27, As tr., Sb tr., Pb tr., insol. 0.24, total 99.50 (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 28).

82 F/9
82 F/10 The Sullivan orebody, near Kimberley, is a sulphide replacement of argillaceous sediments, and the Bluebell orebody, near Riondel, is a sulphide replacement of limestone. Sphalerite and galena are the main minerals and they are associated with pyrrhotite and pyrite (N. Campbell and W.T. Irvine, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, p. 155).

82 K/3 The National Mineral Collection includes tetrahedral crystals of translucent sphalerite from the Lucky Jim Mine at Slocan in the west Kootenay district.

82 N/8 Resin yellow sphalerite occurs at the Monarch Mine, 3 miles east of Field in the Golden mining division (J.D. Galloway, 1915: Rept. of Minister of Mines, British Columbia, pp. K80-82).

104 P/3 Sphalerite, galena, chalcopyrite, scheelite and hydrozincite occur in a shear zone in limestone at the McDame Belle property on McDame Creek about 1 mile east of Centerville (H. Gabrielse, 1963: Geol. Surv. Can., Mem. 319, p. 114).

Manitoba

63 I/6
63 I/7 A lenticular replacement body containing sphalerite, galena, chalcopyrite, jamesonite and freibergite occurs in the Echimamish area, 45 miles northeast of Norway House (T.L. Tanton, 1937: Geol. Surv. Can., Paper 38-18, p. 16).

63 J/13 Seven massive sulphide deposits of the type pyrite-pyrrhotite-sphalerite-chalcopyrite-galena have been investigated in the Snow Lake-Herb Lake area (J.F. Davies, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, p. 142).

63 K/13
63 K/14 Massive copper-zinc sulphide orebodies consisting mainly of pyrite but with minor sphalerite and chalcopyrite are located

63 K/13 63 K/14 in the Flin-Flon and Sherridon areas (C. H. Stockwell, 1946: Geol. Surv. Can., Paper 46-14, p. 4).

New Brunswick

For an extensive listing of occurrences of sphalerite and other metallic minerals see: The Occurrences of Economic Minerals, Rocks and Fuels in New Brunswick, Part B, Metallic, by the New Brunswick Research and Productivity Council, edited by D. Abbott, 1965.

21 G/7 Sphalerite occurs in rhyolite at Mount Pleasant, Charlotte County, along with cassiterite, stannite, chalcopyrite, bornite, chalcocite, tennantite, covellite, galena, molybdenite, wolframite and scheelite (A. A. Ruitenberg, 1963: M. Sc. thesis, Univ. of New Brunswick).

21 O 21 P A large number of occurrences are known in the Bathurst-Newcastle area in Restigouche, Gloucester and Northumberland counties. These include several important massive sulphide base metal orebodies, notably Brunswick, Heath Steele, and Wedge, in which the main associates of sphalerite are: pyrite, pyrrhotite, arsenopyrite, chalcopyrite and galena (Supriya Roy, 1961: Geol. Surv. Can., Bull. 72) (A. L. McAllister, 1960: Can. Inst. Mining Met., Bull. 53, No. 574, pp. 88-98).

Newfoundland

12 A/15 Sphalerite is an important constituent of the massive sulphide orebodies at Buchans. It is associated with chalcopyrite, galena, pyrite and barite (D. M. Baird, 1960: Can. Inst. Mining Met., Bull. 53, No. 574, pp. 77-80).

12 G/1 Massive sulphides (pyrite, chalcopyrite and sphalerite) occur in sheared fragmental chloritized andesite at York Harbour (D. M. Baird, 1960: Can. Inst. Mining Met., Bull. 53, No. 574, pp. 77-80).

Northwest Territories

85 B/16 Sphalerite, galena and marcasite occur as disseminated grains, masses and veinlets replacing dolomite or calcite in the Pine Point area, south of Great Slave Lake. Colloform and stalactitic masses of sulphide are not uncommon (Western Miner and Oil Review, 1963: vol. 36, No. 8, p. 26).

Nova Scotia

The following occurrences have been noted by B. J. Keating, 1960, in Can. Inst. Mining Met., Bull. 53, No. 574, pp. 81-87.

11 E/3 With pyrite and argentiferous galena in limestone at Gays River settlement in Halifax County.

11 E/6 With galena in pyritized limestone at Smithfield, Colchester County.

11 F/9 With pyrite, chalcopyrite and galena at Stirling, 30 miles northeast of St. Peter's, Richmond County.

11 K/10 With pyrite, chalcopyrite and galena in altered lavas and tuffs at Rocky Brook in Inverness County.

11 N/2 With pyrite and pyrrhotite in crystalline limestone at Meat Cove, Inverness County.

21 H/1 With pyrite, chalcopyrite, galena and barite at Magnet Cove, Walton, Hants County.

Ontario

41 A/11 Honey yellow sphalerite of variable degree of transparency has been collected in the Wiarton area in Bruce County (D.S.M. Field, 1952: Can. Mining J., 73, Pt. 3, pp. 86-88).

41 I/11 The massive sulphide orebodies of Consolidated Sudbury Basin Mines, in Fairbanks and Creighton townships, contain sphalerite as the most abundant ore mineral. It is associated with major pyrite and minor chalcopyrite and galena (J.E. Thomson, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 136-140).

42 A/5 Sphalerite occurs with pyrite, pyrrhotite and chalcopyrite at the Kam-Kotia Porcupine Mine in Robb Township, west of Timmins (W. Hogg, 1962: Western Miner and Oil Review, 35, No. 8, p. 18).

42 D/14 Sphalerite is the main ore mineral, and is associated with pyrite, chalcopyrite, and minor pyrrhotite at the Zenmac (Zenith) Metal Mine, located about 15 miles northeast of Rossport in the Thunder Bay district (J.E. Thomson, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 136-140).

42 F/4 The massive sulphide orebodies of Geco and Willroy mines in Gemmell Township contain major amounts of pyrite, pyrrhotite and sphalerite, in that order of abundance, and lesser amounts of chalcopyrite and galena (J.E. Thomson, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 136-140).

Quebec

31 F/10 Sphalerite is the most important base metal sulphide, accompanying pyrrhotite, galena, chalcopyrite and pyrite at New Calumet Mines, located on the west shore of the south half of Calumet Island, 2 3/4 miles west of Bryson bridge, Grand Calumet Township, Pontiac County (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 128-135).

32 C/4 Sphalerite occurs with pyrite, tetrahedrite, galena, chalcopyrite and ruby silvers in the massive sulphide orebody at the Golden Manitou Mine, and with pyrite, pyrrhotite and chalcopyrite in the East Sullivan orebody, Bourlamaque Township (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 128-135).

32 D/6
32 D/14
32 F/13 Massive sulphide deposits in which pyrite is the main sulphide and sphalerite the most abundant of the base metal sulphides include: Normetal Mining Corporation, Desmeloizes Township (32 D/14); West McDonald Mines, Mobrun Copper, Lake Dufault Mines and Waite Amulet Mines, Dufresnoy Township (32 D/6); Quemont Mining Corporation, Rouyn Township (32 D/6); and Mattagami Lake Mines, Galinee Township (32 F/13) (J.E. Gilbert, 1960: Can. Inst. Mining Met., Bull. 53, No. 575, pp. 128-135).

Saskatchewan

The following occurrences of sphalerite have been noted by A.R. Byers, 1960 in Can. Inst. Mining Met., Bull. 53, No. 575, pp. 145-152.

63 K/13 The orebodies of the Flin-Flon deposit are mostly massive sulphides, chiefly pyrite, including economic amounts of sphalerite and chalcopyrite.

63 L/10 Massive sphalerite-galena bodies occur at the Parrex deposit in the Hanson Lake area. Associated minerals are: arsenopyrite, pyrite, pyrrhotite, chalcopyrite, boulangerite, tetrahedrite, and argentite.

64 D/4 The base metals sulphides, sphalerite and chalcopyrite, are associated with pyrrhotite, pyrite and galena in pegmatite at the McKenzie deposit, Brabant Lake. Gahnite is a characteristic accessory mineral.

Yukon

105 A/2 A large deposit of sphalerite and galena is located about 35 miles north of Watson Lake (Western Miner and Oil Review, 35, No. 11, 1962, p. 32).

105 M/14 Sphalerite is an abundant constituent of the ore veins in the Keno Hill-Galena Hill area (R.W. Boyle, 1956: Geol. Surv. Can., Paper 55-30, p. 45).

SPHENE

$CaTiSiO_5$

Sphene is widely distributed as an accessory mineral in intermediate and acid igneous rocks and in metamorphic rocks. The alternative name, titanite, is widely used. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 3.23 (10), 2.99 (9) and 2.60 (9) (ASTM card 11-142).

Ontario

31 F/3
31 F/6 Euhedral dark brown sphene in association with allanite, quartz, microcline, plagioclase and pyroxene can be found in Griffith Township, Renfrew County (E.W. Heinrich, 1959: Can. Mineralogist, 6, p. 344).

31 F/4 Sphene, associated with ilmenite and zircon, occurs at the MacDonald Mine, in Monteagle Township, Hastings County, conc. VII, lots 18 and 19 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 209).

31 F/6 Dark chocolate brown crystals of sphene with an adamantine to resinous lustre, occur in abundance at Turner's Island, Lake Clear, Sebastopol Township, Renfrew County. Chemical analysis: SiO_2 28.76, TiO_2 32.76, Al_2O_3 6.32, Fe_2O_3 2.73, FeO 1.07, MnO 0.03, CaO 27.97, total 99.64 (A.T. Prince, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 59).

Quebec

31 F/15 Brown, wedge-shaped crystals of sphene occur at Lithfield, Pontiac County, range XI, lot 21 (National Mineral Collection).

31 G/10 Chemical analysis of sphene from Grenville, Argenteuil County, by Hunt: SiO_2 31.83, TiO_2 40.00, Fe_2O_3 tr., CaO 28.31, ign. 0.40, total 100.54; S.G. 3.495 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 503).

Chemical analysis of sphene from Grenville, Argenteuil County, by Harrington: SiO_2 32.09, TiO_2 37.06, FeO 1.16, CaO 28.50, ign. 0.66, total 99.47 (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 28G).

31 G/12 Black, wedge-shaped crystals of sphene occur in Hull Township, Gatineau County, range XIV, lot 8 (National Mineral Collection).

Sphene occurs at Little Rapids Mine, Portland East, Papineau County, range I, lot 7 (Donated to the National Mineral Collection by B. Winning, 1912).

Sphene occurs in Templeton Township, Gatineau County, range V, lot 9 (Donated to the National Mineral Collection by J. Choquette, 1910).

31 K/1 Sphene occurs with scapolite in Dorion Township, Pontiac County, lots 31, 32 (Donated to the National Mineral Collection, by H.A. Cameron, 1907).

SPINEL

$MgAl_2O_4$

The term spinel is used generally for a large group of oxides having a common structure type. The compounds are usually oxides of the type AB_2O_4 where A is one or more of the divalent metals Mg, Fe, Zn, Mn, Ni, and B is one or more of the trivalent metals Al, Fe, Cr, Mn or tetravalent Ti. Natural spinels fall into three series, spinel, magnetite and chromite. In the spinel series, Al is the dominant B metal ion, and end-member varieties within the series include: spinel ($MgAl_2O_4$), hercynite ($FeAl_2O_4$), galaxite ($MnAl_2O_4$), and gahnite ($ZnAl_2O_4$).

The four strongest lines in the spinel X-ray powder diffraction pattern have the following spacings and intensities: 2.43 (10), 2.01 (6), 1.551 (6) and 1.427 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 191).

Newfoundland

1 M/6 Honey coloured spinel forms 1 per cent of the granitic rocks of the Ackley batholith exposed 7 miles northeast of Pin Hill (D. A. Bradley, 1962: Geol. Surv. Can., Mem. 321, p. 36).

Northwest Territories

26 G/6 Grains of dark green spinel, anhedral and irregularly outlined, are found in skarn at the north end of Brown Inlet, Baffin Island (G. C. Riley, 1960: Geol. Surv. Can., Bull. 61, p. 40).

Ontario

31 C/9 Crystals of black spinel, up to 2 inches in diameter, have been found in flesh red limestone in South Burgess Township, Leeds County, conc. I, lot 10 (W. G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 210).

31 F/10 Spinel occurs with fluorite, apatite and white orthoclase in a vein of flesh red calcite in Ross Township, Renfrew County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 59T).

Quebec

31 G/13 Spinel occurs in Portland Township, Papineau County, range X, lot 16 (G. C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, pp. 25, 26R).

31 I/4
31 I/5 Small, translucent octahedrons of blue spinel are found in a bed of crystalline limestone in the Seigniory of Daillebout, Joliette County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 59T).

31 J/4 Spinel occurs in Bigelow Township, Labelle County, range V, lot 52 (R. A. A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p. 266).

31 K/1 Spinel occurs in Bouchette Township, Gatineau County, range VI, lots 3 and 4 (R. A. A. Johnston, 1910: Geol. Surv. Can., Sum. Rept., p. 266).

Spinel crystals have been found in Aylwin Township, Gatineau County, range VI, lot 48 (W.F. Ferrier, 1890-91: Can. Rec. Sci., IV, p. 475).

32 D/6 Spinel occurs as a common and abundant mineral in the dalmatianite at Amulet anticlinorium in the Noranda district. The spinel has a moderately deep green colour, well-developed cleavage, and occurs in well-formed crystals, chiefly octahedral (M.E. Wilson, 1941: Geol. Surv. Can., Mem. 229, p. 76).

SPODUMENE

$LiAlSi_2O_6$

Spodumene is a member of the pyroxene group found in complex granite pegmatites associated with other lithian aluminosilicates. Kunzite is a transparent pink to violet variety and hiddenite is a green spodumene used as a gemstone. The geology of Canadian lithium deposits, in which spodumene is by far the most important lithium mineral, has been treated in detail by R.W. Mulligan in Geol. Surv. Can., Econ. Geol. Rept., 21 (1965).

The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 4.21 (6), 2.93 (10), 2.80 (8), 2.45 (6), 1.61 (6) and 1.57 (7) (ASTM card 9-468).

Manitoba

52 E/11 Several spodumene-bearing pegmatites have been found in an east-west band of metavolcanic rocks that extends about 20 miles from East Braintree to West Hawk Lake. The Lucy and Artdon claims lie about 1/2 mile north of the Trans-Canada Highway at a point 6.6 miles east of the East Braintree turnoff. In the vicinity of West Hawk Lake, the Deer claim is in the centre of sec. 16, township 19, range 17, 1,000 feet from the southwest shore of the lake. Two other dykes occur: 4,400'N, 25°W and 1,200'S, 30°E of the Deer claim (R. W. Mulligan, 1965).

52 L/6 Large tonnages of potential lithium ore have been blocked out in the Bernic Lake-Winnipeg River district. Spodumene is the major lithium mineral and is often associated with amblygonite and lepidolite (R. Brinsmead, 1960: Precambrian, 33, No. 8, p. 19).

52 L/6 The most important deposits are: Chemalloy Minerals Limited on the western part of Bernic Lake; Lithium Corporation of Canada property at the east end of Bernic Lake including the Buck, Coe, and Pegle claims; and the Bob or Silverleaf Group, formerly known as the Bear claim, on the Winnipeg River about 4 miles above Lamprey Falls (R. W. Mulligan, 1965).

Chemical analysis of spodumene from the Bear claim by R. J. C. Fabry: SiO_2 66.50, Al_2O_3 26.04, Li_2O 6.47, Na_2O 0.92, CaO 0.25, K_2O 0.12, FeO 0.11, MgO 0.07, MnO 0.01, total 100.49 (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 155).

52 L/11 White and green spodumene is a constituent of pegmatite dykes cutting greenstones and granites in the vicinity of Cat Lake. Properties include: the Spot Group of Lithia Mines and Chemicals Limited, 5 miles west of Cat Lake; the Eagle Group held by Lithium Corporation of America at the northwest end of Cat Lake; the Irgon claim of Lithium Corporation of Canada, 1,700 feet north of Cat Lake, township 19, range 15; and the Central claim about 1,000 feet south of the middle part of Cat Lake (G. D. Springer, 1950: Manitoba Mines Br., Publ. 49-7) (R. W. Mulligan, 1965).

63 I/12 Pegmatite dykes, some of which contain spodumene and lepidolite are abundant to the west of Cross Island in the Cross Lake area (C. K. Bell, 1961: Geol. Surv. Can., Paper 61-22, p. 17).

63 J/13 Spodumene-bearing dykes have been reported in three areas near Crowduck Bay, north of the settlement of Herb Lake, on the east shore of Wekusko Lake. The Green Bay property is at lat. 54°51'30"N, long. 99°38'30"W in township 68, range 15; the Violet Group is at lat. 54°51'05"N, long. 99°42'45"W in township 68, range 15; and the Sherritt-Gordon property is at lat. 54°50'30"N, long. 99°44'00"W in township 67, range 15 (R. W. Mulligan, 1965).

Northwest Territories

85 I
85 J A belt of lithium-bearing pegmatites extends northwesterly for 65 miles from Hearne Channel to a point about 37 miles northeast of Yellowknife, and a branch extends west to the area south of Prosperous Lake, about 8 miles northeast of Yellowknife. Spodumene is the chief lithium mineral of the district. Amblygonite occurs in substantial amounts in the Buckham Lake-Hearne Channel area and has also been reported at Hidden Lake, Reid Lake and Sproule Lake. Petalite, triphylite, lithiophilite and lepidolite are rare. Other minerals of economic interest are beryl, columbite-tantalite, tapiolite and cassiterite. The main occurrences are listed below (R. Mulligan, 1965).

85 I/1 Best Bet property, immediately northwest of the north-central part of Drever Lake or 3 1/2 miles northeast of the tip of Blatchford Lake.

Tan Group, 1 1/2 miles east of the southeast corner of Blatchford Lake.

85 I/6 Ann Group, on the south shore of Reid Lake.

85 I/7 Lit 1 and 2 claims (Campbell pegmatites), on the northwest shore of Buckham Lake near its northernmost tip. Lit 3 claim (McDonald dyke), 5 miles southwest of the north end of Buckham Lake. Chemical analysis of spodumene "from a dyke 3 1/2 miles due west from a point on the west shore of Buckham Lake, 3 miles from its north end" by R.J.C. Fabry: SiO_2 64.09, Al_2O_3 27.06, FeO 1.25, MgO 0.27, CaO 0.51, Na_2O 1.59, K_2O 0.15, MnO 0.02, Li_2O 5.70, total 100.64 (J.A. Maxwell *et al.*, 1965: *Geol. Surv. Can.*, Bull. 115, p. 353).

85 I/8 Echo Group, east of Tanco Lake.

Jo Group, south of the east arm of Tanco Lake.

85 I/11 J.M. Group, east of Hidden Lake and south of Thompson Lake, adjoining the Lit Group on the west.

Lit Group, 1 to 3 miles east of Hidden Lake and 1 to 3 miles south of the Thompson-Lundmark Gold Mine.

Jim-Lit Group, 2 1/2 miles east of Hidden Lake and 2 miles west of Tibbitt Lake.

Taco claim, just south of the central part of Sproule Lake.

Fly Group, southwest part of Sproule Lake.

C.D. Group, along the northeast shore of Upper Ross Lake.

85 I/13 Cota Group, 3 miles north of Blaisdell Lake.

85 J/9 Murphy-UM Group, southeast shore of Bighill Lake.

Limo Group, on and near the north shore of Bighill Lake.

Li Group, southeast end of Prosperous Lake.

Nova Scotia

20 O/16 Spodumene and beryl have been identified in a pegmatite dyke 2,500 feet southeast of Brazil Lake crossroads (F.C. Taylor, 1961: *Geol. Surv. Can.*, Map 44-1960).

Ontario

31 C/16 Spodumene has been reported by Hunt in a small rolled mass of granite near Perth, Lanark County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 59T).

42 E
52 H Spodumene occurs in a belt of pegmatite dykes in the Nipigon district in the general vicinity of Orient Bay. Quartz, albite, minor potash feldspar and muscovite are the common minerals of the dykes. Tourmaline, beryl and a little amblygonite are found in the M. N. W. dyke (R. W. Mulligan, 1965).

The following properties have been explored.

42 E/4 The M. N. W. property situated near the south end of a ridge east of Jackfish River, about 1 1/2 miles west of Cosgrave Lake.

42 E/5 Several showings within about 1 1/2 miles of the north shore of Jean Lake have been investigated by Jean Lake Lithium Mines Limited and Towagmac Exploration Limited. The Conwest property of Ontario Lithium Company Limited consists of several showings in the area near the southwest end of Georgia Lake. The Dunvegan-Newkirk property of Georgia Lake Lithium Mines located about 1 1/4 miles west of Georgia Lake. Aumacho River Mines Limited is located about 4 miles southwest of Georgia Lake at the north end of Blay Lake.

52 H/8 Nama Creek Mines Limited have drilled a number of dykes located just north of Little Postagoni River near its junction with Postagoni River. Several dykes outcrop on a property of Noranda Mines Limited about 1/2 mile east of the northern part of Postagoni Lake. A property held by Lun Echo Gold Mines Limited is situated within 1 mile east of Forgan Lake.

52 C/8 Spodumene-bearing dykes have been drilled by International Lithium Corporation on the south shore of Lac La Croix near its east end; and by Lexindin Gold Mines south of Wisa Lake, about 4 miles north of Lac La Croix (R. W. Mulligan, 1965).

52 F/15 Green and white spodumene occurrences have been evaluated by Lun Echo Gold Mines Limited on a property south of Ghost Lake about 10 miles northeast of Dryden (R. W. Mulligan, 1965).

52 I/8 Several occurrences of spodumene are known in the Falcon Lake-Zigzag Lake area about 20 miles northeast of Lake Nipigon. The Motsen claims at about lat. 50°28'N, long. 88°08'W, extend from about 1 mile to 3 miles west of Falcon Lake. Another occurrence has been reported about 4 miles south of Falcon Lake (R. W. Mulligan, 1965).

52 J/13 Spodumene-bearing pegmatite outcrops on the McCombe property of Capital Lithium Mines Limited and on the Consolidated Morrison deposit located about 3 miles northwest of Root Lake (R. W. Mulligan, 1965).

52 P/9 Three pegmatite dykes containing appreciable quantities of spodumene and lepidolite, much coarse pink tourmaline and some fluorite outcrop just north of Lily Pad Lakes in the Fort Hope area (V. K. Prest, 1942: Ont. Dept. Mines, Ann. Rept., 51, Pt. III, p. 27).

Quebec

31 M/10 Spodumene-bearing dykes occur in Delbreuil Township, near Temiscamingue County near the north shore of Lac Simard (R. W. Mulligan, 1965).

32 C/5
32 D/8 Swarms of pegmatites in the Preissac-Lacorne district of Abitibi County are important sources of the rare-element minerals: spodumene, lepidolite, beryl, molybdenite and pollucite. The main properties are as follows:

(1) Quebec Lithium Corporation property covers the eastern and central lots of ranges VIII and IX and part of range X, Lacorne Township. A mine and mill are on lot 54, range IX, about 1/4 mile south of Lac Lortie.

(2) The property of Canadian Lithium Mining Company Limited includes much of the western part of range X and a few of the western lots of range IX, Lacorne Township, also some adjoining parts of range I, Landrienne Township. Spodumene has been noted on lots 25 and 26, Landrienne Township, and on lots 35 and 38, range X, Lacorne Township.

(3) Lacorne Lithium Mines Limited have conducted exploratory diamond-drilling of spodumene-bearing dykes on lots 59 to 63, range X, Lamotte Township.

(4) Lithium Corporation of America has explored properties on lot 36, range II, Figuery Township, about 1/2 mile west of Harricanaw River, and in the central part of lot 11, range II, Lacorne Township.

(5) Pegmatite is exposed on the property of International Lithium Corporation on lot 39, range II, Figuery Township, on the tip of a peninsula on Harricanaw River.

(6) The property of Valor Lithium Mines Limited includes parts of ranges VII, VIII and IX, in the northwest quarter of Lacorne Township. The main showing is on the southern part of lot 22, range VIII.

32 C/5
32 D/8 (7) A pegmatite dyke has been drilled by Ascot Metals Corporation in range VII, Lamotte Township, about 1 mile west of the narrows of Lake Lamotte.

(8) Spodumene deposits are held by Iso Uranium Mines Limited on lot 5, range V, Lacorne Township, and on lot 60, range VII, Lamotte Township.

(9) Three main spodumene-bearing pegmatites are exposed on the property of Amos Lithium Corporation in the southern part of lots 7 and 8, range III, Lacorne Township, near the southeast shore of Lake Baillarge (R.W. Mulligan, 1965).

Chemical analysis of unaltered spodumene from a dyke in the Preissac-Lacorne district by R.J.C. Fabry: SiO_2 63.72, Al_2O_3 26.24, Fe_2O_3 0.90, FeO tr., MgO 0.16, CaO 0.22, Na_2O 2.25, K_2O 0.03, H_2O 0.52, TiO_2 0.06, MnO 0.06, Li_2O 5.77, total 99.93 (G.W.H. Norman, 1944: Geol. Surv. Can., Paper 44-9, p. 13).

32 D/1 A pegmatite dyke containing some spodumene (Wells-Lacourciere showing) occurs in Montanier Township, about 15 miles south of the Village of Cadillac. It is a few hundred feet northwest of the Rapide II road at a point 9.7 miles south of a guarded gate (R.W. Mulligan, 1965).

32 J/11 Spodumene and beryl are reported to have been found on the property of Sirmac Mines Limited, 9 miles northwest of Assinica Lake (R.W. Mulligan, 1965).

33 E/11 Spodumene occurs in "orthoclastic granitic veinstone cutting syenite" on Walrus Island off the east coast of James Bay (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, pp. 15, 16R).

SPURRITE

$Ca_5Si_2O_8CO_3$

Quebec

34 B/1
34 B/2 The rare metamorphic mineral, spurrite, occurs as white to pinkish nodules that stand out in relief in crystalline limestone near the east end of the largest island in West Clearwater Lake. The mineral was identified optically by H.W. Bostock and confirmed by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.).

The spacings and intensities of the five strongest lines in the X-ray powder pattern of spurrite are: 3.02 (6), 2.70 (10), 2.66 (5), 2.64 (7) and 2.17 (4) (ASTM card 13-496).

STANNITE

Cu_2FeSnS_4

Stannite is an ore mineral of tin. It is rarely discovered in sufficient quantity to be mined directly and is more commonly won as a by-product of base metal operations.

The X-ray powder pattern has three strongest lines with the following spacings and intensities: 3.12 (10), 1.922 (7), 1.642 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 51).

British Columbia

82 F/15 Stannite occurs in quartz veins in closely folded black slates near the summit of Rose Pass, 5 miles northeast of the end of Crawford Bay on Kootenay Lake, in the Ainsworth mining district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 454).

82 L/14 Patches of stannite up to 1 centimetre in size were seen in a groundmass of galena, sphalerite, pyrite, minor chalcopyrite and white quartz in samples from the Crowfoot property, Magna Bay, Shuswap Lake, Kamloops mining district (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 548).

82 N/4 Stannite from the Snowflake Mine on Woolsey Creek, near Revelstoke in the Big Bend area, was analyzed by R.J.C. Fabry in 1929: Sn 26.65, Cu 31.56, Zn 7.72, Fe 3.65, Mn 0.00, Ni 0.00, S 29.76, total 99.34 (National Mineral Collection).

New Brunswick

21 G/7 Stannite occurs with cassiterite, base metal sulphides, wolframite, scheelite, molybdenite, bismuthinite and bismuth at Mount Pleasant in Charlotte County (A.A. Ruitenberg, 1963: Univ. New Brunswick, M. Sc. thesis).

21 P/5 Stannite and cassiterite are constituents of the Brunswick No. 6 orebody in Gloucester County (E.R. Lea and C. Rancourt, 1958: Can. Inst. Mining Met., Bull. 51, pp. 167-177).

Northwest Territories

85 J/8 Zincian stannite was found in one specimen of gold ores from the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist, 38, p. 515).

Ontario

41 I/6 Stannite has been detected in the nickel ores of Sudbury. It occurs always as small irregular patches of characteristic brownish grey

41 I/6 colour. Grain size is irregular, 0.03 millimetre to 0.1 millimetre, the former size being prevalent. Most is anisotropic in shades of blue, grey-blue, to yellow-grey. Very occasionally, fine lamellar twinning has developed. It is most frequently found as minute blebs within sphalerite and pyrrhotite in chalcopyrite rich patches of ore (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 41).

Yukon

95 E/8 Stannite is associated with franckeite and geocronite in calcite veins along a low-angle fault in slates at the headwaters of the east branch of the Coal River at approximately lat. 61°25'N, long. 127°21'W (A.M. Evans, 1957: Can. Mineralogist, 6, pp. 119-127).

STAUROLITE

$(Fe, Mg)_2Al_9Si_4O_{23}(OH)$

Staurolite is typically a mineral of medium grade regionally metamorphosed argillaceous sediments and is particularly characteristic of mica schists where it may be associated with almandine garnet and kyanite. Cruciform twins are common. The spacings and intensities of the three strongest lines in the X-ray powder pattern of staurolite are: 3.01 (10), 2.69 (10) and 2.37 (8) (ASTM card 15-397).

British Columbia

82 F/14
82 K/13 Staurolite is found on the west side of Slocan Lake in the Slocan mining division, in the rocks of the Shuswap Formation (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 213).

103 J/8 Staurolite crystals showing cruciform twins occur in mica schists on the beach and on a high bluff at the site of an old fish fertilizer plant on the mainland, about 5 miles north of Prince Rupert, at Prince Rupert Harbour (F.A. McLean, private communication).

Manitoba

63 J/13 Staurolite is found at Snow Lake (D.S.M. Field, 1951: Can. Mining J., 72, Pt. 2, pp. 76-78). Large, untwinned crystals of long prismatic habit, up to 1 inch wide and 7 inches long, occur on the north bank of Snow Creek, approximately 100 feet below the outlet of Snow Lake. The dark, reddish brown crystals, some of gem quality, occur in random orientation in a banded metamorphosed arkosic greywacke (M.H. Frohberg, 1960: private communication).

New Brunswick

21 G/6 Staurolite occurs in mica schists at Moores Mills, Moore Lake, Charlotte County (L. W. Bailey and G. F. Matthew, 1870-71: Geol. Surv. Can., Rept. Prog., p. 240).

Nova Scotia

11 F/5 Staurolite occurs at the Salmon River Mine in Guysborough County (H. Fletcher, 1886: Geol. Surv. Can., Ann. Rept., II, p. 156P).

20 P/11
20 P/12
20 P/14 Staurolite occurs at Carleton Village, the Jordan River, Red Head and Pubnico Harbour, in Shelburne County (L. W. Bailey, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 58M).

Ontario

31 C/14
31 C/15 Staurolite crystals are prominent in muscovite schist in Barrie Township, Frontenac County in the Clarendon-Dalhousie area. Crystals up to 3 inches long are found in the hanging-wall and footwall of a muscovite schist near Fernleigh (B. L. Smith, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VII, pp. 35, 36).

41 I/5 Staurolite associated with garnet occurs in a schist in Baldwin Township, Sudbury district, conc. III, lot 2. The staurolite crystals are most extensively developed where narrow bands of greywacke are confined between sills (J.E. Thomson, 1952: Ont. Dept. Mines, Ann. Rept., vol. 61, Pt. IV, p. 12).

41 I/11 Argillaceous rock, north of the Copper Cliff Mine, McKim Township, is composed of 75 per cent staurolite, which is found as stumpy crystals up to 3/4 inch in length. Some large knots are up to 8 inches in diameter (T. C. Phemister, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. III, p. 106).

42 L/5 Beautiful, large, twinned staurolite crystals occur in dark coloured medium-grained rock on the northwest shore of Albert Lake, Gzowski Township, in the Kowkash gold area (P.E. Hopkins, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 186).

42 L/6
42 L/7 Staurolite is present in sedimentary schists in the O'Sullivan Lake area (W. W. Moorehouse, 1955: Ont. Dept. Mines, Ann. Rept., 64, Pt. IV, p. 10).

STEPHANITE

Ag_5SbS_4

The X-ray powder pattern of stephanite has four strongest lines with the following spacings and intensities: 3.08 (10), 2.89 (6), 2.58 (9) and 2.13 (5) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 122).

British Columbia

82 E/15 Stephanite occurs at the Waterloo claim, Thunder Hill camp, in the Grand Forks mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

82 F/14 Stephanite is a conspicuous constituent of ore at the Anna Mine at the Slocan mining camp, Slocan City. It is associated with galena in vein matter carrying pyrite, chalcopyrite, sphalerite and native silver in a gangue of quartz and carbonate (C.E. Cairnes, 1934: Geol. Surv. Can., Mem. 173, p. 129).

Stephanite occurs at the Arlington Mine at Springer Creek in the Slocan mining division (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

Ontario

31 M/3 A few brilliant crystals of stephanite, associated with proustite and xanthoconite, occur at the Keeley Mine in South Lorrain. The crystals of stephanite are well formed and are cyclically or pseudohexagonally twinned. Chemical analysis by M. C. Haller: Ag 67.78, Sb 14.89, S 16.57, insol. 0.72, total 99.96; S.G. 6.233 (T. L. Walker and A. L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 69) (T. L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 13).

31 M/5 Stephanite from the Silver Miller and O'Brien mines in the Cobalt camp have been identified by X-ray powder pattern (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Black, tabular crystals of stephanite with a metallic lustre occur at the Penn Canadian Mine, Cobalt district. Chemical analysis by E.W. Todd: Ag 67.81, S 16.21, As 2.34, Sb 13.53, total 99.89; S.G. 5.92-5.94. The analysis corresponds to 81 per cent stephanite, 16 per cent proustite and 3 per cent dyscrasite (Univ. Toronto Stud., Geol. Ser., 12, 1921, p. 69).

Stephanite is found at the Drummond Mine, at the east end of Kerr Lake, Coleman Township (National Mineral Collection).

Well-formed crystals of stephanite occur at the Kerr Lake Mine at Cobalt in the Timiskaming district (R. A. A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

52 A/5 Stephanite occurs at the Badger Mine in the Thunder Bay district (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 210).

Yukon

105 M/14 Massive black stephanite covers one side of a narrow limonite-stained quartz vein at the Elsa Mine, 27 miles north of Mayo on

105 M/14 the north-facing slope of Galena Hill (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

STIBNITE

Sb_2S_3

Stibnite is found typically in hydrothermal veins and replacement deposits of low temperature origin or in hot-spring deposits. It is the most important ore mineral of antimony, but although it is widely distributed, large deposits are of rare occurrence.

The X-ray powder pattern has five strongest lines with the following spacings and relative intensities: 5.07 (4), 3.58 (10), 2.52 (4), 1.933 (5) and 1.692 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 82).

British Columbia

82 K/3 Stibnite has been found at the Alps-Alturas Group on the north fork of Carpenter Creek in the Slocan mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

92 F/6 W.J. Sutton has reported an occurrence of stibnite near Great Central Lake, Vancouver Island, in the Alberni mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

92 I/4 The presence of stibnite has been reported at Jamieson's claims, near Lytton in the Ashcroft mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

92 I/12 Specimens of stibnite have been found near Foster Bar, 23 miles from Lytton, on the Fraser River (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 60T).

92 I/14 An occurrence of stibnite has been reported at Fergusson Creek in the Bridge River area (A.S. Dawson, 1947: Can. Mining J., 68, pp. 20, 21).

92 I/15 Stibnite occurs in a gangue of dolomite and barite near the mouth of Copper Creek, Kamloops Lake, in the Kamloops mining division (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 99A).

92 J/10 Fine-granular, and radiating-columnar masses of stibnite occur in quartz near Cadwallader Creek, in the Lillooet mining division (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 16R).

92 J/15 Massive, coarsely-columnar stibnite has been found on the east side of Tyaughton Lake, near Gun Creek, in the Bridge River

92 J/15 area. Specimens donated by W.F. Ferrier are in the National Mineral Collection (W.S. McCann, 1922: Geol. Surv. Can., Mem. 130, p. 73).

92 N/8 Quartz veins carrying stibnite and associated arsenopyrite are found at the Morris Mine at Tatlayoko Lake (H.V. Warren and R.M. Thompson, 1949: Am. Mineralogist, 34, p. 458).

92 O/1 A deposit of stibnite occurs on Watson Bar Creek in the Bridge River district (J.S. Stevenson, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 104).

92 O/2 Stibnite, associated with scheelite occurs in a small vein from 1 to 3 inches wide, in a large irregular area of carbonatized serpentine in the Tyaughton Creek valley, 14 miles north of Minto Mine in the Bridge River district (J.S. Stevenson, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 96).

92 P/8 A specimen of stibnite found on Chinook Mountain west of Kanaka in the Kamloops district is in the National Mineral Collection.

93 K/8 Stibnite occurs in quartz veins and as small kidney-shaped masses in sheared wall-rock, 10 miles west of Fort St. James, 1/2 mile inland from the bay behind Beaver Island on the south shore of Stuart Lake (J.C. Gray, 1937: Geol. Surv. Can., Paper 38-14, p. 7) (A.S. Dawson, 1947: Can. Mining J., 68, pp. 20, 21).

93 M/5 Silver-lead ores at the Silver Bell claim, Hazelton, contain stibnite (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

93 N/11 Stibnite is associated with jamesonite, arsenopyrite, sphalerite, pyrite, andorite, freibergite, native silver, quartz and calcite in a vein located 20 miles east of Takla Landing on Takla Lake, on a hillside on the west side of the pass from Kwanika Creek to Silver Creek (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 71).

104 M/15 An occurrence of stibnite has been reported near Lake Bennett (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 215).

104 N/4 Stibnite has been found at No. 1 Union camp in the Union Group situated near the glacier at the foot of Atlin Lake in the Atlin Lake mining division (National Mineral Collection).

Manitoba

53 L/13 Stibnite occurs in quartz and schists, associated with gold and sulphides of iron, copper, zinc and lead, at the New Falu claim on the east end of Hyers Island in Oxford Lake (A.S. Dawson, 1947: Can. Mining J., 68, pp. 20, 21).

New Brunswick

The following occurrences of stibnite have been listed in The Occurrence of Economic Minerals, Rocks and Fuels in New Brunswick Record 2, Part B, 1965, by the New Brunswick Research and Productivity Council.

21 G/7 Piskahegan, Charlotte County.

21 G/9 Coates Hill, Queens' County.

21 G/14 Lake George, York County. The stibnite here occurs with native antimony in well-defined quartz veins in highly tilted slates and quartzites (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 60T).

21 H/12 Stewarton, King's County.

21 H/13 Scotch Settlement, King's County.

21 J/3 Southampton, York County.

21 J/5 Hartland, Carleton County.

21 J/6 Coldstream, Carleton County.

21 P/12 Lincour, Gloucester County.

Northwest Territories

85 J/8 Stibnite occurs with native antimony in the gold ores of the Yellowknife Bay area (L. C. Coleman, 1953: Am. Mineralogist, 38, p. 515).

Nova Scotia

11 E/4 Stibnite has been found in considerable abundance in quartzite and calcite veins cutting talcose slates at Rawdon and West Gore in Hants County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 60T).

Ontario

31 C/11 An occurrence of stibnite has been reported in lot 28, conc. I, Sheffield Township, Lennox and Addington counties.

31 C/14 Stibnite has also been reported on lots 21 to 23, conc. VIII, Barrie Township, Frontenac County (W. G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 210).

31 F/2 The National Mineral Collection includes a specimen of stibnite with barite from lot 20, conc. VIII, Lavant Township, Lanark County.

41 J/12
41 K/9 Stibnite is said to occur near Echo Lake and Garden River in the Algoma district (W. G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 210).

42 E/10 Crystals of stibnite and berthierite are associated at the Talmora Mine, Errington Township, Thunder Bay district (E.C. Pye, 1951: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VI, p. 60).

42 E/11 At the Jellico Mine, Lindsley and Errington townships, in the Little Long Lac area, stibnite is associated with chalcopyrite and arsenopyrite (H.S. Armstrong, 1944: Am. Mineralogist, 29, p. 313).

52 F/3 A stibnite occurrence is reported at Gates Lake, 60 miles south of Wakigoon (A.S. Dawson, 1947: Can. Mining J., 68, p. 20).

52 N/4 The massive sulphide ore at the Cochenour-Willans Mine, Red Lake, contains stibnite (M. H. Frohberg, private communication).

Quebec

21 E/13 Stibnite is found with native antimony in argillite on lot 56, range I, South Ham Township, Wolfe County (R. W. Ells, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 80K).

21 E/15 The National Mineral Collection includes a specimen of stibnite from Marlow Township, Beauce County, lot 1, range VI.

Yukon

105 D/3 Stibnite occurs with silver, quartz, calcite, barite, sphalerite, jamesonite, galena, and grey copper on the eastern face of the southern portion of Carbon Hill, extending west across the Wheaton River and the central portion of the eastern face of Chieftan Hill (A. W. G. Wilson, 1917: Can. Mining J., 37, pp. 132-135) (W.E. Cockfield and A.H. Bell, 1944: Geol. Surv. Can., Paper 44-14, p. 16) (J.O. Wheeler, 1952: Geol. Surv. Can., Paper 52-30, p. 13).

105 D/11 Small amounts of stibnite occur with grossular at the Copper King and Anaconda claims in the Whitehorse mining division (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 25R).

105 M/11
105 M/12 Stibnite occurs with quartz at Stewart River, about 5 miles from Gordon Landing, in the Duncan Creek mining division (R. Bell, 1904: Geol. Surv. Can., Ann. Rept., XVI, p. 38A).

116 D/6 An 18-foot-wide outcrop of stibnite occurs at Forty Mile River, 140 miles up river from Forty Mile Post (--, 1916: Can. Mining J., 37, p. 565).

STICHTITE

$Mg_6Cr_2CO_3(OH)_{16}.4H_2O$

This rhombohedral, lilac to rose pink mineral occurs as blebs or veinlets in serpentine rocks. It is isostructural with hydrotalcite (Al for Cr) and pyroaurite (Fe for Cr), and has a hexagonal polymorphic form, barbertonite, with which it is often admixed.

The spacings and intensities of the four strongest lines in the X-ray powder pattern of stichtite are: 7.80 (10), 3.91 (9), 2.60 (4), 2.32 (3) and 1.97 (3) (ASTM card 14-330).

Ontario

42 B/1 Stichtite occurs as small purple eyes in serpentinite on lots 7 and 8 in the southern part of the Keith-Muskego area (V.K. Prest, 1950: Ont. Dept. Mines, Ann. Rept., vol. 59, Pt. VII, p. 17).

Quebec

21 L/3 An occurrence of stichtite at the Megantic Mine, Black Lake, has been described (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull., No. 27, p. 29) (C. Frondel, 1941: Am. Mineralogist, 26, p. 307).

STILBITE

$NaCa_2Al_5Si_{13}O_{36}.14H_2O$

Stilbite is a mineral of the zeolite group of hydrated aluminosilicates which have the characteristic properties of: (1) losing water without change of crystal structure, and absorbing other compounds in place of water; and (2) undergoing cation exchange. Stilbite, also known by the name desmine has a distinctive sheaf-like form. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 9.04 (10), 4.65 (4), 4.07 (9) and 3.04 (7) (ASTM card 18-1203).

British Columbia

92 I/3 Specimens of stilbite have been collected from Zakwaski Mountain, east of Lytton (G.M. Dawson: National Mineral Collection).

Northwest Territories

48 B/15 Amygdules of stilbite are found in volcanic rocks northeast of Peter Richards Islands (R.R.H. Lemon and R.G. Blackadar, 1963: Geol. Surv. Can., Mem. 328, p. 11).

Nova Scotia

21 A/NW 21 H/SE The occurrence of abundant zeolites in the trap rocks that outcrop along the shores of the Bay of Fundy and Minas Basin was first described by F. Alger and C.T. Jackson in 1827, 1828, and 1829 (Am. J. Sci., Ser. 1, vol. XII, p. 227, vol. XIV, pp. 305-330, and vol. XV, pp. 132-160). Stilbite is by far the most abundant and universally distributed of all the zeolites, and has been found at the following localities:

N.T.S.	County	Locality
21 A/12	Annapolis	Digby Gut (northeast)
21 A/12	Digby	Deep Cove
21 A/14	Annapolis	Port Lorne
21 A/14	Annapolis	St. Croix Cove
21 B/8	Digby	Boar's Head
21 B/8	Digby	Digby Neck (west end)
21 B/8	Digby	Petite Passage (east side)
21 H/2	Kings	Black Rock
21 H/2	Kings	Harbourville
21 H/2	Kings	Morden
21 H/3	Annapolis	Margaretville
21 H/3	Annapolis	Port George
21 H/3	Cumberland	Isle Haute
21 H/7	Cumberland	Cape d'Or
21 H/8	Cumberland	Cape Sharp
21 H/8	Cumberland	Clarke's Head
21 H/8	Cumberland	Five Islands
21 H/8	Cumberland	Partridge Island
21 H/8	Cumberland	Wasson Bluff
21 H/8	Kings	Amethyst Cove
21 H/8	Kings	Cape Split

Chemical analyses by E.W. Todd: I. creamy yellow with faint reddish tint, mainly sheaf-like aggregates, from Partridge Island: SiO_2 55.52, Al_2O_3 16.85, Fe_2O_3 0.11, CaO 7.70, Na_2O 1.42, K_2O 0.48, H_2O 18.05, total 100.13; S.G. 2.162; II. white to colourless, approximately parallel growth, from Long Point: SiO_2 55.68, Al_2O_3 17.08, Fe_2O_3 0.06, CaO 7.60, MgO 0.10, Na_2O 1.28, K_2O 0.48, H_2O 18.08, total 100.36; S.G. 2.172; III. radiated white aggregate lacking pearly lustre, from Morden: SiO_2 55.30, Al_2O_3 17.13, Fe_2O_3 0.05, CaO 7.85, Na_2O 1.28, K_2O 0.62, H_2O 18.10, total 100.33; S.G. 2.162 (T.L. Walker and A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, pp. 68-71).

Chemical analysis of stilbite from Port George by How: SiO_2 57.32, Al_2O_3 17.28, CaO 7.57, Na_2O 2.10, H_2O 16.52, total 100.79 (H. How: Phil. Mag., Ser. 5, vol. 1, p. 134).

Quebec

31 G/12 Stilbite, associated with garnet and epidote, has been found in lot 18, range II, Wakefield Township, Gatineau County (C.W. Willimott, 1882-84: Geol. Surv. Can., Rept. Prog., p. 18L).

STILPNOMELANE

$$K(Fe^{+++}, Fe^{++}, Al)_{10}Si_{12}O_{30}(O, OH)_{12}$$

Stilpnomelane is a metamorphic mineral which in small flakes resembles biotite or chlorite. Its main compositional variation is in the ferrous iron to ferric iron ratio, and it has been proposed that the name stilpnomelane be restricted to brown and black varieties rich in ferric iron, and ferrostilpnomelane used for the dark green ferrous-rich mineral.

The four strongest lines in the X-ray powder pattern (Fe radiation) have the following spacings and intensities: 11.9 (10), 4.04 (5), 3.03 (4) and 2.55 (4) (J.W. Gruner, 1937: Am. Mineralogist, 22, p. 919).

Nova Scotia

21 H/8 Stilpnomelane has been observed in dark yellowish green plumose groupings on chalcedony on the west side of Partridge Island, Cumberland County (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 15R).

Ontario

31 C/12 Stilpnomelane occurs at the Wallbridge Mine, lot 12, conc. V, Madoc Township, Hastings County (G.M. Dawson, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 107A).

41 J/2 Brown pleochroic stilpnomelane, in plates up to 1.2 millimetres across, has been found near dykes in conglomerate of the Elliot Group, Blind River. The plates are commonly replaced by chlorite along the edges (P.J. Pienaar, 1963: Geol. Surv. Can., Bull. 83, p. 74).

Quebec

32 I/14 Tufts of stilpnomelane fibres up to 5 millimetres long are present in the cherty parts of the iron carbonate rock found northeast of Trout Point in Mistassini territory, Albanel area (J.N. Neilson, 1953: Que. Dept. Mines, Geol. Rept., 53, p. 21).

STOLZITE

$PbWO_4$

Stolzite occurs as a secondary mineral associated with limonite, wad, vanadinite, mimetite, wulfenite and cerussite in the oxidized zone of ore deposits containing primary tungsten minerals. It is isostructural and probably forms a complete series with wulfenite (Mo for W).

The X-ray powder pattern has five strongest lines with the following spacings and intensities: 3.24 (10), 2.72 (6), 2.02 (8), 1.784 (6) and 1.661 (9) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 228).

British Columbia

93 A/14 Stolzite occurs as crusts of minute crystals that line the vugs in the scheelite-tungstite aggregates at Taylor Scheelite prospect, 30 miles southwest of Wells, on the southwest rim of Snowshoe Plateau. The crystal faces are coated by a thin, brittle film of earthy yellow tungstic oxide, but are themselves white and transparent (J.S. Stevenson, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 137).

STROMEYERITE

CuAgS

The spacings and intensities of the five strongest lines in the X-ray powder pattern of stromeyerite are: 3.30 (6), 2.61 (10), 2.03 (5), 1.985 (5) and 1.884 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 36).

British Columbia

82 F/6 Chemical analysis of stromeyerite by Johnston: S 15.74, Ag 52.27, Cu 31.60, Fe 0.17, total 99.78; S.G. 6.277. The sample was taken from Toad Mountain in the Nelson mining division (G.C. Hoffmann, 1845: Geol. Surv. Can., Ann. Rept., VIII, pp. 12, 13R).

Stromeyerite occurs with bornite, chalcopyrite, pyrite, tetrahedrite, galena, sphalerite and argentite in a feldspathic veinstone traversing schistose eruptives at the Silver King Mine, south of Nelson, on Toad Mountain (G.M. Dawson, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 27A).

Ontario

31 M/5 Stromeyerite occurs at the Foster Mine in the Cobalt district. Analysis by H.C. Rickaby: Cu 31.00, Ag 53.31, Fe tr., S 16.02,

31 M/5 total 100.33 (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 19).

41 P/10 Stromeyerite occurs at the Morrison Mine and Miller Lake-O'Brien Mine in the Gowganda district. Analysis by H.C. Rickaby: Cu 31.46, Ag 51.80, Fe .30, S 16.08, insol. 0.32, total 99.96; S.G. 6.26 (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 19).

STRONTIANITE

$SrCO_3$

Strontianite is an orthorhombic mineral of the aragonite group which includes aragonite, witherite and cerussite. It is a low temperature hydrothermal mineral usually found in veins in limestone or marl, and less frequently as a gangue mineral in sulphide veins.

The spacings and intensities of the four strongest lines in the X-ray powder pattern of strontianite are: 3.535 (10), 3.450 (7), 2.458 (4) and 2.0526 (5) (H.E. Swanson et al., 1954: Nat. Bur. Stds., Circ. 539, vol. III, p. 57).

British Columbia

93 A/6 Strontianite has been found at the Horsefly Mine in the Quesnel mining division (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 30R).

Ontario

31 G/5 Chemical analysis of strontianite from Nepean Township, Carleton County, by Johnston yielded: CO_2 30.54, SrO 65.43, CaO 3.38, insol. 0.17, total 99.52; S.G. 3.704 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, pp. 22, 23R).

Radiating, crystalline strontianite occurs in veins up to 6 inches in width traversing the Chazy limestone in lot 31, conc. A, Nepean Township, Carleton County (R.W. Ells, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 44G).

Quebec

31 H/12 Strontianite occurs in the form of white fibrous tufts in cracks in concretionary limestone masses in the Utica slate on St. Helen Island (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 61T).

STRUVITE

$NH_4MgPO_4 . 6H_2O$

The spacings and intensities of the four strongest lines in the X-ray powder pattern of struvite are: 5.60 (6), 4.26 (10), 2.92 (5) and 2.69 (5) (ASTM card 15-762).

Yukon

115 O/14 Struvite was found with newberyite in the fossil tusk of a mammoth at Quartz Creek, Indian River, in the Duncan Creek mining division (G.C. Hoffmann, 1899: Geol. Surv. Can., Ann. Rept., XII, pp. 13, 14R).

115 P/11 Struvite has been observed in the valleys between the cusps of a molar of a mammoth found on McQuesten Creek, Stewart River, in the Duncan Creek mining division (R.A.A. Johnston, 1913: Geol. Surv. Can., Sum. Rept., p. 327).

SULPHUR

S

The X-ray powder pattern has four strongest lines with the following spacings and intensities: 7.76 (4), 5.75 (5), 3.90 (10) and 3.24 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 22).

Alberta

74 D/14 Sulphur occurs in cones deposited by springs at La Saline, 28 miles below the confluence of the Athabasca and Clearwater rivers, 1/2 mile east of the river on the edge of a valley (R.G. McConnell, 1890: Geol. Surv. Can., Ann. Rept., V, p. 35D).

83 F/4 Sulphur has been found 3 miles above Jasper Lake on the Athabasca River (G.M. Dawson, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 162A).

Northwest Territories

85 B/15 Native sulphur occurs in small quantities as a deposit from mineral springs on the south shore of Great Slave Lake, at Sulphur Point (R.G. McConnell, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 31D).

Nova Scotia

11 E/6 Scattered crystals of native sulphur have been noted in a gypsum quarry, 2 miles west of Hilden, Colchester County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 219).

Ontario

31 C/16 Sulphur has been reported to occur on lot 2, conc. V, North Burgess Township, Lanark County (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 17R).

31 F/3 Sulphur occurs as a product of the decomposition of pyrite or chalcopyrite on lot 3, conc. I, Denbigh Township, Lennox and Addington counties (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 27R).

40 I/16 Sulphur occurs in conc. XII, lot 3, Charlotteville Township, Norfolk County (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 210).

Yukon

106 D/4 Yellow to greenish yellow to whitish coatings of sulphur are found on pyrite in placer deposits at Dublin Gulch in the Mayo mining district. Identification was by X-ray diffraction pattern (X-ray Laboratory, Geol. Surv. Can.).

SUNSTONE

(See potassium feldspar)

SURSASSITE

$$Mn_9Al_4(Si, Al)_{12}O_{39}.6H_2O$$

New Brunswick

21 J/4 Sursassite, previously known only from Oberhalbstein, Switzerland, has been found in the Plymouth orebody, on the south side of the Meduxnekeag River about 5 miles west-northwest of Woodstock and about 8 miles east of Houlton, Maine. The copper-coloured fibrous mineral occurs in veins, with barite, calcite and quartz, cutting black Fe-Mn ore. Chemical analysis by H.B. Wiik: SiO_2 39.39, TiO_2 0.05, Al_2O_3 18.72, Fe_2O_3 3.47, MnO 26.64, MgO 2.68, CaO 2.00, Na_2O 0.18, H_2O 6.70, total 99.83. The spacings and intensities of the seven strongest lines in the X-ray powder pattern are: 4.60 (mw), 3.74 (mw), 2.90 (m), 2.84 (ms), 2.67 (mw), 2.59 (mw) and 2.16 (m) (E.W. Heinrich, 1962: Can. Mineralogist, 7, pp. 291-300).

SYLVANITE

$AuAgTe_4$

Sylvanite is very similar in chemical and physical properties to krennerite and calaverite. It contains Au and Ag in approximately equal atomic proportions, whereas Au is the dominant metal in the other two tellurides. The spacings and intensities of the four strongest lines in the X-ray powder pattern of sylvanite are: 3.05 (10), 2.25 (3), 2.15 (5) and 1.989 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 113).

British Columbia

92 J/15 Sylvanite is associated with native gold and stibnite on the Ida May property in the Bridge River area (W.S. McCann, 1922: Geol. Surv. Can., Mem. 130, p. 55).

94 F/13
94 K/4 Greenish coated cubes of sylvanite up to 3 millimetres in size occur in a gangue of quartz and calcite with small amounts of barite, barytocalcite and sphalerite at Galaga Lakes. Specimens were obtained from J. J. McDougall, Frobisher Limited (R.M. Thompson, 1960: private communication).

Manitoba

63 K/13 Sylvanite makes up a minor part of the lead-copper-zinc sulphide ore mined at Flin Flon (R.F. Coulter, 1962: Can. Inst. Mining Met., Bull. 55, No. 602, p. 376).

Ontario

42 A/1 Specimens of sylvanite have been collected from the Tough Oakes Mine at Kirkland Lake in the Timiskaming district (National Mineral Collection).

42 A/6 Sylvanite has been identified in ore specimens from Dome Mines in the Porcupine area (A.G. Burrows, 1924: Ont. Dept. Mines, Ann. Rept., vol. 33, Pt. II, p. 54).

52 B/10 At the Huronian Gold Mine on lot H, conc. I, Moss Township, sylvanite occurs with argentite and chalcopyrite in a gangue of white subtranslucent quartz (W. McInnes, 1897: Geol. Surv. Can., Ann. Rept., X, p. 59H).

Quebec

32 D/3 Sylvanite occurs associated with gold, pyrite, and chalcopyrite in Dufay Township, Abitibi County, in the Opasatica district (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

Yukon

105 D/2 At the Buffalo Hamp Group on Mount Stevens, sylvanite occurs with galena and gold (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

Quartz veins carrying sylvanite have been found at the Golden Slipper property on Stevens Mountain (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 333).

105 D/6 Sylvanite occurs with hessite, petzite, telluric ochre, pyrite and gold at the Gold Reef claim on Gold Hill in the Wheaton River district (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

SYLVITE

KCl

Nova Scotia

11 E/14 Sylvite occurs with halite in lenticular deposits of varying thickness at Malagash. Chemical analysis of pale yellow, crystalline, almost pure sylvite by H.V. Ellsworth: Mg 0.01, Ca 0.02, NaCl 6.48, KCl 92.89, H_2O 0.29, SO_4 0.03, Br 0.10, insol. 0.12, total 99.94 (H.V. Ellsworth, 1926: Geol. Surv. Can., Sum. Rept., 1924, Pt. C, p. 189).

The X-ray powder pattern of sylvite has three strongest lines with the following spacings and intensities: 3.15 (10), 2.22 (6) and 1.82 (2) (X-ray Laboratory, Geol. Surv. Can.).

Saskatchewan

62 K
62 M
72 P
73 B
73 C

Potash deposits consisting of sylvite admixed with carnallite and halite occur in the upper part of the Prairie Evaporite Formation of Devonian age that underlies southern Saskatchewan and adjacent parts of Manitoba and Alberta. The shallowest occurrences lie along a line from Binscarth, Manitoba, through Yorkton, Saskatoon and Unity, Saskatchewan (C.M. Bartley, 1963: Can. Dept. Mines, Min. Res. Div., Min. Rept., 7, p. 448).

SYMPLESITE

$Fe_3(AsO_4)_2 \cdot 8H_2O$

Symplesite is a secondary mineral in which, like vivianite, the ferrous iron may oxidize more or less completely to ferric iron and cause changes in colour and optical properties. Ferrisymplesite is thought to be the oxidized equivalent of symplesite. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 8.97 (2), 7.50 (2) and 6.79 (10) (ASTM card 8-172).

Ontario

31 M/5 Symplesite is reported to occur at the Penn-Canadian Mine in the Cobalt area (H. V. Ellsworth, 1916: Ont. Dept. Mines, Ann. Rept., vol. 25, Pt. I, p. 237).

Yukon

105 D/2 Nuggets of radiating, green, acicular crystals of symplesite, associated with yukonite, occur sparingly on a mining claim on the west side of Windy Arm, Tagish Lake (J. B. Tyrrell and R. P. D. Graham, 1913: Trans. Roy. Soc. Can., Ser. 3, vol. VII, sec. 4, pp. 13-18).

SZÁJBELYITE

$Mg(BO_2)(OH)$

Szájbelyite is isostructural with sussexite and the two form a solid solution series by substitution of Mn for Mg. The minerals camsellite of Ellsworth and Poitevin, and magnesiosussexite of Gruner have been shown to be identical to szájbelyite, by X-ray diffraction studies. Ascharite is a member of the series, having intermediate composition. The four strongest lines in the X-ray powder pattern of szájbelyite have the following spacings and intensities: 6.20 (10), 2.66 (7), 2.42 (7) and 2.20 (8) (ASTM card 12-179).

British Columbia

92 I/1 Camsellite occurs intimately associated with chrysotile and dolomite, forming sheared veins in serpentine near Douglas Lake. Chemical analysis by H. V. Ellsworth: SiO_2 7.65, Fe_2O_3 0.86, FeO 0.95, MnO 0.85, Al_2O_3 0.26, CaO 3.69, MgO 41.72, B_2O_3 29.07, Na_2O+K_2O 0.03, NiO tr., H_2O (+110°) 9.88, H_2O (-110°) 0.52, CO_2 5.64, total 100.12 (H. V. Ellsworth and E. Poitevin, 1921: Trans. Roy. Soc. Can., 15, p. 1).

SZOMOLNOKITE

$FeSO_4.H_2O$

The spacings and intensities of the five strongest lines in the X-ray powder pattern of szomolnokite are: 4.84 (9), 3.44 (10), 3.31 (8), 3.11 (9) and 2.53 (8) (ASTM card 12-226).

British Columbia

82 N/7 Szomolnokite occurring near Golden has been identified by X-ray powder diffraction pattern (X-ray Laboratory, Geol. Surv. Can.).

Northwest Territories

120 C/13 Szomolnokite from the Lake Hazen area, Ellesmere Island has been identified by X-ray diffraction pattern. It is associated with efflorescent salts along a fault zone (X-ray Laboratory, Geol. Surv. Can.).

Yukon

105 M/14 A white efflorescence on a specimen of arsenopyrite from the Comstock Mine, Keno Hill-Sourdough Hill area in the Mayo mining district, has been identified by X-ray powder diffraction as szomolnokite (X-ray Laboratory, Geol. Surv. Can.).

TALC

$Mg_3Si_4O_{10}(OH)_2$

Talc is the major constituent of rocks known as soapstone or steatite, blocks of which are used for thermal and electrical insulating purposes, and as a material for sculpture by the Eskimos. Uses of talc include: ceramics; filler for paints, paper and rubber; cosmetics preparations; and as a lubricant. The mineral referred to as pyrallolite in this catalogue is probably talc. The four strongest lines in the X-ray pattern of talc have the following spacings and intensities: 9.34 (10), 4.66 (9), 3.12 (10) and 2.48 (6) (ASTM card 13-558).

Ontario

31 C/5 Brownish white, granular, massive talc occurs in conc. II, lot 24, Clarendon Township, Frontenac County (National Mineral Collection).

31 C/11 Pale white, to pale grey, flaky talc occurs at the Henderson Mine, Huntingdon Township, Hastings County, conc. XIV, lot 14, and at the Connolly Mine, conc. XIV, lot 15 (M.E. Wilson, 1922: Can. Mining J., 42, June, p. 356).

31 C/12 Talc occurs at the Eldorado property, Madoc Township, Hastings County, conc. V, lot 21, in an intimate mixture with dolomite, and quartz (M.E. Wilson, 1922: Can. Mining J., 42, p. 356).

31 C/14 Pale green foliated masses of talc occur in Grimsthorpe Township, Hastings County, conc. V, lot 8. Chemical analysis by F.G. Wait: SiO_2 60.45, Al_2O_3 0.27, Fe_2O_3 0.78, FeO 2.04, MgO 29.84,

31 C/14 CaO 0.16, NiO 0.50, H_2O^+ 5.42, H_2O^- 0.32, total 99.78; S.G. 2.65 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 358).

42 A/1 Talc occurs in Maisonville Township, Nipissing district, at Sesikinika Lake (Donated to the National Mineral Collection, by M.E. Wilson).

52 F/10 Soapstone of excellent quality for industrial uses has been reported at Trap Lake, a small lake south of Wabigoon Lake (Can. Mining J., vol. 44, 1923, p. 850).

Quebec

21 L/2 Soapstone of a uniform quality occurs in a great serpentine belt having a general northeasterly strike about 11 miles from Thetford Mines, near Leeds Station, in Broughton Township (R.C. Rowe, 1927: Can. Mining J., 44, pp. 1003-1004).

21 L/2
21 L/7 An outcrop of soapstone about 30 feet in width, at a contact zone between intrusive dunite and conglomerate, can be found on the north side of St. Victor River in the Beauceville area (B.R. MacKay, 1921: Geol. Surv. Can., Mem. 127, p. 87).

24 K/13
24 L/16 Gently dipping talc schists underlie a thick gabbro sill in the Leaf Lake area between Baie des Arpenteurs and Baie aux Refuges. The talc, which is mixed with phlogopite, calcite and quartz, is in a schist zone approximately 25 feet thick (J. Bérard, 1959: Que. Dept. Mines, Prelim. Rept., No. 384).

31 H/1 Talc occurs as an alteration product of serpentine in dykes of widths up to 70 feet with a length of 1,500 feet, 80 miles south-east of Montreal in Bolton Township, Brome County (J.H. Morgan, 1956: Can. Inst. Mining Met., Bull. 49, pp. 188-192).

TANTALITE

$(Fe, Mn)(Ta, Nb)_2O_6$

Tantalite is the tantalum rich end member of an isomorphous series involving mutual substitution of Ta and Nb. It is found in granite pegmatites, particularly those with a well-marked albite, Li silicate, and Li-Mn-Fe phosphate phase.

The spacings and intensities of the five strongest lines in the X-ray powder diffraction pattern are: 3.62 (6), 2.95 (10), 1.728 (5), 1.715 (5) and 0.993 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 210).

Manitoba

52 L/5 Tantalite and other minerals of the columbite-tantalite series, are present in the lithium-caesium ore deposit at Bernic Lake (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 25).

Northwest Territories

85 I/11 Tantalite crystals up to 1 inch in length occur in association with columbite in pegmatite dykes at Peg Tantalum Mines Limited at Ross Lake in the Yellowknife district (1945: The Precambrian, vol. 18, pp. 9-15).

Tantalite occurs associated with columbite as crystals up to 2 inches square and several inches long. It occurs within albite near quartz lenses in pegmatite in the Ross Lake area, 45 miles north-east of Yellowknife, and also in the Yellowknife Beaulieu area (A. W. Jolliffe, 1944: Geol. Surv. Can., Paper 44-12).

Quebec

32 D/8 Tantalite, occurring in Figuery Township, Abitibi County, range II, lot 36, is associated with spodumene in an essentially quartz-microcline, albite-muscovite mineral assemblage (W. W. Weber, 1951: Que. Dept. Mines, Prelim. Rept., 257, p. 15).

Tantalite occurs as isolated crystals ranging in size up to 3/4 inch wide and 3 inches long, and as radiating clusters replacing albite and quartz, at points along the exposed length of a pegmatite dyke, in Preissac Township, Abitibi County, range VII, lot 54 (G. W. H. Norman, 1944: Geol. Surv. Can., Paper 44-9, p. 10).

TAPIOLITE

$FeTa_2O_6$

Tapiolite is the tetragonal form of iron tantalate. Some Nb may substitute for Ta in the structure, but unlike its orthorhombic counterpart, tantalite, the tapiolite series does not appear to extend to the Nb end member. The name mossite has been used for niobian tapiolite. It occurs in granite pegmatites, and as a detrital mineral in areas of granite pegmatites.

The X-ray powder pattern of tapiolite has five strongest lines with the following spacings and intensities: 3.35 (10), 2.57 (9), 1.746 (9), 1.405 (7) and 1.078 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 208).

Manitoba

52 L/5 Small amounts of tapiolite-ixiolite occur in the lithium-caesium ore deposit at Bernic Lake (R. Brinsmead, 1960: Precambrian, vol. 33, No. 8, p. 25).

Northwest Territories

85 I/11 Tapiolite occurs at the Peg Tantalum Mine at Ross Lake (R.W. Hutchinson, 1955: Am. Mineralogist, 40, p. 437).

86 C/1 Tapiolite occurs at the Best Bet Pegmatite Mines property on the north shore of Great Slave Lake, in the Ingray Lake area (R.W. Hutchinson, 1955: Am. Mineralogist, 40, p. 442).

TELLURBISMUTH

Bi_2Te_3

British Columbia

82 E/5 Tellurbismuth occurs in quartz veins of varying size and is associated with arsenopyrite, pyrite, and native gold, at Hedley Yuniman Gold Field Limited, 5 miles east of Hedley on Sixteen Mile Creek in the Osoyoos mining division.

The X-ray powder pattern of tellurbismuth from this location has five strongest lines at: 3.22 (10), 2.37 (8), 2.20 (4), 2.04 (4) and 1.490 (4) (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 5, p. 75) (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 368).

92 G/11 Tellurbismuth occurs associated with chalcopyrite, arsenopyrite, pyrrhotite, sphalerite, sylvanite, gold, and galena in pyrite and quartz at Ashloo Mine on Howe Sound, near Squamish (H.V. Warren and P. Davies, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 109).

92 K/3 Tellurbismuth, intimately associated with gold in white quartz, is found at the Lucky Jim Mine, Quadra Island, in the Nanaimo mining district (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 548).

92 L/3 Plates of tellurbismuth can be found cementing quartz crystals at the Fil-Mil Mine on the south side of Amai Inlet, about 2 miles from its entrance into Kyuquot Sound, 15 miles by boat from Kyuquot (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

103 H/1
103 H/2 Tellurbismuth is present as grains in pyrite, rarely as plates up to 1/2 inch wide and 1/8 inch thick, associated with chalcopyrite, arsenopyrite, pyrrhotite, sphalerite, sylvanite and gold at the

103 H/1 103 H/2 Hunter Group claims, Khutze Inlet near Swanson Bay (H.V. Warren and P. Davies, 1940: Univ. Toronto Stud., Geol. Ser., 44, p. 109).

Manitoba

52 L/13 Tellurbismuth occurs in quartz as plates up to 10 millimetres across and is closely intergrown with gold, at the Jeep Mine, at Bissett (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 454).

Northwest Territories

85 I/14 Tellurbismuth is associated with bismuth, gold, sphalerite, chalcopyrite and arsenopyrite in quartz veins at Allan Lake, northeast of Yellowknife (H.V. Warren and R.M. Thompson, 1949: Am. Mineralogist, 34, p. 458).

Ontario

42 A/11 Tellurbismuth occurs in milky quartz with some greenish white talc containing much visible gold at Porcupine Reef Gold Mines Limited, Pamour, Whitney Township, in the Cochrane district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 369).

52 B/10 Tellurbismuth was identified with pyrrhotite, chalcopyrite, pyrite and galena in polished sections from the Ardeen Mine, Moss Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 368).

Tellurbismuth was identified by X-ray powder photo from the Huronian Mine, Moss Township (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

32 C/3 Tellurbismuth was found in a quartz vein with pyrite, chalcopyrite, scheelite, and selenite, at Buffadison Gold Mines, Louvicourt Township, Abitibi County (J. Claveau, W.N. Ingham and W.R. Robinson, 1957: Que. Dept. Mines, Prelim. Rept., 256, p. 44).

32 C/4 Tarnished tellurbismuth in close association with calaverite and calcite was identified in several specimens of tourmalinized quartz at the Louvicourt Goldfields Mine in Louvicourt Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 369).

Tellurbismuth was identified by X-ray powder pattern in a specimen from the Beacon Gold Mine, Louvicourt Township, Abitibi County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

32 C/4 Tellurbismuth can be found at the Lamaque Mine, Bourlamaque Township, and at the Sullivan Consolidated Mine, Dubuisson Township, Abitibi County (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 369).

32 D/3 Tellurbismuth was identified in a polished section, intergrown in part with altaite, at the Horne Mine, Noranda (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 369).

32 D/6 Rich aggregates of tellurides, sulphides, and gold, with substantial masses of tellurbismuth and altaite, were found at the Robb-Montbray Mine in Montbray Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 369).

Yukon

115 G/6 Tellurbismuth has been identified from placer workings of Mr. G. Loland, on the Upper Burwash Creek in the Kluane Lake district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 368).

TELLURITE

TeO_2

Tellurite is a white acicular transparent mineral that forms as an oxidation product of native tellurium or tellurides. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.72 (9), 3.28 (10), 3.01 (5) and 2.73 (4) (H.E. Swanson *et al.*, 1960: Nat. Bur. Stds., Circ. 539, vol. 9, p. 57).

Yukon

105 D/6 Tellurite occurs associated with sylvanite, hessite, petzite, pyrite and native gold at the Gold Reef claims on Gold Hill (E. Thomson, 1936-47: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

TELLURIUM

Te

Native tellurium occurs in hydrothermal veins associated with tellurides and sulphides, usually in a quartz gangue. The spacings and intensities of the four strongest lines in the X-ray powder pattern of tellurium are: 3.23 (10), 2.36 (4), 2.23 (3) and 1.173 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 21).

British Columbia

82 E/2 Tellurium occurs associated with altaite, hessite, gold, copper, chalcocite, chalcopyrite and pyrrhotite at the Lakuria claim, Jewel Lake camp, in the Greenwood mining division (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

92 F/15 Native tellurium has been found in small quantities associated with galena and chalcopyrite in a quartz vein at the Commodore claim, near Vananda, Texada Island, in the Nanaimo mining division (G.C. Hoffmann, 1900: Geol. Surv. Can., Ann. Rept., XIII, p. 21R).

103 I/9 Tin white prismatic crystals of tellurium up to 3 millimetres in length have been found at the Grotto Group, 1 1/2 miles from Pitman, on Hardscrabble Creek, 1 mile west of the Canadian National Railway, in the Skeena mining division (R.M. Thompson, 1954: Am. Mineralogist, 39, p. 527).

Ontario

41 I/16 Tellurium from the Golden Rose Mine on Timagami Lake was identified by X-ray powder pattern (E.W. Nuffield and D.H. Gorman, 1960: private communication).

TEMISKAMITE

(See maucherite)

TENGERITE

Yttrium carbonate

The spacings and intensities of the three strongest lines in the X-ray powder pattern of tengerite are reported to be: 4.55 (7), 3.86 (10) and 2.95 (7) (ASTM card 16-698).

Quebec

31 G/13 Tengerite occurs in the form of white dendritic crusts on fractures in albite in a pegmatite quarry in West Portland Township, range V, lot 2, north of the Lièvre River at lat. 45°45'30"N, long. 75°36'30"W (H.S. Spence, 1953: Am. Mineralogist, 20, p. 728).

TENNANTITE

$(Cu, Fe, Zn, Ag)_{12}As_4S_{13}$

Tennantite forms a complete solid solution series with tetrahedrite through substitution of As for Sb. Cu is the predominant metal but considerable substitution takes place to yield ferrian, zincian, argentian and bismuthian varieties. Tennantite is somewhat less common than tetrahedrite.

The X-ray powder pattern of tennantite shows three strongest lines with the following spacings and intensities: 2.94 (10), 1.801 (8) and 1.535 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, pp. 55, 56).

British Columbia

82 K/8
82 K/9 Tennantite occurs with barite on Toby Creek, north of Windermere Lake in the Kootenay district (National Mineral Collection: donated by C.D. Ellis).

92 I/14 Quartz veins containing pyrite and chalcopyrite with tennantite have been found on the Bonaparte River 2 1/2 miles above Hat Creek in the Clinton mining division (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 12R).

New Brunswick

21 G/7 Tennantite is found with chalcopyrite, bornite and covellite in the tin ore deposit at Mount Pleasant in Charlotte County (A.A. Ruitenberg, 1963: M. Sc. thesis, Univ. New Brunswick).

21 H/10 Quartz-carbonate veins at Teahan in Albert County carry tennantite (W.J. Wright, 1940: New Brunswick, Mines Br., Paper 40-4).

21 H/15 Tennantite occurs in a shear zone at Lumsden in Albert County (D. Abbott, 1965: New Brunswick Res. and Prod. Council, Record 2, Part B).

Newfoundland

12 A/15 The workings of the Buchans Mining Company, Limited, Buchans, contain some tennantite. This mineral forms a minor part of the lead-zinc sulphide ore (R. Guimond, 1961: Precambrian, 34, p. 27).

Nova Scotia

21 H/1 Tennantite forms a part of the Magnet Cove barium-lead-zinc-silver deposit. It is the main silver-bearing mineral and is closely associated with chalcopyrite, in which it occurs as irregular intergrowths (R.W. Boyle, 1962: Can. Mining J., 83, No. 4, p. 104).

Ontario

31 C/14 Tennantite occurs with either quartz, quartzo-feldspathic rocks, or fine granular dolomite in Barrie Township, Frontenac County, conc. IX, lots 6, 7, 8, 9 (G.C. Hoffmann, 1892-93: Geol. Surv. Can., Ann. Rept., VI, p. 28R).

32 D/4 Tennantite was identified by X-ray powder pattern in a specimen from Upper Canada Mine, Gauthier Township, in the Kirkland Lake area (E.W. Nuffield and D.H. Gorman, 1960: private communication).

42 H/6 Tennantite, identified by X-ray powder pattern, has been found at the Hollinger Mine, Timmins (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Quebec

21 E/5 Tennantite occurs at the Crown, Capelton, and Eustic Copper mines in Ascot Township, Sherbrooke County, conc. IX, lot 2, with chalcopyrite, pyrite and quartz. Analysis by Harrington: S 27.99, As 15.34, Sb 4.52, Cu 42.09, Fe 3.77, Zn 4.56, Pb 0.25, Ag 0.21, insol. 0.09, total 98.82; S.G. 4.622 (B.J. Harrington, 1885: Trans. Roy. Soc. Can., vol. 1, sec. 3, p. 80).

32 C/4 Tennantite was identified by X-ray powder pattern in a specimen from the Golden Manitou Mine, in Bourlamaque Township, Abitibi County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

TENORITE

CuO

Melaconite, the massive variety of tenorite, is a common mineral in the oxidized portion of copper deposits. It is usually associated with cuprite, iron and manganese oxides and copper silicates.

The X-ray powder pattern has five strongest lines with the following spacings and intensities: 2.53 (10), 2.33 (10), 1.870 (7), 1.508 (8) and 1.377 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 172).

British Columbia

82 F/5 Melaconite, a variety of tenorite, occurs at the head of Copper Creek along with many other oxides of iron and copper (R. Bell, 1902: Geol. Surv. Can., Ann. Rept., XV, p. 125A).

82 F/15 Melaconite, is found at the True Blue mining claim, near Kaslo (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 154).

Northwest Territories

78 B/6 Tenorite has been found in the volcanic rocks of the Shaler Mountains on Victoria Island (R. Thorsteinsson and E.T. Tozer, 1962: Geol. Surv. Can., Mem. 330, p. 77).

Quebec

21
31 Some of the copper deposits of the Eastern Townships have shown traces of melaconite (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 45T).

TETRADYMITE

Bi_2Te_2S

Tetradymite is found in gold-quartz veins formed at moderate to high temperatures, also in contact metamorphic deposits, associated with tellurides, sulphides and commonly gold. The spacings and intensities of the five strongest lines in the X-ray powder pattern of tetradymite are: 3.11 (10), 2.29 (4), 1.645 (4), 1.296 (4) and 1.211 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 26).

British Columbia

82 E/2 Tetradymite is associated with altaite at the Rhoderic Dhu claim, Jewel Lake camp in the Greenwood mining division (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 97).

82 F/4 A thin film of tetradymite and gold on monzonite has been described from the Jumbo Mine, Rossland (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 372).

82 K/3 Tetradymite occurs with a little hessite intermixed with altaite 6 miles north of Liddle (Lyle?) Creek, Kaslo River, West Kootenay district. It has a foliated structure and a lead grey to steel grey colour with occasionally a pale yellow tarnish, a metallic lustre, and a black streak. Chemical analysis by R.A.A. Johnston, is as follows: S 4.30, Se tr., Ag 0.91, Te 36.01, Pb 3.50, Bi 51.85, Th tr., insol. 3.52 (quartz), total 100.09; S.G. 7.184 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, pp. 298, 299).

82 L/4 Foliated tetradymite occurs in intimate association with wehrlite in a quartz body, with pyrrhotite, chalcopyrite and free gold, 15 miles southwest of Vernon at the White Elephant Mine. Chemical analyses: (1) by Forward, Bi 59.10, S 4.85, Te 35.90, total 99.85; (2) by Williams, Bi 60.72, 60.88, S 4.29, 4.29, Te 34.71, 34.47, totals 99.72, 99.64; (3) by Williams, tetradymite with minor wehrlite, Bi 61.05, S 3.65, Te 35.10, total 99.80 (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 50, p. 77).

92 G/10 A specimen showing coarse platy masses of tetradymite embedded in a groundmass of quartz, green diopside and scheelite was collected from the Katanga Group on the east side of Pitt Lake near the mouth of Scott (Vickers) Creek, New Westminster mining division (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 548).

92 H/8 Tetradymite associated with gold and arsenopyrite is found at the Nickel Plate Mine, northeast of Hedley Creek in the Osoyoos mining division (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 46, p. 97).

92 O/3 Tetradymite was identified from the Taylor Windfall property on Battlement Creek, near the Taseko River, in the Clinton mining district (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 83).

93 E/6 Quartz veins containing tetradymite are irregularly scattered in diorite near its contact with greenstone at the Harrison Group claims, Tweedsmuir Park, on the north side of Lindquist Lake, Omineca mining division (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 76).

Manitoba

63 K/13 The copper-lead-zinc sulphide ore mined at Flin Flon contains a small amount of tetradymite (R.F. Coulter, 1962: Can. Inst. Mining Met., Bull. 55, No. 602, p. 376).

Ontario

31 M/13
32 D/4 Tetradymite is associated with calaverite, petzite, pyrite, gold, chalcopyrite and sphalerite at Boston Creek; and with other tellurides, pyrite, chalcopyrite, hematite and galena at Miller Independence Mine; in Pacaud Township, Timiskaming district (E. Thomson, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 98).

32 D/4 Tetradymite having good cleavage both in polished section and in hand specimens occurs closely associated with matildite, sphalerite, chalcopyrite and calaverite, at Glacier Gulch, 6 miles west of Smithers (G.M. Pratt, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 55).

41 I/6 The occurrence of tetradymite and hessite in non-vein galena at Sudbury, has been described. Three mineral associations exist: as small grains in nonmagnetic pyrrhotite; as an impure intergrowth with native bismuth in the galena-Ni-Bi-S type of mineralization; and, most commonly as grains in galena (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 102).

41 P/12 Tetradymite occurs on Narrow Peninsula near Clam Lake, Chester Township, Sudbury district, in the Three Duck Lake area (H.C. Laird, 1932: Ont. Dept. Mines, Ann. Rept., vol. 41, Pt. III, p. 33).

42 A/1 The No. 2 vein at the Tough Oakes Mine in the Kirkland Lake area contains tetradymite and hessite (A.G. Burrows, 1923: Ont. Dept. Mines, 32, Pt. IV, p. 24).

42 A/9 In the vicinity of Painkiller Lake, northeast of Matheson, Beatty Township, Timiskaming district, tetradymite has been deposited contemporaneously with native gold, filling fractures in quartz (E. Thomson, 1922: Univ. Toronto Stud., Geol. Ser., 14, p. 93).

42 A/11 Small amounts of tetradymite and gold occur in massive white quartz at the Broulan Mine, in the Porcupine district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 371).

42 A/16 Tetradymite and altaite have been reported from conc. IV, lot 7, Rickard Township, Cochrane district, in the Matachewan area (--, 1918: Ont. Dept. Mines, Ann. Rept., vol. 27, Pt. 1, p. 214).

42 D/14 Examination of a polished section of a specimen from the McKellar Longworth Mine, at Schreiber, revealed the presence of tetradymite chalcopyrite and gold (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 371).

52 E/9 Tetradymite, calaverite and petzite have been found at Bigstone Bay on Lake of the Woods (E. Thomson, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 48).

52 F/3 Stringers and tiny blebs of tetradymite occur in quartz and carbonate gangue in veins at Straw Lake, 36 miles north of Fort Frances, in the Kenora district (E. Thomson, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 33).

52 N/4 Tetradymite is associated with gold and chalcopyrite in a mixed quartz-carbonate gangue at the Gold Shore Mine, west of Howey Bay, Red Lake, Dome Township (E. Thomson, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 47).

It has also been identified by X-ray powder pattern at the Mackenzie Red Lake Gold Mine, associated with galena (E.W. Nuffield and D.H. Gorman, 1960: private communication).

53 C/13 A quartz vein containing tetradymite and gold occurs on the Zione property, located between Rat House Bay and North Trout Lake, in the Favourable-Sandy Lake area (M.E. Hurst, 1929: Ont. Dept. Mines, Ann. Rept., vol. 38, Pt. 2, p. 69).

Quebec

32 C/4 Small flakes or grains of tetradymite have been found in specimens from the Perron Mine, Pascalis Township, Abitibi County; the Lamaque Mine, Bourlamaque Township; and the Sisco Gold Mine, near Sisco Island in Lac de Montigny (R.M. Thompson, 1949: Am. Mineralogist, 34, pp. 371, 372) (E.W. Nuffield and D.H. Gorman, 1960: private communication).

32 C/5 Specimens from the Eureka Mine, Tiblemont Township, Abitibi County, contain tetradymite, gold and galena as the chief metallic minerals, and some sphalerite and chalcopyrite, in a quartz gangue (E. Thomson, 1934: Univ. Toronto Stud., Geol. Ser., 36, p. 33).

32 D/2 The main metallic mineral at the McWatters Mine in Rouyn Township is tetradymite. It occurs as short veins and bleb-like forms with minor chalcopyrite and gold in a predominantly quartz gangue (E. Thomson, 1935: Univ. Toronto Stud., Geol. Ser., 38, p. 48).

32 D/6 A specimen from the Powell Rouyn Mine, at Noranda consisted of a somewhat decomposed stringer of tetradymite in dark green pyritized quartzose rock, coated on two sides by greenish black chlorite, pink calcite crystals, pyrite and free gold (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 372).

Altaite occurs along cleavage planes in tetradymite to produce a pseudo-eutectic structure that is the predominant metallic mineral phase in parts of the ore at the Robb-Montbray property, located 3 miles northwest of the southeast corner of Montbray Township (E. Thomson, 1928: Univ. Toronto Stud., Geol. Ser., 27, p. 12).

Yukon

106 D/4 A small pebble of tetradymite containing an embedded subhedral crystal of gold has been found in placer workings at Dublin Gulch, Mayo district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 371).

115 H/14
115 I/3 Pebbles of tetradymite up to 10 millimetres in length have been found in placers at Discovery Fork, and along the east fork of Nansen Creek, in the Carmacks district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 371).

115 J/15 A number of solid compact nuggets of tetradymite, containing some coloradoite, have been taken from the Reno placer property at Canadian Creek (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 454).

TETRAHEDRITE

$(Cu, Fe, Ag, Zn)_{12}Sb_4S_{13}$

Tetrahedrite is one of the most common of sulphosalts, widespread in its occurrence and varied in its association. It forms an apparent complete solid solution series with tennantite through substitution of As for Sb. It is an important ore mineral of copper; and the argentian variety, freibergite, may be an important ore mineral of silver. The strongest lines in the X-ray powder patterns have the following spacings and intensities: tetrahedrite - 3.00 (10), 2.61 (2), 1.831 (6), 1.563 (3) and 1.056 (2); and freibergite - 3.00 (10), 1.855 (8) and 1.583 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 53).

British Columbia

82 E/6 Dull grey, fine-grained, disseminated freibergite occurs in the ore of the Highland Bell Mine, at Wallace Mountain, near Beaverdell, 23 miles east of Penticton. It is associated with galena and polybasite. Chemical analyses by R.N. Williams are as follows: Ag 25.25, 26.40; Cu 17.85, 18.06; Fe 6.68, 5.30; Zn 3.03, 3.59; Pb 0.44, 0.44; Sb 21.20, 21.17; As 1.55, 1.20; S 22.68, 22.91, insol. 1.09, 0.84; total 99.95, 99.91; S.G. 5.02 ± 0.02, 4.94 ± 0.04 (A.B. Staples and H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 29).

82 F/14 Analysis of plumbian-argentian tetrahedrite from the Antelope claim, Carpenter Creek (also called Seaton Creek) in the Slocan mining division, by Johnston: S 21.68, Sb 28.22, As 0.23, Cu 22.14, Ag 11.20, Pb 9.38, Zn 6.22, Fe 0.93, total 100.00; S.G. 5.082 (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 12R).

82 G/13 Masses of mercurian tetrahedrite with minor pyrite occur in a quartz-siderite gangue at the Red Rock Group on Copper Creek (also called Sandown Creek) a small tributary of Skookumchuck Creek, 6 miles west of Torrent Station, in the Fort Steele mining division. Chemical analysis by R.N. Williams yielded: Cu 36.62, Hg 4.94, Zn 4.50, Fe 4.00, Sb 24.42, As 0.35, S 25.04, total 99.87; S.G. 4.95; cube edge 10.34Å (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 548).

82 K/8
82 K/9 Tetrahedrite occurs at the Pretty Girl claim, which is located on the ridge between Boulder (or Bruce) Creek and its tributary Law Creek, both of which empty into Horsethief Creek. The claim is northeast of the peak of Boulder (or Slade) Mountain at an elevation of 8,800 feet. It is on the property of North Kootenay Mines Limited, in the Fort Steele mining division (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 549).

82 L/15 Argentiferous tetrahedrite occurs near Craigellachie on the Eagle River (G.C. Hoffmann, 1890-91: Geol. Surv. Can., Ann. Rept., V, p. 65R).

92 H/6 Freibergite occurs at Hope on the Fraser River (C. Camsell, 1911: J. Can. Min. Inst., p. 603).

92 I/10 An argentiferous variety of tetrahedrite is reported to occur in the Vernon mining division at Cherry Creek (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 33T).

92 I/12 Tetrahedrite, massively banded in gangue, has been found on the Fraser River, near Foster Bar (National Mineral Collection).

92 J/15 Tetrahedrite occurs with zinckenite and jamesonite at the Robson Group, Tyaughton Lake area, Bridge River district. Chemical analysis by R.N. Williams yielded: Cu 30.50, Ag 1.80, Pb 1.10, Zn 4.50, Fe 5.73, As 7.26, Sb 20.40, S 23.06, insol. 5.61, total 99.96 (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p. 73).

92 O/3 Disseminated masses and crystals of tetrahedrite, up to 1/4 inch in size, occur in a compact mass of sericite at the Taylor Windfall Mine on Battlement Creek, near its junction with the Taseko River, about 9 miles east of Taseko Lake. Chemical analysis by R.N. Williams: Cu 35.03, Fe 2.65, Zn 8.50, Sb 12.54, Pb 2.05, As 12.48, S 26.49, total 99.74; S.G. 4.68 (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507).

103 P/12 Argentian tetrahedrite has been identified in drill core from the 1,050-foot adit level on the North Star claim of Torbrit Silver Mines Limited, located 17 miles north of Alice Arm on the west side of the Kitsault River, at lat. 55°40'N, long. 129°30'W (D.A. Moddle, 1960: private communication).

Manitoba

64 I/7 Replacement lenses in altered volcanic rock on the Echimamish Gold property, contain sphalerite, galena, chalcopyrite, jamesonite, and freibergite (C.K. Bell, 1961: Geol. Surv. Can., Paper 61-22, p. 17).

New Brunswick

21 G/1 Quartz veins carrying tetrahedrite occur at Frenchman Creek in Saint John County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st ed., Industrial and Educational Pub. Co., Gardenvale, Que.).

21 G/8 Tetrahedrite occurs at McKiel Lake in Queen's County. It is associated with sphalerite, galena, chalcopyrite, pyrite, arsenopyrite and silver (G.S. MacKenzie, 1951: Geol. Surv. Can., Paper 51-15).

21 G/9 Tetrahedrite is one of the minerals found at the lead-zinc-silver prospect at Reserve Brook in Queen's County (G.S. MacKenzie, 1942: New Brunswick, Mines Br., Paper 42-1).

21 H/12 Veins containing galena, chalcocite, tetrahedrite and sphalerite occur in limestone and quartzite at Norton in King's County (W.L. Goodwin, 1928: Geology and Minerals of New Brunswick, 1st ed., Industrial and Educational Pub. Co., Gardenvale, Que.).

21 O/9 Tetrahedrite is a constituent of sulphide bodies on the property of Tetagouche Exploration at Orvan Brook in Restigouche County (A.L. McAllister, 1960: Can. Inst. Mining Met., Bull. 53, No. 574, pp. 88-98).

21 P/5 Tetrahedrite is a minor constituent of the sulphide ores at Brunswick No. 12 and No. 6 mines, in Gloucester County (A.L. McAllister, 1960: Can. Inst. Mining Met., Bull. 53, No. 754, pp. 88-98).

Ontario

31 C/6 A specimen of granular tetrahedrite from lot 9, conc. IV, Hungerford Township, Hastings County, is in the National Mineral Collection.

31 F/2 A specimen of tetrahedrite in barite, found in Lavant Township, Lanark County, conc. VIII, lot 19, was donated to the National Mineral Collection by J.B. Caldwell in 1914.

31 M/5 Chemical analysis of tetrahedrite from Coleman Township in the Timiskaming district, by Burrows: S 22.86, Sb 21.86, Cu 36.04, Pb undet., Zn 8.14, Fe 9.84, total 98.74 (W.G. Miller, 1905: Ont. Bur. Mines, Ann. Rept., vol. 14, Pt. II, p. 22).

Freibergite is present in quartz at the Silver Queen Mine, near Cobalt (National Mineral Collection).

42 E/11 Tetrahedrite occurs as fine irregular replacement blebs in arsenopyrite and chalcopyrite at Bankfield Consolidated Mines and the Little Long Lac Mine, Errington Township (E.G. Pye, 1941: Ont. Dept. Mines, Ann. Rept., vol. 60, Pt. VI, p. 60).

42 L/7 An occurrence of tetrahedrite is reported at Kupfer Lake in the O'Sullivan Lake area (W.W. Moorhouse, 1956: Ont. Dept. Mines, Ann. Rept., vol. 64, Pt. IV, p. 22).

52 N/4 The massive sulphide ore at the Cochenour-Willans Mine, at Red Lake, in Dome Township, contains tetrahedrite associated with stibnite, berthierite, jamesonite, pyrite, pyrrhotite, arsenopyrite and gold (M.H. Frohberg: private communication).

53 B/14 Massive tetrahedrite is reported to occur in a quartz fissure vein at the contact between a diorite and basic volcanic rocks at the

53 B/14 Ayrhart showing, between Agutua Arm of Weagamow Lake and Randall Lake, Kenora district (D.A. Moddle, 1960: private communication).

Quebec

32 C/4 Massive sulphide ore from a high grade shoot at Golden Manitou Mines, Bourlamaque Township, Abitibi County, was found to contain tetrahedrite (M.H. Frohberg: private communication).

Yukon

105 M/14 Freibergite occurs at a number of localities in the Mayo district. Among them are the following: (1) at the Bunny Highlander and Cub Group at Keno Hill in a shear zone with siderite, pyrite, galena and sphalerite; (2) on the Silver King property at Galena Hill with galena, siderite and sphalerite in a vein; (3) in a vein with galena, pyrite, siderite, quartz, cerussite, limonite and manganese oxide at the Arctic Mastiff property, Galena Hill; (4) at the Elsa Mine on the north slope of Galena Hill with native silver, galena (bearing ruby silver) and argentite (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 507) (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 601).

THENARDITE

Na_2SO_4

Thenardite is formed in lakes in arid regions by evaporation of relatively concentrated brine waters in warm weather. The hydrated sulphate, mirabilite, forms instead of thenardite at lower temperatures and from more dilute brines.

The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 4.66 (7), 3.178 (5), 3.075 (5), 2.783 (10) and 2.646 (5) (H.E. Swanson and R.K. Fuyat, 1953: Nat. Bur. Stds., Circ. 539, vol. II, p. 60).

Alberta

83 I/3 Thenardite occurs at the bottom of a small lake near Pozerville (R.A.A. Johnston, 1909: Geol. Surv. Can., Sum. Rept., p. 250).

Northwest Territories

120 C/13 Thenardite has been identified by X-ray diffraction pattern and spectrographic analysis in specimens of efflorescent salts collected from the Hazen Lake area on Ellesmere Island (X-ray Laboratory, Geol. Surv. Can.).

THOMSONITE

$NaCa_2Al_5Si_5O_{20}.6H_2O$

Thomsonite is a mineral of the zeolite group of hydrated alumino-silicates which have the characteristic properties of: (1) losing water without change of crystal structure, and absorbing other compounds in place of water; and (2) undergoing cation exchange. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 2.95 (8), 2.86 (10) and 2.68 (8) (ASTM card 9-490).

Nova Scotia

21 A/NW
21 H/SE
Abundant zeolites occur in the trap rocks that outcrop along the shores of the Bay of Fundy and Minas Basin. Thomsonite usually occurs as radiating masses of delicate fibres, sometimes pearly in lustre and asbestiform in appearance. It may be readily confused with mesolite. Compact forms have also been found. Notable localities include: Port Lorne, Annapolis County (21 A/14); west end of Digby Neck, Digby County (21 B/8); Margaretville and Port George, Annapolis County (21 H/3); Amethyst Cove, Kings County and Five Islands, Cumberland County (21 H/8). Chemical analyses by E.W. Todd (I and II) and H. How (III): I - asbestiform variety from Amethyst Cove: SiO_2 39.96, Al_2O_3 31.02, Fe_2O_3 0.14, CaO 11.98, Na_2O 4.19, K_2O 0.18, H_2O 12.85, total 100.32; S.G. 2.299; II - compact variety from about 3/4 of a mile east of Port George: SiO_2 39.74, Al_2O_3 31.08, Fe_2O_3 0.08, CaO 12.24, Na_2O 4.17, K_2O 0.06, H_2O 12.98, total 100.35; S.G. 2.339; III - mean of 2 analyses of thomsonite from Port George: SiO_2 41.45, Al_2O_3 29.65, CaO 11.81, Na_2O 4.37, H_2O 12.85, total 100.13 (T.L. Walker and A.L. Parsons, 1922: Univ. Toronto Stud., Geol. Ser., 14, pp. 72, 73).

Ontario

41 N/12
41 N/13
Thomsonite has been reported from Michipicoten Island in Lake Superior (G.G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 17).

42 I/4
Radiating masses of thomsonite are found in cavities in augite at Sextant Rapids on the Abitibi River in the Timiskaming district. Some of the thomsonite crystals are terminated with crystal faces (T.L. Walker, 1932: Univ. Toronto Stud., Geol. Ser., 32, p. 5).

Quebec

21 L/3
At the Caribou Chrome pit, thomsonite is associated with albite and grossular garnets as minute crystals filling vugs in altered aplite and pegmatitic granite. It was also found at the Jacob,

21 L/3 King, Johnston, Bencer, Martin and Bennett asbestos pits. Chemical analysis by R. J. C. Fabry: SiO_2 38.10, Al_2O_3 28.98, Fe_2O_3 0.38, CaO 13.61, MgO 0.38, Na_2O 5.28, K_2O 0.22, H_2O 12.76, total 99.71; S.G. 2.36-2.37 (E. Poitevin, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 63).

THORIANITE

ThO_2

A complete solid solution series exists between thorianite and uraninite through substitution of U for Th. Rare-earth elements may substitute for Th in amounts up to several per cent, and Pb is usually present as a daughter product of radioactive decay. The X-ray powder pattern has four strongest lines with the following spacings and intensities: 3.18 (10), 1.953 (7), 1.667 (8) and 0.935 (6) (L. G. Berry and R. M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 184).

British Columbia

92 I/4 Thorianite occurs in the black sand of the Fraser River near Lytton as grains from 50 to 100 microns in diameter, some rounded and others almost perfect cubes (R. M. Thompson, 1954: Am. Mineralogist, 39, p. 526).

Ontario

31 E/1 Thorianite has been identified by X-ray powder pattern in a specimen from Baptiste Lake, Herschel Township (E. W. Nuffield and D. H. Gorman, 1960: private communication).

31 F/4 Uranian thorianite is present as cubes up to 1/4 inch in diameter, some of which are twinned, in zones marked by salmon coloured calcite and phlogopite, in country rock composed of impure micaceous marble and schist intruded by granite, at Normingo Mines Limited, Dungannon Township, Hastings County, conc. XVI, lot 14. Partial chemical analysis: U_3O_8 40.0, ThO_2 46.4, PbO 8.0, total 94.4 (S. C. Robinson and A. P. Sabina, 1955: Am. Mineralogist, 40, p. 627).

Quebec

31 F/9 A pyroxenite body in which thorianite is associated with scapolite, diopside and hornblende occurs on the Stratmat property, range X, lots 54, 55, Masham Township, Gatineau County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 44).

31 F/15 (1) Uranian thorianite is associated with monazite, rutile, and garnet in diopside-calcite-phlogopite rock at Calumet Uranium

31 F/15 Mines Limited, Grand Calumet Township, Pontiac County, range VII, lot 29. Partial chemical analysis: U_3O_8 39.8, ThO_2 41.0, PbO 8.4, total 89.2.
(2) The Yates Uranium Mines Limited deposit on lot 20, range IV, Huddersfield Township, Pontiac County is made up of a salmon coloured calcite, euhedral diopside and bands of phlogopite in impure crystalline limestone. Uranian thorianite is disseminated in the calcite. Thorite, titanite and minor chondrodite, allanite and pyrite are associated. Partial chemical analysis: U_3O_8 25.0, ThO_2 55.5, PbO 6.8, total 87.3.
(3) Small cubes of uranian thorianite, some of which are twinned, occur in calcite-diopside-phlogopite rock at the Yates Uranium Mines Limited deposit on lot 20, range V, Huddersfield Township, Pontiac County. Actinolite and chondrodite are locally abundant; thorite and lessingite have also been identified. Partial chemical analysis: U_3O_8 36.8, ThO_2 40.1, PbO 7.7, total 84.6.
(4) Interpenetration cubes of uranian thorianite up to 1/2 inch in diameter have been found in radioactive calcite-diopside-phlogopite zones in crystalline limestone on the property of Huddersfield Uranium and Minerals Limited, lots 21, 22, range V, Huddersfield Township, Pontiac County. Partial chemical analysis: U_3O_8 36.3, ThO_2 49.7, PbO 8.6, total 94.6 (S.C. Robinson and A.P. Sabina, 1955: Am. Mineralogist, 40, pp. 624-633).

Thorianite has also been reported at the following properties: Calumet Uranium Mines Limited, lots 31 and 32, range VI, Grand Calumet Township; and Soma-Duveray Gold Mines Limited, lot 26, range IV, Huddersfield Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, pp. 31-40).

31 J/12
31 J/13 An occurrence of thorianite is reported from Baskatong Lake (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Saskatchewan

74 P/7 Thorianite and uraninite occur with biotite and molybdenite in sheared pegmatite at the Row Group on the south shore of Charlebois Lake in the Fond-du-Lac region (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 112).

THORITE

$ThSiO_4$

All analyzed thorites depart to a considerable extent from the ideal composition. Variation in the primary mineral involves substitution of U for Th, and such uranoan thorite is commonly called uranothorite. The rare-earth elements, and Ca, Zr, Fe, Mn and Al may also substitute for Th. A second chemical variant, for which the name thorogummite is used, results from substitution of $(OH)_4$ for (SiO_4). It occurs as an alteration product and is usually metamict. Thorite is isostructural with zircon and has an identical crystal habit. It inverts on heating to the monoclinic polymorph, huttonite. The spacings and intensities of the five strongest lines in the X-ray powder pattern of pure synthetic thorite are: 4.69 (9), 2.66 (8), 3.56 (10), 1.84 (10) and 1.336 (8) (C. Frondel, 1958: U.S. Geol. Surv., Bull. 1064, p. 273).

British Columbia

82 M/12 Radioactive zones occur in trachyitic rocks on the Rexspar property in central British Columbia, 3 miles south of Birch Island Station, on the main line of the Canadian National Railway, about 80 miles north of Kamloops. Uraninite and uranothorite are the principle radioactive minerals; uranoan thorianite, bastnaesite, torbernite and metatorbernite have also been reported (A.H. Lang, J.W. Griffith and H.R. Steacy, 1962: Geol. Surv. Can., Econ. Geol. Ser., 16, 2nd ed., p. 206).

Manitoba

52 E/14 Thorite occurs in a zone composed of alternating bands of pegmatite and biotite schist and gneiss at the East Found Group, 1 mile west of Star Lake and 10 miles east of Rennie Station (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 116).

Ontario

Uranothorite is of widespread distribution in the radioactive rocks of the Haliburton-Bancroft area, and is sufficiently abundant locally to have been mined as an ore mineral of uranium. A list of mining properties and localities where the presence of thorite has been confirmed by X-ray powder pattern is given below. The identifications were made at the X-ray Laboratory, Geological Survey of Canada.

		Lot	Concession	Township
31 D/16	Haliburton County			
	Kemp Uranium	5	XIV	Cardiff
	Kenmac Uranium	6	XIV	Cardiff
	Dyno	12	VIII	Faraday
	Aumacho River	22	IX	Faraday
	Canada Radium	8, 11	XII, XIII	Faraday
	Nu-Cycle Uranium	26, 28	II	Glamorgan
	Blue Rock Cerium	18, 20	V, VI	Monmouth
	Silanco	32	VI	Monmouth
	Rare Earth	20	VIII	Monmouth
	Roford	13	XIII	Monmouth
	Saranac Uranium	24	X	Monmouth
	Hastings County			
	Faraday Uranium	16, 17	XI	Faraday

		Lot	Concession	Township
31 D/16	Peterborough County			
	Cavendish Uranium	14, 15	VII	Cavendish
31 E/1	Haliburton County			
	Bicroft Uranium	26, 27	XI	Cardiff
	Halo Uranium	4, 5	XVIII	Cardiff
	Prospect Pit	7	XX	Cardiff
	Fission	5, 8	XXI	Cardiff
	Nu-Age	8	XXI	Cardiff
	Topspar Fluorite	13	XXII	Cardiff
	Hastings County			
	Reesor	31	XVI	Faraday
31 F/4	Hastings County			
	Normingo	14	XVI	Dungannon
	Faraday Uranium	16, 17	XI	Faraday
	Greyhawk Uranium	10	XVII	Faraday
	Bonville Gold	21, 24	A	Faraday
	Carr-Quirk-Mellish	5	I	Monteagle
	Musclow	17, 18	II	Monteagle
	MacDonald	18	VII	Monteagle

31 D/16 Partial chemical analyses of thorite crystals by Sydney Abbey: (1) brown to black crystals, partly altered, from the Saranac property, lot 24, conc. X, Monmouth Township, Haliburton County - SiO_2 45.5, PbO 0.32, U_3O_8 0.3, ThO_2 28.2, rare earths 1.5, Fe_2O_3 5.3, CaO 1.25, H_2O 6.0, total 86.37; (2) rough brown crystals, partly altered, from the Kemp property, lot 5, conc. XIV, Cardiff Township, Haliburton County - SiO_2 52.7, PbO 0.48, U_3O_8 1.08, ThO_2 29.89, rare earths 0.25, Fe_2O_3 6.37, CaO 0.94, H_2O 5.92, total 97.61 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, pp. 16, 17).

Partial chemical analyses of uranothorites by Sydney Abbey: (1) black subhedral to massive uranothorite from No. 1 showing, Kenmac Chibougamau Uranium Mines Limited, lot 6, conc. XIV, Cardiff Township, Haliburton County: SiO_2 19.20, PbO 0.64, U_3O_8 11.72, ThO_2 51.56, rare earths <0.2, Fe_2O_3 3.96, CaO 2.16, H_2O 9.3, C 0.1, total 98.86; S.G. 4.37; (2) red massive uranothorite, same locality as (1) above - SiO_2 19.32, PbO 0.50, U_3O_8 10.83, ThO_2 48.29, rare earths 2.05, Fe_2O_3 2.40, CaO 2.59, H_2O 11.1, total 97.08; S.G. 4.20; (3) black uranothorite from the Silanco property, lot 32, conc. VI, Monmouth Township, Haliburton County - SiO_2 19.18, PbO 1.23, U_3O_8 9.00, ThO_2 52.42, rare earths <0.2, Fe_2O_3 2.74, CaO 2.37, H_2O 9.75, C 0.59, CO_2 0.26, total 97.74; S.G. 4.34; (4) red uranothorite from the same locality as (3) above - SiO_2 18.83, PbO 1.03, U_3O_8 1.68, ThO_2 58.98, rare earths <0.2, Fe_2O_3 3.96, CaO 3.32, H_2O 8.92, C 0.25, CO_2 0.54, total 97.51; S.G. 4.48; (5) black uranothorite crystals from the Roford property, lot 13, conc. XIII, Monmouth Township, Haliburton County - SiO_2 17.62, PbO

31 D/16 1.27, U_3O_8 5.78, ThO_2 57.55, rare earths 1.69, Fe_2O_3 3.89, CaO 2.42, H_2O 9.54, total 99.76; S.G. 4.41 (S.C. Robinson and S. Abbey, 1957: Can. Mineralogist, 6, pp. 1-15).

31 E/1 Partial chemical analyses of uranothorites by Sydney Abbey: (1) massive brown to black uranothorite, adit level, No. 2 dyke, station 301, Bicroft Uranium Mines Limited, lots 26 and 27, conc. XI, Cardiff Township, Haliburton County - SiO_2 20.84, PbO 3.16, U_3O_8 12.31, ThO_2 43.49, rare earths <0.2, Fe_2O_3 2.70, CaO 3.29, H_2O 11.1, C 0.24, CO_2 0.04, total 97.17; S.G. 3.98-4.13; (2) yellow to brown, massive to platy uranothorite, 150-foot level, Bicroft Uranium Mines Limited, lots 26 and 27, conc. XI, Cardiff Township, Haliburton County - SiO_2 21.06, PbO 3.48, U_3O_8 15.09, ThO_2 39.46, rare earths <0.2, Fe_2O_3 2.26, CaO 3.88, H_2O 11.08, total 96.31; S.G. 4.1; (3) cigar-shaped crystal of submetallic to pitchy uranothorite from Fission Mines Limited, lots 5 and 8, conc. XXI, Cardiff Township, Haliburton County - SiO_2 17.80, PbO 1.46, U_3O_8 11.32, ThO_2 49.08, rare earths 1.66, Fe_2O_3 3.42, CaO 2.30, total 87.04; (4) massive black uranothorite from east wall of adit, 10 feet south of portal, Topspar Fluorite Mines Limited, lot 13, conc. XXII, Cardiff Township, Haliburton County - SiO_2 19.73, PbO 1.58, U_3O_8 13.94, ThO_2 46.78, rare earths 3.99, Fe_2O_3 0.36, CaO 5.75, H_2O 9.72, total 101.85; S.G. 4.33 (S.C. Robinson and S. Abbey, 1957: Can. Mineralogist, 6, pp. 1-15).

31 F/4 Elongated square prisms of uranothorite occur in a pegmatite dyke at the MacDonald Mine, lots 18 and 19, conc. VII, Monteagle Township, Hastings County. Chemical analysis by H.V. Ellsworth: SiO_2 19.56, ThO_2 46.33, UO_3 9.46, UO_2 7.67, PbO 1.32, Fe_2O_3 0.75, MnO 0.07, FeO 0.43, MgO 0.01, $(Ce, La, Di)_2O_3$ 0.08, $(Y, Er)_2O_3$ 0.36, H_2O 9.24, BeO + Al_2O_3 0.13, CaO 4.38, insol. 0.15, total 99.94; S.G. 4.414 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 204).

31 F/6 Uranothorite occurs as subhedral crystals in leucogranite cementing brecciated metapyroxenite in conc. X, lot 24, Brudenell Township, Renfrew County, at Rockingham Mines Limited. Partial analysis yielded: SiO_2 19.81, PbO 1.72, U_3O_8 20.73, ThO_2 40.37, rare-earth oxides <0.2, Fe_2O_3 0.20, CaO 5.17, H_2O 9.88, total 98.08; S.G. 4.3. It also occurs in leucogranite pegmatite in conc. C, lot 39, Sebastopol Township, Renfrew County. Partial analysis yielded: SiO_2 20.40, PbO 3.62, U_3O_8 10.73, ThO_2 49.92, rare-earth oxides 0.41, Fe_2O_3 2.44, CaO 2.79, H_2O 9.48, C 0.31, CO_2 0.19, total 100.29 (S.C. Robinson and S. Abbey, 1957: Can. Mineralogist, 6, pp. 1-15).

42 D/9 Thorite was identified in a specimen sent to the Geological Survey of Canada from the property of the Pic Bamoos Syndicate, 2 miles west of Marathon, north of Lake Superior (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 119).

52 F/13 Thorite is distributed erratically in pegmatite and in shear zones along contacts between pegmatite and lava on the Byberg property, located along the Trans-Canada Highway, 30 miles east of Kenora (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 118).

Quebec

31 F/10 A yellowish mineral found in a pegmatite dyke on the property of Struon Uranium Mines Limited was identified as thorite by its X-ray powder pattern. The property is on lots 11 and 12, range IX, Grand Calumet Township, Pontiac County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 34).

31 F/15 Grains of red uranothorite occur in a skarn deposit on the Calumet Uranium Mines property in Grand Calumet Township, lots 29 and 30, range VII, Pontiac County.

Dark brown elongated square prisms of uranothorite are found in fluorite on claims held by Calumet Contract Uranium Mines Limited, lot 31, range VIII, Grand Calumet Township, Pontiac County.

Rounded grains of pale red-brown uranothorite are reported to be present in pinkish calcite at Huddersfield Uranium Mines Limited, lots 21 and 22, range V, Huddersfield Township, Pontiac County.

Red uranothorite is present in scapolite-diopside rock, and grey-black prisms occur in the skarn zone at the Yates Uranium Mines property, lot 20, range V, Huddersfield Township, Pontiac County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, pp. 30-40).

31 G/12 Uranothorite occurs with allanite at O'Leary-Malartic Mines Limited, range III, lot 25, Wakefield Township, Gatineau County.

31 J/12 Uranothorite occurs in round grains less than 1/4 inch in diameter at the Dewex Oils and Mines Limited property, near Mercier Dam on the Gatineau River, Mitchell Township, Gatineau County.

Grains of uranothorite in association with uraninite were found in a zone of metamorphic pyroxenite at the Gatineau Uranium Mines property, range II, lots 29-31, Baskatong Township, Gatineau County.

31 K/8 Strings of red uranothorite grains occur in a zone of microcline granite at the Maniwaki Kid Uranium Mining Corporation property, range V, lots 39 and 40, Egan Township, Gatineau County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80).

THUCHOLITE

(See hydrocarbons)

THURINGITE

(See chlorite)

TIEMANNITE

HgSe

The three strongest lines in the X-ray powder pattern of tiemannite have the following spacings and intensities: 3.51 (10), 2.15 (8) and 1.834 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 49).

Saskatchewan

74 N/8 Tiemannite has been identified in the high-grade gold-pitchblende lens of the No. 2 zone at Nicholson Mines Limited, located about 200 feet east of the head of a small bay called Nicholson Bay on the north shore of Lake Athabasca, 2 miles east of Goldfields (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 95).

TIMISKAMITE

(See maucherite)

TIN

Sn

Saskatchewan

74 N/9 Native tin can be found in association with pitchblende in fractures crosscutting a slaty formation at Nesbitt Labine Uranium Mines in the Beaverlodge area. The tin is creamy white in colour, ductile, very soft, and occurs in discrete grains up to 1.5 millimetres in diameter in feathery tongues in the host calcite (J.F.B. Silman, 1954: Am. Mineralogist, 39, p. 529).

The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 2.89 (8), 2.77 (10) and 2.01 (10) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 13).

TITANITE

(See sphene)

TODDITE

(See columbite)

TOPAZ

$Al_2SiO_4(OH, F)_2$

Topaz is found chiefly in veins and druses in granites, in pegmatites, and in high temperature quartz veins. Transparent topaz is valued as a gemstone.

The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.69 (6), 3.20 (7), 2.94 (10), 2.36 (5) and 2.10 (4) (H.E. Swanson et al., 1962: Nat. Bur. Stds., Mono. 25, Sec. 1, p. 5).

Alberta

83 F/4 Topaz has been observed in the gravel of a small river to the west of Jasper House, Jasper Park, in the Rocky Mountain district (G.C. Hoffmann, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 18R).

British Columbia

83 D/14 Topaz occurs associated with large plates of mica at Mica Mountain near Tête Jaune Cache, south of the junction of the Fraser River and McLennan River in the Cariboo mining division (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 226).

Manitoba

52 L/6 A number of unusual minerals, including topaz, beryl and lithia mica have been reported on the property of Contact Minerals Limited (Dyke Group) situated on the south shore of the eastern part of Shatford Lake (R.W. Mulligan, 1965: Geol. Surv. Can., Econ. Geol. Rept., 21, p. 78).

Crude, long, pyramidal crystals and crystalline masses of topaz can be found at the Bear mineral claim, 3 miles southeast of Lamprey Falls on the Winnipeg River. The whitish or blue-green crystals have well-developed basal cleavage. Analysis by R.J.C. Fabry: SiO_2 32.13, Al_2O_3 58.16, F_2 16.51, Na_2O 0.24, MgO 0.37, H_2O 0.24, less O for F 6.95, total 100.70 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 156).

Cleavable masses of topaz with very poor crystal outlines can be found in the Winnipeg River district, section 17, township 16, 52 L/6 range 16, 10 miles northeast of Pointe du Bois (E. Poitevin, R.J.C. Fabry and C.H. Stockwell, 1926-27: Geol. Surv. Can., Unpublished file No. 21, p. 2).

New Brunswick

21 J/10 Topaz occurs as crystalline masses and individual crystals up to 3/4 of an inch in diameter at a deposit near the mouth of Burnt Hill Brook, Southwest Miramichi River, York County. The colour is generally milk white but some small translucent smoky grey crystals have been observed. Associated minerals include wolframite, molybdenite and cassiterite (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 226).

Newfoundland

13 O/2 Irregular grains of topaz occur in an amazonite aplite dyke on the south shore of northern Adlavik Island, 1 mile east of Maconet Bay, Long Tickle (E.P. Wheeler, 1935: Am. Mineralogist, 20, p. 44).

Ontario

52 G/15 Topaz has been observed by E.D. Moore in some of the hornblende syenite in the Sturgeon Lake gold field, on the eastern shore of the upper portion of the narrows of the lake, Thunder Bay district (N.L. Bowen, 1911: Ont. Bur. Mines, Ann. Rept., vol. 20, p. 155).

Quebec

22 D/11
22 D/12 A small pegmatite in Taché Township, Chicoutimi County, range V, lot 13, contains massive topaz, intergrown with muscovite and albite. The topaz is greenish and somewhat darker in colour than associated greenish beryl (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 252).

Yukon

105 B/3 Gem quality topaz crystals have been found on claims situated on the north face of a 5,900-foot mountain on the east side of Seagull Creek about 4 1/2 miles north of Swift River, Mile 733, Alaska Highway, at lat. 60°04'N, long. 131°08 1/2'W (R. Skinner, 1961: private communication).

TOURMALINE

$$Na(Mg,Fe)_3Al_6(BO_3)_3Si_6O_{18}(OH,F)_4$$

Tourmaline is characteristically a mineral of granites, granite pegmatites, and pneumatolytic veins, but it also occurs in some metasomatic and metamorphic rocks and as a detrital mineral in sediments. The composition of tourmaline is extremely variable: Na may be replaced by Ca, and Al by Fe; and Li is often present. Varietal names include: rubellite, the red variety; siberite, violet-red; dravite, brown; and schorl, black.

Tourmaline is of common occurrence in many parts of Canada and no attempt at a complete listing is made here. Instead, only occurrences of special interest, and some localities from which good specimens have been taken, are listed.

The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 4.22 (6), 3.99 (8), 3.48 (6), 2.96 (8) and 2.58 (10) (ASTM card 14-76).

British Columbia

92 I/6
92 I/11 Extraordinarily large amounts of black irregular masses of small closely packed crystals of tourmaline and specular hematite occur in quartz-diorite rock, in the Highland Valley copper area, east of Ashcroft (J.S. Stevenson, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 127).

Manitoba

52 L/5 Rubellite tourmaline is present as a minor constituent of the lithium-cesium ore at the Chemalloy property (R. Brinsmead, 1960: Precambrian, 33, No. 8, p. 25).

52 L/6 Tourmaline, blue in colour, associated with spessartite and apatite, occurs 3 miles southeast from Lamprey Falls on the Winnipeg River at the Bear mineral claim (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 157).

Nova Scotia

21 A/14 Fine crystals of tourmaline occur in quartz near Paradise, southwest of Middleton, Annapolis County (L.B. Bailey, 1896: Geol. Surv. Can., Ann. Rept., IX, p. 149M).

Ontario

31 C/6 A peculiar variety of black tourmaline is found in white quartz, near Madoc, Hastings County. It forms veins, an inch or more in width, made up of very fine fibres transverse to the sides of the vein, velvet black in colour (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 493).

31 C/8 Large crystals of black tourmaline occur in pegmatite on Yeo's Island, near the upper end of Tar Island, on the north side of English Channel, Thousand Islands (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 492).

31 C/11 Small, randomly-oriented, black prismatic crystals of tourmaline can be found in siliceous limestone in Huntingdon Township, Hastings County, lot 16, conc. XIV (donated to the National Mineral Collection by A. T. McKinnon, 1919).

31 C/12 Acicular prisms of black tourmaline penetrating fibrolamellar masses of bismuthinite were found at Smith's Mine, lot 34, conc. III, Tudor Township, Hastings County (C. W. Willimott, 1883: Geol. Surv. Can., Rept. Prog., p. 9L).

Black, divergent crystal groups of tourmaline have been collected in Lake Township, lot 7, conc. XI, Hastings County (donated to the National Mineral Collection by R. L. Broadbent, 1901).

31 C/16 Fine terminated crystals of black tourmaline, 1 inch in diameter occur in white quartz on lot 18, conc. IV, Bathurst Township, Lanark County (W. E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 493).

31 E/1 Terminated crystals of the dravite variety of tourmaline have been found in disintegrated green diopside rock at the east showing of Desmont Mining Corporation (formerly Homer Yellowknife) on lot 31, conc. XVII, Monmouth Township, Haliburton County (D. A. Moddle, 1960: private communication).

Dark green and crimson gem-quality tourmaline has been found at Wilberforce in Monmouth Township, Haliburton County (G. G. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 77).

Large, greenish black, prismatic crystals of tourmaline occur in Cardiff Township, Haliburton County, conc. XXI, lot 1 (National Mineral Collection).

52 P/9 Three pegmatite dykes containing much coarse pink tourmaline, appreciable quantities of spodumene and lepidolite and some fluorite, outcrop just north of Lily Pad Lakes in the Fort Hope area (V. K. Prest, 1942: Ont. Dept. Mines, Ann. Rept., vol. 51, Pt. III, p. 27).

Quebec

31 F/10 Partly translucent brown crystals of tourmaline, up to 1 inch in diameter, occur with vesuvianite in flesh red limestone at Grand Falls (or Calumet Falls) on Calumet Island (W. E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 493).

31 G/5 Squat, brown, perfect tourmaline crystals up to 2 inches across were found in a small vug in a pyritized quartz vein in Hull Township, Gatineau County, range VI, lot 14, near Pinks Lake (D. D. Hogarth: private communication).

31 G/9 Pale green, slender, prismatic crystals of tourmaline have been collected in Chatham Township, Argenteuil County, range XI, lot 10 (National Mineral Collection).

31 G/12 Fine specimens of black tourmaline crystals, often with terminal faces can be found in Hull Township, range XIV, lots 10, 17 and 18, and in Wakefield Township, range VII, lot 26, and range VIII, lot 25, Gatineau County (National Mineral Collection).

The Leduc Mine, on the east half of lot 25, range VII, Wakefield Township, Gatineau County, is interesting as the only mine ever worked in Canada with the idea of producing gem tourmaline. The tourmaline occurred abundantly as large crystals up to 2 inches in diameter and also in aggregates showing different colours in different parts of the crystals. Colours included shades of pink and brown, and light green passing to darker green, to greenish blue, and almost black. The crystals were generally too much fractured to yield profitable gem material (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 239).

31 G/13 The Villeneuve Mine, located on the east end of a low hill, a short distance north of the main road from Notre-Dame-de-la-Salette, on lot 31, range I, Villeneuve Township, was one of Canada's greatest producers of muscovite, operating from 1884 to 1909. Black tourmaline was an abundant constituent of the pegmatite and occurred as crystals up to 2 inches in diameter and 2 to 3 feet in length. Most of the crystals were coated with mica and some small crystal pseudomorphs of mica after tourmaline were found (H. V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 240).

31 I/6 Small, yellowish brown, translucent crystals of tourmaline were found near Hunterstown, Hunterstown Township, Maskinonge County (National Mineral Collection).

31 I/10 Black, prismatic tourmaline crystals in quartz from St. Boniface, Shawinigan Township, St. Maurice County, were donated to the National Mineral Collection by E. Bergeron.

31 K/1
31 K/8 Short, black, prismatic crystals of tourmaline were found in Egan Township, Gatineau County, range III, lot 29, by G.W. Willimott, and donated to the National Mineral Collection.

TREMOLITE

$$Ca_2Mg_5Si_8O_{22}(OH)_2$$

Tremolite, a member of the amphibole group, together with actinolite forms a series in which tremolite is the iron-free member and actinolite has a significant iron content, replacing magnesium. The division between the two varieties is arbitrary and usually based on colour; tremolite is white and actinolite green. Tremolite is of common occurrence in metamorphosed dolomitic rocks across Canada and only a few of the known occurrences will be recorded here. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 8.38 (10), 3.27 (7), 3.12 (10), 2.71 (9) and 1.89 (5) (ASTM card 13-437).

Ontario

31 C/13 Tremolite crystals, apparently weathered from a limestone ridge, were found in soil on lot 27, conc. B, Faraday Township, Hastings County. The morphology was studied in detail. Chemical analysis by H.C. Rickaby: SiO_2 57.36, TiO_2 0.14, Al_2O_3 1.04, Fe_2O_3 0.21, FeO 0.72, CaO 12.41, MgO 25.22, Na_2O 1.49, K_2O 0.47, H_2O 0.44, total 99.50; S.G. 2.96 (T.L. Walker and A.L. Parsons, 1927: Univ. Toronto Stud., Geol. Ser., 24, p. 15).

31 C
31 F Partial chemical analyses of some Ontario tremolites by Johnston: (1) fine fibrous, very pale greenish grey, FeO 0.96, lot 37, conc. VII, Clarendon Township, Frontenac County, 31 C/15; (2) faint greenish grey, FeO 0.92, lot 26, west half, conc. XII, Bathurst Township, Lanark County, 31 C/16; (3) radiating fibrous, faintly greenish greyish white, FeO 0.91, lot 13, conc. III, Bagot Township, Renfrew County, 31 F/7; (4) fibrous, light greenish grey, FeO 2.25, lots 22 and 23, conc. IV, Blythfield Township, Renfrew County, 31 F/7; (5) greyish white, translucent, vitreous lustre, FeO 0.17, lot 23, conc. IV, Ross Township, Renfrew County, 31 F/10 (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., IX, p. 53R).

TRIPHYLITE

$Li(Fe, Mn)PO_4$

A complete series exists between triphylite and lithiophilite by mutual substitution of Fe for Mn. These minerals occur in lithium-bearing granite pegmatites. The spacings and intensities of the three strongest lines in the X-ray powder pattern are: 4.29 (8), 3.51 (9) and 2.54 (10) (X-ray Laboratory, Geol. Surv. Can.).

Manitoba

52 L/6 A crystal fragment of triphylite, bounded by basal and prismatic (110) cleavage was found in the vicinity of the Huron claim at Pointe du Bois, township 16, range 16, lot 17.

Chemical analysis by V.J. Oswald: LiO_2 8.36, Na_2O 0.12, K_2O 0.44, H_2O 0.99, MgO 0.23, CaO 0.65, FeO 21.70, MnO 21.13, P_2O_5 46.41, insol. 0.20, total 100.23; S.G. 3.482. It occurs in a well-formed salmon pink, medium-grained pegmatite dyke consisting largely of feldspar, mostly albite-oligoclase (T.L. Walker, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 10).

Northwest Territories

85 I/1 A member of the triphylite-lithiophilite series was identified in specimens of pegmatite from the Best Bet property at lat. 62°11'N, long. 112°17'W. Huhnerkobelite is associated (X-ray Laboratory, Geol. Surv. Can., collected by R. Mulligan, 1957).

85 I/13 A member of the triphylite-lithiophilite series has been identified in specimens of pegmatite from the Cota Group of claims at lat. 62°51'N, long. 113°33'W, in the Blaisdell Lake area. It is associated with huhnerkobelite, columbite, and apatite (X-ray Laboratory, Geol. Surv. Can., collected by R. Mulligan, 1958).

Nova Scotia

21 A/9 Triphylite has been found near Lake Ramsay, New Ross, in Lunenburg County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 229).

TUNGSTITE

$WO_3.H_2O$

Tungstite is found as a yellowish alteration product of wolframite and other tungsten minerals. Pseudomorphs of tungstite after scheelite are known and have been named meymacite. The five strongest lines in the X-ray powder pattern of tungstite have the following spacings and intensities: 5.39 (10), 3.48 (9), 2.68 (5), 2.56 (6) and 1.161 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 181).

British Columbia

82 F/3 Massive tungstite with small druses lined with tiny tungstite crystals occurs with wolframite and gold at the Kootenay Belle Mine, near Salmo (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 229).

93 A/14 Tungstite occurs in a narrow quartz vein 1 inch to 4 inches wide, that is exposed 30 miles southwest of Wells on the southwestern rim of Snowshoe Plateau, at the Taylor scheelite prospect in the Cariboo district. It is associated with scheelite, stolzite and pyrite (J.S. Stevenson, 1941: Univ. Toronto Stud., Geol. Ser., 46, p. 137).

Nova Scotia

11 D/15 Tungstite was found 2 miles west of Moose River in Halifax County (National Mineral Collection).

11 K/6 Tungstite occurs at Emerald, Inverness County (National Mineral Collection).

Quebec

21 E/15 Meymacite is found associated with scheelite in Marlow Township, Beauce County, range VII, lot 1 (G.C. Hoffmann, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 14R).

TYRRELLITE

near $Co_3Ni_2Cu_{3.5}Se_{9.5}$

Saskatchewan

74 N/10 Although never formally introduced, the name tyrrellite (after the Canadian geologist J.B. Tyrrell) has crept into the literature and has been applied to the selenide mineral discovered by S.C. Robinson in 1950 and described by Robinson and Brooker in 1952. The mineral was found at the western part of the Eagle claims and also at a deposit near the head of Ato Bay on Beaverlodge Lake, in the Goldfields district. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 3.016 (6), 2.886 (7), 2.501 (9), 1.926 (6) and 1.769 (10) (S.C. Robinson and E.J. Brooker, 1952: Am. Mineralogist, 37, p. 542).

ULEXITE

$NaCaB_5O_9 \cdot 8H_2O$

Ulexite is typically found in salt playas and saline lakes but may also be associated with bedded gypsum deposits, as in the Canadian occurrences. The four strongest lines in the X-ray powder pattern of ulexite have the following spacings and intensities: 12.20 (10), 7.75 (8), 6.00 (3) and 4.16 (3) (ASTM card 12-419).

New Brunswick

21 H/15 Ulexite occurs with inyoite at Hillsborough (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 54).

Nova Scotia

21 A/16 Ulexite occurs with cryptomorphite, howlite, mirabilite, halite, aragonite and selenite at Windsor, Three Mile Plains, and Wentworth Creek in Hants County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 63, 64T).

Chemical analysis by E.W. Todd of ulexite from Windsor: CaO 14.06, Na_2O 7.32, H_2O 34.59, B_2O_3 44.46, total 100.43; S.G. 1.91 (T.L. Walker, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 54).

21 H/1 Ulexite occurs with cryptomorphite, howlite, mirabilite, halite, aragonite and selenite at Bramber and Newport Station (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, pp. 63, 64T)

Chemical analysis: B_2O_3 44.10, CaO 14.20, Na_2O 7.21, H_2O 34.49, total 100.00 (H. How, --: Phil. Mag, Ser. 4, vol. 35, pp. 36, 37 also Am. J. Sci., vol. 32, p. 9).

ULLMANNITE

NiSbS

Ullmannite is a member of the cobaltite group, and is isostructural with gersdorffite and cobaltite. It occurs in veins, most frequently in a siderite gangue, with other nickel minerals such as gersdorffite and niccolite.

The X-ray powder pattern has seven strongest lines with the following spacings and intensities: 2.64 (10), 2.40 (6), 1.774 (7), 1.573 (5), 1.092 (5), 0.810 (5) and 0.802 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 95).

Ontario

32 D/4 Ullmannite has been identified by X-ray powder pattern as occurring at the Kerr Addison Mine, McGarry Township, in the Timiskaming district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Saskatchewan

74 N/8 Ullmannite has been identified by X-ray powder pattern in specimens from the Nicholson Mine, No. 4 zone, located about 2 miles east of Goldfields (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31, p. 18).

UMANGITE

Cu_3Se_2

The X-ray powder pattern of umangite from the type locality, Sierra de Umango, Argentina, has six strongest lines with the following spacings and intensities: 3.559 (10), 3.202 (6), 3.108 (7), 2.258 (7), 1.829 (9) and 1.778 (8) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 43).

Saskatchewan

74 N/7
74 N/10 Umangite has been identified in specimens from three deposits in the Goldfields mining camp. It is the most abundant of the

74 N/7
74 N/10

selenides, although not as widespread as clausthalite, and is associated with other selenides, hematite, pitchblende, and locally with pyrite and chalcopyrite.

At the Eagle Group, three small deposits north of Hal Lake about 1,500 feet west of the Eagle shaft contain massive selenides including umangite, klockmannite, tyrrellite, berzelianite and clausthalite.

Carbonate veins containing pitchblende, hematite, sulphides, umangite and klockmannite occur at the Gil Group located along the shore of Lodge Bay of Lake Athabasca extending across the ridge that separates that lake from Beaverlodge Lake.

Umangite, klockmannite, berzelianite and clausthalite have been identified with pitchblende, hematite, copper sulphides, native copper and carbonate at the Martin Lake Mine on the west side of Beaverlodge Lake (S.C. Robinson, 1955: Geol. Surv. Can., Bull. 31).

URANINITE

UO_2

Uraninite and its variety, pitchblende, are important ore minerals of uranium because they are relatively abundant, have high contents of uranium, and are amenable to chemical extraction of the uranium. Although uraninite is the preferred species name, it is commonly used to denote the crystalline variety that contains several per cent of thorium and rare earths; and pitchblende is used for the cryptocrystalline variety, usually massive, botryoidal, banded or colloform, containing no more than traces (less than 0.1 per cent) of thorium and rare earths. Uraninite forms a complete isomorphous series with thorianite and is isostructural with cerianite.

The spacings and intensities of the seven strongest lines in the X-ray powder pattern of uraninite from Loughton Township, Ontario are: 3.15 (7), 1.926 (6), 1.647 (10), 1.255 (5), 1.114 (5), 1.052 (5) and 0.927 (6) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 183).

The following list of properties where uraninite or pitchblende have been found is taken from Geol. Surv. Can., Econ. Geol. Ser., No. 16, Canadian Deposits of Uranium and Thorium, by A.H. Lang, J.W. Griffith and H.R. Steacy, 1962, to which the reader is referred for additional details.

Property	Location	N. T. S.
	Alberta	
All-Rabo	Leggo Lake area	74 M/10
Chip-Chico-Kazan-Lassie	6 to 10 miles north of Fort Chipewyan	74 L/14
Fort Chipewyan	Twp. 113, range 6, west end of Lake Athabasca	74 L/15
TBY and BYT	5 miles north of Lake Athabasca at Fidler Point	74 M/1
	British Columbia	
Am	Skagit River tributary near Mile 30 on Hope-Princeton highway	92 H/6
Armstrong	5 miles east of Armstrong	82 L/6
Atlin (Boulder)	Headwaters of Boulder Creek	104 N/11
Atlin (Husselbee)	10 miles northwest of Atlin between Atlin and Tagish lakes	104 N/12
Bugaboo placers	Bugaboo Creek	82 K/15
Gem	25 miles northwest of the Bridge River camp	92 J/15
Genelle area	7 miles north of Trail, near Highway 3	82 F/4
Gibson Creek	North of Castlegar	82 F/5
Golden Wonder	Juniper Creek, Rocher Déboulé Mountain	93 M/4
Index	Texas Creek, near Lillooet	92 I/12
Lucky-Bill-Tag	On Kootenay River near C. P. R. bridge at Sproule Creek	82 F/6
Lytton Bar	Lytton, on Fraser River	92 I/4
Molly Mine	Lost Creek, south of Salmo	82 F/3

Property	Location	N. T. S.
Nation River placer	Nation River	93 O/5
Pacific Gold	25 miles northwest of the Bridge River camp	92 J/15
Rexspar (Smuggler)	Birch Island	82 M/12
Rocher Déboulé Mine	South of Hazelton	93 M/4
Verity	23 miles north of Blue River Village	83 D/6
Victoria	South of Hazelton	93 M/4
	Manitoba	
East Found	1 mile west of Star Lake near West Hawk Lake	52 E/14
Huron claim	Winnipeg River about 10 miles above Pointe du Bois	52 L/6
Triangle and West Found	North and south of Trans-Canada Highway at Mile 101, in the West Hawk Lake area	52 E/14
	New Brunswick	
Coxs Brook	Mouth of Coxs Brook on the Upsalquitch River near Robinsonville	21 O/15
Shippigan Island	About 3 miles southeast of Savoy Landing	21 P/10
	Newfoundland	
Indian Head	St. George's Bay	12 B/9
Kitts showing, Monkey Hill showings	Makkovik area	13 O/3
Seal Lake	Ten Mile Lake area	13 K
	Northwest Territories	
Achook Island	Great Bear Lake	86 K/5
Rayrock Mine (Beta)	Near Maryleer Lake Marian River area	85 N/7

Property	Location	N. T. S.
Bingo	Southeast corner of Hottah Lake	86 D/16
Blende	Zebulon Lake	86 F/4
BM (Altomac)	Marian River area	85 N/7
CA 1-7 (New Alger)	Marian River area	85 N/7
Contact Lake	9 miles southeast of Eldorado	86 K/4
Cormac	East arm of Beaverlodge Lake, Hottah Lake area	86 D/9
Echo Bay	East coast of Great Bear Lake, east of Labine point	86 L/1
El Bonanza	East coast of Great Bear Lake, 6 miles south of Port Radium	86 K/4
Eldorado Mine	Port Radium, Great Bear Lake	86 L/1
Gamma	Marian River area	85 N/7
Gee	East of the Burpee River outlet on the north shore of the east arm of Great Slave Lake	75 L
Glen Lake	Southwest end of lake, 1 1/2 miles east of El Bonanza	86 K/4
GM (Am. Yellowknife)	1 1/2 miles northeast of entrance to Murky Channel, east arm of Great Slave Lake	75 L/6
Hab 1-14 (Eldorado)	McLean Bay near Snowdrift, east arm of Great Slave Lake	75 L/8
Hunter Bay	East shore of Great Bear Lake	86 K/6
JG	South shore of Stark Lake	75 L/8
Key (Eldorado)	Lat. 60°54'N, long. 109°42'W	75 C/13

Property	Location	N. T. S.
Marian	North of Marian Lake	85 N/1
Mystery Island	Great Bear Lake	86 L/1
Pitch 8-10	Beverley Bay area, south end of Hottah Lake	86 D/16
Pitch 27, 28	3/4 mile east of northeast corner of Hottah Lake	86 E/1
Pitch-Ind	North shore of east arm, Beaverlodge Lake, Hottah Lake area	86 D/9
Rag	South shore of Stark Lake	75 L/8
Rex	Stark Lake, east arm of Great Slave Lake	75 L/8
Sun	Marian River area	85 N
Ted	Treasure Lake, Marian River area	85 N/10
Thompson	Bow Lake, east coast Great Bear Lake, Echo Bay area	86 K/4
UR	Hidden Bay, west side of Hardisty Lake	86 C
Uranium	La Bine Point, Great Bear Lake	86 L/1
Workman Island	East coast of Great Bear Lake	86 K/4
XAM	Barnston River area	75 L/16
	Ontario	
Agawa Bay area	North of Agawa Bay, Lake Superior	41 N/7
Anstruther Township	Conc. 1, lots 26-27	31 D/16
	Conc. 3, lots 22-28	31 D/16
	Conc. 4, lots 23-27	31 D/16
	Conc. 17, lots 5-6	31 D/16
	Conc. 18, lots 4-9	31 D/16
Bagot Township	Conc. 4, lot 23	31 F/7

Property		Location	N. T. S.
Baldhead River		At mouth of river, on shore of Lake Superior	41 N/7
Buckles Mine		Twp. 149	41 J/7
Burleigh Township		Conc. 11, lots 23-25	31 D/9
		Conc. 12, lots 23-25	31 D/9
Butt Township		Conc. 7, lot 13	31 E/10
Cameron		2 miles east of the south end of Vermilion Lake	52 E/16
Camray		On Lake Superior, at Theano Point, 50 miles north of Sault Ste. Marie	41 N/2
Cane Township		Conc. 2, lot 2	41 P/9
Can-Met Mine		Twp. 144	41 J/7
Cardiff Township	(Triton)	Conc. 2, lot 8 (N1/2)	31 D/16
	(Dyno)	Conc. 8, lot 12	31 D/16
	(Aumacho)	Conc. 9, lot 22	31 D/16
	(Bicroft)	Conc. 11, lots 27, 28 (N1/2)	31 E/1
	(Can. Rad.)	Conc. 12, lots 7-11	31 D/16
		Conc. 13, lots 7, 8	31 D/16
	(Cons. Tung)	Conc. 13, lot 31 (S1/2)	31 E/1
	(Mindus)	Conc. 14, lot 11 (S1/2)	31 E/1
	(Halo)	Conc. 15, lots 6, 7	31 E/1
	(Stratmat)	Conc. 15, lots 2, 3 (S1/2)	31 E/1
		Conc. 16, lots 1-3	31 E/1
		Conc. 16, lot 4 (N1/2)	31 E/1
	(Cardiff)	Conc. 17, lot A (N1/2)	31 E/1
	(Halo)	Conc. 18, lot 4 (N1/2)	31 E/1
		Conc. 18, lot 6 (N1/2)	31 E/1
	(Anuwon)	Conc. 19, lots 8-10	31 E/1
	(Burma Shore)	Conc. 20, lot 7 (S1/2)	31 E/1
	(Pickens)	Conc. 20, lots 7, 8	31 E/1
	(Richardson)	Conc. 21, lots 4-6, 7 (N1/2)	31 E/1
	(Nu-Age)	Conc. 21, lots 8, 9	31 E/1
Cavendish Township	(Cavendish)	Conc. 7, lot 14 (S1/2)	31 D/16
	(Silanco)	Conc. 11, lot 21 (N1/2)	31 D/16
	(Kelbee)	Conc. 14, lot 24 (S1/2)	31 D/16
		Conc. 14, lot 25 (N1/2)	31 D/16
Conger Township		Conc. 9, lots 4, 7, 9, 10	31 E/4
Consolidated Denison Mine		Twp. 150	41 J/7

Property	Location	N.T.S.
Creelman Township (Leslie)	Conc. 3, lots 10, 11	41 I/14
Dolan Group	North side of MacGregor Cove, Lake Superior	41 N/7
Eric Nelson	45 miles west of Port Arthur, rock cut along Trans-Canada Highway	52 B/12
Faraday Township (Faraday)	Conc. 11, lots 16-18	31 F/4
(Greyhawk)	Conc. 12, lots 9, 10	31 F/4
(Lockwood)	Conc. A, lot 29	31 C/13
Galway Township	Conc. 8, lot 27	31 D/9
	Conc. 9, lot 30 (S1/2)	31 D/9
	Conc. 11, lots 23, 24	31 D/16
	Conc. 12, lot 24 (S1/2)	31 D/16
Glamorgan Township	Conc. 1, lots 18-20	31 D/16
	Conc. 1, lots 22-24	31 D/16
	Conc. 2, lots 17-20	31 D/16
	Conc. 2, lots 22-24	31 D/16
	Conc. 3, lots 15-17	31 D/16
	Conc. 5, lot 32	31 D/16
Greenwich Lake	West side of Greenwich Lake, 30 miles northeast of Port Arthur	52 A/15
Henvey Township (Besner)	Conc. B, lot 5	41 H/15
Jalore Property	Mileage 105, Algoma Central, 2 miles north of Frater Station	41 N/7
Lacnor Mine	Twp. 149	41 J/7
MacNicol Township	Richard Lake, about 32 miles east of Kenora near highway	52 F/13
March Township	Conc. 2, lot 6	31 G/5
Mattawan Township	Conc. 2, lots 6, 7	31 L/7
McDougall Township	Conc. 9, lot 27	41 H/8
Migneron Property	Mileage 71, Montreal River Highway	41 N
Milliken Lake Mine	Twp. 149	41 J/7

Property	Location	N.T.S.
Monmouth Township	Conc. 4, lot 19 (N1/2)	31 D/16
	Conc. 6, lot 5 (N1/2)	31 D/16
	Conc. 6, lots 18, 19 (S1/2)	31 D/16
	Conc. 9, lots 5-8	31 D/16
	Conc. 11, lots 5, 6	31 D/16
	Conc. 12, lot 13	31 D/16
	Conc. 16, lot 27 (S1/2)	31 E/1
	Conc. 17, lots 30, 31	31 E/1
Monteagle Township	Conc. 2, lots 17, 18	31 F/4
	Conc. 3, lot 3 (N1/2)	31 F/4
	Conc. 7, lots 18, 19 (N1/2)	31 F/4
Nordic Mine	Twp. 149	41 J/7
Palmerston Township	Conc. 3, lot 9	31 C/15
	Conc. 5, lots 2, 3	31 C/15
Panel Mine	Twp. 144	41 J/7
Pronto Mine	Long Twp.	41 J/2
Quirke Mine	Twp. 150	41 J/10
Raglan Township (Craigmont)	Conc. 18, lots 3, 4	31 F/5
Ranson Property	Lower dam on the Montreal River	41 N/7
Ranwick Property	Twps. 28, 29; ranges 14 and 15, 1 1/2 miles south-east of Montreal River mouth	41 N/7
Roche Group	North of Ranwick property	41 N/7
Snowdon Township	Conc. 2, lot 11	31 D/15
South Sherbrooke Township	Conc. 3, lot 18 (N1/2)	31 C/16
Spanish-American Mine	Twp. 150	41 J/7
Stanleigh Mine	Twps. 149, 155	41 J/7
Stanrock Mine	Twps. 144, 150	41 J/7
Tarbutt Township	Conc. 3, lot 1	41 J/5
Tustin Township	Near Game Lake	52 F/13

Property	Location	N. T. S.
Vermilion Lake	1 1/2 miles east of Vermilion Lake	52 K/1
	Quebec	
Atwater Township	1 mile southeast of Hunter's Point, Kipawa Lakes area	31 L/15
Bressani Township	Yvonne Lake, 112 miles northeast of Senneterre	
Callieres Township	Ranges SW 1, SW 1/4, NW 1/2, SW 2, SE 1/2, NE 2, SW 3	21 N/13
Clapham Township	Range 2, lots 38, 39, 42-49; range 3, lot 46	31 F/16
Egan Township	Range 1, lot 1; range 3, lots 6-13	31 K/8
Grand Calumet Township	Range 8, lots 11, 12; range 9, lots 9-12	31 F/10
Lepine	About 5 miles northwest of Lepine Depot, north of Maniwaki	
Letellier Township	10 miles northeast of Seven Islands	22 J/8
Levy Township	Opemiska Mine, Chibougamau area	32 G/15
Low Township	Range 8, lot 22; range 9, lots 19-25; range 11, lots 30, 31	31 F/16
Maisonneuve Township	Range 2, lots 1, 2, Maisonneuve Mine	31 J/16
Mann Township	Range 1, lots 1-3, Cross Point	22 B/2
Mont Laurier	Near Leivre River, 1 mile from Mont Laurier	31 J/11
Oka	Two Mountains County, Quebec Columbium Ltd.	31 G/8

Property	Location	N.T.S.
Portland Township	Range 10, lots 29-32	31 G/13
Portneuf County	Ranges 2 and 3 of Deschambault and Portneuf parishes	21 L/12
Sicotte Township	Range 1, lots 22-30; range 2, lots 26-29	31 J/12
Villeneuve	Range 1, lots 30-35, 37, 38; range 2, lots 30-35	31 G/13
Wakefield Township	Range 3, lots 24, 25	31 G/12
	Saskatchewan	
ABC	Beaverlodge Lake	74 N/10
Ace	Beaverlodge Lake	74 N/9
Al	Felix Bay, Lake Athabasca	74 N/8
Alco	Beaverlodge Lake	74 N/7
Alda	Dumont Lake	64 D/8
Amax	Beaverlodge Lake	74 N/10
Andy	Laird Island, Tazin Lake	74 N/14
Arko-Gulch	Black Bay, Lake Athabasca	74 N/10
Axe	Beaverlodge Lake	74 N/10
Azor	Beaverlodge Lake	74 N/10
B 1-18	Dewdney Island, Tazin Lake	74 N/15
Bar	Beaverlodge Lake	74 N/9
Baska	Foster Lakes area	74 A/11
Baska	Beaverlodge Lake	74 N/9
Bat	Beaverlodge Lake	74 N/9
Bay	Black Bay, Lake Athabasca	74 N/10
Beaver River	Lat. 59°24'N, long. 107°45'W	74 O/5

Property	Location	N.T.S.
Bell	Charlebois Lake	74 P/7
Bev	Beaverlodge Lake	74 N/7
Bob	Tazin Lake	74 N/14 74 N/15
Bob	Cameron Island, Lake Athabasca	74 N/8
Bolger	Beaverlodge Lake	74 N/9
Boom	Beaverlodge Lake	74 N/10
Box Mine	Beaverlodge Lake	74 N/7
Bur-Hub-Rub	Foster Lakes area	74 A/11
Butch	4 miles east of Stony Rapids	74 P/5
Cab, Paul, Mike, Tom, Jim	Beaverlodge Lake	74 N/9
Car	Black Bay, Lake Athabasca	74 N/10
CC	Lake Athabasca	74 N/10
Chum	Beaverlodge Lake	74 N/10
Clix	Beaverlodge Lake	74 N/7
Corrigan	Charlebois Lake	74 P/7
Dette	Beaverlodge Lake	74 N/10
Di	Beaverlodge Lake	74 N/7
Dick	Beaverlodge Lake	74 N/7
Dill	Beaverlodge Lake	74 N/10
Don	Beaverlodge Lake	74 N/10
Eagle	Beaverlodge Lake	74 N/10
Ed-Bon (Gunnar Mine)	St. Mary's Channel, Lake Athabasca	74 N/7
Ed-Tom	Beaverlodge Lake	74 N/10
Emar	Beaverlodge Lake	74 N/9

Property	Location	N. T. S.
Fish-hook Bay	Lake Athabasca	74 N/8
FKR	Sucker Bay, Lake Athabasca	74 O/7
Fold Lake	Beaverlodge Lake	74 N/10
Foster Lake (Eldorado claims)	Foster Lakes, area Middle Foster Lake	74 A/11
Fox	Lake Athabasca	74 N/7
Gal	Beaverlodge Lake	74 N/9
GC	Lake Athabasca	74 N/7
Gil	Lake Athabasca	74 N/7
Gretta	Beaverlodge Lake	74 N/9
Hab	Beaverlodge Lake	74 N/9
Ham	Lake Athabasca	74 N/7
Hap	Milliken Lake	74 N/7
Holm	Alces Lake	74 N/9
Hub	Hunter Bay, Lac la Ronge	73 P/1
HU-HP	Oldman River near Forget Lake	74 N/9
HW	Beaverlodge Lake	74 N/10
IO	Stewart Island, Lake Athabasca	74 N/7
Jag	Lake Athabasca	74 N/7
Jam	Beaverlodge Lake	74 N/10
Jim-Gal	Beaverlodge Lake	74 N/9
JN	Grease Bay, Lake Athabasca	74 O/7
JO	Milliken Lake	74 N/7
Job	Beaver River, Lake Athabasca	74 O/5

Property	Location	N. T. S.
Jos	Laird Island, Tazin Lake	74 N/14
Kara	Blackstone Lake area	74 B/6
Kix	Lodge Bay, Lake Athabasca	74 N/7
Laird-Dew	Laird Island, Tazin Lake	74 N/14
L and B	Mackintosh Bay, Lake Athabasca	74 N/8
Loc-Moc-Doc	Beaverlodge Lake	74 N/9
Lor	Viking Lake	74 N/9
Lux	Laird Island, Tazin Lake	74 N/14
Mar	Lake Athabasca	74 N/7
Martin Lake	Beaverlodge Lake	74 N/10
MH	Laird Island, Tazin Lake	74 N/14
Mic	Beaverlodge Lake	74 N/10
Mick	Lake Athabasca	74 N/7
Mike	Laird Island, Tazin Lake	74 N/14
Mor	Beaverlodge Lake	74 N/10
Nagus	Reed Bay, Lake Athabasca	74 N/8
Nap	Laird Island, Tazin Lake	74 N/14
Neiman	Neiman Lake	74 O/12
Net-Ver-Vic-Wil	Beaverlodge Lake	74 N/10
Nicholson Mine	Lake Athabasca	74 N/8
Nisto	Black Lake	74 P/3
Nunn Lake	Near Hunter Bay, Lac la Ronge	73 P/1
NW-GC-LEE	Beaverlodge Lake	74 N/9
OJ	Soulier Lake	74 N/15
Orb 1	Beaverlodge Lake	74 N/10

Property	Location	N. T. S.
Orb 2	Black Bay (Orbit Bay) Lake Athabasca	74 N/10
Pat	Donaldson Lake	74 N/9
Pitch	Max Lake	74 N/9
Pitch-Blende-Hope	St. Joseph's Point, Lake Athabasca	74 N/6
Pitchco	Near Guest Lake	74 N/10
Pitche	Beaverlodge Lake	74 N/7
Pitch-Ore	Beaverlodge Lake	74 N/10
Point	St. Joseph Point	74 N/6
Pro	Foster Lakes area	74 A/11
RA	Martin Lake	74 N/10
Ran	Martin Lake	74 N/10
Raz	Beaverlodge Lake	74 N/10
Reno	Donaldson Lake	74 N/9
Rix	Beaverlodge Lake	74 N/10
R. L.	Felix Bay, Lake Athabasca	74 N/8
Ron	Gatzke Lake	74 N/9
Row-Mike	Charlebois Lake area	74 P/7
Rusty	Fond du Lac	74 O/8
Strike	Beaverlodge Lake	74 N/9
Sure	Gatzke Lake	74 N/9
Tena	Near Goldfields	74 N/8
Tot	Elder Lake	74 N/10
Ura	Beaverlodge Lake	74 N/9
Urex	Camsell Portage area	74 N/11

Property	Location	N. T. S.
Van	Cornwall Bay, Lake Athabasca	74 N/8
Verna	Beaverlodge Lake	74 N/9
Voy	Laird Island, Tazin Lake	74 N/14
White Dog	Near Moose Island, Lake Athabasca	74 N/8
Wolf	Beaver River	74 O/5
WS	Bleasdell Lake	64 D/9
YBY	Lake Athabasca	74 N/7
YK	Milliken Lake	74 N/7

Manitoba

52 L/6 Uraninite was discovered during 1930 in a pegmatite on the Huron claim, located about 1/2 mile inland from a point on the southeast shore of Winnipeg River, 9 or 10 miles above Pointe du Bois. Chemical analyses by Ellsworth: I. panned concentrate, PbO 16.63, U_3O_8 63.08, ThO_2 14.18, Ce_2O_3 oxides 0.37, Y_2O_3 oxides 1.02, Fe_2O_3 0.64, MnO 0.18, BeO + Al_2O_3 0.10, CaO 1.45, MgO 0.07, SiO_2 0.67, insol. 0.12, total 98.51; S.G. 8.082; II. panned concentrate washed with dilute hydrochloric acid, PbO 16.71, U_3O_8 64.86, ThO_2 13.94, Ce_2O_3 oxides 0.28, Y_2O_3 oxides 1.19, Fe_2O_3 0.75, MnO 0.13, BeO + Al_2O_3 0.12, CaO 1.72, MgO 0.06, SiO_2 0.37, total 100.13; S.G. 8.968 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

Northwest Territories

86 L/1 Uraninite in massive form (pitchblende) is associated with silver and gold at Labine Point, 35 miles south of Hunter Bay, on Great Bear Lake in the Mackenzie district. It is found in shear and shatter zones traversing the altered rocks of the point in a general east-northeast direction. Analysis from the property of Eldorado Gold Mines Limited: U_3O_8 61.56, Pb 10.51, ThO_2 0.01, SiO_2 15.26, CaO 1.44, MgO 0.26, ZrO_2 0.00, CuO 1.11, Ag 0.01, MnO 0.01, Ce_2O_3 0.18, Yt_2O_3 0.53, La_2O_3 0.39, other rare earths 0.31, Fe_2O_3 1.52, Al_2O_3 0.27, TiO_2 0.05, BaO 0.01, K_2O and Na_2O 1.36, Y_2O_5 and MoO_3 1.14, NiO and CoO 2.41, S 0.75, H_2O (-110°) 0.66, H_2O (+110°) 0.87, total 100.63; S.G. 5.95 (J. P. Marble, 1939: Am. Mineralogist, 24, p. 272).

Ontario

31 D/16 Uraninite cubes, rarely modified by octahedral, up to 3/8 inch in diameter occur in radioactive zones composed mainly of rounded diopside and phlogopite crystals in salmon coloured calcite at Wadasa Gold Mines Limited, conc. VI, lot 5, Monmouth Township, Haliburton County. Partial XRF analysis: U_3O_8 53.0, ThO_2 27.0, PbO 10.0; unit cell edge 5.510Å (S.C. Robinson and Ann P. Sabina, 1955: Am. Mineralogist, 40, p. 626).

31 E/1 (1) Cubes of uraninite up to 1/4 inch in diameter occur in calcite-diopside-phlogopite skarn at the property of Homer Yellowknife Mines Limited, conc. XVII, lot 30, Monmouth Township, Haliburton County. Partial XRF analysis: U_3O_8 48.0, ThO_2 28.8, PbO 9.4; unit cell edge 5.519Å.

(2) At the Centre Lake Mine, concs. XI, XII, lots 27, 28, Cardiff Township, Haliburton County, subhedral grains of uraninite up to 1/8 inch in diameter are found in the fine-grained footwall of No. 1 dyke at the adit level. Partial XRF analysis: U_3O_8 64.5, ThO_2 9.2, PbO 11.9; unit cell edge 5.468Å.

(3) Disseminated uraninite occurs in No. 4 dyke at the Centre Lake Mine in a lens-shaped band of oligoclase-microcline along with minor diopside, titanite, biotite and fluorite. Partial XRF analysis of uraninite from the 205-foot level: U_3O_8 65.0, ThO_2 7.7, PbO 11.9; unit cell edge 5.461Å.

(4) Crystals of uraninite up to 1 inch in diameter occur in biotite-rich pyroxenite at the Centre Lake Mine. Partial XRF analysis: U_3O_8 68.0, ThO_2 17.0, PbO 10.75; unit cell edge 5.475Å.

(5) Anhedral to subhedral grains of uraninite up to 1/4 inch in diameter were found in a small syenite dyke, conc. XV, lot 6, Cardiff Township, Haliburton County. Partial XRF analysis: U_3O_8 66.7, ThO_2 8.5, PbO 11.4; unit cell edge 5.461Å.

(6) Partly rounded cubes of uraninite up to 1 1/2 inches in diameter occur in calcite-fluorite dykes at Cardiff Uranium Mines Limited, conc. XVII, lot A, Cardiff Township, Haliburton County. Partial XRF analysis of crystals from the 125-foot level of the mine: U_3O_8 62.8, ThO_2 13.6, PbO 12.8; unit cell edge 5.497Å.

(7) Partial XRF analysis of uraninite from syenite and calcite-diopside rock collected at the Cardiff Uranium Mines Limited adit, conc. XIX, lot 2, Cardiff Township: U_3O_8 62.7, ThO_2 14.3, PbO 10.7; unit cell edge 5.491Å.

(8) Uraninite occurs in mica pyroxenite on the property of Anuwon Uranium Mines Limited, conc. XIX, lot 8, Cardiff Township. Partial XRF analysis: U_3O_8 59.6, ThO_2 16.3, PbO 10.3; unit cell edge 5.477Å.

31 E/1 (9) Partial XRF analysis of uraninite from a small pegmatite or migmatite band, conc. XX, lot 7, Cardiff Township, Haliburton County: U_3O_8 73.0, ThO_2 7.7, PbO 10.75; unit cell edge 5.454Å.

(10) Uraninite cubes up to 1 inch in diameter occur in a lens-shaped pegmatite on conc. XXI, lot 8, Cardiff Township, Haliburton County. Partial XRF analysis: U_3O_8 59.0, ThO_2 17.6, PbO 10.5; unit cell edge 5.488Å.

(11) Subhedral grains of uraninite are present in fine-grained syenite associated with an irregular pegmatite in conc. XXI, lot 9, Cardiff Township. Partial XRF analysis: U_3O_8 66.7, ThO_2 10.0, PbO 8.4; unit cell edge 5.469Å (S.C. Robinson and Ann P. Sabina, 1955: Am. Mineralogist, 40, p. 626).

Chemical analysis by E.W. Todd of a large uraninite crystal from the Wilberforce showings, conc. XXI, lot 4, Cardiff Township, Haliburton County: UO_2 45.18, UO_3 24.90, ThO_2 11.40, PbO 10.40, Ce_2O_3 group 1.82, Y_2O_3 group 2.74, MgO 0.19, CaO 0.28, MnO 0.04, Fe_2O_3 0.58, SiO_2 0.43, H_2O 0.61, He 0.35, total 98.92; S.G. 9.082 (T.L. Walker, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 42).

Chemical analysis by H.V. Ellsworth of a large uraninite crystal from the Wilberforce showings, conc. XXI, lot 4, Cardiff Township: UO_2 39.10, UO_3 32.40, ThO_2 10.60, PbO 10.95, Ce_2O_3 group 1.88, Y_2O_3 group 2.14, Fe_2O_3 0.43, MnO 0.03, BeO + Al_2O_3 0.09, CaO 1.01, MgO 0.08, SiO_2 0.19, H_2O 0.70, He 0.31, insol. 0.15, total 100.06; S.G. 9.062.

Chemical analysis by H.V. Ellsworth of altered uraninite from the Wilberforce showings, conc. XXI, lot 4, Cardiff Township: UO_2 13.55, UO_3 52.04, ThO_2 13.56, PbO 11.05, Ce_2O_3 group 1.26, Y_2O_3 group 1.87, Fe_2O_3 0.47, MnO 0.03, BeO + Al_2O_3 0.11, CaO 0.27, MgO 0.07, SiO_2 0.58, H_2O 1.60, insol. 0.67, CO_2 0.67, SO_3 0.58, P_2O_3 0.04, total 98.42; S.G. 7.178 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

Partial chemical analyses by A. Sherwood of portions of a uraninite crystal from the Wilberforce showings, conc. XXI, lot 4, Cardiff Township: (a) outer 4 millimetres - UO_2 44.0, UO_3 23.7, ThO_2 13.5, PbO 9.47, R.E. 1.9, CaO 0.02; (b) core - UO_2 39.5, UO_3 27.9, ThO_2 13.4, PbO 9.47, R.E. 0.7, CaO 0.02 (R.M. Berman, 1957: Am. Mineralogist, 42, p. 710).

31 E/4 Uraninite occurs as scattered crystals in the feldspathic parts of a pegmatite dyke on lots 9 and 10, conc. IX, Conger Township, near a bay of Blackstone Lake. The uraninite is often very fresh, unusually hard and heavy, and almost a steel grey colour. Three chemical analyses are reported by H.V. Ellsworth: I. 30 crystals carefully selected for freshness and hand picked for purity;

31 E/4 II. a second sample of 30 crystals prepared as for I; and III. a single crystal considerably altered to the black stage.

The analyses were: I. PbO 11.67, UO_2 53.63, UO_3 26.32, ThO_2 3.22, Ce_2O_3 group 0.98, Y_2O_3 group 2.19, Fe_2O_3 0.15, MnO 0.01, BeO + Al_2O_3 0.03, CaO 0.41, MgO 0.02, SiO_2 0.29, H_2O 0.72, He 0.37, insol. 0.13, total 100.14; S.G. 9.116; II. PbO 11.60, UO_2 51.27, UO_3 28.37, ThO_2 3.55, Ce_2O_3 group 0.44, Y_2O_3 group 2.31, Fe_2O_3 0.27, MnO 0.03, BeO + Al_2O_3 0.02, CaO 0.47, MgO 0.03, SiO_2 0.35, Na_2O 0.23, H_2O 0.74, insol. 0.17, total 99.85; S.G. 9.026; III. PbO 10.52, UO_2 38.05, UO_3 39.13, ThO_2 3.35, Ce_2O_3 group 0.78, Y_2O_3 group 1.90, Fe_2O_3 0.91, MnO 0.04, BeO + Al_2O_3 0.11, CaO 1.40, MgO 0.17, SiO_2 1.36, H_2O (-110°) 0.45, H_2O (+110°) 1.08, insol. 0.14, total 99.39 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

31 E/9 Uraninite has been found in granite pegmatite on lot 14, conc. IV, Murchison Township, Nipissing district (D.F. Hewitt, 1960: private communication).

31 E/11 Uraninite was discovered in 1919 in a granite pegmatite carrying considerable muscovite, in Butt Township, conc. VII, on the south half of lot 13. Four chemical analyses have been made by H.V. Ellsworth: I. good quality single crystal - PbO 10.80, U_3O_8 79.48, ThO_2 1.56, R.E. oxides 5.02, Fe_2O_3 0.40, MnO 0.12, BeO + Al_2O_3 0.08, CaO 1.18, MgO 0.07, SiO_2 0.31, H_2O (-110°) 0.26, H_2O (+110°) 0.35, insol. 0.35, total 99.98; S.G. 8.859; II. mixed fragments - PbO 9.84, U_3O_8 76.87, ThO_2 1.83, Ce_2O_3 group 2.71, Y_2O_3 group 2.77, Fe_2O_3 0.53, MnO 0.21, BeO + Al_2O_3 0.03, CaO 1.50, MgO 0.03, SiO_2 1.02, H_2O 1.33, insol. 1.40, total 100.07; III. mixed fragments - PbO 10.58, UO_2 43.33, UO_3 33.42, ThO_2 1.23, Ce_2O_3 group 0.96, Y_2O_3 group 4.02, Fe_2O_3 0.62, MnO 0.06, BeO + Al_2O_3 0.10, CaO 0.98, MgO 0.04, SiO_2 0.36, H_2O (-110°) 0.40, H_2O (+110°) 0.34, insol. 2.27, total 98.71; S.G. 8.788; IV. altered crystal - PbO 10.36, U_3O_8 75.74, ThO_2 1.13, R.E. oxides 5.58, Fe_2O_3 0.86, MnO 0.16, BeO + Al_2O_3 0.07, CaO 1.35, MgO 0.03, SiO_2 2.04, H_2O (-110°) 0.72, H_2O (+110°) 1.20, insol. 0.43, total 99.67 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

31 F/4 (1) The Faraday Mine is located on conc. XI, lots 16, 17, Faraday Township, Hastings County. In the west drift of the west adit, small subhedral grains of uraninite occur in an ore shoot which consists of equal amounts of feldspar, magnetite and locally, titanite. Partial XRF analysis: U_3O_8 70.0, ThO_2 7.7, PbO 13.7; unit cell edge 5.460Å.

(2) Rounded grains of uraninite occur with subhedral uranothorite in coarse-grained tremolite-calcite rock on J. Lockwood's farm, along the Monck Road, in conc. A, lot 29, Faraday Township,

31 F/4 Hastings County. Partial XRF analysis: U_3O_8 46.0, ThO_2 35.0, PbO 9.0; unit cell edge 5.540Å (S.C. Robinson and Ann P. Sabina, 1955: Am. Mineralogist, 40, pp. 625-627).

31 G/5 A small amount of uraninite was discovered in a pegmatite dyke worked for feldspar on lot 6, conc. II, March Township, Carleton County. Chemical analysis by Ellsworth: PbO 11.61, UO_2 49.44, UO_3 24.28, ThO_2 4.92, Ce_2O_3 group 2.10, Y_2O_3 group 2.30, Fe_2O_3 0.37, MnO 0.02, BeO + Al_2O_3 0.05, CaO 1.56, MgO 0.11, SiO_2 0.64, H_2O (-110°) 0.22, H_2O (+110°) 1.33, insol. 0.16, total 99.11; S.G. 8.674 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

31 L/5 Uraninite has been identified in limestone at the Beaucage Mine, Manitou Islands, Lake Nipissing (D.F. Hewitt, 1960: private communication).

41 H/15 Uraninite is intimately associated with thucholite in the Besner pegmatite, lot 5, conc. B, Henvey Township, Parry Sound district. Three analyses are reported by Ellsworth: I. panned concentrate - S.G. 8.173, PbO 8.66, UO_2 49.35, UO_3 29.76, ThO_2 1.78, Ce_2O_3 group 1.47, Y_2O_3 group 1.48, Fe_2O_3 0.88, MnO 0.02, BeO + Al_2O_3 0.17, CaO 2.69, MgO 0.03, CuO 0.03, SiO_2 1.36, H_2O 1.44, total 99.12; II. panned concentrate - S.G. 7.827, PbO 8.09, U_3O_8 79.30, ThO_2 1.73, R.E. oxides 2.87, CaO 2.82, CuO 0.03, SiO_2 1.76, total 96.60; III. heavy fraction from single crystal - S.G. 7.809, PbO 8.16, U_3O_8 79.35, ThO_2 2.11, R.E. oxides 3.48, MnO 0.02, CaO 1.97, CuO 0.02, SiO_2 2.12, total 97.23 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 268).

41 I/9 Uraninite is reported to have been identified in Loughrin Township, Sudbury district (E.W. Nuffield and D.H. Gorman, 1960: private communication).

41 N/2 Partial chemical analysis of vein pitchblende from calcareous reddish quartzite, Theano Point, Algoma district, by H. Levine: PbO 5.25, UO_2 20.4, UO_3 43.2, R.E. oxides 0.53, CaO 13.24, SiO_2 2.60 (R.M. Berman, 1957: Am. Mineralogist, 42, p. 730).

What appears to have been the first Canadian discovery of uranium was recorded by the American geologist LeConte in 1847. He stated that he had found a mineral resembling pitchblende in a collection made by a Mr. Stanard on the north shore of Lake Superior, and he named it "coracite". The mineral was subsequently re-examined by Whitney (1849: J. Boston Soc. Nat. Hist., p. 36) and Genth (1857: Am. J. Sci., Ser. 2, p. 421) who stated they believed it to be pitchblende. Chemical analyses: by Whitney, UO_2 + UO_3 59.30, PbO 5.36, Fe_2O_3 2.24, Al_2O_3 0.90, CaO 14.44, SiO_2 4.35, CO_2 7.47, H_2O 4.64, total 98.70; S.G. 4.38; by Genth, UO_2 16.47, UO_3 46.21, PbO 7.39, Fe_2O_3 3.51, 41 N/2 Al_2O_3 0.52, CaO 5.33, MgO 0.56, SiO_2 13.15, $CO_2 + H_2O$ 6.14, total 99.28 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, pp. 78, 79).

Quebec

21 M/16 In 1893 or 1894 J. Obalski, Inspector of Mines for Quebec, collected a crystal of uraninite about 2 inches in diameter from a pegmatite dyke worked for muscovite on the north side of Lac Pied des Monts, about 18 miles northeast of Murray Bay, Charlevoix County. A fragment weighing 4 1/2 grams was later sawn from the crystal and analyzed by Ellsworth: PbO 11.69, U_3O_8 86.16, ThO_2 0.10, Ce_2O_3 oxides 0.06, Y_2O_3 oxides 0.73, $Fe_2O_3 + Al_2O_3$ 0.35, MnO 0.14, CaO 0.35, MgO 0.06, SiO_2 0.21, total 99.85; S.G. 8.958 (H.V. Ellsworth and F. Fitz-Osborne, 1934: Am. Mineralogist, 19, p. 421).

31 F/9 Black cubes of uraninite are scattered sporadically through metamorphic pyroxenite on the property of Quebec Metallurgical Industries Limited, lot 5, range XII, and lot 3, range XIII, Clarendon Township, Pontiac County (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 24).

31 G/12 Uraninite crystals up to 1/2 inch in diameter occur at the contact between a zoned granite pegmatite and amphibolite on lot 26, range III, Wakefield Township, Gatineau County. Partial XRF analysis: U_3O_8 69.0, ThO_2 8.1, PbO 13.9; unit cell edge 5.44Å (S.C. Robinson and Ann P. Sabina, 1955: Am. Mineralogist, 40, p. 625).

31 G/13 The Villeneuve Mine, lot 31, range I, Villeneuve Township, is located on the east end of a low hill a short distance north of the main road from Notre-Dame-de-la-Salette, about 20 miles north of Buckingham. In 1886, G.C. Hoffmann of the Geological Survey of Canada reported receipt of a specimen of uraninite weighing nearly a pound from this mine. Chemical analysis by W.F. Hillebrand (1891) gave: PbO 11.27, UO_2 34.67, UO_3 41.06, ThO_2 6.41, Ce_2O_3 group 1.51, Y_2O_3 group 2.57, $Fe_2O_3 + Al_2O_3$ 0.10, CaO 0.39, SiO_2 0.19, H_2O 1.47, Bi_2O_3 0.09, total 99.73. Three distinct zones due to progressive alteration were analyzed by Ellsworth with the following results: Zone A, nearest the centre of the crystal and least altered, S.G. 9.144, steely black colour, PbO 11.43, UO_2 41.08, UO_3 34.98, ThO_2 6.40, Ce_2O_3 oxides 0.79, Y_2O_3 oxides 3.31, $Fe_2O_3 + Al_2O_3$ 0.18, CaO 0.36, MgO 0.03, SiO_2 0.21, H_2O 1.70, total 99.47; Zone B, next stage of alteration, S.G. 7.779, colour pitch black, PbO 10.73, UO_2 9.49, UO_3 62.42, ThO_2 6.23, Ce_2O_3 oxides 0.68, Y_2O_3 oxides 2.97, $Fe_2O_3 + Al_2O_3$ 0.13, CaO 0.42, MgO 0.02, SiO_2 0.34, H_2O 5.97, total 99.40; Zone C, "flame-scarlet" coloured substance, S.G. 5.273, PbO 14.93, UO_2 none, UO_3 60.36, ThO_2 7.66, Ce_2O_3 group 0.14, Y_2O_3 group 1.61, $Fe_2O_3 + Al_2O_3$ 0.14, CaO 1.37, MgO 0.12, SiO_2 3.81, H_2O 9.42, total 99.56 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 272).

31 J/5 A pegmatite sill containing uraninite and sphene occurs on the property of Opawica Explorers Limited, Kensington Township, Gatineau County (D. M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 42).

31 J/13 Uraninite and uranothorite occur in metamorphic pyroxenite on lots 29-31, range II, Baskatong Township, Gatineau County (D. M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 19).

URANOPHANE and BETA-URANOPHANE

$CaO.2UO_3.2SiO_2.6H_2O$

Uranophane and beta-uranophane are dimorphous minerals which are similar in appearance but may be distinguished optically and by their X-ray powder patterns. Uranophane is probably the most commonly occurring uranium silicate mineral. The spacings and intensities of the strongest lines in their X-ray patterns are: uranophane, 7.55 (10), 4.67 (6), 3.83 (9), 2.94 (9), 2.17 (7) and 2.08 (8); beta-uranophane, 7.49 (10), 5.04 (8), 4.53 (8), 3.83 (9), 3.51 (8), 3.02 (8) and 2.80 (9) (D. H. Gorman and E. W. Nuffield, 1955: Am. Mineralogist, 40, pp. 634-646).

Northwest Territories

86 L/1 Uranophane is reported to occur as an oxidation product of pitchblende at Great Bear Lake (C. Palache and H. Berman, 1933: Am. Mineralogist, 18, p. 20).

Ontario

31 D/16 Uranophane has been identified by X-ray diffraction in specimens from Canada Radium Mines Limited, lots 8-11, concs. XII and XIII, Cardiff Township; and beta-uranophane from Blue Rock Cerium Mines Limited, lots 18-20, concs. V and VI, Monmouth Township, both in Haliburton County (X-ray Laboratory, Geol. Surv. Can.).

31 F/4 Uranophane and beta-uranophane are found in fresh granitic rock underground at Faraday Uranium Mines Limited, conc. XI, lots 16 and 17, Faraday Township, Hastings County. They were identified by the X-ray Laboratory, Geol. Surv. Can. Crystals of beta-uranophane suitable for single crystal X-ray study have also been found at Faraday (D. H. Gorman and E. W. Nuffield, 1955: Am. Mineralogist, 40, p. 640).

41 H/15 Uranophane has been reported in the Besner pegmatite, lot 5, conc. B, Henvey Township, Parry Sound district (H. S. Spence, 1930: Am. Mineralogist, 15, p. 474).

41 N/2 Uranophane and beta-uranophane occur as fibrous crusts and aggregates associated with uraninite, at Theano Point on Lake Superior (C. Frondel, 1956: Am. Mineralogist, 41, p. 557).

52 F/13 Scaly beta-uranophane which fluoresces bright green occurs in MacNicol Township, Kenora district (D.H. Gorman and E.W. Nuffield, 1955: Am. Mineralogist, 40, p. 640).

Quebec

21 L/12
21 L/13 Uranophane is widespread as a yellow-green coating on joints and schistosity planes on the Goudry property, range III, lot 33, Portneuf Seigneury (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 48).

31 F/15 Yellow uranophane is reported to be present in a pink calcite rock at Huddersfield Uranium Mines Limited, Huddersfield Township, Pontiac County. It is also found in the scapolite-diopside rocks at Yates Uranium Mines, lot 20, range IV, Huddersfield Township (D.M. Shaw, 1959: Que. Dept. Mines, Geol. Rept., 80, pp. 36, 40).

31 G/13 Uranophane is found associated with gummite, uraninite, tourmaline, apatite, and spessartite in a coarse pegmatite vein which traverses grey garnet gneiss in range I, lots 31, 32, Villeneuve Township, Papineau County (G.C. Hoffmann: Geol. Surv. Can., Ann. Rept., XII, p. 16R).

31 J/12 Minute needles of secondary uranophane occur on the Kelly property, range I, lot 57, Egan Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 26).

Saskatchewan

74 N/7 Uranophane is the principal supergene mineral, with some barite and gypsum on the property of Gunnar Mines Limited, on the south shore of Crackingstone Point, about 15 miles southwest of Uranium City (J.A. Fraser and S.C. Robinson, 1954: Can. Mining J., 75, Pt. 2, pp. 59-62).

74 N/8 Uranophane occurs as clusters of tiny radiating yellow to greenish yellow needles lining crevices, and a yellow colloform crust filling cracks at the Nicholson Mine, on Lake Athabasca (D.D. Hogarth, 1951: Am. Mineralogist, 36, p. 412).

URANOPILITE

$$(UO_2)_6(SO_4)(OH)_{10}.12H_2O$$

Uranopilite is a secondary mineral which occurs as a yellow coating on primary uranium minerals. The mineralogy of the hydrated uranyl sulphates is not clear and several species may be confused under the names uranopilite and zippeite. The X-ray powder pattern of uranopilite, as recorded by Frondel, has the following strongest lines: 9.18 (8), 7.12 (10), 5.51 (4), 4.28 (8), 3.65 (5), 3.31 (4) (C. Frondel, 1958: U.S.G.S., Bull. 1064, p. 139).

Northwest Territories

86 D
86 L Uranopilite has been identified as an alteration product of pitchblende from the Hottah Lake district and the Great Bear Lake deposit (C. Frondel, 1958: U.S.G.S., Bull. 1064, p. 139).

Saskatchewan

74 N A bright yellow mineral coating pitchblende from the Goldfields area was identified as uranopilite on the basis of optical properties and X-ray diffraction pattern (R.J. Traill, 1952: Am. Mineralogist, 37, p. 403).

URANOTHORITE

(See Thorite)

UVAROVITE

$Ca_3Cr_2(SiO_4)_3$

Uvarovite, the calcium-chromium garnet, is probably the rarest of the garnet species. The name has been loosely applied to chromian garnet, especially chromian grossular, and the Canadian minerals noted below are probably that species rather than uvarovite. The spacings and intensities of the four strongest lines in the X-ray powder pattern of pure synthetic uvarovite are: 2.999 (7), 2.684 (10), 2.449 (5) and 1.603 (6) (H.E. Swanson et al., 1960: Nat. Bur. Stds., Circ. 539, vol. 10, p. 17).

Quebec

22 B/5 Bright green uvarovite is found with chromite on lot 11, range IV, Awantjish Township, Matapedia County (E. Aubert de la Rue, 1941: Que. Dept. Mines, Geol. Rept., 9, p. 25).

31 G/12 Chemical analysis of uvarovite from lot 29, range IV, Wakefield Township, Gatineau County: SiO_2 37.50, Al_2O_3 18.65, Fe_2O_3 1.07, Cr_2O_3 4.95, CaO 36.13, MgO 0.52, loss on ignition 0.48, total 99.30; S.G. 3.542 (B.J. Harrington, 1881: Can. Nat., Ser. 2, IX, p. 305).

31 H/8 Granular masses and disseminated grains of beautiful green uvarovite occur on lot 6, range XII, Orford Township, Sherbrooke

31 H/8 County. Chemical analysis by Hunt: SiO_2 36.65, Al_2O_3 17.50, FeO 4.97, Cr_2O_3 6.20, CaO 33.20, MgO 0.81, loss on ignition 0.30, total 99.63 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 497).

VALENTINITE

Sb_2O_3

Valentinite occurs as a secondary mineral resulting from the oxidation of stibnite, native antimony, kermesite, tetrahedrite and other antimony minerals. It is found as paramorphs after senarmontite, and is said to alter to native antimony. The spacings and intensities of the six strongest lines in the X-ray powder pattern are: 4.56 (2), 3.494 (2), 3.173 (2), 3.142 (10), 3.117 (8) and 1.804 (2) (H.E. Swanson et al., 1960: Nat. Bur. Stds., Circ. 539, vol. 10, p. 17).

Quebec

21 E/13 Valentinite is found with native antimony, stibnite, senarmontite, and kermesite in veins in argillite on conc. I, lot 56, South Ham Township, Wolfe County (R.W. Ells, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 80K).

VALLERIITE

$Cu_2Fe_4S_7$ or $Cu_3Fe_4S_7$

Valleriite is a massive metallic mineral resembling pyrrhotite in colour, and graphite in physical properties. In polished section, it is cream white in colour and is strongly anisotropic. It occurs in high-temperature copper deposits. The X-ray powder pattern of valleriite has four strongest lines with the following spacings and intensities: 11.58 (10), 5.75 (10), 3.29 (5) and 1.900 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 61).

Ontario

41 I/6 Valleriite is a very minor constituent of the Sudbury ores but it is not uncommon in copper-rich materials. Reflection pleochroism and double refraction are very strong. It occurs frequently, as long spindles less than 0.01 millimetre wide which in some cases are clearly aligned by the crystal structure of the enclosing chalcopyrite (J.E. Hawley and R.L. Stanton, 1962: Can. Mineralogist, 7, p. 85).

VANDENDRIESSCHEITE

Hydrated oxide of Pb and U

Northwest Territories

86 L/1 Vandendriesscheite was originally described as 'mineral X' from Great Bear Lake, where it occurs as minute crystals associated with fourmarierite on altered pitchblende. The following two slightly different sets of X-ray powder data are given for this mineral: 7.41 (8), 3.61 (9), 3.22 (10), 2.55 (4), 2.01 (4); and 7.31 (10), 3.58 (8), 3.19 (9), 2.53 (5) and 1.99 (7) (C. Frondel, 1958: U.S.G.S., Bull. 1064, p. 86).

VERMICULITE

$$(Mg, Fe, Al)_{6-7}(Si, Al)_8O_{20}(OH)_4 \cdot 8H_2O$$

Vermiculite is a hydrous mica-like mineral whose commercial importance is due to its property of rapid expansion or exfoliation when heated to high temperatures. The expanded product is valued for insulation and as a lightweight aggregate. The X-ray powder pattern of vermiculite has three strongest lines with the following spacings and intensities: 14.00 (10), 3.45 (6) and 1.53 (6) (ASTM card 10-439).

British Columbia

83 D/6 Vermiculite admixed with biotite occurs in crystalline limestone interbanded with gneiss at the Verity property near Blue River in the Kamloops mining division (J.W. McCammon, 1950: British Columbia, Minister of Mines Rept., A229-230).

Ontario

31 C/7 Light tan to silvery vermiculite is present on lot 1, conc. XI, Loughborough Township, Frontenac County. The showing is on the open slope of a southerly facing hillside, some 200 feet east of the road and 1 1/3 miles north of the Village of Holleford (J.W. Hoadley, 1960: Geol. Surv. Can., Econ. Geol. Ser., 19, p. 99).

31 C/16 Vermiculite admixed with phlogopite has been exploited commercially in the Stanleyville area. The product varies in colour from light silver tan through several shades of brown to almost black. The main showings are located on the north half of lot 17, conc. VIII, and on lot 14, conc. IX, North Burgess Township, Lanark County (J.W. Hoadley, 1960: Geol. Surv. Can., Econ. Geol. Ser., 19, p. 96).

31 D/9 A band of crystalline limestone carrying vermiculite is exposed near Mississagua Lake on lots 13, 14, conc. II, Cavendish Township, Peterborough County (J.W. Hoadley, 1960: Geol. Surv. Can., Econ. Geol. Ser., 19, p. 98).

VESUVIANITE

$$Ca_{10}(Mg, Fe)_2Al_4Si_9O_{34}(OH)_4$$

Vesuvianite, also known as idocrase, is a contact metamorphic mineral found in impure limestones. It is commonly associated with calcite, wollastonite and grossular. The spacings and intensities of the five strongest lines in the X-ray powder pattern are: 2.95 (4), 2.75 (10), 2.59 (8), 2.45 (5) and 1.62 (6) (ASTM card 11-145).

British Columbia

92 F/10 Fine specimens have been found at Marble Bay, Texada Island (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 233).

92 I/4 Vesuvianite occurs on the Green Gold jade claims at the head of Kwoiek Creek on Antimony Mountain, Kamloops district (1958: Canadian Rockhound, vol. 2, No. 2).

Brown and green, opaque to translucent vesuvianite occurs as a fine-grained aggregate 2 miles southwest of Skihist Mountain in the Ashcroft area (S. Duffell and K.C. McTaggart, 1952: Geol. Surv. Can., Mem. 262, p. 114).

New Brunswick

21 G/2 Massive green idocrase is found at Charley Cove on Frye Island, Charlotte County (E. Coste, 1887: Geol. Surv. Can., Ann. Rept., III, p. 76S).

Northwest Territories

85 I/10 A small quantity of crystal groups of vesuvianite up to 5" x 5" x 3" and single crystals up to 1 inch in length, chocolate brown with a greenish tint, stout prismatic in habit, occur in Precambrian sediments near a granite contact at Turnback Lake, 40 miles north of Great Slave Lake. Chemical analysis by V.B. Meen: SiO_2 36.68, TiO_2 0.81, Al_2O_3 15.62, BeO 1.07, Fe_2O_3 2.81, FeO 2.96, MgO 1.39, MnO 0.46, CaO 35.88, Na_2O 0.10, K_2O 0.03, H_2O^+ 0.84, H_2O^- 0.04, F_2 2.03, O for F_2 0.85, total 99.87 (V.B. Meen, 1939: Univ. Toronto Stud., Geol. Ser., 42, p. 69).

Ontario

31 C/9
31 C/10
31 C/14
31 C/15

Vesuvianite is found in the crystalline limestone of Bedford and Clarendon townships, in Frontenac County (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 211).

31 F/4

Tabular crystals of vesuvianite with a maximum thickness of 8 millimetres and a width of 20 millimetres are associated with a pyroxenitic band, immediately below a layer of pink sodalite, near Bancroft in Dungannon Township, Hastings County. Chemical analysis by H.C. Rickaby gave: SiO_2 35.76, TiO_2 4.11, Al_2O_3 17.56, Fe_2O_3 2.64, FeO 2.05, CaO 34.34, MgO 1.50, MnO 0.13, Na_2O 0.89, K_2O 0.45, H_2O 0.58, F 0.47, total 100.48; S.G. 3.337 (T.L. Walker and A.L. Parsons, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 9).

Quebec

21 L/3

Several varieties of vesuvianite have been described from the Montreal Chrome pit, lot 25, range II, Coleraine Township, Megantic County. Pale yellow crystals of vesuvianite are found with colourless diopside near the walls of dyke cutting serpentine and massive chromite. Chemical analysis by Graham: SiO_2 36.62, Al_2O_3 15.96, Fe_2O_3 4.30, FeO 0.54, MgO 1.25, CaO 38.66, H_2O^+ 3.11, H_2O^- 0.07, MnO tr., total 100.51. Vesuvianite also forms compact fine-grained crystalline masses having a deep lilac tint. The colour fades after exposure to light. Chemical analysis by Graham: SiO_2 36.88, Al_2O_3 20.03, Fe_2O_3 0.85, MgO 2.17, CaO 37.61, MnO 0.23, H_2O^+ 3.06, H_2O^- 0.03, total 100.86; S.G. 3.32. Brilliant emerald green crystals of vesuvianite have also been found associated with white, compact diopside (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull., 27, p. 60).

Clove brown and reddish brown crystals of vesuvianite occur at the Southwark and Caribou Chrome pits (range B, lot 28, east half; and Block B; Coleraine Township) (E. Poitevin and R.P.D. Graham, 1918: Geol. Surv. Can., Museum Bull., 27, p. 57). Chemical analysis of vesuvianite from the Southwark pit, by R.J.C. Fabry: SiO_2 36.69, Al_2O_3 18.95, Fe_2O_3 1.76, FeO 1.89, MgO 2.97, CaO 36.61, Na_2O 0.17, K_2O 0.12, TiO_2 0.25, MnO 0.36, F 1.25, H_2O 0.37, total 101.39, less O for F 0.53, total 100.86 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 342).

Vesuvianite occurs as compact masses of pale yellow colour at the American Chrome pit, range IV, lot 25, Coleraine Township. Chemical analysis by R.J.C. Fabry: SiO_2 36.96, Al_2O_3 18.05, Fe_2O_3 2.24, FeO 0.97, MgO 2.10, CaO 36.76, Na_2O 0.19, K_2O 0.13, TiO_2 0.18, MnO 0.13, H_2O 0.39, CO_2 0.10, F 2.61, total 100.81, less O for F 1.10, total 99.71 (J.A. Maxwell et al., 1965: Geol. Surv. Can., Bull. 115, p. 343).

21 L/3 Vesuvianite occurs in masses and minute crystals of bright pink colour at the Montreal Chromite pit at Black Lake in Megantic County. Chemical analysis gave: SiO_2 36.77, Al_2O_3 20.05, CaO 37.47, FeO 0.65, MnO 0.20, MgO 2.69, Na_2O 2.88, K_2O 0.21, total 100.92 (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 233).

31 F/9 Hard, prismatic, brown vesuvianite is found in a metamorphic pyroxenite consisting chiefly of diopside with some pink calcite at the Quebec Metallurgical Industries property, range XII, lot 5, and range XIII, lot 3, in Clarendon Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 24).

31 F/10 Good specimens of vesuvianite have been found with tourmaline at Calumet Falls, Litchfield Township, Pontiac County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

31 G/10 Vesuvianite occurs as yellow crystals with garnet, pyroxene and zircon in calcite, in Greenville Township, Argenteuil County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

31 G/12 Idocrase from range XII, lot 16, in Templeton Township, Papineau County, was donated to the National Mineral Collection by C.W. Willimott (1894).

Vesuvianite occurs as small green prisms at lot 1, range XIV, Wakefield Township, Gatineau County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

Vesuvianite occurs in quartzose rock at range XII, lots 16, 17, in Templeton Township, Papineau County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

31 G/15 Vesuvianite occurs at range IV, lot 4, Harrington Township, Argenteuil County (G.M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 102A). A specimen was donated to the National Mineral Collection by C.W. Willimott (1894).

31 G/16 Vesuvianite occurs as scattered crystals with mica and apatite in dykes of white granite on range VII, lot 23, Wentworth Township, Argenteuil County (R.W. Ells, 1899: Geol. Surv. Can., Ann. Rept., XII, p. 23J).

Idocrase of gem quality has been found at Laurel in Argenteuil County (A.L. Parsons, 1938: Univ. Toronto Stud., Geol. Ser., 41, p. 47).

Yukon

105 O/4 Veinlets of vesuvianite, prehnite and carbonate traverse an aggregate of garnet and epidote found at the contact of an inclusion of

105 O/4 aphanitic rock and a serpentinite body, west of Lake Laberge (J.O. Wheeler, 1961: Geol. Surv. Can., Mem. 312, p. 91).

VIBERTITE

(See bassanite)

VIOLARITE

Ni_2FeS_4

Violarite is a relatively rare, violet-grey mineral which has been classified as a member of the linnaeite series. The X-ray powder pattern has five strongest lines with the following spacings and intensities: 2.85 (10), 2.36 (5), 1.820 (6), 1.674 (8) and 1.059 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 77).

Ontario

41 I/6 Violarite has rather limited development in the nickel ores of the
41 I/11 Sudbury camp where it is associated with pentlandite, pyrrhotite, millerite and chalcopyrite. The species was originally described from the Vermilion Mine in Denison Township, and later from the Worthington Mine, Drury Township, and the Levack Mine, Levack Township. Chemical analysis: Co 1.05, Ni 38.68, Fe 17.01, Cu 1.12, S 41.68, insol. 0.40, total 99.94 (M.N. Short and E.V. Shannon, 1930: Am. Mineralogist, 15, pp. 1-22).

52 L/7 Violarite has been identified in a specimen of massive sulphide ore from the Marpax Nickel Mines property, 55 miles northwest of Kenora, Werner Lake district (D.A. Moddle, 1960: private communication).

Quebec

21 L/9 Violarite has been identified in a specimen from Eastern Metals Corporation, Panet Township, Montmagny County (E.W. Nuffield and D.H. Gorman, 1960: private communication).

VIVIANITE

$Fe_3(PO_4)_2 \cdot 8H_2O$

Vivianite is a hydrated ferrous phosphate but it generally contains some ferric iron. Oxidation can extend over a wide range without apparent change in crystal structure. The spacings and intensities of the four strongest lines in the X-ray powder pattern of synthetic vivianite are: 6.80 (10), 3.20 (5), 2.97 (6) and 2.71 (6) (ASTM card 3-0070).

Manitoba

62 G/1 Blue encrustation of vivianite has been noted along a creek bed 1/2 mile east of the bridge across Pembina River south of Kaleida (Can. Inst. Mining Met., Bull., vol. 49, No. 441, 1949, pp. 11-16).

New Brunswick

21 O/1 Vivianite is found in small quantities in heavy beds of clay on the banks of the St. John River, 4 miles above Grand River in Queen's County (L. W. Bailey, 1897: Geol. Surv. Can., Ann. Rept., X, p. 18M).

Nova Scotia

11 F/12 Vivianite occurs in small amounts at Antigonish, Antigonish County (H. Fletcher, 1886: Geol. Surv. Can., Ann. Rept., 11, p. 114P).

Ontario

30 M/1 Vivianite from Don Valley, Toronto, has been identified by powder diffraction pattern (E. W. Nuffield and D. H. Gorman, 1960: private communication).

Quebec

21 E/5 A bright blue, earthy vivianite occurs in a bed of laminated clay on range II, lot 25, Hatley Township, Stanstead County (G. C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 17R).

31 G/8 A bright blue vivianite has been found underlying a bed of bog-iron ore in Cote St. Charles Seignory, Vaudreuil County (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

31 I/9 Vivianite occurs as a clear blue powder accompanying masses of fossil wood buried in a bed of rusty sand a few inches thick beneath about 100 feet of post glacial clays at Deschaillons in Lotbinière County (Mrs. J. S. Stevenson, 1960: private communication).

Yukon

116 B/4 Vivianite occurs about 40 miles above Forty Mile River in the Yukon River valley (G. M. Dawson, 1894: Geol. Surv. Can., Ann. Rept., VII, p. 100A).

116 N/5 Earthy forms of vivianite can be found near the Ramparts of the Porcupine River (G. C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 64T).

VOLBORTHITE

$Cu_3(VO_4)_2 . 3H_2O$

British Columbia

92 K/3 Volborthite is present as a weathering product of a thin interlava sedimentary rock which outcrops west of Menzies Bay on Vancouver Island and north of Gowland Harbour on Quadra Island. It displays a wide range of colours in shades of yellow, green, and brown. Chalcocite is a major constituent of the sedimentary rock. Associated minerals are malachite, brochantite, cuprite, tenorite, azurite, calcite, cyanotrichite and connellite. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 7.18 (10), 2.88 (6), 2.57 (6) and 2.39 (6) (J.L. Jambor, 1960: Am. Mineralogist, 45, pp. 1307-1309).

WEDDELLITE

$CaC_2O_4 . 2H_2O$

Northwest Territories

45 O/4 This rare oxalate mineral previously described from bottom muds of the Weddell Sea, Antarctica, has been identified as colourless crystals in sponge spicules from Fisher Strait, Hudson Bay area. The X-ray powder pattern has four strongest lines with the following spacings and intensities: 6.18 (10), 4.42 (4), 2.78 (7) and 2.24 (3) (X-ray Laboratory, Geol. Surv. Can.).

WEHRLITE

$Bi_{2+x}Te_{3-x}$

This mineral occurs in foliated masses with perfect cleavage resembling tetradymite. It is classed by Berry and Thompson as a variety of tellurbismuth deficient in tellurium. The X-ray powder pattern shows four strongest lines with the following spacings and intensities: 3.23 (10), 2.37 (7), 2.21 (5) and 1.404 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 25).

British Columbia

82 L/4 Wehrlite with a bronze tarnish occurs in intimate association with foliated tetradymite in a quartz body at the White Elephant Mine, 15 miles southwest of Vernon in the Vernon mining division (H.V. Warren, 1945: Univ. Toronto Stud., Geol. Ser., 50, p. 75).

92 F/10 Wehrlite occurs with hessite in chalcopyrite and bornite at Marble Bay and Little Billie mines on Texada Island near Vananda (H.V. Warren, 1946: Univ. Toronto Stud., Geol. Ser., 51, p.76).

92 H/5 Small amounts of wehrlite intimately associated with gold are occasionally seen embedded in quartz in samples from a property known variously as Laidlaw Group, Sovereign property and Telluride Gold property, located a short distance above the Jones Creek bridge on the main highway about 12 miles west of Hope (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 549).

92 O/1 Wehrlite has been found in weathered quartz veins and in stream beds at the Monty and Ajax claims near the head of the north fork of Watson Bar Creek, on the Clinton mining division (R.M. Thompson, 1953: Am. Mineralogist, 38, p. 549).

92 O/4 Wehrlite, associated with galena in quartz and containing inclusions of hessite, occurs at the Charlie Vein on the Tchaikazan River in the Taseko Lake district (H.V. Warren, 1947: Univ. Toronto Stud., Geol. Ser., 52, p. 83).

Ontario

42 A/9 Wehrlite was identified in several specimens of white quartz from the Treadwell property, Painkiller Lake, Beatty Township, Cochrane district (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 370).

Quebec

21 M/1 Wehrlite was identified as thin films on rather glassy quartz, associated with grains of petzite, gold and pyrite at Canadian Malartic Gold Mines Limited, Fournier Township, L'Islet County (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 370).

32 C/3 Wehrlite, disseminated with altaite, petzite and gold in massive white quartz, occurs at the Bevcourt Mine, Louvicourt Township (R.M. Thompson, 1949: Am. Mineralogist, 34, p. 370).

WILSONITE

(altered scapolite)

The name wilsonite was given to a mineral discovered in Bathurst Township, Lanark County, Ontario (31 C/16) by Dr. Wilson of Perth. Its form resembled scapolite, but its composition differed as noted in the following chemical analyses by T. Sterry Hunt.

Analyses of Wilsonite

	1	2	3	4	5
SiO_2	42.90	43.00	43.55	47.50	47.70
Al_2O_3	28.10	27.80	27.94	31.17	31.22
FeO		0.70	0.20		
MgO	3.99	3.83	3.81	4.25	4.14
CaO	6.94	6.72	6.50	1.51	0.39
Na_2O	0.95	0.95	1.45	0.82	0.95
K_2O	8.27	8.27	8.37	9.22	9.38
H_2O	9.00	9.40	8.61	5.50	5.35
Total	100.15	100.67	100.43	99.97	99.13

1, 2, 3 Lot 2, conc. IX, Bathurst Township. Massive with cleavages that indicate an oblique system of crystallization. Vitreous lustre, occasionally pearly on cleavage surfaces. Colour rose red to peach-blossom red. Subtranslucent (Geol. Surv. Can., Rept. Prog., 1852-53, p. 170).

4, 5 Bathurst Township. Rose red prismatic masses which have 2 parallel perfect cleavages and 2 distinct diagonal cleavages. Lustre vitreous to pearly. Translucent in thin fragments (Geol. Surv. Can., Geology of Canada, 1863, p. 483).

The X-ray pattern of a very old specimen of wilsonite from Bathurst Township, taken from the National Mineral Collection, resembles muscovite (Ann P. Sabina and R.J. Traill, 1960: G.S.C. Paper 60-4, p. 113). This evidence coupled with the early analyses and morphology suggests that wilsonite is muscovite pseudomorphous after scapolite. The following occurrences have also been reported.

Ontario

31 C/7 Foxton Mine, lot 7, conc. VIII, Loughborough Township, Frontenac County (W.G. Miller, 1900: Ont. Bur. Mines, Ann. Rept., vol. 9, p. 212).

31 D/15 Lot 13, conc. XIV, Lutterworth Township, Haliburton County (F.O. Adams and A.E. Barlow, 1910: Geol. Surv. Can., Mem. 6, p. 216).

Quebec

31 F/10 Calumet Mines, lots 9-12, range IV, Calumet Township, Pontiac County (F. Fitz Osborne, 1944: Que. Dept. Mines, Geol. Rept., 18, p. 16).

31 F/16 Lot 35, range IX, Low Township, Gatineau County (J.F. Torrance, 1882-84: Geol. Surv. Can., Rept. Prog., p. 10J).

31 G/12 Lot 2, range III, Portland Township, Papineau County. Lot 26, range VI, Wakefield Township, Gatineau County (H.S. de Schmid, 1912: Canada Dept. Mines, Mines Br., Pub. 118, p. 300).

Lot 23, range XIII, and lot 10, range IX, Templeton Township, Papineau County (B.J. Harrington, 1877-78: Geol. Surv. Can., Rept. Prog., p. 33G).

Lilac colour. Wallingford Mine, lot 16, range VIII, Templeton Township, 1 1/2 miles west of Perkins Mills, Papineau County (K.K. Landes, 1938: Am. Mineralogist, 23, p. 38).

31 I/16 Sporadic occurrence in the Montauban ore zone in Montauban and Chavigny townships, Portneuf County (J.R. Smith, 1956: Que. Dept. Mines, Geol. Rept., 65).

31 J/11 Mauve colour. Near Clement Station, lot 19, range I, Campbell Township, Labelle County (E. Aubert de la Rue, 1948: Que. Dept. Mines, Geol. Rept., 23, p. 56).

WINKWORTHITE

(borosilicate and sulphate of calcium)

Nova Scotia

21 A/16 Said to occur as embedded nodules in gypsum at Winkworth (now Wentworth?) Creek, Hants County. Named by How on the basis of the following chemical analysis: SiO_2 4.98, Be_2O_3 14.37, SO_3 31.51, CaO 31.14, H_2O 18.00, total 100.00 (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 65T). It has not been established as a valid species and probably represents a mixture of howlite and gypsum.

WITHERITE

$BaCO_3$

Witherite is a member of the aragonite group and is isostructural with aragonite, strontianite and cerussite. Only a minor amount of substitutional solid solution takes place within the group. Although ranked as the second most common barium mineral, witherite is nevertheless of rather infrequent occurrence. The spacings and intensities of the five strongest lines in the X-ray pattern of synthetic witherite are: 3.72 (10), 3.68 (5), 2.628 (2), 2.590 (2) and 2.150 (3) (H.E. Swanson and Ruth E. Fuyat, 1954: Nat. Bur. Stds., Circ. 539, vol. III).

Ontario

31 G/5 Crystallized specimens of witherite have been found in Nepean Township, Carleton County (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 238).

52 A/4 Witherite occurs with calcite, quartz and fluorite as a prominent constituent of a veinstone carrying native silver and argentite at the Porcupine Mine, Gillies Township, Thunder Bay district (E.D. Ingall, 1887-88: Geol. Surv. Can., Ann. Rept., III, p. 71H).

WITTICHENITE

Cu_3BiS_3

Wittichenite is a rare sulfosalt mineral which alters easily to mixtures of secondary copper and bismuth minerals. The four strongest lines in the X-ray powder pattern have the following spacings and relative intensities: 4.55 (4), 3.08 (8), 2.85 (10) and 2.66 (4) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 126).

British Columbia

114 P/10 Wittichenite occurs as minute stringers and blebs with bornite, chalcocite and chalcopyrite at the Maid of Erin Mine, near the head of Klehini River, in the Rainy Hollow district (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 455).

Yukon

105 D/11 Microscopic examination of polished sections from pyrometasomatic deposits at Best Chance, Carlisle, Copper Cliff and Rabbit Foot claims in the Whitehorse copper belt showed minute stringers and blebs of wittichenite in intimate association with bornite, chalcocite and chalcopyrite (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 455).

WODGINITE

$(Ta, Mn, Sn)_{16}O_{32}$

Manitoba

52 L/5 Wodginite is a new (1962) tantalate mineral found at Wodgina, Australia, and Bernic Lake, Manitoba. In the Montgary pegmatite, Bernic Lake, it is found in coarse perthitic microcline and in fine-grained albite. Chemical analysis by McAdam: Ta_2O_5 70.05, Nb_2O_5 1.35, SnO_2 13.20, MnO 9.04, FeO 1.87, TiO_2 2.39, SiO_2 0.60, total 98.50. The spacings and intensities (Fe radiation) of the three strongest lines in the X-ray powder pattern are: 3.64 (7), 2.98 (10) and 2.95 (9) (E.H. Nickel, J.F. Rowland and R.C. McAdam, 1962: Can. Mineralogist, 7, p. 390).

WOLFRAMITE

$(Fe, Mn)WO_4$

The wolframite minerals form a complete series between ferberite ($FeWO_4$) and huebnerite ($MnWO_4$) and constitute the principal ore minerals of tungsten. Most specimens are of intermediate composition. The spacings and intensities of the strongest lines in the X-ray powder patterns are: huebnerite, 2.99 (10), 2.95 (9), 2.49 (7) and 1.779 (6); intermediate wolframite, 2.96 (10), 2.94 (10), 2.48 (7) and 1.715 (7); ferberite, 2.91 (10), 2.45 (5), 1.704 (7) and 1.505 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, pp. 221-223).

British Columbia

82 F/3 Wolframite occurs with tungstite and scheelite at the Kootenay Belle Mine on Sheep Creek in the Nelson mining division. Analysis yielded: WO_3 74.90, FeO 17.75, MnO 2.75, CaO 1.52, MgO 2.66, SiO_2 1.02, total 100.60; S.G. 7.137 (T.L. Walker, 1908: J. Can. Min. Inst., XI, p. 368) (T.L. Walker, 1909: Canada Dept. Mines, Mines Br. Pub, 25, p. 38).

82 G/12 Wolframite occurs north of Cranbrook on the St. Mary River, in the Fort Steele mining division (T.L. Walker, 1908: J. Can. Mining. Inst., XI, p. 369).

93 M/4 Ferberite occurs in the Red Rose Mine near Hazelton with scheelite, arsenopyrite, pyrrhotite, chalcopyrite and pyrite. It occupies a shear zone in diorite (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 42).

104 N/11 Wolframite, originally derived from ultrabasic rocks in the upper region of Ruby Creek, is found in deep or buried type placer deposits 17 miles east of Atlin (T.L. Gledhill, 1921: Univ. Toronto Stud., Geol. Ser., 12, p. 40).

New Brunswick

21 G/7 The tin deposits at Mount Pleasant in Charlotte County contain some wolframite (A.A. Ruitenberg, 1963: M.Sc. thesis, Univ. of New Brunswick).

21 G/8 Wolframite occurs in quartz veins at Square Lake in Queen's County (W.J. Wright, 1940: New Brunswick, Mines Br. Paper 40-3).

21 J/10 Large crystals of wolframite are found at the Burnt Hill Brook molybdenite deposit at the confluence of the S.W. Miramichi River in York County. The crystals occur in bunches with topaz near the centre or along the borders of quartz veins cutting slate. Analysis of wolframite: WO_3 75.45, SiO_2 0.23, FeO 15.75, MnO 8.31, total 99.74; S.G. 7.10 (W.L. Swanson, 1925: Univ. Toronto Stud., Geol. Ser., 20, p. 28).

Wolframite occurs in quartz veins at McKiel Lake and Sisters Brook in York County (W.H. Poole, 1960: Geol. Surv. Can., Paper 60-15).

Wolframite occurs in quartz veins at Burnt Hill Brook and Todd Mountain; and as a detrital mineral at Fall Brook in York County (W.J. Wright, 1940: New Brunswick, Mines Br., Paper 40-2).

21 P/12 Wolframite occurs in a contact zone on the Sturgeon River property at Nicholas Denys in Gloucester County (M. Tauchid, 1964: Geol. Surv. Can., Paper 64-31).

Northwest Territories

85 H/10 Brownish black ferberite occurs at Slave Lake Mines on the Outpost Islands in the east arm of Great Slave Lake as nodules or crystals up to 1/2 inch across in quartz; as clusters of small grains with magnetite and andalusite; and as fine needles and plates in aggregates up to 3 millimetres across, disseminated throughout the older quartz in the gold-bearing zones. An iridescent bluish tarnish sometimes appears on the surface of the ferberite. Chemical analysis by H.V. Ellsworth: FeO 23.03, MnO 0.49, WO_3 74.50, Al_2O_3 0.51, CaO 0.10, MgO 0.97, SiO_2 0.41, Ta + Sn oxides 0.10, total 100.10 (H.C. Cooke, 1936-37: Univ. Toronto Stud., Geol. Ser., 40, p. 79).

Nova Scotia

11 K/6 Huebnerite occurs with chalcopyrite and hydrous mica in quartz at Emerald on Tom Murphy's Brook, Inverness County. Analysis of wolframite by Johnston yielded: WO_3 74.28, MoO_3 tr., MnO 22.73, FeO 0.47, CaO 0.02, MgO 0.86, SiO_2 1.33, total 99.69; S.G. 6.975 (G.C. Hoffmann, 1898: Geol. Surv. Can., Ann. Rept., XI, p. 10R).

21 A/9 21 A/10 Wolframite occurs near Lake Ramsay, New Ross, in Lunenburg County (E.R. Faribault, 1907: Geol. Surv. Can., Sum. Rept., p. 82).

Ontario

31 D/11 Analysis by Hunt of wolframite found in a boulder on the west side of Chief Island in Lake Couchiching, Ontario County: WO_3 73.45, Nb_2O_3 1.95, FeO 9.05, MnO 15.35, SiO_2 0.20, total 100.00; S.G. 6.938 (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 503).

42 A/8 Wolframite is a constituent of tin deposits in the vicinity of acid intrusions on the Bourkes Mines Limited property in the Black River area, conc. II, lot 7, Benoit Township (D.G.H. Wright, 1921: Ont. Dept. Mines, Ann. Rept., vol. 30, Pt. VI, p. 48).

Yukon

106 D/4 Wolframite is a dominant constituent of near surface gold-bearing gravels near the head of Canadian Creek in the Klotassin area (H.S. Bostock, 1957: Geol. Surv. Can., Mem. 284, p. 443).

Wolframite occurs with scheelite in gold placer deposits at Dublin Gulch in the Mayo mining district (H.W. Little, 1959: Geol. Surv. Can., Geol. Ser., 17).

115 G/9 Wolframite has been identified in specimens taken from Alaskite Creek in the Kluane Lake area (X-ray Laboratory, Geol. Surv. Can., specimens submitted by J.E. Muller, 1957).

WOLLASTONITE

$CaSiO_3$

Wollastonite has a formula analagous to the pyroxene group but does not crystallize with the pyroxene structure. It is a metamorphic mineral formed at fairly high temperatures. The spacings and intensities of the four strongest lines in the X-ray pattern are: 3.83 (8), 3.52 (8), 3.31 (8) and 2.97 (10) (ASTM card 10-487).

British Columbia

92 E/10 Wollastonite occurs at Nootka Sound in the Clayoquot mining division (R.A.A. Johnston, 1915: Geol.Surv.Can., Mem.74, p.239).

92 F/9 Wollastonite occurs in skarn deposits on Texada Island, 75 miles from Vancouver (--, 1960: Western Miner and Oil Review, vol. 33, No. 8, p. 30).

92 F/10 White splintery wollastonite, associated with diopside, garnet, epidote, chalcopyrite, bornite, native silver and molybdenite occurs at the Marble Bay Mine on Texada Island. A chemical analysis yielded: SiO_2 51.60, Al_2O_3 1.82, Fe_2O_3 0.32, FeO 0.13, MgO 0.28, CaO 44.50, MnO 0.08, Na_2O 0.52, K_2O 0.32, H_2O 0.31, CO_2 0.30, total 100.18; S.G. 2.924 (T.L. Walker, 1930: Univ. Toronto Stud., Geol. Ser., 29, p. 6).

92 H/8 Wollastonite is found on the Oregon property between Sixteen Mile and Eighteen Mile creeks and 3 miles east of Hedley in the Osoyoos mining division (R.M. Thompson, 1951: Am. Mineralogist, 36, p. 505).

Northwest Territories

26 K/8 Pale yellow lineated metacrysts of wollastonite occur in lime-silicate rock at Narrow Bay, Freshwater Lake, on Baffin Island (G.C. Riley, 1960: Geol. Surv. Can., Bull. 61, p. 40).

Ontario

31 C/8 Wollastonite occurs at Outlet Post in Lansdowne Township, Leeds County (National Mineral Collection, donated by J.H. Slack, 1913).

31 C/9
31 C/16 Wollastonite is found with mica, pyroxene, quartz and other minerals in crystalline limestone, Bastard Township, Leeds County, and North Burgess and North Elmsley townships, in Lanark County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 66T).

Quebec

22 A/14 Wollastonite with fine-grained recrystallized quartz of a white to light blue colour, was found on Needle Mountain, Holland Township, Gaspe-North County (J.E. Riddell, 1952: Que. Dept. Mines, Prelim. Rept., 269, p. 7).

31 G/10 The gangue material of a graphite deposit in lot 10, range V, Grenville Township, Argenteuil County, contains wollastonite (R.A.A. Johnston, 1915: Geol. Surv. Can., Mem. 74, p. 239). Chemical analysis of wollastonite from Grenville: SiO_2 53.05, CaO 45.74, FeO 1.20, total 99.99; S.G. 2.89-2.92 (T.S. Hunt, 1863: Geol. Surv. Can., Geology of Canada, p. 465).

31 G/12 An association of wollastonite with blue calcite is reported in range I, lot 7, of Wakefield Township, Gatineau County (C.W. Willimott, 1880-82: Geol. Surv. Can., Rept. Prog., p. 13GG).

31 G/16 Wollastonite occurs at St. Jerome, Morin, in Terrebonne County (W.E. Logan, 1863: Geol. Surv. Can., Geology of Canada, p. 465).

31 J/12 Specimens of wollastonite have been collected from range VI, lot 17, and range II, lot 16, in Amherst Township, Papineau County (National Mineral Collection).

Yukon

105 D/10
105 D/11 Wollastonite is associated with andradite, pyroxene, calcite, quartz and bornite in a number of test pits and trenches between Cowley Creek and Dugdale Station at the southern end of the Whitehorse copper belt. Masses of snow white wollastonite up to 1 cubic foot in diameter were noted (M. H. Frohberg, 1962: private communication).

WULFENITE

$PbMoO_4$

Wulfenite occurs as a secondary mineral, formed in the oxidized zones of deposits of lead- and molybdenum-containing minerals. W may substitute for Mo, and Ca for Pb, forming at least a partial series with the isomorphous minerals stolzite and powellite. The X-ray powder pattern of wulfenite has six strongest lines with the following spacings and intensities: 3.23 (10), 2.02 (8), 1.791 (7), 1.653 (9), 1.312 (7) and 0.802 (7) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 227).

British Columbia

82 G/5 Wulfenite occurs sparingly as minute yellow tablets implanted on crystals of pyromorphite at the Society Girl Mine in Moyie at the headwaters of Farrell Creek, less than 2 miles east of Moyie Lake (X-ray pattern identification by R.M. Thompson, 1960: private communication).

WURTZITE

ZnS

Wurtzite is the hexagonal polymorph of ZnS. It is the rarer and unstable form, and normally alters to the cubic form, sphalerite. Synthetic wurtzite crystallizes from acid solutions above 250°C. The X-ray powder pattern of wurtzite has six strongest lines with the following spacings and intensities: 3.25 (5), 3.12 (10), 1.906 (9), 1.633 (7), 1.105 (5) and 0.915 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 59).

British Columbia

82 E/4 Wurtzite occurs as very thin films and anhedral grains occupying small fractures in milky white quartz at the Fairview Mine, 5

82 E/4 miles northwest of Oliver in the Osoyoos mining division (R.M. Thompson, 1950: Am. Mineralogist, 35, p. 455).

XANTHOCONITE

Ag_3AsS_3

Xanthoconite has the same chemical composition as proustite (ruby silver) with which it is usually associated. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 3.14 (3), 3.00 (10), 2.82 (6) and 2.14 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 125).

Ontario

31 M/5 Xanthoconite occurs as approximately hemispherical radiating aggregates of a buffy brown colour and as a few isolated crystals, at the La Rose Mine, near Cobalt. Well-formed crystals of proustite are found protruding from the hemispherical drusy aggregates of xanthoconite. Analysis by E.W. Todd: Ag 64.07, As 14.98, S 14.99, Fe tr., CaO tr., Sb tr., total 94.04 (A.L. Parsons, 1924: Univ. Toronto Stud., Geol. Ser., 17, p. 11).

XENOTIME

$YtPO_4$

Xenotime is tetragonal and isostructural with zircon which it greatly resembles. Like zircon, it occurs as an accessory mineral in igneous rocks; as a pegmatite mineral; and as a detrital mineral. The spacings and intensities of the four strongest lines in the X-ray powder pattern of xenotime from St. Simeon, Quebec are: 4.48 (6), 3.40 (10), 2.54 (8) and 1.76 (7) (D.M. Shaw, 1957: Can. Mineralogist, 6, p. 64).

Ontario

31 L/7 Xenotime occurs in a coarse granite vein composed of quartz, feldspar, muscovite and biotite, cutting hornblendic gneiss near Mattawa in Calvin Township (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IX, pp. 13, 14R) (H.S. Spence, 1930: Am. Mineralogist, 15, p. 479).

41 H/15 Xenotime occurs in granite pegmatite, on Dokis Island, Key Harbour area, Parry Sound district (D.F. Hewitt, 1960: private communication).

Quebec

21 N/13 A yellow translucent mineral, xenotime, occurs as small grains in a hydrid granite in ranges II and III, lots 8 and 9, on the Brouillard property, Callieres Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 20). Xenotime also occurs on range I, lot 15, Callieres Township, Charlevoix County, 2 miles east of St. Simeon along Highway 15, 500 feet north of a house belonging to M. Lebret on the east side of the road, and also about 1,500 feet away on the opposite side of the highway. Spectrographic analysis gave: Y_2O_3 49.9, ThO_2 1.73, UO_2 2.75, P_2O_5 38.6, SiO_2 1-5, Gd 1-5, Dy 1-5, (Nd, Sm, Fe, Pb, Zr) 0.1-1.0, Mg, Al 0.01-0.1, (Ca, Ni, Cu, Sb, Bi) tr. (D.M. Shaw, 1957: Can. Mineralogist, 6, pp. 61-68).

Saskatchewan

73 P/1 Xenotime has been identified as a major constituent, with uraninite, in hand specimens collected from the Jahala property, Lee Lake (X-ray Laboratory, Geol. Surv. Can.).

XONOTLITE

$6CaSiO_3.2H_2O$

The spacings and intensities of the five strongest lines in the X-ray powder pattern of xonotlite are: 3.65 (7), 3.23 (7), 3.07 (10), 2.04 (8) and 1.95 (8) (ASTM card 10-488).

Newfoundland

12 G/1 Both massive and fibrous forms of xonotlite are found in ultrabasic rock of the Bay of Islands igneous complex. Fibrous xonotlite occurs in veins up to 3 inches in width and several feet long at Winter House Brook and Shoal Brook, Bonne Bay; and near First Trout River Pond. Xonotlite is also found filling joints in serpentine near the basal contact of the North Arm Mountain pluton and in the valley walls of a stream draining into North Arm, Bay of Islands (C.H. Smith, 1954: Am. Mineralogist, 39, p.531).

YUKONITE

$Ca_6Fe_{16}(AsO_4)_{10}(OH)_{30}.23H_2O$

Yukon

105 D/2 Yukonite was found on the west side of Windy Arm in Tagish Lake. Analysis by R.P.D. Graham: (1) CaO 10.00, Fe_2O_3 35.72, As_2O_5 34.06, H_2O 20.28, total 100.06; (2) CaO 10.14, Fe_2O_3

105 D/2 36.81, As_2O_5 33.85, H_2O 20.28; total 101.06 (J.B. Tyrrell and R.P.D. Graham, 1913: Trans. Roy. Soc. Can., Ser. 3, vol. VII, sec. 4, pp. 13-18). The relationship of this mineral to arseniosiderite is not clear. Re-examination of type material has confirmed the original analysis. Yukonite was found to give a weak X-ray powder pattern which differs from that of arseniosiderite most notably in the absence of the strongest line at 9.9Å (J. L. Jambor, 1966: Abstract in Technical Program, Min. Assoc. Can., Ann. Meeting, Halifax).

ZEUNERITE

$Cu(UO_2)_2(AsO_4)_2 \cdot 10\text{-}16H_2O$

The spacings and intensities of the five strongest lines in the X-ray powder of Synthetic zeunerite ($10H_2O$) are: 10.33 (9), 5.27 (5), 5.07 (7), 3.60 (10) and 3.40 (6) (C. Frondel, 1958: U.S.G.S. Bull. 1064, p. 193).

British Columbia

104 N/12 Zeunerite is reported to occur in some weathered outcrops of mineralized alaskite in the Boulder Creek-Ruby Creek area, Atlin district (J.D. Aitken, 1959: Geol. Surv. Can., Mem. 307, p. 72).

ZINC

Zn

The spacings and intensities of the three strongest lines in the X-ray powder pattern of pure artificial zinc are: 2.48 (5), 2.09 (10) and 1.344 (5) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 15).

Yukon

105 M/14 Whiskers and tiny stacked crystals of native zinc have been found associated with native silver in the oxidized zone of the Elsa Mine, in the Galena Hills area of the Mayo mining district (X-ray Laboratory, Geol. Surv. Can., submitted by R.W. Boyle).

ZINCKENITE

$6PbS \cdot 7Sb_2S_3$

The spacings and intensities of the four strongest lines in the X-ray powder pattern of zinckenite are: 3.45 (10), 2.81 (4), 1.985 (3) and 1.828 (3) (L.G. Berry and R.M. Thompson, 1962: Geol. Soc. Am., Mem. 85, p. 165).

British Columbia

92 O/2 Zinckenite occurs intergrown with calcite, and associated with sphalerite and tetrahedrite, near Bonanza Creek in the Tyaughton Lake area, Bridge River district. Chemical analysis by J.P. Beley yielded: Pb 33.3, Sb 33.3, Sb 40.8, S 20.9, As tr., total 95.0; S.G. 5.15. Chemical analysis by J.R. Williams and Son: Pb 34.58, Sb 42.30, S 21.84, Fe 0.50, As 0.48, total 99.70 (H.V. Warren and R.M. Thompson, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 83).

Northwest Territories

85 J/8 Zinckenite is found in association with stibnite, in the gold ores of the Yellowknife Bay area (L.C. Coleman, 1953: Am. Mineralogist, 38, p. 516).

ZINNWALDITE

$$K_2(Li, Fe^{++}, Al)_6(Si, Al)_8O_{20}(F, OH)_4$$

Zinnwaldite is one of the less common trioctahedral micas, and resembles biotite in its properties. It occurs mainly in granite pegmatites and in cassiterite-bearing veins. The spacings and intensities of the four strongest lines in the X-ray powder pattern are: 9.80 (8), 3.29 (10), 3.09 (4) and 1.98 (5) (ASTM card 13-227).

Manitoba

52 L/5 Zinnwaldite occurs in the Bear pegmatites at Pointe du Bois (E.W. Heinrich and A.A. Levinson, 1953: Am. Mineralogist, 38, p. 35).

Nova Scotia

21 A/9 Zinnwaldite occurs in albite at Reeves Farm, New Ross, Lunenburg County, in the form of irregular masses devoid of crystal outline. Analysis by E.W. Todd: SiO_2 46.58, Al_2O_3 24.10, K_2O 10.81, MnO 1.34, Fe_2O_3 0.69, FeO 4.28, CaO 0.68, MgO 0.49, Na_2O 0.84, Li_2O 3.56, H_2O 1.50, F 7.90, less O for F 3.33, total 99.44; S.G. 2.916 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 256).

ZIPPEITE

$$(UO_2)_3(SO_4)_2(OH)_2 \cdot 8H_2O$$

Zippeite is a secondary mineral which occurs as a yellow coating on primary uranium minerals. It has been assigned variable properties, and several compounds may be confused under this name. A synthetic compound having optical properties and an

X-ray powder pattern very close to zippeite proper from Joachimsthal, Bohemia, has been prepared and described fully. The three strongest lines in the X-ray powder pattern have the following spacings and intensities: 7.06 (10), 3.49 (9) and 3.13 (9) (R.J. Traill, 1952: Am. Mineralogist, 37, p. 403).

Northwest Territories

86 L Zippeite occurs occasionally as golden yellow crusts on massive pitchblende at Great Bear Lake (C. Frondel, 1952: Am. Mineralogist, 37, p. 957).

ZIRCON

$ZrSiO_4$

Zircon is a widely distributed accessory mineral in igneous rocks, it is a fairly common detrital mineral in some sediments and it is also found in metamorphic rocks. Well-crystallized varieties, both clear and coloured have long been used as gem stones. The name crytolite is used for radioactive zircon that commonly contains some calcium and rare-earth elements in addition to uranium and thorium, and is usually hydrated. The spacings and intensities of the five strongest lines in the X-ray powder pattern of zircon are: 4.43 (7), 3.30 (10), 2.52 (6), 1.712 (7) and 1.651 (6) (J. Berman, 1955: Am. Mineralogist, 40, p. 813).

Manitoba

52 E/13 Crytolite, thorite, uraninite, and doubtful allanite and uranothorite occur together in rocks composed of pegmatite interbanded with biotite schists and gneisses on the East Found Group, 1 mile west of Star Lake (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 116).

Nova Scotia

10 N/16
10 O/13 Zircon crystals are found in the sand of Sable Island. The fluorescent zircon has been identified by X-ray diffraction (E.W. Nuffield and D.H. Gorman, 1960: private communication).

Ontario

31 C/15 Zircon is reported to be a constituent of granite pegmatite on the Orser-Kraft property, conc. V, lot 13, South Sherbrooke Township, Lanark County (D.F. Hewitt, 1960: private communication).

31 C/16 Museum specimens of zircon have been obtained and studied from near Otty Lake, North Burgess Township, about 4 miles directly south of Perth. The best crystals were obtained from a pit known as the Sand Pit in lot 4, conc. VIII. Chemical analysis by

31 C/16 H.V. Ellsworth yielded: SiO_2 32.51, ZrO_2 67.02, BeO 0.21, CaO 0.22, Fe_2O_3 0.08, $(Ce, La, Di)_2O_3$ 0.04, MgO 0.01, loss on ignition 0.03, total 100.12; S.G. 4.659 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 237) (C. Palache and H.V. Ellsworth, 1928: Am. Mineralogist, 13, p. 384).

31 D/16 Zircon crystals were found in granite pegmatite in conc. VII, lot 20, Monmouth Township, Haliburton County (D.F. Hewitt, 1960: private communication).

Chemical analysis of well-crystallized pure zircon from zircon-thorite leucogranite on the Saranac property, conc. X, lot 24, Monmouth Township, Haliburton County, in the Bancroft area, by the Provincial Assay Office: ZrO_2 61.0, SiO_2 35.4, U_3O_8 0.75, H_2O 5.5, total 102.65 (J. Satterly, 1956: Ont. Dept. Mines, Ann. Rept., vol. 65, Pt. VI, p. 24).

31 E/4 Thucholite nodules found in Conger Township, conc. IX, lots 9 and 10, contain crytolite embedded in their outer surfaces. The crytolite occasionally shows a development of typical zircon-like square prisms with curved faces characteristic of crytolite. Chemical analysis by H.V. Ellsworth: Zr_2O_3 43.03, U_3O_8 1.46, ThO_2 0.66, $(Ce, La, Di)_2O_3$ 0.34, $(Yt, Er)_2O_3$ 6.76, Fe_2O_3 4.16, Al_2O_3 3.12, MnO 0.02, TiO_2 0.06, V_2O_5 not detected, CaO 1.58, MgO 0.18, SiO_2 22.86, P_2O_5 3.53, loss at 110° 1.64, loss above 110° 10.90, total 100.30 (H.V. Ellsworth, 1928: Am. Mineralogist, 13, p. 439).

31 E/9 Granite pegmatite containing zircon, uraninite, allanite and columbite occurs on the J.G. Gale property, conc. IV, lot 14, Murchison Township, in the Nipissing district (D.F. Hewitt, 1960: private communication).

31 F/4 Crytolite is found in the abandoned workings of the Woodcox feldspar mine in lot 17, conc. VII, Monteagle Township. It occurs with calciosamarskite and hatchettolite. Chemical analysis by E.W. Todd: SiO_2 26.14, Fe_2O_3 2.06, FeO 1.72, CaO 1.16, ZrO_2 62.16, Nb_2O_5 0.72, UO_3 1.26, H_2O 4.21, total 99.43; S.G. 4.102 (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 211).

Crytolite was reported to have been found in Faraday Township, on a property located on lots 14 and 16, north of Monck road (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 138).

Crytolite, lyndochite and monazite occur together in a pegmatite dyke in lot 23, conc. XXIII, Lyndoch Township. The dyke is over 200 feet long and was formerly worked for beryl (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 146).

31 F/4 Crytolite is present in a pegmatite dyke on conc. XV, lot 23, Lyndoch Township. Among the associated minerals are beryl, columbite, lyndochite and monazite. The crytolite forms fist-sized masses which are grey or yellowish in colour (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 230).

Zircon was found in granite pegmatite at the Faraday Uranium Mines property, conc. XI, lots 16 and 17, Faraday Township, Hastings County (D.F. Hewitt, 1960: private communication).

The abandoned MacDonald Feldspar Mine in conc. VII, lots 18 and 19, Monteagle Township, contains crytolite with uranothorite, allanite, ellsworthite and a variety of other minerals (A.H. Lang, 1952: Geol. Surv. Can., Econ. Geol. Ser., 16, p. 147).

31 F/6 Red, prismatic crystals of zircon, some twinned, occur on conc. X, lot 31, Sebastopol Township, Renfrew County (National Mineral Collection).

Large zircon crystals, many of them reaching a foot in length and 12 to 15 inches in girth, have been collected at Lake Clear, conc. V, lot 2, Brudenell Township. Facetted gems cut from these giant crystals are of the hyacinth variety, being bright red colour and quite transparent (D.S.M. Feild, 1952: Can. Mining J., 73, Pt. 1, map, pp. 78-80). Also see: A.L. Parsons, 1931: Univ. Toronto Stud., Geol. Ser., 30, p. 21; C. Palache, 1932: Am. Mineralogist, 17, p. 363; and G.C. Waite, 1944: Univ. Toronto Stud., Geol. Ser., 49, p. 78).

31 F/7 Crystals of crytolite are found in the nepheline rocks occurring along the York River (L. Moyd, 1949: Am. Mineralogist, 34, p. 747).

31 F/10 Large brown prismatic crystals of zircon were collected from the east end of Muskrat Lake, conc. I, lot 13, Westmeath Township, Renfrew County (National Mineral Collection).

41 H/15 Crytolite has been found at the Besner Mine, and abandoned pegmatite in lot 5, conc. B, Henvey Township. Minerals occurring with the crytolite are uraninite, allanite and thucholite (H.V. Ellsworth, 1932: Geol. Surv. Can., Econ. Geol. Ser., 11, p. 171).

52 F/15 Zircon appears as tiny inclusions in quartz in a schist of mixed argillaceous and arenaceous rocks in the vicinity of the pulp mill in the Dryden gold area (E. Thomson, 1917: Ont. Dept. Mines, Ann. Rept., vol. 26, p. 174).

Quebec

31 G/10 31 G/15 Cherry red, transparent crystals of zircon occur in crystalline limestone, range V, lot 10, Grenville Township, Argenteuil County (G.C. Hoffmann, 1888-89: Geol. Surv. Can., Ann. Rept., IV, p. 39T).

31 G/12 Zircon crystals occur at the Little Rapids Mine, range I, lot 7, at Portland East, Papineau County (National Mineral Collection: donated by B. Winning, 1912).

31 G/13 Small crystals of pale green crytolite are fairly abundant in the fine textured pegmatite exposed in a quarry on lot 2, range V, of West Portland Township. The crystals tend tc occur as single individuals ranging up to 3 millimetres in diameter (H.S. Spence, 1935: Am. Mineralogist, 20, p. 728).

31 J/12 Zircon crystals occur in a zone of pyroxene granites and syenites as dark brown euhedral crystals up to 1 inch long at the property of Duvex Oils and Mines Limited, in Mitchell Township (D.M. Shaw, 1958: Que. Dept. Mines, Geol. Rept., 80, p. 45).

NTS INDEX TO MINERAL LOCALITIES

ALBERTA

72 E/13	gypsum
E/16	quartz (agate)
L/1	quartz (agate)
L/2	quartz (agate)
L/13	opal
M/8	gypsum
73 E	gold
E/15	halite
74 D/11	anhydrite, enargite, gypsum, halite
D/14	sulphur
L/14	uraninite
L/15	uraninite
M/1	uraninite
M/6	gypsum
M/10	uraninite
82 G/7	halite
G/9	analcime
G/10	potassium feldspar
J/7	anhydrite
J/15	epsomite, fibroferrite
O/1	copiapite
O/4	azurite, bornite, enargite, malachite
O/11	bornite
P/7	quartz
82 P/15	quartz (silicified wood)
83 A/6	gold
C/3	sulphur
F/4	sulphur, topaz
F/5	gypsum
G/8	iron
G/12	gold
H	gold
H/11	platinum
H/12	platinum
I/3	thenardite
K	sulphur
L	sulphur
M	sulphur
N	sulphur
N/11	halloysite
N/12	pickeringite
84 C	sulphur
C/3	sal-ammoniac
P/1	gypsum
P/2	gypsum

BRITISH COLUMBIA

82 E	bornite, platinum
E/1	barite, boulangerite, fluorite, gersdorffite, gold, malachite
E/2	acanthite, altaite, analcime, azurite, bismuthinite, bornite boulangerite, cuprite, hematite, hessite, malachite, opal, petzite, pyrargyrite, tellurium, tetradymite
E/3	bismuthinite, gold platinum
E/4	hessite, petzite, proustite, silver, wurtzite
E/5	altaite, braunite, hessite, mordenite, petzite, potassium feldspar, rhodochrosite, rhodonite, tellurbismuth
E/6	acanthite, aragonite, galena, polybasite, pyrargyrite, sphalerite, tetrahedrite
E/9	pyrargyrite
E/14	fergusonite
E/15	boulangerite, stephanite
E/16	boulangerite, sphalerite
F	chalcopyrite
F/2	erythrite, kyanite, magnetite
F/3	aragonite, caledonite, hemimorphite, kobellite, meneghinite, scheelite, tungstite, uraninite, wolframite
F/4	apophyllite, arsenopyrite, bismuthinite, boulangerite, chalcopyrite, cinnabar, cobaltite, corundum, erythrite, gmelinite, heulandite, laumontite, magnetite, meneghinite, molybdenite, natrolite, owyheeite, prehnite, pyrrhotite, tetradymite, uraninite
F/5	tenorite, uraninite
F/6	acanthite, azurite, bornite, cerussite, gold, magnesite, magnetite, malachite, scheelite, spencerite, stromeyerite uraninite
F/7	beryl
F/8	gold

British Columbia (cont'd)

82 F/9 beryl, calcite, cerussite, galena, jamesonite, sphalerite
F/10 bournonite, fibroferrite, galena, hemimorphite, silver, sphalerite
F/11 allanite, arsenic, bornite, chrysocolla, fergusonite, fluorite
F/13 bastnaesite, boulangerite
F/14 acanthite, anglesite, aragonite, azurite, barite, bastnaesite, bornite, boulangerite, bournonite, cerussite, covellite, galena, gersdorffite, heulandite, jamesonite, opal, owyheeite, proustite, pyrargyrite, scheelite, staurolite, stephanite, tetrahedrite
F/15 calcite, galena, rhodonite, stannite, tenorite
F/16 beryl
G/4 barite
G/5 altaite, cerussite, galena, pyromorphite, wulfenite
G/6 barite, limonite
G/9 heulandite
G/12 azurite, bismuthinite, boulangerite, copper, silver, wolframite
G/13 cinnabar, tetrahedrite
J/4 gypsum
J/5 gypsum
K/1 boulangerite
K/2 barite, calcite
K/3 acanthite, altaite, anglesite, cerussite, copper, jamesonite, pyrargyrite, sphalerite, staurolite, stibnite, tetradymite, tetrahedrite
K/4 bornite
K/7 clinohumite, galena
K/8 barite, bournonite, tennantite, tetrahedrite
K/9 pyrochlore, tennantite, tetrahedrite
K/10 smithsonite
K/11 aragonite, nagyagite, platinum

British Columbia (cont'd)

82 K/13 boulangerite
K/15 jamesonite, pyrochlore, uraninite
K/16 barite
L/1 jamesonite, polybasite
L/3 chalcanthite
L/4 joseite, tetradymite, wehrlite
L/5 anhydrite
L/6 andalusite (chiastolite), uraninite
L/11 bornite, gypsum, kyanite
L/12 alunogen
L/13 mercury
L/14 bismuthinite, stannite
L/15 pyrrhotite, tetrahedrite
L/16 beryl, boulangerite
M/1 bournonite, gersdorffite, meneghinite
M/4 barite, copiapite
M/6 copiapite
M/12 fluorite, thorite, uraninite
N/1 andradite (schorlomite), caledonite, hydronephelite, ilmenite, knopite, nepheline, perovskite, sodalite
N/2 barite, nepheline
N/3 linarite
N/4 beryl, bornite, stannite
N/5 lepidolite
N/7 cinnabar, muscovite, szomolnokite
N/8 cookeite, sphalerite
N/10 muscovite
N/11 muscovite
83 D/6 pyrochlore, uraninite, vermiculite
D/11 kyanite
D/14 beryl, kyanite, topaz
D/15 alunogen
92 A osmiridium
A/6 quartz
B osmiridium
B/5 chalcopyrite, pyrrhotite, quartz (agate, jasper)
B/6 pyrrhotite, quartz
B/12 arsenic
B/13 barite, bornite, quartz (jasper)
C/9 magnetite, rhodonite
C/13 gold
C/14 cinnabar, magnetite, mercury

British Columbia (cont'd)

92 C/15 ilvaite, magnetite
C/16 bornite
E/8 bornite, magnetite
E/9 chalcopyrite, gold
E/10 wollastonite
E/15 chalcopyrite, gold, magnetite
E/16 magnetite
F/2 arsenic, gold, magnetite
F/3 chalcopyrite, magnetite
F/4 bornite
F/5 chalcopyrite, gold, owyheeite
F/6 stibnite
F/9 bornite, calcite, limonite, magnetite, wollastonite
F/10 andradite, calcite, grossular, hessite, limonite, magnetite, vesuvianite, wehrlite, wollastonite
F/11 copper
F/12 magnetite
F/13 magnetite
F/15 bornite, calcite, erythrite, limonite, tellurium
G/2 quartz (jasper)
G/4 copper, halite, quartz
G/6 sphalerite
G/10 tetradymite
G/11 anhydrite, bornite, pyrite, tellurbismuth
G/16 altaite
H actinolite (jade) platinum, serpentine
H/1 wolframite
H/3 jamesonite
H/5 epidote, wehrlite
H/6 chalcopyrite, chrysocolla, copper, gold, lazulite, mercury, pentlandite, pyrrhotite, tetrahedrite, uraninite
H/7 ankerite, corundum, gold, iridosmine, magnetite, osmiridium, platinum
H/8 axinite, bismuth, boulangerite, chalcanthite, cobaltite, erythrite, hedenbergite, hedleyite, joseite, opal, osmiridium, quartz (silicified wood), safflorite, tetradymite, wollastonite

British Columbia (cont'd)

92 H/10 bornite, chalcopyrite, diamond, platinum
H/12 epidote
H/14 cinnabar
H/15 bornite, copper, quartz (chalcedony)
I ankerite, actinolite (jade), platinum
I/1 mesolite, szájbelyite
I/2 chalcopyrite, harmotome, malachite, montmorillonite
I/3 cinnabar, mesolite, quartz (agate), stilbite
I/4 magnetite, platinum, quartz (jasper), scheelite, sperrylite, stibnite, thorianite, uraninite, vesuvianite
I/5 magnetite
I/6 chalcopyrite, magnetite, quartz, tourmaline
I/7 chalcocite
I/8 gold, opal (hyalite), scheelite
I/9 bornite, chalcopyrite, columbite, hydromagnesite, magnetite, quartz (chalcedony)
I/10 cinnabar, magnetite, opal, quartz (chalcedony), tetrahedrite
I/11 alunogen, chromite, chrysocolla, epsomite, hematite, souesite, sphalerite, tourmaline
I/12 alunogen, andradite, hornblende, molybdenite, nickel-iron, stibnite, tetrahedrite, uraninite
I/14 chalcanthite, chromite, diamond, epsomite, hexahydrite, magnesiochromite, prehnite, sphalerite, stibnite, tennantite
I/15 alunogen, analcime, antimony, arsenic, cinnabar, copper, ferrierite, gold, heulandite, mesolite, natrolite, oligoclase, potassium feldspar, prehnite, stibnite
I/16 oligoclase, quartz (chalcedony)
J actinolite (jade)
J/7 chalcocite

British Columbia (cont'd)

92 J/10 stibnite
J/15 allanite, arsenopyrite, chromite, cinnabar, gold, magnesite, nickel-iron, prehnite, stibnite, sylvanite, tetrahedrite, uraninite
K/3 brochantite, carnotite, chalcocite, metacinnabarite, prehnite, pumpellyite, quartz (chalcedony), tellurbismuth, volborthite
K/6 bornite, carnotite
K/7 magnetite
K/11 magnetite
K/13 hornblende
K/15 bornite, cinnabar
L pyrophyllite
L/2 chalcopyrite, gold, magnetite, realgar
L/3 natroalunite, tellurbismuth
L/5 magnetite
L/6 magnetite
L/7 magnetite
L/12 fibroferrite
M/2 magnetite
N/8 stibnite
N/9 jamesonite
O platinum
O/1 arsenic, arsenolite, nitre, quartz (agate, jasper), realgar, stibnite, wehrlite
O/2 chromite, cinnabar, jamesonite, scheelite, stibnite, zinckenite
O/3 muscovite, tetradymite, tetrahedrite
O/4 altaite, antimony, gold, hessite, wehrlite
O/5 gold, hessite
O/15 hydromagnesite, melanterite
P/2 gold
P/3 chabazite, opal (hyalite), sphalerite
P/4 epsomite, gold, gypsum, hydromagnesite, natron, sphalerite
P/5 hydromagnesite, natron, quartz (agate, jasper)
P/8 fluorite, gold, joseite, magnetite, rhodonite, stibnite

British Columbia (cont'd)

92 P/9 fluorite, muscovite, rhodonite
P/11 cookeite, hydromagnesite
P/14 olivine (peridot), tourmaline
93 A gold
A/1 topaz
A/2 molybdenite
A/3 scheelite, siderite
A/6 aragonite, barite, copper, leucite, opal, platinum, strontianite
A/11 muscovite, platinum
A/12 osmiridium, platinum
A/13 muscovite
A/14 scheelite, stolzite, tungstite
B platinum
B/9 osmiridium, platinum
B/13 nitre
B/14 halite
B/16 leucophosphite, osmiridium, platinum
C/9 magnetite
C/11 psilomelane
C/14 magnetite, psilomelane
D/4 magnetite
D/11 magnetite
E altaite
E/6 cosalite, hessite, meneghinite, tetradymite
E/10 meneghinite
E/11 galena
E/15 quartz (agate, chalcedony)
F/12 quartz (agate, chalcedony)
F/15 sabugalite
G platinum, serpentine
G/1 olivine (peridot)
G/11 pyrite
H gold
H/3 scheelite
H/4 cosalite, galenobismutite
H/6 mercury
J/15 gold
K/1 pyrolusite
K/2 pyrolusite
K/4 collinsite, quercyite
K/8 stibnite
K/9 cinnabar
K/13 rhodonite
L/11 bismuthinite, bornite
L/14 bornite, calaverite, joseite, matildite
L/15 boulangerite

British Columbia (cont'd)

93 M/3 boulangerite
M/4 allanite, chalcopyrite, cobaltite, erythrite, pyrite, safflorite, scheelite, skutterudite, uraninite, wolframite
M/5 galena, gold, jamesonite, meneghinite, polybasite, pyrargyrite, scheelite, stibnite
M/11 magnetite
M/16 bornite
N/1 jamesonite, scheelite
N/6 braunite
N/7 gold
N/9 gold, pyrochlore
N/10 gold
N/11 andorite, jamesonite, silver, stibnite
N/15 gold, silver
O/5 uraninite
94 A/2 epsomite, mirabilite
A/4 calcite
C/7 beryl, cassiterite
C/10 pyrargyrite, sphalerite
C/11 galena, pyrargyrite
C/12 linnaeite
C/13 bournonite
D/8 beryl
D/9 gold
D/16 gold
F/4 pyrrhotite
F/13 sylvanite
K/4 sylvanite
K/10 barite
M/8 barite, barytocalcite, copiapite, fluorite
103 B/5 magnetite
B/6 arsenic, magnetite
B/12 bornite, magnetite
B/13 magnetite
C/16 gold
F quartz (agate, chalcedony), hydrocarbons
G quartz (agate, chalcedony)
G/4 magnetite
G/5 gold
G/12 gold
G/13 gold
G/16 magnetite
H/1 tellurbismuth
H/2 tellurbismuth

British Columbia (cont'd)

103 H/12 magnetite
H/13 laumontite, pyrite
I/2 magnetite
I/6 halite
I/8 gold
I/9 bornite, covellite, empressite, galena, gold, rickardite, scheelite, tellurium
I/16 gold
J quartz (agate, chalcedony), hydrocarbons
J/1 magnetite
J/4 gold
J/8 staurolite
K quartz (agate, chalcedony), hydrocarbons
K/2 manganite, pyrolusite
P/5 chalcopyrite, pyrargyrite
P/6 pyrargyrite
P/11 allophane, marcasite
P/12 acanthite, argyrodite, polybasite, pyrargyrite, tetrahedrite
P/13 jamesonite, pyrite
P/14 berthierite
104 A/4 pyrite
B/1 electrum, gold
B/8 electrum
G/14 bornite
J/6 aenigmatite
J/8 iridosmine
J/15 platinum
J/16 platinum
K/11 graphite
K/12 boulangerite, gold, jamesonite, pyrite
M/1 cobaltite, erythrite
M/8 allemontite, calaverite, gold
M/9 bismuth
M/15 stibnite
N quartz (jasper)
N/4 stibnite
N/5 copper
N/11 cassiterite, gold, iridosmine, lansfordite, magnesiochromite, uraninite, wolframite
N/12 ankerite, gold, hydromagnesite, lansfordite, linarite, metazeunerite, uraninite, zeunerite
O/3 aegirine (acmite), riebeckite
O/6 riebeckite

British Columbia (cont'd)

104 O/13 beryl
P/3 azurite, barite, chalcopyrite, galena, gold, hydrozincite, malachite, scheelite, sphalerite
P/4 alabandite, antimony, bismuth, bismuthinite, danalite, dyscrasite, gold, marcasite, muscovite
P/5 cordierite, serpentine (asbestos)
P/7 beryl
P/11 gold
P/12 gold
114 P/10 wittichenite

MANITOBA

52 E/11 amblygonite, beryl, molybdenite, scheelite, spodumene
E/12 molybdenite
E/13 zircon
E/14 thorite, uraninite
G/1 vivianite
J/13 spodumene
L almandine, rose quartz
L/5 albite (cleavelandite), chromite, columbite, lepidolite, molybdenite, monazite, petalite, pollucite, rhodochrosite, tantalite, tapiolite, tourmaline, wodginite, zinnwaldite
L/6 albite (cleavelandite), amblygonite, apatite, beryl, bismuthinite, cassiterite, columbite, fuchsite, lepidolite, lithiophilite, monazite, muscovite, petalite, pollucite, spodumene, topaz, tourmaline, triphylite, uraninite
L/11 beryl, gold, spodumene
L/12 gold
L/13 gold, tellurbismuth
L/14 gold
L/16 columbite, gadolinite
M/4 gold, petzite
P/9 spodumene
53 L/13 stibnite
O/13 sillimanite

Manitoba (cont'd)

54 L/9 lazulite
62 C/14 melanterite
G/1 vivianite
G/9 anhydrite
H/3 gypsum
H/14 gypsum
I quartz (rose)
J/3 halite
J/8 gypsum
J/10 anhydrite, gypsum, quartz
N/2 pyrrhotite
O/9 copper
O/10 anhydrite
O/15 gypsum
P/1 gold
P/7 barite
P/12 gold
63 B/13 marcasite
F/8 hydrocarbons (amber)
I/6 galena, gold, sphalerite
I/7 boulangerite, sphalerite
I/12 spodumene
J/10 lepidolite
J/13 arsenopyrite, beryl, gold, kyanite, labradorite, pyrrhotite, sphalerite, spodumene, staurolite
K/2 melanterite
K/3 beryl
K/6 marcasite
K/9 pyrite, pyrrhotite
K/10 gold
K/11 altaite, gold
K/12 gypsum, malanterite
K/13 almandine, chalcopyrite, cubanite, electrum, gold, greenockite, pentlandite, sillimanite, sphalerite, sylvanite, tetradymite
K/14 altaite, sphalerite
K/15 gold
K/16 arsenopyrite, gahnite, gold, gudmundite, meneghinite, pyrite, pyrrhotite
N/2 anthophyllite, cordierite
N/3 almandine, analcime, chabazite, chalcopyrite, cubanite, pyrrhotite
O/13 pentlandite
64 A/2 pyrrhotite
B/3 cordierite
C/4 pyrrhotite

Manitoba (cont'd)

64 C/14 gold, natrolite
I/7 jamesonite, tetrahedrite

NEW BRUNSWICK

21 B/1 quartz (agate, chalcedony)
B/10 chalcocite, copper, quartz (amethyst, jasper)
B/15 barite, chalcocite, quartz (amethyst, jasper)
G/1 azurite, gold, graphite, hematite, molybdenite, sphalerite, tetrahedrite
G/2 barite, bismuth, bornite, copper, fluorite, gold, magnetite, molybdenite, pyrrhotite, vesuvianite
G/3 andalusite, arsenopyrite, chromite, pentlandite, pyrite, pyrrhotite
G/6 andalusite, gold, graphite, molybdenite, pyrrhotite, staurolite
G/7 bismuth, bismuthinite, bornite, cassiterite, covellite, fluorite, galena, glaucodot, gold, indium, marcasite, molybdenite, scheelite, scorodite, sphalerite, stannite, stibnite, tennantite, wolframite
G/8 arsenopyrite, bismuth, calcite, fluorite, graphite, hematite, molybdenite, tetrahedrite, wolframite
G/9 arsenopyrite, fluorite, quartz (jasper, agate), stibnite, tetrahedrite
G/10 uraninite
G/11 fluorite, kermesite, stibnite, uraninite
G/12 uraninite
G/14 antimony, berthierite, kermesite, molybdenite, stibnite
G/15 azurite, limonite
G/16 gold, limonite
H/4 azurite, chrysocolla, hematite, quartz (jasper)

New Brunswick (cont'd)

21 H/5 barite, graphite, gypsum, jarosite, manganite, psilomelane, pyrolusite, quartz (agate, jasper)
H/6 bornite, gypsum
H/7 chabazite
H/8 chabazite
H/10 alunite, azurite, barite, bornite, gold, gypsum, manganite, psilomelane, pyrolusite, tennantite
H/11 barite, bornite, braunite, calcite, graphite, gypsum, hausmannite, ilmenite, manganite, psilomelane, pyrolusite
H/12 gypsum, magnetite, quartz (agate, chalcedony, jasper), stibnite, tetrahedrite
H/13 gypsum, quartz, stibnite
H/14 graphite, gypsum, manganite, psilomelane, pyrolusite
H/15 anhydrite, azurite, graphite, gypsum, halite, hydrocarbons (albertite), inyoite, manganite, psilomelane, pyrolusite, tennantite, ulexite
H/16 fluorite
I/2 barite, fluorite
I/4 gold, hematite, limonite
I/7 limonite
J/2 beryl, molybdenite
J/3 gold, limonite, molybdenite, stibnite
J/4 barite, braunite, gold, rhodochrosite, rhodonite, sursassite
J/5 stibnite
J/6 gold, hematite, pentlandite, pyrrhotite, stibnite
J/7 cassiterite, magnetite, rhodochrosite, siderite
J/10 arsenopyrite, barite, beryl, cassiterite, fluorite, molybdenite, rhodochrosite, rhodonite, topaz, wolframite
J/13 quartz (agate, chalcedony, jasper)
J/14 gypsum, quartz (agate, chalcedony, jasper)
J/16 bornite, chrysocolla, cinnabar, gold, mercury

New Brunswick (cont'd)

21	O/1	galena, gold, pyrite, sphalerite, vivianite
	O/2	gold
	O/3	bornite, gold
	O/7	arsenopyrite, galena, pyrite, sphalerite
	O/8	anglesite, arsenopyrite, bismuth, bismuthinite, bismutite, cobaltite, covellite, freibergite, galena, gold, pentlandite, pyrite, pyrrhotite, sphalerite
	O/9	arsenopyrite, covellite, galena, gold, pyrite, sphalerite, tetrahedrite
	O/10	arsenopyrite, chalcedony, galena, pyrite, quartz (agate, amethyst), sphalerite
	O/15	gold, heulandite, uraninite
	O/16	apatite, barite, uraninite
	P	beudantite
	P/3	limonite
	P/4	cobaltite
	P/5	anglesite, arsenopyrite, bismuth, cassiterite, covellite, enargite, galena, gold, hematite, linnaeite, magnetite, molybdenite, pyrite, pyrrhotite, siderite, sphalerite, stannite, tetrahedrite
	P/10	uraninite
	P/12	arsenopyrite, beryl, galena, goethite, gold, magnetite, manganite, molybdenite, psilomelane, pyrite, pyrolusite, pyrrhotite, rhodonite, scheelite, sphalerite, stibnite, wolframite
	P/13	analcime, arsenopyrite, bornite, calcite, covellite, galena, jamesonite, molybdenite, pyrite, sphalerite
22	B/1	prehnite, quartz (agate, amethyst)

NEWFOUNDLAND

1	L/4	fluorite
	M	proustite

Newfoundland (cont'd)

1	M/6	spinel
	M/10	barite, malachite, pyrite, quartz (jasper), riebeckite
	M/16	alunite
	N/5	galena
	N/10	hematite, pyrophyllite
	N/11	hematite
	N/12	galena
2	C/3	hematite
	C/4	goethite, hematite
	C/5	magnesite
	D/8	chalcopyrite
	D/10	cordierite, riebeckite
	D/16	andalusite
	E/12	chalcopyrite
	E/13	chalcopyrite
	F/4	chalcopyrite
3	E/4	labradorite
11	B/9	beryl
	O/9	gold
	O/14	anhydrite, gypsum
	O/16	sphalerite
12	A/5	barite, chalcopyrite, covellite, galena, prehnite, sphalerite, tennantite
	B/2	anhydrite, enstatite, gypsum
	B/3	anhydrite, gypsum
	B/7	anhydrite, gypsum
	B/8	magnetite
	B/9	magnetite, uraninite
	B/10	aragonite, barite, celestite, galena
	B/11	gypsum
	B/15	chromite, copper, cuprite, serpentine (asbestos)
	B/16	chromite
	G/1	chalcopyrite, chromite, epidote (clinozoisite), hornblende, pectolite, prehnite, serpentine (asbestos), sphalerite, xonotlite
	G/8	pectolite, serpentine (asbestos)
	H/5	pectolite
	H/9	epidote (zoisite)
	H/15	gold
	H/16	prehnite, serpentine (asbestos)
	I/1	epidote
	L/15	muscovite
13	G/11	labradorite

Newfoundland (cont'd)

13	K/5	aegirine, barylite, copper, eudialyte, eudidymite, neptunite, riebeckite, uraninite
	O/2	potassium feldspar (amazonite), topaz
	O/3	uraninite
14	C/3	labradorite
	C/5	labradorite
	C/11	hypersthene
	C/12	graphite, hypersthene
	L/7	graphite
23	B	cummingtonite
	B/15	hematite
	G	cummingtonite
	G/2	anthophyllite, hematite
	J/1	chamosite
25	A/7	graphite

NORTHWEST TERRITORIES

25	K/13	graphite
26	B/15	sillimanite
	G	graphite
	G/6	spinel
	K/8	wollastonite
27	C	calcite
33	M/15	magnetite
34	C	ankerite
	C/2	quartz (agate), siderite
	D/2	magnetite
	F	ankerite
35	P/10	diopside
36	B/8	magnetite
	B/9	magnetite
37	D	calcite
	E	calcite
38	B/10	copper
45	O/4	weddellite
46	K/2	cordierite
48	B/15	prehnite, stilbite
	B/16	prehnite
	C/2	pyrite
	C/3	quartz
55	K/16	pentlandite, pyrrhotite
59	B/14	quartz (jasper)
66	A/1	fluorite
75	C/13	uraninite
	E/13	hydrocarbons (anthraxolite)
	L	emplectite, quartz (jasper), uraninite
	L/5	bismuth

Northwest Territories (cont'd)

75	L/6	uraninite
	L/7	barite, chalcopyrite
	L/8	erythrite, monazite, uraninite
	L/12	niccolite, rammelsbergite
	L/16	erythrite, uraninite
	N/12	beryl
	N/15	beryl
76	D/3	gold
	D/14	monazite
	O/9	beryl
78	B/6	tenorite
	B/7	malachite
	B/11	chrysocolla, copper
85	A/1	gypsum, halite
	A/14	gypsum
	B/15	sulphur
	B/16	marcasite, sphalerite
	F/11	scheelite
	G/1	marcasite
	G/15	gypsum
	H/10	wolframite
	H/11	andalusite, corundum, covellite, marcasite, powellite
	H/12	marcasite, powellite
	H/16	hydrocarbons (anthraxolite)
	I	molybdenite
	I/1	amblygonite, beryl, cassiterite, columbite, hühnerkobelite, spodumene, triphylite
	I/2	niccolite, parkerite, rammelsbergite
	I/5	niccolite
	I/6	spodumene
	I/7	amblygonite, beryl, niccolite, scheelite, spodumene
	I/8	beryl, spodumene
	I/10	vesuvianite
	I/11	amblygonite, beryl, cassiterite, columbite, spodumene, tantalite, tapiolite
	I/12	beryl, columbite
	I/13	beryl, columbite, hühnerkobelite, spodumene, triphylite
	I/14	bismuth, gold, tellurbismuth

Northwest Territories (cont'd)

85	J/8	antimony, arsenopyrite, berthierite, bournonite, cassiterite, chalcostibite, gersdorffite, gold, gudmundite, jamesonite, malachite, marcasite, meneghinite, molybdenite, stannite, stibnite, zinckenite
	J/9	aurostibite, beryl, chalcopyrite, jamesonite, spodumene
	J/16	jamesonite
	M/12	andalusite, cordierite
	N/1	uraninite
	N/7	uraninite
	N/10	uraninite
	O/1	gold
	O/4	cordierite
	O/13	fluorite
	O/14	amblygonite
	P	andalusite
	P/4	gold
86	B/3	gold
	B/6	gold
	B/12	cummingtonite
	C/1	tantalite, tapiolite, uraninite
	D	schoepite, uranopilite, vandendriesscheite
	D/9	uraninite
	D/16	uraninite
	E	schoepite, vandendriesscheite
	E/1	erythrite, schoepite, uraninite
	E/2	schoepite
	E/7	schoepite
	E/8	safflorite, schoepite
	E/9	gersdorffite, silver
	F	vandendriesscheite
	F/3	uraninite
	F/4	uraninite
	F/12	acanthite, bismuth, bismuthinite, dolomite, matildite, niccolite
	F/13	silver
	I	erythrite
	J/5	uraninite
	J/7	cubanite

Northwest Territories (cont'd)

86	K/4	bismuth, chloanthite, covellite, psilomelane, skutterudite, uraninite
	K/5	uraninite
	K/6	bornite, uraninite
	L/1	acanthite, cobaltite, curite, fourmarierite, johannite, kasolite, rammelsbergite, skutterudite, uraninite, uranophane, uranopilite, vandendriesscheite, zippeite
	L/11	hydromagnesite
	L/12	hydromagnesite
	L/14	hydromagnesite
	N	copper
	N/8	prehnite
	O/5	prehnite
	O/13	actinolite (nephrite)
87	H/2	celadonite, prehnite
	K	copper
88	H/16	copiapite
95	F/7	hydrocarbons (anthraxolite)
	J/8	gypsum
96	F/2	gypsum
120	C/13	leonhardtite, szomolnokite, thenardite
	C/14	szomolnokite, thenardite
	F/3	szomolnokite, thenardite
340	D/16	szomolnokite, thenardite

NOVA SCOTIA

10	N/16	zircon
	O/13	zircon
11	D	pickeringite
	D/4	galena
	D/10	gold
	D/11	gold
	D/12	andalusite, cordierite, gold, quartz (amethyst)
	D/13	gold, scheelite
	D/14	gold
	D/15	andalusite, cassiterite, gold, scheelite, tungstite
	D/16	gold
	E	gypsum, malachite, mesolite, pickeringite
	E/1	gold
	E/2	gold
	E/3	anhydrite, barite, gold, sphalerite

Nova Scotia (cont'd)

11 E/4 anhydrite, antimony, gold, kermesite, psilomelane, stibnite, valentinite

E/5 ankerite, aragonite, barite, calcite, goethite, hematite, howlite, limonite, pyrite, pyrolusite, siderite, turgite

E/6 anhydrite, barite, calcite, centrallassite, cyanolite, galena, gypsum, hematite, manganite, prehnite, psilomelane, pyrolusite, sphalerite, sulphur

E/7 anhydrite, ankerite, goethite, limonite, manganite, ramsdellite

E/8 ramsdellite

E/9 halite, hematite

E/10 ramsdellite, siderite, sphalerite

E/11 covellite

E/12 barite, opal

E/13 calcite, halite

E/14 halite, magnesite, sylvite

E/15 barite

E/16 hematite

F gypsum

F/4 anatase, andalusite, cassiterite, gold

F/5 arsenopyrite, cordierite, gold, hematite, siderite, staurolite

F/6 bornite

F/9 sphalerite

F/10 anhydrite, barite

F/11 anhydrite, barite, bornite

F/12 bornite, halite, vivianite

F/13 bornite

F/14 barite, magnesite, montmorillonite

F/15 anhydrite, barite, calcite, galena

F/16 hematite, molybdenite

J/4 halotrichite, melanterite

K gypsum

K/1 calcite, celestite

K/2 anhydrite, gold, muscovite

K/3 barite, fluorite, gypsum, halite

K/6 tungstite, wolframite

K/7 anhydrite, bismuth

K/8 calcite

Nova Scotia (cont'd)

11 K/9 anhydrite

K/10 gold, sphalerite

K/15 anhydrite

K/16 anhydrite

L/2 calcite

N/2 brucite, sphalerite

20 O/16 andalusite, ilmenite, spodumene

P ilmenite

P/11 andalusite

P/12 andalusite, staurolite

P/14 andalusite, beryl, staurolite

P/15 andalusite, beryl

21 A analcime, apophyllite, ilmenite, pickeringite, thomsonite

A/2 gold, scheelite, sillimanite

A/4 gold

A/6 calcite, gold, ulexite

A/7 gold, scheelite

A/8 gold

A/9 cassiterite, durangite, eosphorite, gold, lepidolite, manganite, opal, quartz (jasper), scheelite, triphylite, wolframite, zinnwaldite

A/10 albite, amblygonite, beryl, opal, wolframite

A/11 columbite

A/12 analcite, chabazite, chalcocite, hematite (martite), heulandite, ilmenite, laumontite, mesolite, mordenite, quartz (agate, amethyst), scolecite, stilbite

A/13 analcite, laumontite, mesolite, mordenite, quartz (agate, amethyst)

A/14 analcite, heulandite, laumontite, mesolite, mordenite, opal, quartz (agate, amethyst), stilbite, thomsonite, tourmaline

A/16 anhydrite, calcite, ginorite, howlite, manganite, mirabilite, scheelite, ulexite, winkworthite

B/8 copper, hematite (martite), heulandite, ilmenite, laumontite, mesolite, stibnite, thomsonite

Nova Scotia (cont'd)

21	B/9	hematite (martite), ilmenite, laumontite, mesolite, quartz (agate), stilbite
	B/10	quartz (amethyst)
	B/15	quartz (amethyst)
	H	analcime, apophyllite, gypsum, pickeringite, thomsonite
	H/1	acanthite, andalusite, anhydrite, azurite, barite, calcite, epsomite, galena, gersdorffite, heulandite, howlite, laumontite, malachite, manganite, mesolite, mirabilite, mordenite, pickeringite, proustite, psilomelane, pyrolusite, quartz (agate, amethyst), sphalerite, stilbite, tennantite, thomsonite, ulexite
	H/2	analcime, cerinite, heulandite, laumontite, mesolite, mordenite, okenite, prehnite, quartz (amethyst), stilbite, thomsonite
	H/3	analcime, copper, epistilbite, gyrolite, heulandite, laumontite, mesolite, mordenite, natrolite, stilbite, thomsonite
	H/7	barite, chabazite, copper, cuprite, heulandite, laumontite, mesolite, natrolite, quartz (agate), scolecite, stilbite
	H/8	analcime, ankerite, barite, calcite, chabazite, copper, cuprite, gismondite, gmelinite, hematite, heulandite, laumontite, malachite, mordenite, natrolite, opal, prehnite, pyrite, quartz (agate, chalcedony, jasper), rutile, scolecite, siderite, stilbite, stilpnomelane, thomsonite
	H/9	alunogen, barite, siderite
	H/16	bassanite, halite, opal

ONTARIO

30	L/13	gypsum
	M/1	vivianite
	M/3	calcite, epsomite
	M/4	anhýdrite, gypsum
	M/11	petalite
	M/12	celestite
	M/13	celestite
31	B/12	cacoxenite, pyrallolite, pyrite, pyrrhotite
	B/13	pyrite
	C/1	celestite
	C/3	fairchildite, buetschliite
	C/4	potassium feldspar
	C/5	axinite, corundum, labradorite, magnetite, meneghinite, pyrallolite, smaltite, stibnite, talc
	C/6	barite, calcite, celestite, chalcopyrite, erythrite, fluorite, franklinite, hematite, limonite, pyrallolite, quartz, rutile, tetrahedrite, tourmaline
	C/8	apatite, barite, diopside, phlogopite, quartz, tourmaline, wollastonite
	C/9	apatite, barite, celestite, chondrodite, clinohumite, diopside, magnetite, phlogopite, pyrallolite, quartz, scapolite, spinel, vesuvianite, wollastonite
	C/10	apatite, barite, calcite, celestite, corundum, datolite, fluorite, galena, magnetite, phlogopite, potassium feldspar, scapolite, vesuvianite
	C/11	actinolite, barite, bismuth, bismuthinite, calcite, fluorite, gold, jamesonite, kainosite, kyanite, meneghinite, stibnite, talc, tourmaline

Ontario (cont'd)

31 C/12 antimony, arsenolite, arsenopyrite, barite, bismuth, bismuthinite, bismutite, bournonite, cancrinite, corundum, dufrenite, epsomite, erythrite, fluorite, galena, gold, hematite, labradorite, lepidomelane, magnetite, meneghinite, muscovite, natrolite, nepheline, potassium feldspar, pyrite, stibnite, stilpnomelane, talc, tourmaline

C/13 andradite, annabergite, epidote, magnetite, melanocerite, pyrochlore, scapolite, sodalite, thorite, tremolite, uraninite

C/14 bismuthinite, jamesonite, kyanite, meneghinite, pyrochlore, staurolite, stibnite, talc, tennantite, vesuvianite

C/15 apatite, barite, boulangerite, calcite, euxenite, jamesonite, labradorite, magnetite, oligoclase, serpentine (asbestos), staurolite, tremolite, uraninite, vesuvianite, zircon

C/16 albite (peristerite), anhydrite, apatite, barite, brannerite, calcite, corundum, diopside, euxenite, hematite, hornblende, kainosite, magnetite, oligoclase, phlogopite, potassium feldspar, scapolite, spinel, spodumene, sulphur, tourmaline, tremolite, vermiculite, wilsonite, wollastonite, zircon

D/8 barite

D/9 albite (peristerite), corundum, fergusonite, melanocerite, pyrochlore, scapolite, uraninite, vermiculite

D/10 barite

Ontario (cont'd)

31 D/11 hematite, serpentine, wolframite

D/12 hematite, serpentine

D/13 serpentine

D/15 andradite, corundum, löllingite, magnetite, scapolite, uraninite, wilsonite

D/16 allanite, anatase, apatite, bastnaesite, calcite, chabazite, curite, fergusonite, fluorite, kainosite, kasolite, lepidomelane, magnetite, marcasite, melanocerite, nepheline, norbergite, potassium feldspar, pyrochlore, scapolite, thorite, uraninite, uranophane, zircon

E/1 albite (peristerite), allanite, anthophyllite, apatite, bastnaesite, chamosite, chondrodite, clinohumite, cordierite, dolomite, euxenite-polycrase, fluorite, humite, jarosite, kasolite, lepidomelane, magnetite, melanocerite, norbergite, pyrochlore, scapolite, scorodite, thorianite, thorite, tourmaline, tremolite, uraninite

E/2 apatite, tremolite

E/4 allanite, columbite, euxenite-polycrase, hydrocarbons (thucholite), samarskite, uraninite, zircon

E/5 allanite

E/6 pyrochlore

E/8 euxenite, hematite

E/9 allanite, euxenite, potassium feldspar, uraninite, zircon

E/10 uraninite

E/11 allanite, humite, jarosite, pyrochlore, uraninite

E/12 allanite, pyrochlore

E/13 allanite

E/14 albite (peristerite), beryl

F/1 barite, diopside, graphite, pyrallolite

F/2 barite, bournonite, diopside, graphite, magnetite muscovite, scapolite, stibnite, tetrahedrite

Ontario (cont'd)

31 F/3 bismuthinite, dumortierite, muscovite, pyrochlore, quartz, sphene, sulphur, tourmaline

F/4 albite (peristerite), allanite, andradite, apatite, calciosamarskite, calcite, cancrinite, celestite, cenosite, chabazite, columbite, corundum, diopside, euxenite, fergusonite, fluorite, grossular, hastingsite, hornblende, hyblite, ilmenite, kainosite, kasolite, lepidomelane, magnesite, marcasite, melanocerite, muscovite, natrolite, nepheline, oligoclase, potassium feldspar, pyrochlore, realgar, samarskite, scapolite, scorodite, sillimanite, sodalite, spencite, sphene, thorianite, thorite, uraninite, uranophane, vesuvianite, zircon

F/5 albite, corundum, epidote, gahnite, kyanite, matildite, nepheline, potassium feldspar, sillimanite

F/6 albite (cleavelandite), allanite, apatite, beryl, bismite, bismuthinite, bismutite, calcite, columbite, cubanite, dolomite, euxenite, hornblende, magnetite, microline, molybdenite, monazite, nepheline, potassium feldspar, quartz, samarskite, scapolite, sillimanite, sphene, thorite, tourmaline, zircon

F/7 boulangerite, bournonite, celestite, chlorite, corundum, magnetite, potassium feldspar, serpentine (asbestos), uraninite, zircon

F/8 barite, celestite, galena, parisite

F/9 barite

Ontario (cont'd)

31 F/10 apatite, dolomite, fluorite, pyrallolite, scapolite, serpentine (asbestos), spinel, tourmaline, wilsonite, zircon

F/11 allanite, apatite, scapolite

F/12 euxenite, fluorite, monazite, pyrochlore

F/14 euxenite

F/15 actinolite, bismuthinite, calcite, zircon

F/16 wilsonite

G/5 barite, bytownite, potassium feldspar, strontianite, uraninite, witherite

G/7 labradorite

G/8 britholite, labradorite

G/10 celestite, pyrallolite

G/12 phlogopite, rutile, sphene, stilbite, wilsonite

G/13 phlogopite, spinel

G/15 phlogopite, pyrallolite, serpentine

H/12 epsomite

I/4 spinel

I/5 spinel

I/16 wilsonite

J/4 spinel

J/5 phlogopite

J/11 wilsonite

J/12 phlogopite

K/1 spinel

K/8 phlogopite

L/1 fluorite, potassium feldspar

L/2 allanite, beryl, magnetite, muscovite, potassium feldspar

L/5 barite, magnetite, pyrochlore

L/6 brucite

L/7 beryl, brucite, calcite, euxenite, fergusonite, hedenbergite, iron, potassium feldspar, pyroaurite, pyrochlore

L/13 chabazite, erythrite

M acanthite, annabergite, aragonite, argyropyrite, arsenolite

M/2 breithauptite

Ontario (cont'd)

31 M/3 pararammelsbergite, polybasite, proustite, safflorite, skutterudite, stephanite

M/4 bismuthinite, cobaltite, erythrite, gersdorffite, gold, löllingite, marcasite, mimetite, pararammelsbergite

M/5 aikinite, arsenopyrite, bismuth, chabazite, chalcocite, chapmanite, chloanthite, cobaltite, cosalite, danaite, dyscrasite, erythrite, ferrisymplesite, galena, gersdorffite, heterogenite, heulandite, löllingite, matildite, mercury, millerite, mimetite, mohawkite, niccolite, pararammelsbergite, polybasite, proustite, pyrargyrite, rammelsbergite, safflorite, samsonite, scorodite, silver, skutterudite, smaltite, stephanite, stromeyerite, symplesite, tetrahedrite, xanthoconite

M/8 bornite, emplectite, erythrite

M/12 bornite, gersdorffite, safflorite

M/13 calaverite, petzite, tetradymite

32 C/12 brucite

D/4 altaite, aurostibite, azurite, bismuth, bismuthinite, calaverite, chalcopyrite, coloradoite, cosalite, galena, galenobismutite, gold, hessite, malachite, millerite, muscovite, petzite, quartz (jasper), serpentine (asbestos), tennantite, tetradymite, ullmanite

D/5 epidote, gold, muscovite

D/6 spinel

D/11 serpentine

D/12 gold, serpentine

D/13 chromite, serpentine

Ontario (cont'd)

32 E/4 altaite

E/9 fergusonite

40 I/16 anhydrite, gypsum, sulphur

J/1 marcasite

J/3 calcite, celestite

J/5 iron

O/1 humboldtine

P/2 gypsum, rhodochrosite

P/12 halite

41 A sphalerite

A/4 halite

A/9 bornite

A/10 celestite

A/11 sphalerite

G/15 celestite

H/1 calciosamarskite, hisingerite

H/3 erythrite

H/8 uraninite

H/12 celestite

H/14 sillimanite

H/15 anatase, beryl, eschynite-priorite, euxenite, hydrocarbons (thucholite), uraninite, uranophane, xenotime, zircon

H/16 albite (peristerite), allanite

I/1 magnetite

I/2 aegirine (acmite), cancrinite, euxenite, graphite, lepidomelane, nepheline

I/3 gold

I/4 cobaltite, gold, morenosite

I/5 huttonite, staurolite

I/6 annabergite, arsenic, arsenopyrite, bismuth, cassiterite, chalcopyrite, cubanite, gersdorffite, hessite, lepidomelane, marcasite, maucherite, melanterite, millerite, morenosite, niccolite, parkerite, pentlandite, polydymite, pyrite, pyrrhotite, scheelite, silver, smaltite, sperrylite, stannite, tetradymite, valleriite, violarite

Ontario (cont'd)

41 I/7	chalcopyrite, columbite, cubanite, euxenite, froodite, gersdorffite, gold, kyanite, millerite, oligoclase, parkerite, pentlandite, pyrochlore, pyrrhotite, sillimanite, smaltite
I/9	almandine, uraninite
I/10	chalcopyrite, cosalite, gersdorffite, gold, magnesite, marcasite, michnerite, pentlandite, pyrrhotite, silver, staurolite, violarite
I/11	hydrocarbons (thucholite), pentlandite, silver, sphalerite, staurolite, violarite
I/14	gypsum, uraninite
I/15	anatase, beryl, zircon
I/16	altaite, chalcopyrite, gersdorffite, millerite, pyrite, tellurium
J	quartz (jasper)
J/1	cobaltite, muscovite
J/2	brannerite, coffinite, marcasite, stilpnomelane, uraninite
J/4	bornite, chalcopyrite
J/5	ankerite, bornite, chalcopyrite, erythrite, iron, uraninite
J/6	gold
J/7	anatase, bornite, pyrrhotite, uraninite
J/10	hydrocarbons, monazite, pyrrhotite, uraninite
J/11	bismuth
J/12	bismuth, erythrite, stibnite
K	quartz (jasper)
K/9	galena, manganite, stibnite
K/15	bornite, hematite, quartz (jasper)
K/16	quartz (jasper)
L/16	altaite
N	copper, cuprite

Ontario (cont'd)

41 N/2	chalcocite, clausthalite, copper, klockmannite, mesolite, molybdomenite, scheelite, selenium, uraninite, uranophane
N/7	pyrochlore, uraninite
N/11	copper
N/12	analcime, copper, domeykite, niccolite, pumpellyite, quartz (agate), thomsonite
N/13	analcime, niccolite, pumpellyite, thomsonite
N/15	gold, limonite, riebeckite, siderite
O/9	gold
O/11	riebeckite
O/14	cerianite
O/15	quartz (jasper)
P	acanthite, annabergite, augite
P/5	azurite
P/7	iron
P/8	löllingite
P/9	azurite, barite, bismuth, bismuthinite, bornite, covellite, erythrite, malachite, maucherite, pararammelsbergite, rammelsbergite, silver, uraninite
P/10	bismuth, bornite, breithauptite, chloanthite, cobaltite, erythrite, löllingite, maucherite, millerite, niccolite, pararammelsbergite, rammelsbergite, safflorite, serpentine, silver, skutterudite, smaltite, stromeyerite
P/11	gold
P/12	bornite, covellite, malachite, tetradymite
P/14	limonite, muscovite, serpentine (asbestos)
P/15	altaite, barite, bornite, erythrite, fluorite, gold, muscovite, quartz (jasper), serpentine (asbestos), smaltite
P/16	quartz (jasper)
42 A	acanthite, gold

Ontario (cont'd)

42 A/1 altaite, barite, calaverite, celestite, coloradoite, dyscrasite, gold, hessite, melonite, muscovite, petzite, platinum, quartz (jasper), sylvanite, talc, tetradymite

A/2 altaite, barite, erythrite, fluorite, krennerite

A/3 altaite

A/5 chalcopyrite, pyrrhotite, sphalerite

A/6 altaite, anhydrite, ankerite, axinite, barite, chloritoid, chromite, coloradoite, gold, hessite, magnesite, muscovite, petzite, scheelite, serpentine (asbestos), sylvanite, tennantite, tourmaline

A/8 epidote, gold, petzite, wolframite

A/9 andalusite, calaverite, chiastolite, cordierite, gold, labradorite, muscovite (mariposite), niccolite, pyrrhotite, serpentine (asbestos), tetradymite, wehrlite

A/10 chromite, morenosite, platinum, pyrrhotite, serpentine (asbestos)

A/11 tellurbismuth, tetradymite

A/14 chromite, diamond, platinum

A/16 tetradymite

B/1 barite, serpentine (asbestos), stichtite

C/2 chloritoid, cordierite, gold, hematite, muscovite, scheelite, siderite, turgite, wehrlite

C/4 melonite, muscovite

C/7 muscovite, pyrite, riebeckite

C/8 bytownite, gold, pigeonite, riebeckite, siderite

D copper, cuprite

D/9 thorite

D/10 coloradoite, fluorite, nepheline

Ontario (cont'd)

42 D/13 barite, copper, prehnite, quartz (agate), sphalerite

D/14 altaite, barite, fluorite, galena, prehnite, quartz (agate), serpentine (asbestos), sphalerite, tetradymite

E/1 quartz (jasper)

E/4 spodumene

E/5 muscovite, spodumene

E/10 analcime, antimony, berthierite, bournonite, krennerite, löllingite, pyrite, scheelite, stibnite

E/11 analcime, gold, stibnite, tetrahedrite

E/12 halite

E/13 barite, gold

E/14 barite, gold

E/15 cubanite, gold

F/4 chalcopyrite, pyrite, pyrrhotite, sphalerite

F/16 staurolite

I/4 thomsonite

I/11 gypsum

I/14 gypsum

L/3 dumortierite

L/4 bismuthinite, chloritoid

L/5 staurolite

L/6 dumortierite, marcasite, serpentine, staurolite

L/7 marcasite, polybasite, serpentine, staurolite, tetrahedrite

L/10 beryl, spodumene

N/2 klockmannite, uraninite

N/12 quartz (agate)

P/3 gypsum

43 D/2 magnetite

52 A aragonite, copper, cuprite

A/3 acanthite, apophyllite, azurite, barite, erythrite, fluorite, kalinite, pectolite, rhodochrosite

A/4 calcite, fluorite, pyrrhotite, witherite

A/5 copper, fluorite, harmotome, lead, marcasite, quartz (jasper), saponite, stephanite, witherite

Ontario (cont'd)

52 A/6 acanthite, annabergite, barite, calcite, chamosite, hydrocarbons (anthraxolite), kalinite, marcasite, prehnite, quartz (jasper)
A/7 acanthite, arsenic, calcite, domeykite, erythrite, fluorite, marcasite, niccolite, quartz (agate), rhodochrosite
A/8 fluorite
A/9 fluorite
A/10 datolite, galena, quartz (jasper)
A/11 gold, quartz (jasper)
A/12 gold, quartz (jasper)
A/15 uraninite
B/1 quartz (jasper)
B/2 quartz (jasper)
B/3 hematite, quartz (jasper), siderite
B/9 erythrite
B/10 altaite, coloradoite, hessite, nagyagite, petzite, sylvanite, tellurbismuth
B/12 uraninite
B/13 beryl, epidote (clinozoisite), geothite, hematite, quartz (jasper)
C/8 spodumene
C/9 quartz
C/10 bismuthinite, quartz
C/13 tetradymite
C/16 bismuthinite, quartz
E/8 gold
E/9 calaverite, copper, covellite, hessite, petzite, tetradymite
E/10 gold
E/13 tetradymite
E/16 uraninite
F/3 stibnite, tetradymite
F/5 pentlandite
F/9 covellite
F/10 bismuthinite, talc
F/11 cordierite, tourmaline
F/12 pentlandite
F/13 beryl, pentlandite, pyrrhotite, thorite, uraninite, uranophane

Ontario (cont'd)

52 F/15 azurite, beryl, columbite, sillimanite, spodumene, zircon
F/16 altaite, bismuthinite, grunerite, quartz (jasper)
G/14 gold
G/15 copper, topaz
H/1 amblygonite, beryl, hühnerkobelite
H/7 hematite, scapolite
H/8 analcime, pectolite, prehnite
H/9 gold, prehnite
I/8 spodumene
I/10 beryl
J/2 topaz
J/4 gold, melanterite
J/13 spodumene
K/1 uraninite
K/13 gold, realgar
K/14 quartz (jasper)
L/2 jarosite
L/7 beryl, cobaltite, linnaeite, violarite
M/1 gold, serpentine (asbestos)
N/4 altaite, andalusite, berthierite, gold, jamesonite, kermesite, krennerite, senarmontite, serpentine (asbestos), stibnite, tetradymite, tetrahedrite
N/9 gold
P/5 gold
P/9 spodumene, tourmaline
P/10 almandine

53 B/14 tetrahedrite
C/13 serpentine (asbestos), tetradymite
D/2 dyscrasite

PRINCE EDWARD ISLAND

11 L/2 calcite
L/6 braunite
L/7 limonite
L/12 saponite

QUEBEC

11 N/4 gypsum
N/5 gypsum, manganite, quartz (jasper)
N/11 manganite

Quebec (cont'd)

11	N/12	manganite
12	L/4	anthophyllite
	L/7	fluorite
	L/8	sillimanite
	L/14	actinolite, annabergite
	M/5	potassium feldspar, sillimanite
	M/12	labradorite, potassium feldspar
21	E/4	andalusite
	E/5	andalusite, magnetite, pyrite, quartz (jasper), sphalerite, tennantite, uraninite, vivianite
	E/6	andalusite
	E/10	andalusite
	E/11	pyrite
	E/12	kermesite, magnetite, senarmontite, serpentite (asbestos)
	E/13	antimony, bornite, brucite, chromite, gudmundite, nickel-iron, senarmontite, serpentine (asbestos), stibnite, valentinite
	E/14	andalusite, aragonite, chromite, diopside, hydromagnesite, magnesiochromite, magnetite, pyrite, serpentine
	E/15	osmiridium, platinum, quartz, scheelite, stibnite, tungstite
	E/16	iridosmine, osmiridium, platinum
	L	copper
	L/1	osmiridium
	L/2	actinolite, iridosmine, osmiridium, platinum, serpentine, talc
	L/3	almandine, andradite, apatite, apophyllite, bornite, calcite, chalcocite, chlorite, chloritoid, chromite, grossular, magnesiochromite, magnetite, malachite, natrolite, nickel-iron, pectolite, prehnite, scolecite, serpentine (asbestos), stichtite, thomsonite, vesuvianite

Quebec (cont'd)

21	L/4	bornite
	L/6	bornite, chalcocite, gold
	L/7	beryl, magnetite, platinum, talc
	L/9	linnaeite, millerite, serpentine (asbestos), violarite
	L/11	bornite, copper, kaolinite
	L/12	azurite, hydrocarbons (thucholite), hydrotalcite, magnetite, malachite, uraninite, uranophane
	L/13	magnesiochromite, uranophane
	L/14	andesine, epsomite, glauconite, hypersthene, ilmenite, labradorite, pyrite
	L/15	glauconite, quartz (jasper)
	L/16	hydrocarbons (thucholite)
	M/1	wehrlite
	M/2	andesine, chondrodite
	M/8	fluorite, ilmenite
	M/9	beryl, biotite, ilmenite
	M/10	ilmenite, laumontite, sapphirine
	M/16	fergusonite, hydrocarbons (thucholite), muscovite, samarskite, uraninite
	N/5	quartz (jasper)
	N/13	albite (peristerite), allanite, fergusonite, uraninite, xenotime
22	A	quartz (agate)
	A/3	barite
	A/7	löllingite, quartz (jasper)
	A/13	chalcopyrite, pigeonite
	A/14	wollastonite
	B	quartz (agate)
	B/2	galena, kasolite, uraninite
	B/5	chromite, pectolite, serpentine, uvarovite
	B/16	chromite, enstatite, epidote (clinozoisite), serpentine (asbestos)
	C/4	muscovite
	C/5	beryl
	C/14	muscovite
	D	hypersthene
	D/6	beryl, bismuthinite
	D/7	beryl
	D/11	magnetite, topaz
	D/12	beryl, topaz
	D/13	labradorite

Quebec (cont'd)

22 F hypersthene
I/7 ilmenite, labradorite
J/1 ilmenite
J/2 ilmenite
J/8 ilmenite, uraninite
J/9 sillimanite
L/7 gold
23 B/11 safflorite
B/14 bismuth, bismuthinite, cobaltite, löllingite
B/16 hematite
C/1 rhodonite
I/4 quartz (jasper)
I/5 quartz (jasper)
J minnesotaite
J/7 quartz (jasper)
J/8 quartz (jasper)
J/10 ankerite, minnesotaite
J/15 cryptomelane, goethite, hematite, hollandite, pyrolusite
24 C/14 ankerite, quartz (jasper)
K/4 pyrite
K/5 pyrite
K/13 talc
25 D/15 pyrite
31 F/9 chondrodite, hydrocarbons (thucholite), magnetite, molybdenite, pyrallolite, pyrargyrite, pyrochlore, thorianite, uraninite, vesuvianite
F/10 anhydrite, arsenopyrite, brucite, calcite, diopside, galena, hisingerite, niccolite, pyrallolite, pyrochlore, pyrrhotite, scapolite, serpentine (asbestos), silver, sphalerite, thorite, tourmaline, uraninite, vesuvianite, wilsonite
F/15 apatite, calcite, chondrodite, euxenite, fluorite, graphite, grossular, lessingite, monazite, pyrallolite, pyrochlore, scapolite, sphene, thorianite, thorite, uraninite, uranophane, wilsonite
F/16 allanite, andradite, graphite, kornerupine, scapolite, thorite, uraninite

Quebec (cont'd)

31 G diopside
G/1 chalcopyrite
G/5 apatite, magnetite, potassium feldspar, quartz (jasper), tourmaline
G/8 andesine, andradite, britholite, gonnardite, niccolite, perovskite, pyrochlore, uraninite, vivianite
G/9 akermanite, calcite, kaolinite, tourmaline
G/10 diopside, graphite, hornblende, kaolinite, magnesite, potassium feldspar, scapolite, serpentine, sphene, vesuvianite, wilsonite, wollastonite, zircon
G/11 albite (peristerite), apatite, barite, calcite, cassiterite, datolite, faujasite, graphite, scapolite
G/12 albite (peristerite), allanite, apatite, barite, brucite, calcite, chabazite, chlorite, clinochlore, diopside, euxenite, fluorite, graphite, grossular, hematite, hornblende, lepidolite, magnetite, oligoclase, phlogopite, potassium feldspar, prehnite, pyrite, pyrochlore, quartz (jasper), scapolite, serpentine (asbestos), sphene, thorite, tourmaline, uraninite, uvarovite, vesuvianite, wilsonite, wollastonite, zircon
G/13 albite (peristerite), apatite, beryl, chabazite, hematite, kaolinite, monazite, muscovite, phlogopite, potassium feldspar, prehnite, quartz, spessartine, spinel, tengerite, tourmaline, uraninite, uranophane, zircon
G/14 cassiterite, hydrocarbons (thucholite), scapolite
G/15 hydrotalcite, phlogopite, potassium feldspar, scapolite, serpentine, sillimanite, vesuvianite, zircon

Quebec (cont'd)

31 G/16 diopside, graphite, ilmenite, labradorite, sillimanite, vesuvianite, wollastonite
H/1 andalusite, chromite, ilmenite, kammererite, magnesite, millerite, muscovite, sodalite
H/2 bornite, chloritoid, hematite, ilmenite, magnesite, millerite, muscovite, sodalite
H/3 calcite, hematite
H/5 aegirine (acmite), analcime, melilite, natrolite, nepheline, olivine, sodalite
H/6 cancrinite, hornblende, oligoclase
H/7 bytownite, cuprite, hematite, nepheline, potassium feldspar
H/8 bornite, calcite, chalcopyrite, chromite, cuprite, grossular, kammererite, maucherite, millerite, quartz, serpentine, uvarovite
H/9 bornite, chromite, diopside, kammererite, kaolinite, serpentine
H/10 azurite, bornite
H/11 analcime, augite, nepheline, olivine, sodalite
H/12 aegirine (acmite), anhydrite, arsenic, cancrinite, dawsonite, epsomite, hornblende, natrolite, nepheline, sodalite, strontianite
H/13 chondrodite, ilmenite, labradorite, magnetite
H/14 biotite
H/16 bornite
I/1 glockerite, melanterite
I/4 labradorite, spinel
I/5 spinel
I/6 scapolite, tourmaline
I/9 vivianite
I/10 magnetite, tourmaline
I/13 chrysoberyl, samarskite

Quebec (cont'd)

31 I/14 aegirine (acmite), cancrinite, goethite, greenalite, hastingsite, labradorite
I/15 sapphirine
I/16 anthophyllite, bytownite, cordierite, electrum, epidote (clinozoisite), hisingerite, magnesite, scapolite, sillimanite, sphalerite, wilsonite, wollastonite
J/1 ilmenite
J/2 quartz, wollastonite
J/3 chondrodite, fluorite
J/4 chondrodite, goethite, greenockite, hematite, melanterite, olivine, spinel
J/5 chrysoberyl, eschynite-priorite, euxenite, fergusonite quartz, uraninite
J/6 chondrodite
J/9 samarskite
J/11 graphite, scapolite, uraninite, wilsonite
J/12 beryl, fluorite, potassium feldspar, thorianite, thorite, uraninite, uranophane, zircon
J/13 pyrochlore, thorianite, uraninite
J/15 eschynite
J/16 beryl, chondrodite, fergusonite, samarskite, uraninite
K/1 calcite, phlogopite, scapolite, sphene, spinel, tourmaline
K/7 pyrite
K/8 calcite, jarosite, phlogopite, saponite, thorite, tourmaline, uraninite
K/9 fluorite, saponite
K/14 britholite
K/16 allanite, fluorite
L/4 phlogopite
L/5 phlogopite, uraninite
L/7 kyanite
L/9 pyrite
L/15 eucolite
L/16 potassium feldspar, pyrochlore
M/3 axinite, smaltite
M/6 galena, gold

Quebec (cont'd)

31 M/7 altaite, gold, hessite, petzite
M/10 beryl, spodumene
M/14 sulphur
M/15 beryl
M/16 beryl
N/11 axinite
N/12 enstatite
N/13 beryl
N/14 beryl
N/15 axinite
P/3 allanite
32 B/13 gold
C/2 gold
C/3 altaite, gold, gypsum, petzite, scheelite, tellurbismuth, wehrlite
C/4 calaverite, carrollite, chalcopyrite, diamond, gold, hessite, muscovite (mariposite), pearceite, petzite, pyrite, scheelite, sphalerite, tellurbismuth, tennantite, tetradymite, tetrahedrite
C/5 albite (cleavelandite), beryl, bismuthinite, columbite, euxenite, holmquistite, lepidolite, microlite, molybdenite, muscovite, pollucite, powellite, pyrochlore, spessartine, sphalerite, spodumene, tetradymite
C/6 boulangerite, frohbergite
C/10 pyrite
C/11 pyrite
C/12 gold, sphalerite
C/15 pyrite
D/1 bismuthinite, calaverite, gold, petzite, spodumene
D/2 beryl, gold, hessite, tetradymite
D/3 altaite, chalcopyrite, galena, gold, hisingerite, petzite, pyrite, rickardite, sphalerite, sulphur, sylvanite, tellurbismuth
D/5 krennerite

Quebec (cont'd)

32 D/6 altaite, ankerite, calaverite, chalcopyrite, cordierite, cosalite, gold, krennerite, melonite, petzite, pyrite, sphalerite, spinel, tellurbismuth, tetradymite
D/7 gold, pyrite, sphalerite
D/8 beryl, bismuthinite, coloradoite, gold, lepidolite, molybdenite, phenakite, spessartine, sphalerite, spodumene, tantalite
D/9 gold, spessartine, sphalerite
D/12 bismuth
D/13 gold
D/14 chalcopyrite, pyrite, sphalerite
D/15 magnetite
D/16 montbrayite
E/3 kyanite
F/5 pigeonite
F/7 gold
F/9 paragonite, perovskite, polybasite, pyrargyrite
F/11 hornblende, labradorite, pigeonite
F/12 chalcopyrite, pyrite
F/13 pyrite, sphalerite
F/14 kaolinite
G/4 gold
G/9 gold
G/10 pyrite
G/12 pyrite, rutile
G/13 gold, paragonite
G/14 chalcopyrite, pyrite
G/15 pyrite, uraninite
G/16 cobaltite, gold, pyrite, pyrrhotite
H/1 millerite
H/2 millerite
H/14 chalcopyrite
I lazulite, psilomelane
I/12 psilomelane
I/13 psilomelane
I/14 aegirine, goethite, greenalite, grunerite, hornblende, minnesotaite, psilomelane, stilpnomelane
I/16 hornblende
J/11 spodumene
P lazulite, psilomelane

Quebec (cont'd)

32 P/2 grunerite
P/3 psilomelane
33 D/15 danalite, epidote, spodumene
E/11 spodumene
N/11 axinite
N/15 axinite
O/13 quartz (chalcedony)
34 B/1 spurrite
B/2 spurrite
C/1 epidote, quartz, rhodochrosite
C/2 hematite, quartz (jasper)
C/7 hematite, quartz (jasper)
C/8 epidote, quartz, rhodochrosite
C/10 hematite, quartz (jasper)
C/15 hematite, quartz (jasper)
F/2 hematite, quartz (jasper)
F/7 hematite, quartz (jasper)

SASKATCHEWAN

62 K sylvite
M sylvite
63 K/12 scheelite
K/13 sphalerite
L/9 almandine, chalcopyrite, molybdenite
L/10 chalcopyrite, sphalerite
64 D/4 sphalerite
D/5 chalcopyrite
D/9 uraninite
72 P sylvite
73 B sylvite
C sylvite
C/1 mirabilite
C/6 halite
P/1 monazite, uraninite, xenotime
P/7 gold
P/8 pyrrhotite
P/10 pyrrhotite, sphalerite
74 A/7 pyrrhotite
A/11 brannerite, uraninite
B/6 uraninite
N/7 gold, hydrocarbons (thucholite), muscovite, nolanite, uraninite, uranophane

Saskatchewan (cont'd)

74 N/8 clausthalite, cuprosklodowskite, gold, hydrocarbons (thucholite), klockmannite, magnetite, malachite, metazeunerite, niccolite, nolanite, rammelsbergite, tiemannite, ullmanite, umangite, uraninite, uranophane, uranopilite
N/9 hydrocarbons (thucholite), hypersthene, pyrochlore, tin, uraninite, uranophane
N/10 becquerelite, berzelianite, chalcomenite, clausthalite, tyrrellite, umangite, uraninite
N/14 uraninite
N/15 uraninite
O/5 uraninite
O/12 pyrrhotite, uraninite
O/13 allanite, apatite, harmotome, potassium feldspar (hyalophane), scapolite
P/2 graphite
P/3 uraninite
P/4 graphite, phosphuranylite
P/5 phosphuranylite, uraninite
P/7 thorianite, uraninite
P/13 graphite
P/14 graphite

YUKON

95 E/8 franckeite, geocronite, stannite
105 A/2 galena, sphalerite
B/3 ludwigite, topaz
B/6 beryl
C/6 enstatite, serpentine (asbestos)
D/1 bornite
D/2 gold, quartz (jasper), realgar, sylvanite, symplesite, yukonite
D/3 bornite, chalcostibite, copper, gold, hessite, stibnite
D/5 quartz (jasper)
D/6 hessite, petzite, sylvanite, tellurite
D/10 wollastonite

Yukon (cont'd)

105 D/11 allophane, azurite, bornite, chrysocolla, cuprite, erythrite, gold, grossular, hematite, magnetite, malachite, stibnite, wittichenite, wollastonite
D/14 bornite, prehnite
E/8 gold
F/4 galena
F/8 muscovite
F/15 realgar
F/16 nickel-iron
G/13 almandine
H/16 scheelite
I/7 scheelite
J/5 scheelite
M/11 scheelite, stibnite
M/12 bismuth, scheelite, stibnite
M/13 acanthite, andalusite, anglesite, galena, pyrargyrite, scheelite
M/14 acanthite, anglesite, beudantite, bindheimite, boulangerite, galena, gunningite, lepidocrocite, malachite, manganite, meneghinite, mimetite, pharmacosiderite, psilomelane, pyrargyrite, pyromorphite, scorodite, silver, sphalerite, stephanite, symplesite, szomolnokite, tetrahedrite, zinc
O/4 vesuvianite
O/5 leucite
O/14 struvite

106 B/5 hematite
D/4 beudantite, bismuth, bismutite, boulangerite, cassiterite, cerussite, galenobismutite, gold, jamesonite, lead, litharge, mimetite, scheelite, scorodite, senarmontite, sphalerite, sulphur, tetradymite, wolframite
E/15 quartz (jasper)
K/5 epsomite
O/4 tetradymite

115 A/6 copper, gold
A/11 bornite, chalcopyrite, gold

Yukon (cont'd)

115 A/13 serpentine (asbestos)
B copper
B/16 gold
F/9 scheelite
F/15 heazlewoodite, maucherite, realgar
F/16 scheelite
G/1 gold
G/5 hedleyite, hessite
G/6 altaite, hessite, silver, tellurbismuth
G/9 gold, wolframite
G/12 scheelite
G/13 scheelite
H/1 magnetite
H/2 magnetite
H/3 gold
H/4 gold
H/14 tetradymite
I actinolite (jade)
I/3 bismuthinite, bournonite, jamesonite, tetradymite
I/6 gold, magnetite
I/14 gold
J/4 gold
J/15 cassiterite, tetradymite
K/15 coloradoite
N/15 gold
O gold, osmiridium
O/1 gold
O/2 gold
O/3 gold, rutile
O/4 leucite
O/5 leucite
O/9 anthophyllite
O/10 gold
O/14 gold, newberyite, struvite
P joseite, scheelite
P/9 bismuth, joseite
P/10 axinite
P/11 struvite
P/12 quartz
P/13 quartz
P/14 joseite, quartz
P/16 bismuth, gold

116 A osmiridium, struvite
B osmiridium
B/13 actinolite, cassiterite, electrum, gold, lead, muscovite
B/4 vivianite
D/6 stibnite
N/5 vivianite