

# GEOLOGICAL SURVEY OF CANADA

G. M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR

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## REPORT

OF THE

# SECTION OF CHEMISTRY AND MINERALOGY

BY

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OTTAWA

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To

G. M. DAWSON, C.M.G., LL.D., F.R.S.

*Director of the Geological Survey of Canada.*

SIR,—In laying before you the accompanying report, I should mention that it does not by any means cover all the work carried out in this Laboratory during the year which it embraces—indeed scarcely half, a considerable number of mineral determinations, qualitative examinations, and partial quantitative analyses, the results of which possess but little or no interest—save to those immediately concerned, having been altogether excluded.

I have the honour to be,

Sir,

Your obedient servant,

G. CHRISTIAN HOFFMANN

OTTAWA, 30th June, 1898.



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# REPORT

OF THE

## SECTION OF CHEMISTRY AND MINERALOGY

### COALS AND LIGNITES.

[Continued from page 18 R, of the Annual Report of this Survey for 1895.]

88.—**ANTHRACITIC COAL.**—From the neighbourhood of Moose Mountain, on the north side of Elbow River, north-east quarter of section 8, township 23, range 6, west of the fifth initial meridian, district of Alberta, North-west Territory. Seam said to be upwards of five feet in thickness. Geological position—Cretaceous. Sent to Mr. William Pearce by Mr. Daniels.

Anthracitic coal from near Moose Mountain, district of Alberta, N.W.T.

Structure, somewhat coarse lamellar, made up of irregularly alternating layers of grayish-black, somewhat bright, and dense jet-black coal of brilliant lustre, with an occasional interposed film of mineral charcoal, contorted, shows slickensides in an eminent degree—compact; firm; fracture, irregular; powder, brownish-black; it communicates a pale brownish-yellow colour to a boiling solution of caustic potash.

An analysis by fast coking, gave:

Hygroscopic water .....	2.74
Volatile combustible matter.....	18.62
Fixed carbon .....	75.52
Ash.....	3.12
	<hr/>
	100.00
Coke, per cent .....	78.64
Ratio of volatile combustible matter to fixed carbon	1 : 4.05

It yields, by fast coking, a non-coherent coke. The gases evolved during coking burn with a yellow, slightly luminous, almost smokeless flame. The ash, which is of a reddish-white colour, remains unaffected at a bright red heat, but at a most intense red heat it becomes fritted.

Coals and Lignites—*Cont.*

Lignitic coal, from a stream flowing into Tooya River, Cassiar district, B.C.

89.—LIGNITIC COAL.—From a seam on a small stream flowing into Tooya River from the west, some sixteen miles above the confluence of the latter with the Stikine, Cassiar district, province of British Columbia. Received from Mr. W. T. Jennings, C.E.

The material examined answered to the following description—structure, fine lamellar, compact; made up of alternating layers of a grayish-black, dull, and bright black coal. It is, here and there, intersected by thin plates of gypsum, and contains, in parts, a few particles of honey-yellow, translucent resin; fracture, uneven; powder, blackish-brown; it communicates a brownish-red colour to a boiling solution of caustic potash.

An analysis by fast coking, gave:

Hygroscopic water.....	4.59
Volatile combustible matter.....	33.77
Fixed carbon.....	42.67
Ash.....	18.97
	100.00
Coke, per cent....	61.64
Ratio of volatile combustible matter to fixed carbon 1:	1.26

It yields, by slow coking, a non-coherent coke; by fast coking, a slightly fritted coke. The gases evolved during coking burn with a yellow, luminous, smoky flame. The ash has a light brownish-white colour—exposed to a bright red heat it becomes very slightly agglutinated, at a most intense red heat it becomes slightly fritted.

Lignite from Coal Creek, Yukon district, N.W.T.

90.—LIGNITE.—From a seam discovered by Mr. William Ogilvie, Dominion Land Surveyor, some seven miles up Coal Creek, a stream flowing into the Yukon five miles below the mouth of Forty-mile River, Yukon district, North-west Territory. Seam twelve feet six inches thick.

The material forwarded was found, at the time of its receipt, to be completely disintegrated. It had evidently lost a certain proportion of its hygroscopic water, hence the following analysis must be regarded as more nearly representing the composition of the fuel in an air-dried condition, than as it occurs in its natural state. The material examined, and which ought perhaps to be considered a selected sample, answered to the following description—structure, fine lamellar; colour, velvet-black; lustre, sub-resinous; in parts coated with a film of ferric hydrate; contains, here and there, particles of a pale brownish-yellow, translucent resin; fracture, uneven—occasionally verging on the sub-conchoidal; powder, brownish-black; it communicates a dark brownish-red colour to a boiling solution of caustic potash.

An analysis by fast coking, gave :

Hygroscopic water.....	7·24
Volatile combustible matter.....	41·45
Fixed carbon.....	48·91
Ash.....	2·40
	<hr/>
	100·00
Coke, per cent.....	51·31
Ratio of volatile combustible matter to fixed carbon 1 :	1·18

Coals and Lignites—*Cont.*

Lignite, from Coal Creek, Yukon district, N. W. T. —*Cont.*

It yields, by slow coking, a non-coherent coke; by fast coking, a slightly fritted coke. The gases evolved during coking burn with a yellowish, luminous, somewhat smoky flame. The ash has a brownish-yellow colour—when exposed to a bright red heat it becomes very slightly agglutinated, at a most intense red heat it becomes fritted.

### MISCELLANEOUS MINERALS.

#### 1. BADDECKITE (A NEW VARIETY OF MUSCOVITE).

This interesting variety of muscovite was met with about half a mile from the town of Baddeck, Victoria county, in the province of Nova Scotia, where it occurs in the form of minute isolated scales, small scaly aggregations, and thin scaly layers, distributed through a highly plastic clay; which also contains a large proportion of fine crystalline, white, pearly scales of kaolinite, some minute crystals of white quartz and small particles of pyrite and calcite.

Baddeckite, from Baddeck, Victoria county, N.S.

The mineral has a fine copper-red colour; a pearly lustre; and affords a tile-red streak. With water it forms a highly plastic mass. Its specific gravity, at 15·5° C., is 3·252. Before the blow-pipe it fuses, at about 4·5, to a shiny black slag, which on continued heating in the reducing flame becomes magnetic. It is decomposed by strong hydrochloric acid, with separation of slimy silica.

An analysis by Mr. R. A. A. Johnston, upon very carefully prepared and apparently perfectly pure material, showed it to have the following composition :—

Silica.....	48·96
Alumina.....	13·85
Ferric oxide.....	25·82
Lime.....	1·17
Magnesia.....	2·65
Potassa.....	3·47
Soda.....	0·22
Water (direct estimation) . . . . .	3·78
	<hr/>
	99·92

Miscellaneous  
minerals—  
*Cont.*

Baddeckite,  
from Bad-  
deck, Victoria  
county, N.S.  
—*Cont.*

These figures afford a ratio for  $RO : R_2O_3 : SiO_2 : H_2O$  closely corresponding to 1 : 3 : 8 : 2 giving the formula  $H_4 (Ca, Mg, K_2 Na_2) (Fe_2 Al_2)_3 Si_8 O_{28}$  and, assuming the hydrogen to be basic, the quantivalent ratio for  $R' : R'' : Si$  of 3 : 9 : 16 or for bases to silicon of 3 : 4 agreeing with that required for some varieties of muscovite. The mineral is therefore a hydro-muscovite in which a very large proportion of the alumina ordinarily present is replaced by ferric oxide, and to this may be ascribed its exceptional behaviour before the blow-pipe; its comportment with strong acids; as likewise its noticeably high specific gravity.

The name "Baddeckite," is given by the writer to this mineral from the above mentioned locality where it was first found.

## 2. CHALCANTHITE.

Chalcanthite,  
from Bona-  
parte River,  
Lillooet dis-  
trict, B.C.

This species, not previously noticed as a mineral occurring in Canada, has been met with, in some quantity, as a result of the alteration of tennantite, associated with other decomposition products of copper minerals, in the upper part of a quartz vein carrying tennantite, small quantities of pyrite, occasionally a little chalcopyrite, and some coarsely crystalline galena, at the Avoca claim, on the west side Bonaparte River, two miles and a half above Hat Creek, Lillooet district, in the province of British Columbia.

A fine large specimen of the mineral from this locality has been examined by Mr. R. A. A. Johnston. It is in the form of finely crystalline, sometimes stalactitic, masses of a Berlin-blue colour and vitreous lustre, associated with some bluish-green, massive and botryoidal, at times also earthy, chrysocolla, a little ferric sulphate, and a very little native sulphur, in a skeleton aggregate of angular fragments of white quartz still containing, in parts, a little unaltered tennantite and a few particles of iron and copper-pyrites.

## 3. EPSOMITE, AND FIBROFERRITE?

Epsomite, and  
Fibroferrite?,  
from the dis-  
trict of Al-  
berta, N.W.T.

The material here referred to, a saline incrustation, occurs, according to Mr. A. O. Wheeler, D.L.S.,—by whom it was collected, as a deposit around the source of a small stream which issues from the base of high cliffs of limestone and flows into the Cañon branch of the Elbow River, in the foot-hills of the Rocky Mountains, district of Alberta, North-west Territory.

It is in the form of straw-yellow, very fine-crystalline masses. Before the blow-pipe, on charcoal, it fuses with difficulty to a black magnetic globule: in the closed tube, gives off a large amount of water which

reacts acid: is readily soluble in water, to which it imparts a brownish-yellow colour and strongly acid reaction: taste, acid, astringent, and metallic.

Its composition, as shown by Mr. R. A. A. Johnston's analysis, is as follows:—

	I.	II.	Mean.
Sulphur trioxide.....	36·374	36·486	36·43
Ferric oxide.....	13·115	13·180	13·15
Ferrous oxide.....	0·942	0·910	0·93
Alumina.....	5·617	5·525	5·57
Magnesia.....		5·920	5·92
Water (direct estimation).....	37·057	36·915	36·98
Insoluble residue.....	0·453	0·505	0·48
			99·46

This would correspond to a mixture of epsomite and a hydrous basic sulphate of iron, in which part of the iron is replaced by aluminium, having the formula of amaranthite, but which, by reason of its solubility, would appear to be referable to fibroferrite.

#### 4. TENNANTITE.

A somewhat argentiferous variety of tennantite, associated with small quantities of pyrite—at times more or less well crystallized, and coarsely crystalline galena, as likewise, occasionally, a little chalcopyrite, has been met with in some abundance at the Avoca mineral claim, on the west side of Bonaparte River, two miles and a half above Hat Creek, Lillooet district, in the province of British Columbia.

The mineral is, on the whole, compact, massive; in one instance, however, a fairly perfect tetrahedron, with the solid angles replaced, was observed occupying a small cavity. It has a dark grayish-black colour; a metallic lustre; and affords a cherry-red streak. In thin splinters it is subtranslucent and deep ruby-red by transmitted light. In addition to the essential constituents—sulphur, arsenic, and copper, it was found by Mr. R. A. A. Johnston to contain small quantities of antimony, silver, lead, zinc, and iron. An estimation of the copper and silver in a sample of this ore afforded him the following results:—copper 35·65, silver 0·2045, insoluble residue (quartz) 14·26 per cent. The metalliferous portion of the ore would therefore contain—copper 41·51 and silver 0·2385 per cent, the latter being equivalent to 69·562 ounces of silver per ton of 2,000 pounds.

#### 5. XENOTIME.

A very remarkable occurrence of what, on examination by Mr. R. A. A. Johnston, proves to be xenotime—a mineral not previously

Miscellaneous minerals—*Cont.*

Epsomite, and fibroferrite?, from the district of Alberta, N. W. T.—*Cont.*

Tennantite, from Bonaparte River, Lillooet district, B. C.

Xenotime from the township of Calvin, Ont.

Miscellaneous  
minerals—  
*Cont.*

Xenotime,  
from the town-  
ship of Calvin,  
Ont.—*Cont.*

identified as occurring in Canada—has somewhat recently been observed by Mr. C. W. Willimott, in the township of Calvin, district of Nipissing, in the province of Ontario. Here, in one part of a coarse granite vein of some twenty feet in width—cutting a reddish fine-grained hornblendic gneiss, and composed of quartz, microcline, albite or oligoclase, muscovite and biotite—he found, embedded in the microcline, a mass of the mineral in question weighing not less than 312 grammes. This is made up of a closely compacted aggregation of more or less divergent long slender prisms, among which, however, a few stout individuals are observable, one of which measures seven millimetres in diameter. It has a prismatic cleavage; an uneven fracture; a dark reddish-brown colour; a resinous lustre; and a light flesh-red streak. Its hardness was found by Mr. Johnston to be about 5, and the specific gravity, at 15.5° C., 4.395. Small quantities of an altered magnetite and somewhat small crystals of a reddish-brown garnet—most probably spessartite—are found accompanying the mineral; and a fine specimen of yellow beryl has been received which is said to have come from this vein.

#### MINERALOGICAL NOTES.

Almandite,  
from Hudso  
Strait, N. E. T.

1.—Almandite. A noteworthy occurrence of garnetiferous schist has been observed by Mr. A. P. Low on the south side of Whitley Bay, twenty-five miles south of Cape Prince of Wales, Hudson Strait, North-east Territory, and a fine specimen of the same was collected by him, which is now in the mineralogical collection of the Museum of this Survey. It consists of large, although somewhat imperfect, dark cherry-red rhombic dodecahedral crystals of almandite, of from fifteen to thirty millimetres in diameter, freely disseminated through a brownish-black mica-schist.

Chalcocite,  
from Cumber-  
land county,  
N. S.

2.—Chalcocite, copper-glance or vitreous copper. Specimens of this have been received which were found on the farm of Mr. Amos Blenkhorn, on the east side of the road between Maccan and Nappan, Cumberland county, in the province of Nova Scotia, where, according to Mr. H. Fletcher, it occurs in considerable quantity, with some pyrite, a little chalcopyrite, and carbonized trunks and leaves of trees, in a highly shattered, dark gray, fine-grained calcareous sandstone of Lower Carboniferous age, which is also occasionally cut by small veins of barite and veinlets of coal.

Native Cop-  
per, from Yale  
district, B. C.

3.—Copper, Native. This has been met with in the form of thin laminae, freely scattered through a calcareous brecciated con-

glomerate, with some chalcocite and brown hematite, at the Pot Hook claim, about a mile and a quarter north-west of Sugar Loaf Hill, or some six miles and a half west by south of Kamloops, Yale district, in the province of British Columbia. Mineralogical notes—Cont.

- 4.—Corundum. This mineral has been found by Mr. G. Bennett in a mica mine on the fourteenth lot of the ninth concession of the township of Methuen, Peterborough county, in the province of Ontario. A specimen of the mineral from this locality, presented to the Museum of this Survey by Mr. Archibald Blue, consists of a fragment of a rough hexagonal pyramid showing three faces, the largest of which measures, approximately, fifty-seven by thirty-eight millimetres in its greatest dimensions, in a matrix composed of felspar and mica. It is of a bluish ash-gray colour, mottled with violet-blue, and translucent. Specimens of corundum have also been received which were obtained at a point due north of the above-mentioned locality, namely, the north-west corner of the township of Cardiff, in Haliburton county. Mr. R. S. James has likewise presented specimens of this mineral to the Museum, from the fourth lot of the eighteenth concession of the township of Raglan, in the more easterly county of Renfrew, in the same province. These are in the form of cleavable masses and large rough hexagonal crystals, which are subtranslucent, have a clove-brown colour, and exhibit a bronzy sheen. A small rolled fragment, not exceeding seven millimetres in its greatest diameter, of a transparent, light celandine-green variety of corundum—which was found by Mr. Johnston to have a specific gravity, at 15° C., of 3.957, has been received by Mr. R. G. McConnell from Mr. F. Fletcher, P.L.S., who stated that it had been found in washing for gold on the Pend d'Oreille River, in the West Kootenay district of the province of British Columbia. Corundum, from various localities in Ontario.
- 5.—Gahnite, or zinc-spinel. Crystals of this mineral have been found by Mr. W. F. Ferrier—who was the first to make known its occurrence in Canada—lining cavities in a dark hair-brown laminated massive corundum, occurring on the second lot of the eighteenth concession of the township of Raglan, Renfrew county, in the province of Ontario. The form of the crystals is that of the octahedron, with the interfacial edges replaced by the dodecahedron. They are blackish-green by reflected, and green-blue-green by transmitted, light; are translucent on the edges, and have a vitreous lustre. Gahnite, from the township of Raglan, Renfrew county, Ont.
- 6.—Gersdorffite. This mineral has been observed in the form of small octahedral crystals distributed through specimens of an intimate Gersdorffite, from near Rossland, West Kootenay district, B.C.

Mineralogical  
notes—*Cont.*

association of massive pyrrhotite and chalcopyrite, from the Columbia-Kootanie property, Kootenay Mountain, a mile and a quarter north-east of the town of Rossland, in the southern part of the West Kootenay district of the province of British Columbia.

Graphite,  
from Alkow  
Harbour,  
Dean Canal,  
B.C.

- 7.—Graphite. A very interesting occurrence of this mineral—which, however, was mistaken by the finder for molybdenite—was discovered by Mr. W. Downie, in 1860, at Alkow Harbour, Dean Canal, on the coast of British Columbia. Several fragments of the material were received from him. The largest of these measures ten inches in length by six inches in width, has a maximum thickness of close on three inches, and weighs six pounds twelve ounces. It consists of minute, lustrous, dark steel-gray coloured scales and scaly layers of graphite, together with small quantities of pyrite, disseminated through a matrix consisting almost wholly of heulandite. An analysis of what was regarded as a fair average sample of the material showed it to contain 23.17 per cent of graphite.

Grossularite,  
from the town-  
ship of Coler-  
aine, Megan-  
tic county, Q.

- 8.—Grossularite. A very pretty specimen of this mineral has been received by Mr. C. W. Willimott, from Mr. J. Obalski, which was found at the P. P. Hall chromite mine, near Black Lake, block A, of the township of Coleraine, Megantic county, province of Quebec. It consists of small, brilliant, pale hyacinthine-reddish-brown transparent dodecahedrons of grossularite—the specific gravity of which, at 15.5° C., was found by Mr. Johnston to be 3.600—implanted upon a fragmental rock made up of a chromite-bearing quartz and white crystalline calcite.

Molybdenite,  
from the town-  
ship of Egan,  
Ottawa coun-  
ty, Q.

- 9.—Molybdenite. This, as pointed out in my last report (*Rep. Geol. Surv. Can., Vol. viii., p. 14 R, 1895*), is found in considerable abundance, in the form of foliated masses, which are sometimes of large dimensions, and not unfrequently more or less thickly coated with molybdenite or molybdenic ochre, on the sixty-ninth lot of the fourth range of the township of Egan, Ottawa county, in the province of Quebec.

Mr. C. W. Willimott has since visited the locality in question, and his observations tend to confirm the above statement in regard to the abundance of the mineral in this locality. He collected many fine specimens of the same, some of which consist of massive aggregations of crystalline plates having a more or less perfectly hexagonal outline; and also some large more or less weathered fragments of what he thought might not improbably



represent the original containing rock, which he found, here and there, scattered through the soil with the molybdenite. These rock specimens have been examined, and found, after having been carefully treated for the removal of products of decomposition, to consist of a massive pyroxene containing disseminated scales and lamellar aggregations of a brownish mica, a large amount of pyrite, and some foliated masses of molybdenite. From this it may be inferred that the present presence of this mineral, in a loose condition, in the soil, is ascribable to the weathering and ultimate complete disintegration of a highly pyritiferous pyroxenic rock through which it was formerly distributed.

Mineralogical notes—Cont.

- 10.—Molybdenite. This has been met with by Mr. C. W. Willimott, in considerable abundance, intermixed with the soil in which the molybdenite occurring on lot sixty-nine of the fourth range of the township of Egan, Ottawa county, province of Quebec, is found. A sample of the earth in question, collected by him, and which is of a dull yellowish colour, has been examined by Mr. Wait and found to contain, in addition to the usual constituents of soil, a very large proportion of ferric hydrate, sulphates of lime, magnesia and iron, and, approximately, 7.5 per cent of molybdenum trioxide. The composition of this material varies, however, as might be expected, considerably, other samples having been found to contain, in some instances more, at other times less, of the last named constituent.
- 11.—Quartz, Radiated. Fine specimens of a massive radiated quartz, made up of spherulitic groups, averaging from ten to twelve millimetres in diameter, having an internal structure of radiating acicular crystals and an exterior covered with projecting pyramids, with bornite filling the interstices between the spherules, have been met with in the Triassic trap rocks on the west side of Valdes Island, near Seymour Narrows, at the north end of the Strait of Georgia, province of British Columbia.
- 12.—Sulphur, Native. Some small crystals and crystalline aggregates, to which my attention was drawn by Mr. R. L. Broadbent, observable in some parts of a large fragment of iron ore from the second lot of the fifth concession of the township of North Burgess, Lanark county, province of Ontario, have been examined by Mr. Johnston and found to be native sulphur. The fragment of ore in question, consists of specular iron containing, here and there, small embedded masses of chalcopyrite. In this, the sulphur occurs as a light yellowish crystalline incrustation lining cavities previously occupied by chalcopyrite, as likewise in isolated

Molybdenite, from the township of Egan, Ottawa county, Que.

Radiated quartz, from Valdes Island, Strait of Georgia, B.C.

Native sulphur from the township of North Burgess, Lanark county, Ont.

Mineralogical notes—*Cont.*

Topaz, from Rocky Mountains, district of Alberta, N.W.T.

crystals, or groupings of these on the partially weathered chalcopyrite still remaining in them.

- 13.—Topaz. Two small rolled pebbles, of what on examination by Mr. Johnston proved to be topaz, were received from Mr. George Purches, of Edmonton, who stated that they had been found in the gravel of a small river to the west of Jasper House, in the Rocky Mountains, district of Alberta, North-west Territory. Of these, one, measuring twenty by twenty by thirteen millimetres, is of a light bluish-green colour, is transparent, has a hardness of 8, and a specific gravity of 3.557; while the other, measuring twenty-five by fifteen by fifteen millimetres, has a faint orange-yellow colour, is transparent, and has a specific gravity of 3.568.

### ROCKS.

*The analyses of these, were all conducted by Mr. F. G. Wait.*

Cyanite-granite-gneiss, from near Snake Creek, Ottawa River, Que.

- 1.—Cyanite-granite-gneiss. From the Ottawa River, near Snake Creek, Pontiac county, province of Quebec. This, and the five following rock specimens were collected by Mr. A. E. Barlow.

It was found to have the following composition:—

Silica.....	66.94
Alumina.....	17.84
Ferrous oxide.....	4.30
Manganous oxide.....	trace.
Lime.....	1.86
Magnesia.....	1.82
Potassa.....	3.36
Soda.....	1.85
Water, at 100° C.....	0.15
Water, above 100° C.....	1.75
	99.87

Granitite-gneiss, from Taggart Bay, Lake Keepawa, Que

- 2.—Granitite-gneiss. From the north end of Lake Keepawa, west shore of Taggart Bay, near entrance, Pontiac county, province of Quebec.

Its analysis afforded the following results:—

Silica.....	71.69
Alumina.....	14.84
Ferrous oxide.....	1.25
Manganous oxide.....	trace.
Lime.....	1.03
Magnesia.....	0.37
Potassa.....	7.09
Soda.....	3.13
Water, at 100° C.....	0.10
Water, above 100° C.....	0.49
	99.99

- 3.—Granitite-gneiss. From the north end of Lake Keepawa, south shore of McLaren Bay, Pontiac county, province of Quebec. Rocks—Cont.

Its composition was found to be as follows:—

Silica.....	69·39
Alumina.....	17·46
Ferrous oxide.....	1·38
Lime.....	2·14
Magnesia.....	0·52
Potassa.....	2·77
Soda.....	5·18
Water, at 100° C.....	0·06
Water, above 100° C.....	0·47
	99·37

Granitite-gneiss,  
from McLaren Bay, Lake Keepawa, Que

- 4.—Granite-gneiss. From the west shore of Lake Wicksteed, town-ship 8 E., district of Nipissing, province of Ontario. Granite-gneiss,  
from Lake Wicksteed, Ont.

Its analysis afforded the following results:—

Silica.....	67·50
Alumina.....	18·23
Ferrous oxide.....	2·39
Lime.....	1·85
Magnesia.....	1·56
Potassa.....	4·25
Soda.....	3·79
Water, at 100° C.....	0·08
Water, above 100° C.....	0·90
	100·55

- 5.—Granitite-gneiss. From the north end of Opimika Narrows, west shore of Lake Temiscaming, district of Nipissing, province of Ontario. Granitite-gneiss,  
from Opimika Narrows, Lake Temiscaming, Ont.

It was found to have the following composition:—

Silica.....	67·74
Alumina.....	16·13
Ferric oxide.....	1·50
Ferrous oxide.....	1·96
Manganous oxide.....	trace.
Lime.....	4·41
Magnesia.....	1·36
Potassa.....	1·30
Soda.....	4·92
Water, at 100° C.....	0·10
Water, above 100° C.....	0·86
	100·28

- 6.—Quartz-mica-diorite-gneiss. From Otter-tail Creek, lower end of 7th portage, below North Bay and Temiscaming Road, district of Nipissing, province of Ontario. Quartz-mica-diorite-gneiss,  
from Otter-tail Creek, Ont.

Rocks—Cont.

Its composition was found to be as follows :

Silica.....	44.92
Alumina.....	18.88
Ferric oxide.....	2.73
Ferrous oxide.....	13.76
Manganous oxide.....	0.26
Lime.....	9.07
Magnesia.....	5.38
Potassa.....	0.53
Soda.....	2.94
Water, at 100° C.....	0.20
Water, above 100° C.....	1.62
	100.29

## LIMESTONES.

(Continued from page 17 of the last Annual Report of this Survey—vol. viii., 1895.)

Limestone,  
from St. Louis  
de Mile-end  
quarries,  
Montreal,  
Hochelaga  
county, Que.

- 1.—From the St. Louis de Mile-end quarries, Montreal, Hochelaga county, province of Quebec. Geological position—Trenton formation, Cambro-Silurian. Collected by Dr. H. M. Ami, 1896.

A light gray, somewhat coarse-crystalline, massive limestone. Its analysis afforded Mr. R. A. A. Johnston the following results :

(After-drying at 100° C.—Hygroscopic water = 0.14 per cent.)

Carbonate of lime.....	97.68	
“          magnesia.....	0.42	
“          iron.....	0.19	
Alumina.....	0.02	} 1.18
Silica, soluble.....	0.04	
Insoluble mineral matter.....	1.05	
Organic matter.....	0.07	
	99.47	

This stone has been wrought to a considerable extent, chiefly for building purposes.

Limestone,  
from  
St. Laurent de  
Montreal  
quarries,  
Jacques Car-  
tier county,  
Que.

- 2.—From the St. Laurent de Montreal quarries, Jacques Cartier county, province of Quebec. Geological position—Chazy, Cambro-Silurian. Collected by Dr. H. M. Ami, 1896.

A somewhat dark-gray, fine to moderately coarse-crystalline, massive, limestone. An analysis by Mr. Johnston, showed it to have the following composition :

(After drying at 100° C.—Hygroscopic water = 0.16 per cent.)

Carbonate of lime.....	95·03		
“       magnesia.....	2·75		Limestones—
“       iron.....	0·47		Cont.
Alumina.....	0·01	} 1·85	
Silica, soluble.....	0·03		
Insoluble mineral matter.....	1·66		
Organic matter....	0·15		
			100·10

This stone is extensively quarried for structural purposes, and is also used for the manufacture of lime.

3.—From the old quarry on Gale’s farm, Hochelaga, Hochelaga county, Limestone, province of Quebec. Geological position—Trenton formation, from old Cambro-Silurian. Collected by Dr. H. M. Ami, 1896. quarry on Gale’s farm, Hochelaga, Hochelaga county, Que.

A dark gray, for the most part compact, massive limestone. Its composition was found by Mr. Johnston to be as follows :

(After drying at 100° C.—Hygroscopic water = 0·34 per cent.)

Carbonate of lime.....	87·11	
“       magnesia.....	2·79	
“       iron.....	0·50	
Sulphate of lime.....	0·02	
Alumina.....	0·01	} .....
Silica, soluble.....	0·14	
Insoluble matter, consisting of—		} .....
Silica.....	6·73	
Alumina.....	1·40	
Ferric oxide.....	0·31	
Lime.....	0·11	
Potassa.....	none	
Soda.....	none	
Organic matter.....	0·56	
		99·68

This stone has been found to yield a good hydraulic lime.

GOLD AND SILVER ASSAYS.

*These were all conducted by Mr. R. A. A. Johnston.*

As explanatory of the numerous instances in which no trace of either gold or silver was found, it may be mentioned that in nearly all these cases the assay was carried out by special request.

PROVINCE OF NOVA SCOTIA.

1.—From the Boisdale Hills, south-east of the south end of Long Island, Cape Breton county. Examined for Mr. N. L. Nicholson. Province of Nova Scotia.

An association of white sub-translucent quartz with a little serpentine, carrying very small quantities of galena, copper-

Gold  
and silver  
assays—*Cont.*

pyrites and zinc-blende. The sample, consisting of a dozen fragments, weighed two ounces and a half.

It contained neither gold nor silver.

Province of  
Nova  
Scotia—*Cont.*

- 2.—From two miles from Gore Court House, Hants county. Examined for Mr. W. O'Brien.

A weathered schistose rock, carrying small quantities of iron-pyrites. The sample, consisting of two fragments, weighed twelve ounces. It was found to contain :

Gold.....1·925 ounce to the ton of 2,000 lbs.  
Silver.....none.

#### PROVINCE OF NEW BRUNSWICK.

Province of  
New  
Brunswick.

- 3.—From Woodstock, Carleton county. From the so-called No. 1 vein.

An association of white sub-translucent quartz with a gray granular felspathic rock, carrying small quantities of iron-pyrites and galena. The sample, consisting of three fragments, weighed thirteen ounces.

It contained neither gold nor silver.

- 4.—Also from Woodstock, Carleton county. From the so-called No. 2 vein.

A white sub-translucent quartz, carrying galena and iron-pyrites. The sample, consisting of two fragments, weighed four ounces. It was found to contain :

Gold.. .....none.  
Silver.....7·642 ounces to the ton of 2,000 lbs.

- 5.—From Frenchman's Creek, parish of Lancaster, St. John county. This, and the four following specimens, were collected by Prof. L. W. Bailey.

A grayish-white fine granular dolomite, traversed by seams of white sub-translucent quartz carrying small quantities of a honey-yellow zinc-blende, crystalline galena, and tetrahedrite. Weight of sample, a single fragment, one pound. The metallic sulphides, freed from all gangue, contained :

Gold.....none.  
Silver, at the rate of ....25·083 ounces to the ton of 2,000 lbs.

- 6.—Average sample of material from veins at and near the supposed gold mine on Serpentine River, Victoria county.

It consisted of an association of white and gray sub-translucent quartz with gray chloritic and grayish-white quartz-mica schists, carrying very small quantities of iron-pyrites. The sample, consisting of some thirty fragments, weighed twelve pounds and a half.

Gold and silver assays—*Cont.*  
Province of New Brunswick—*Cont.*

It contained neither gold nor silver.

7.—From Bailey Settlement, Charlotte county.

An association of white sub-translucent quartz with a little gray chloritic schist, in parts stained with hydrated peroxide of iron, carrying very small quantities of iron-pyrites. The sample, consisting of seven fragments, weighed four pounds nine ounces.

It contained neither gold nor silver.

8.—From the Murchie Place, between Basswood Ridge road and Getchell Settlement road, Charlotte county.

A white sub-translucent quartz, stained and coated with hydrated peroxide of iron. The sample, consisting of twelve fragments, weighed three pounds five ounces.

It contained neither gold nor silver.

9.—From the Grunner farm, between Basswood Ridge road and Getchell Settlement road, Charlotte county.

An association of white sub-translucent quartz with some crystalline dolomite and a little gray chloritic schist, in parts stained with hydrated peroxide of iron, carrying very small quantities of iron-pyrites and pyrrhotite. The sample, consisting of seven fragments, weighed eight pounds five ounces.

It contained neither gold nor silver.

10.—From near St. Andrews, Charlotte county. Examined for Mr. E. A. Charters.

A flesh-red felspathic rock, through which was disseminated small quantities of iron-pyrites. The sample, consisting of three fragments, weighed six ounces.

It contained neither gold nor silver.

PROVINCE OF QUEBEC.

11.—From the fourteenth lot of the sixth range of the township of Hatley, Stanstead county. This, and the five following specimens were collected by Mr. R. Chalmers.

Province of Quebec.

Gold  
and silver  
assays—*Cont.*

Province of  
Quebec—*Cont.*

An association of a white sub-translucent quartz with some gray talcose schist, carrying small quantities of iron-pyrites and pyrrhotite. The sample, consisting of four fragments, weighed seven pounds.

It contained neither gold nor silver.

12.—From the same locality as the preceding specimen.

A white sub-translucent quartz with which was associated a little gray chloritic schist, carrying very small quantities of pyrrhotite. The sample, consisting of two fragments, weighed one pound nine ounces.

It contained neither gold nor silver.

13.—From the foot of Devils Rapids, Chaudière River, Beauce county.

An association of white quartz with a dark gray schistose rock, for the most part stained with hydrated peroxide of iron. The sample, consisting of three fragments, weighed two pounds eight ounces.

It contained neither gold nor silver.

14.—From the O'Farrell vein, Devils Rapids, Chaudière River, Beauce county.

A white sub-translucent quartz, in parts coated with hydrated peroxide of iron, carrying small quantities of iron-pyrites. The sample, consisting of two fragments, weighed two pounds seven ounces. It was found to contain :

Gold .....	trace
Silver .....	none

15.—From St. Charles, Gilbert River, Beauce county.

A grayish-white quartz stained and coated with hydrated peroxide of iron. The sample, consisting of two fragments, weighed four pounds eleven ounces.

It contained neither gold nor silver.

16.—From the Short farm, near Sherbrooke, Sherbrooke county.

An association of white cryptocrystalline to compact quartz with a little green diorite, in parts coated with hydrated peroxide of iron, carrying small quantities of iron-pyrites. The sample, which was composed of numerous fragments, weighed two pounds six ounces.

It contained neither gold nor silver.

17.—From the eleventh lot of the eleventh range of the township of Sutton, Brome county. Examined for Mr. E. G. Smith.



An association of white quartz-felspar rock with some grayish-green chloritic schist, carrying small quantities of iron-pyrites and pyrrhotite. The sample, consisting of two fragments, weighed six pounds fifteen ounces.

Gold and silver assays—*Cont.*  
Province of Quebec—*Cont.*

It contained neither gold nor silver.

- 18.—From the twenty-second lot of the first range of the township of Thetford, Megantic county. Examined for Dr. James Reed.

An association of a white sub-translucent quartz with some gray chloritic schist, carrying small quantities of iron-pyrites. The sample, which was composed of six fragments, weighed one pound four ounces.

It contained neither gold nor silver.

#### NORTH-EAST TERRITORY.

- 19.—From a vein twenty miles above Fort Chimo, south bank of Koksoak River. This and the five following specimens were collected by Mr. A. P. Low.

North-east Territory.

A weathered rock carrying large quantities of iron-pyrites. The sample, a single fragment, weighed one pound eleven ounces.

It contained neither gold nor silver.

- 20.—From a vein on Fisher Bay, south shore of Hudson Strait.

The sample consisted of two fragments, one of which was an association of white translucent quartz with a little dark gray garnetiferous hornblendic gneiss, carrying very small quantities of iron pyrites; the other, an association of white translucent quartz with very small quantities of gray felspar and cleavable white calcite, in parts stained and coated with hydrated peroxide of iron. Weight of sample, fourteen ounces.

It contained neither gold nor silver.

- 21.—From a vein at the head of Wakeham Bay, south shore of Hudson Strait.

An association of white sub-translucent quartz with a little garnetiferous hornblendic gneiss, through which was disseminated a few particles of pyrrhotite. Weight of sample, eight ounces.

It contained neither gold nor silver.

- 22.—From a vein on Joy Bay, south shore of Hudson Strait.

An association of bluish-white opalescent quartz with a grayish black hornblendic gneiss. Weight of sample, three ounces.

It contained neither gold nor silver.

Gold  
and silver  
assays—*Cont.*

North-east  
Territory—  
*Cont.*

- 23.—From another vein on Joy Bay, south shore of Hudson Strait.

The sample was composed of three fragments, consisting, respectively of—a somewhat coarse grained gray granite with a little hematite; a white translucent quartz, stained and coated with hydrated peroxide of iron; and a white cryptocrystalline quartz, also stained and coated with hydrated peroxide of iron. Weight of sample, seven ounces.

It contained neither gold nor silver.

- 24.—From a vein near Cape Hope's Advance, south shore of Hudson Strait.

An association of white sub-translucent quartz with a dark gray gneissoid rock, carrying small quantities of iron-pyrites. Weight of sample, four ounces.

It contained neither gold nor silver.

#### PROVINCE OF ONTARIO.

Province of  
Ontario.

- 25.—From the south-west arm of Lake Tamagamingue, about two miles from the end of the bay, on the north side, district of Nipissing. Width of vein, twenty-one feet. Taken eighteen feet from the surface. Examined for Mr. P. A. Ferguson.

A grayish-white quartz, carrying somewhat large quantities of crystalline iron-pyrites. The sample, a single fragment, weighed ten pounds four ounces.

It contained neither gold nor silver.

- 26.—From the township of Davis, district of Nipissing.

An association of grayish-white sub-translucent quartz with some white felspar, carrying somewhat large quantities of copper-pyrites and iron-pyrites. Weight of sample, a single fragment, eight ounces. It was found to contain:

Gold..... trace.  
Silver..... 0.408 of an ounce to the ton of 2,000 lbs.

- 27.—From the tenth lot of the sixth concession of the township of Davis, district of Nipissing. Examined for Mr. D. O'Connor.

An association of gray sub-translucent quartz, with a little gray diorite, in parts stained and coated with hydrated peroxide of iron, carrying very small quantities of iron-pyrites and pyrrhotite. Weight of sample, consisting of five fragments, one pound six ounces.

It contained neither gold nor silver.

- 28.—From lot three of the first concession of the township of McKim, Gold and silver assays—*Cont.*  
 district of Nipissing. Examined for Mr. D. O'Connor.

An association of quartz and actinolite, more or less coated with hydrated peroxide of iron, carrying iron-pyrites, copper-pyrites and pyrrhotite. The sample, consisting of several fragments, weighed two pounds seven ounces. Assays gave :  
 Province of Ontario—*Cont*

Gold..... none.

Silver.... 0.700 of an ounce to the ton of 2,000 lbs.

- 29.—From a vein on lot twelve of the fourth concession of the township of Blezard, district of Nipissing. This, and the following specimen were examined for Mr. M. Allard.

The specimen, which was taken from the surface, consisted of a grayish-white quartz carrying iron-pyrites, copper-pyrites and pyrrhotite. The sample, consisting of three fragments, weighed eight ounces.

It contained neither gold nor silver.

- 30.—From the same vein as the preceding specimen, but taken at a depth of seven feet.

It consisted of a grayish-white quartzo-felspathic rock. The sample, consisting of six fragments, weighed one pound.

It contained neither gold nor silver.

- 31.—From lot one of the sixth concession of the township of Shedden, district of Algoma. Examined for Mr. R. J. Whalen.

An association of grayish-white quartz with a dark gray granitic gneiss, more or less coated with hydrated peroxide of iron. The sample, consisting of several fragments, weighed nine pounds.

It contained neither gold nor silver.

- 32.—From lot three of the fourth concession of the township of May, district of Algoma. Examined for Mr. George Boyes.

An association of gray sub-translucent quartz with small quantities of mica-schist, carrying some specular iron and a very little iron-pyrites. The sample, consisting of a very large number of fragments, weighed twenty-five pounds.

It contained neither gold nor silver.

- 33.—From lot thirty-five of the eighth concession of the township of Clarendon, Frontenac county. This, and the following specimen were examined for Mr. J. Muldoon.

Gold  
and silver  
assays—*Cont.*

A massive iron-pyrites, thickly coated with hydrated peroxide of iron. Weight of sample, one pound.

It contained neither gold nor silver.

Province of  
Ontario—*Cont*

34.—From the thirty-eighth lot of the tenth concession of the township of Clarendon, Frontenac county.

An association of white sub-translucent quartz with a small amount of hornblendic rock, containing a few particles of garnet, some black mica and very small quantities of iron-pyrites. The sample, which was, in parts, coated with hydrated peroxide of iron, weighed eleven ounces.

It contained neither gold nor silver.

35.—From the property of Mr. George McLean, lot twenty-six, concession eleven, of the township of Dungannon, Hastings county.

A greenish-gray calcareous pyroxenite, carrying small quantities of iron-pyrites. The sample, consisting of several fragments, weighed three pounds two ounces.

It contained neither gold nor silver.

36.—From lot thirty-five, East Hastings road, township of Dungannon, Hastings county.

A weathered gneissoid rock, through which was disseminated small quantities of iron-pyrites. Weight of sample, ten ounces.

It contained neither gold nor silver.

37.—From the O'Brien shaft, east half of lot twelve, concession four, of the township of Lavant, Lanark county.

A grayish-white dolomitic limestone, through which was distributed a somewhat large quantity of iron-pyrites. It contained :

Gold, ... ..	trace.
Silver.....	none.

38.—From the north-east half of lot twelve, concession two, of the township of South Sherbrooke, Lanark county.

A white translucent quartz, carrying small quantities of copper-pyrites, iron-pyrites and coarsely crystalline galena. The specimen, which was, in parts, coated with hydrated peroxide of iron, weighed one pound eleven ounces. It was found to contain :

Gold.....	3.500 ounces to the ton of 2,000 lbs.
Silver....	0.408 of an ounce " "

39.—A specimen of the bismuthinite, which occurs, in the form of lead-gray lamellar masses, associated with beryl, sphene, et cætera, in

a coarse granite vein in the township of Lyndoch, Renfrew county, has been submitted to assay, and with the following result : Gold and silver assays—*Cont.*

It contained neither gold nor silver.

40.—From the township of Westmeath, Renfrew county.

Province of Ontario—*Cont.*

An association of gray sub-translucent quartz, black pyroxene, fine crystalline gray dolomite, and a little black mica—here and there coated with a little blue carbonate of copper, carrying some iron-pyrites and a little copper-pyrites. The sample, some twenty fragments, weighed twenty-three pounds.

It contained neither gold nor silver.

41.—From the township of Grimsthorpe, Hastings county.

A white, for the most part cryptocrystalline, quartz, carrying small quantities of mispickel. Weight of sample, consisting of three fragments, twenty pounds. It was found to contain :

Gold.....	.....trace.
Silver.....	.....none.

42.—From near the village of Wabigoon, district of Rainy River. Examined for Mr. George Aske.

A white sub-translucent quartz, carrying somewhat large quantities of pyrrhotite. The sample, consisting of two fragments, weighed thirteen ounces.

It contained neither gold nor silver.

43.—From the vicinity of Heron Bay, district of Thunder Bay. Examined for Mr. J. B. Dumoulin.

A white translucent quartz, carrying very small quantities of iron-pyrites and pyrrhotite. The sample, consisting of four fragments, weighed three pounds.

It contained neither gold nor silver.

#### NORTH-WEST TERRITORY.

44.—From Muskow River, below Elbow Lake, district of Keewatin. This, and the two following specimens were collected by Mr. J. B. Tyrell. North-west Territory.

A grayish-white quartz, for the most part stained with hydrated peroxide of iron, carrying small quantities of iron-pyrites.

It contained neither gold nor silver.

45.—From Nelson River, Cross Lake, district of Keewatin.

A weathered quartzose rock. Weight of sample, four ounces.

It contained neither gold nor silver.

Gold  
and silver  
assays—*Cont.*

- 46.—From Nelson River, above Pipestone Lake, district of Keewatin.  
A dark gray quartzite, containing, here and there, a few particles of iron-pyrites. Weight of sample, a single fragment, fourteen ounces.

It contained neither gold nor silver.

North-west  
Territory—  
*Cont.*

- 47.—Ash from a burnt-out seam of lignite on the left bank of the North Saskatchewan River, at Edmonton, district of Alberta. Collected by Dr. G. M. Dawson. Weight of sample, one pound.

It contained neither gold nor silver.

- 48.—From near the west end of Castle Mountain, about two miles from Baker Creek, District of Alberta. Examined for Major Walker.

A somewhat coarsely crystalline galena in a gangue composed of an association of grayish-white felspathic rock with white calcite. The sample, consisting of several fragments, weighed one pound five ounces. It was found to contain :

Gold.....	trace.
Silver.....	1.167 ounce to the ton of 2,000 lbs.

- 49.—From the claim of T. Grierson on Sheep Creek, district of Alberta. Received from Mr. Wm. Pearce.

The material consisted of a mixture of a gray, slightly calcareous sandstone—in some instances stained with hydrated peroxide of iron, with a gray quartz-conglomerate. Weight of sample, two pounds two ounces.

It contained neither gold nor silver.

- 50.—From near the head of Smoky River, district of Alberta. Examined for Mr. George Purches.

A quartz-conglomerate, in parts coated with hydrated peroxide of iron. The sample, consisting of two fragments, weighed eleven ounces.

It contained neither gold nor silver.

- 51.—From No. 8 claim, Eldorado Creek, Klondike River, about three-quarters of a mile up the creek, Yukon district. This, and the two following specimens were collected by Mr. William Ogilvie.

An association of white cryptocrystalline quartz with some grayish-green mica-schist. The sample, a single fragment, weighed nine ounces.

It contained neither gold nor silver.

- 52.—From lower end of cañon on Forty-mile River, Yukon district

An association of white translucent quartz with small quantities of gray mica-schist, in parts thickly coated with hydrated peroxide of iron. The sample, two fragments, weighed one pound two ounces. Gold and silver assays—Cont.

It contained neither gold nor silver.

North-west Territory—Cont.

53.—From the Cone Hill gold claim, Yukon district.

An association of a dark grayish-green serpentine limestone with a white quartzo-felspathic rock, in parts stained and coated with hydrated peroxide of iron and green carbonate of copper.

It contained neither gold nor silver.

#### PROVINCE OF BRITISH COLUMBIA.

Of the following—

Specimens Nos. 54-60 are from the West Kootenay district.

"	61-80	"	Interior plateau region.
"	81-87	"	Coast ranges and coast region.

54.—From the Ruth claim, one and a quarter mile, by road, from Sandon, West Kootenay district. Province of British Columbia.

A coarsely crystalline galena, in parts coated with hydrated peroxide of iron. Weight of sample, one pound one ounce. Assays gave :

Gold.....	.....	none.
Silver.....	..	194.687 ounces to the ton of 2,000 lbs.

55.—From the Black Fox mine, near Nelson, West Kootenay district.

A coarse crystalline galena to which was attached radiating groups of white transparent quartz crystals. The galena, freed from associated quartz, was found to contain :

Gold.....	.....	none.
Silver.....	.....	80.937 ounces to the ton of 2,000 lbs.

56.—From the Cable claim, head of Woodberry Creek, Kootenay Lake, West Kootenay district. Examined for Mr. H. A. Cameron.

A gray quartzo-felspathic rock, through which was disseminated numerous fine particles of iron-pyrites. The sample, two fragments, weighed one pound. It contained :

Gold.....	..	trace.
Silver ..	.....	6.008 ounces to the ton of 2,000 lbs.

57.—From the Sunset claim, near Lardeau, West Kootenay district.

An association of white translucent quartz with a little green chromiferous mica-schist, in parts thickly coated with hydrated

Gold  
and silver  
assays—*Cont.*

peroxide of iron, carrying somewhat large quantities of coarsely crystalline galena. The sample, consisting of five fragments, weighed one pound ten ounces. Assays showed it to contain :

Province of  
British Col-  
umbia—*Cont.*

Gold.....none  
Silver.....86·333 ounces to the ton of 2,000 lbs.

- 58.—From Cariboo Creek, South Fork of Kaslo Creek, West Kootenay district. Examined by Mr. A. Goodanough.

A coarsely crystalline galena, with which was associated small quantities of calcite and cerussite. Assays gave :

Gold.....none  
Silver.....14·583 ounces to the ton of 2,000 lbs.

- 59.—From Laforme Creek, Columbia River, twenty miles north of Revelstoke, West Kootenay district. Examined for Mr. W. E. McLauchlin.

An association of pyrrhotite and mispickel, through which was disseminated a little quartzose gangue. The sample, a single fragment, weighed one pound. It was found to contain :

Gold.....0·467 of an ounce to the ton of 2,000 lbs.  
Silver.....0·408                   "                   "

- 60.—From Six-mile Creek, ten miles below Slocan Lake—West Kootenay district. Examined for Mr. S. L. Goldberg.

An association of white quartz with a white felspar and gray pyroxene, carrying small quantities of pyrrhotite and a few scales of graphite. Weight of sample, one pound one ounce.

It contained neither gold nor silver.

- 61.—From a ledge on Roper Mountain, one mile south of Kamloops Lake, and two miles and a half from Cherry Creek siding on the line of the Canadian Pacific Railway—Interior plateau region. Examined for Mr. John Morrill.

Copper-pyrites with a very small amount of a calcareous gangue. Weight of sample, seven ounces. It contained :

Gold.....none  
Silver.....4·258 ounces to the ton of 2,000 lbs.

- 62.—From three miles south-west of Grande Prairie—Interior plateau region. This, and the two following specimens were collected by Mr. J. McEvoy.



A weathered felspathic rock, here and there coated with green carbonate of copper, carrying large quantities of copper-pyrites. The sample, a single fragment, weighed one pound. Assays gave :

Gold..... trace  
Silver..... 6·533 ounces to the ton of 2,000 lbs.

Gold and  
silver assays—  
*Cont.*  
  
Province of  
British Col-  
umbia—*Cont.*

63.—From Salmon River, fifteen miles south of Grande Prairie, Interior plateau region.

A gray quartzo-felspathic rock, through which was distributed numerous particles of pyrrhotite. The sample, a single fragment, weighed one pound four ounces.

It contained neither gold nor silver.

64.—From nine miles west of Chaperon Lake, Interior plateau region.

A white cryptocrystalline quartz, through which was distributed a few particles of iron-pyrites and copper-pyrites. The sample, consisting of three fragments, weighed two pounds four ounces.

It contained neither gold nor silver.

65.—From the Iron Mask claim, situated about half a mile south of the south-eastern corner of Roper's wire fence on the Savona wagon road, and about half way between Dufferin and Sugar Loaf Hills, Interior plateau region. This, and the six following specimens were examined for Mr. Wentworth F. Wood.

The material, which was taken at a depth of forty feet below the surface, consisted of an association of copper-pyrites, iron-pyrites and magnetite. The sample, two fragments, weighed one pound four ounces. It was found to contain :

Gold..... trace.  
Silver..... 0·483 of an ounce to the ton of 2,000 lbs.

66.—From the Charlotte claim, situated south-east of Coal Hill and about one mile west of James Mellon's house, Interior plateau region.

A white quartz, in parts coated with hydrated peroxide of iron, carrying iron-pyrites and copper-pyrites. The sample, a single fragment, weighed one pound two ounces. Assays showed it to contain :

Gold..... trace.  
Silver..... 1·575 ounce to the ton of 2,000 lbs.

67.—From the Lucky Strike claim, situated half way between Dufferin and Sugar Loaf Hills, Interior plateau region.

Gold and  
silver assays—  
*Cont.*

The material, which was taken from near the surface, consisted of a weathered copper-pyrites. The sample, a single fragment, weighed one pound ten ounces. It contained :

Province of  
British Col-  
umbia—*Cont.*

Gold..... trace.  
Silver..... 0·233 of an ounce to the ton of 2,000 lbs.

- 68.—From the Copper King claim, situated some three hundred yards north of William Roper's house, Interior plateau region.

The material, which was taken at a depth of eighteen feet below the surface, consisted of copper-pyrites in a gangue of gray quartzo-felspathic rock. The sample, a single fragment, weighed four pounds ten ounces. It was found to contain :

Gold..... trace.  
Silver..... 3·792 ounces to the ton of 2,000 lbs.

- 69.—From the Laurier claim, situated on the north side of the Savona wagon road, about half way between James Guerin's and J. L. Hughes's ranches, Interior plateau region.

The sample, a surface specimen, consisted of an association of a gray quartzo-felspathic rock with some white crystalline calcite, in parts coated with green carbonate of copper, carrying somewhat large quantities of copper-glance. Weight of sample, eight ounces. Assays gave ;

Gold..... none.  
Silver..... 0·933 of an ounce to the ton of 2,000 lbs.

- 70.—From the Python claim, situated on the second bench from the top of Coal Hill, north-west of the peak, Interior plateau region.

A weathered quartzo-felspathic rock, coated with hydrated peroxide of iron and green carbonate of copper, carrying somewhat large quantities of iron-pyrites and copper-pyrites. Weight of sample, a single fragment, two pounds. It contained :

Gold..... trace.  
Silver..... 0·117 of an ounce to the ton of 2,000 lbs.

- 71.—From the Iron Cap claim, situated two hundred feet west of the wagon road running from Savona road to Hull's ranch, and about half a mile from the junction of the two roads, Interior plateau region.

A white quartz, in parts coated with hydrated peroxide of iron, carrying copper-pyrites and iron-pyrites. The sample, a single fragment, weighed one pound thirteen ounces. Assays showed it to contain :

Gold..... trace.  
 Silver..... 1·108 ounce to the ton of 2,000 lbs.

Gold and silver assays—*Cont.*

72.—From a boring at the Excelsior claim, Cayoosh Creek, Interior plateau region.

A somewhat finely crushed rock matter, consisting of an association of gray quartz and grayish-black chloritic schist. Weight of sample, two ounces.

Province of British Columbia—*Cont.*

It contained neither gold nor silver.

73.—From a ledge on Dog Creek, Fraser River, Interior plateau region.

A white sub-translucent quartz, in parts coated with hydrated peroxide of iron and blue and green carbonates of copper, carrying small quantities of copper-pyrites. Weight of sample, two fragments, ten ounces.

It contained neither gold nor silver.

74.—From a ledge on Upper Deadman's Creek, Thompson River, Interior plateau region.

A dark gray to white felspathic rock, through which was distributed a few particles of iron-pyrites. The sample, consisting of three fragments, weighed nine ounces.

It contained neither gold nor silver.

75.—This, and the three following specimens are from the Avoca claim, on the west side of Bonaparte River, two miles and a half above Hat Creek, Interior plateau region.

A white quartz, carrying small quantities of iron-pyrites, copper-pyrites and a dark grayish-black tennantite. The sample, consisting of two fragments, weighed two pounds nine ounces. It contained :

Gold..... trace.  
 Silver..... 29·458 ounces to the ton of 2,000 lbs.

76.—A dark grayish-black, massive, tennantite, together with some iron-pyrites and galena and a little quartz. The sample, a single fragment, weighed six pounds twelve ounces. Assays gave :

Gold..... none.  
 Silver..... 57·925 ounces to the ton of 2,000 lbs.

77.—Another sample of this tennantite—free from all foreign admixture—was found to contain :

Gold..... none.  
 Silver..... 69·562 ounces to the ton of 2,000 lbs.

Gold and  
silver assays—  
*Cont.*

The copper was, in this instance, also estimated; it amounted to 41·51 per cent.

Province of  
British Col-  
umbia—*Cont.*

- 78.—Consisted of kaolinite carrying iron-pyrites. The sample, consisting of two fragments, weighed two pounds one ounce.

It contained neither gold nor silver.

- 79.—From the Maggie claim, west side of Bonaparte River, about two miles and a half above Hat Creek, Interior plateau region. This, and the following specimen were examined for Mr. J. B. Bryson.

A white, honeycombed quartz, in parts coated with hydrated peroxide of iron. The sample, consisting of several fragments, weighed four ounces. It was found to contain :

Gold.....trace.  
Silver.....0·525 of an ounce to the ton of 2,000 lbs.

- 80.—Also from the Maggie claim.

An association of gypsum and quartz, coated with hydrated peroxide of iron and green carbonate of copper. The sample, which consisted of numerous fragments, weighed five ounces.

It contained neither gold nor silver.

- 81.—From the Golden Sceptre claim, on Birkenhead River, a tributary of the Mosquito, Coast ranges and Coast region. Examined for Mr. G. Griffith.

A weathered quartz rock, carrying copper-pyrites. Weight of sample, an ounce and a half. Assays gave :

Gold ..... none.  
Silver.....2·187 ounces to the ton of 2,000 lbs.

- 82.—Also from the Golden Sceptre claim.

A white crystalline quartz, for the most part thickly coated with hydrated peroxide of iron and green carbonate of copper, carrying iron-pyrites and copper-pyrites. The sample, consisting of seven fragments, weighed one pound two ounces. It contained :

Gold .....trace.  
Silver.....3·208 ounces to the ton of 2,000 lbs.

- 83.—A specimen of the so-called "red blanket" from the Bimetallic claim—same locality as the two preceding specimens. Examined for Mr. G. Griffith.

A massive iron-ochre. Weight of sample, one ounce and a half.

It contained neither gold nor silver.

84.—From the west side of Harrison Lake, Coast ranges and Coast region. Gold and silver assays—*Cont.*

A light gray quartzo-felspathic rock, in parts coated with hydrated peroxide of iron, carrying small quantities of iron-pyrites. The sample, consisting of four fragments, weighed one pound four ounces. Province of British Columbia—*Cont.*

It contained neither gold nor silver.

85.—From lot eight hundred and twelve, group one, on the north arm of Burrard Inlet, twelve miles from the city of New Westminster and thirteen miles from the city of Vancouver, Coast ranges and Coast region. Examined for Mr. E. H. Rainey.

The material, fifteen samples, consisted of: (1) iron-pyrites and pyrrhotite in a weathered felspathic rock; (2) an association of magnetite with some iron-pyrites and a little copper-pyrites; (3) iron-pyrites and magnetite in a gangue composed of felspar and a little actinolite; (4) a grayish-white quartzo-felspathic rock, carrying iron-pyrites; (5) iron-pyrites in a gangue composed of felspar and a little dolomite; (6) a grayish-white felspathic rock, carrying iron-pyrites; (7) an association of a white sub-translucent quartz with a little yellowish-green epidote; (8) iron-pyrites and magnetite in a grayish-green hornblendic rock; (9) a white quartzo-felspathic rock carrying small quantities of iron-pyrites; (10) a gray quartzo-felspathic rock through which was disseminated small quantities of iron-pyrites; (11) a white, sub-translucent quartz carrying small quantities of copper-pyrites and galena; (12) an association of fine granular pyroxene and white quartz, carrying small quantities of copper-pyrites and iron-pyrites; (13) iron-pyrites in a gangue composed of a gray quartzo-felspathic rock; (14) iron-pyrites in a gangue of white opaque quartz; (15) an association of magnetite and iron-pyrites. The whole was reduced to fine powder, and of this a fair average sample submitted to assay.

It contained neither gold nor silver.

86.—From near Deserted Bay, Jarvis Inlet, Coast ranges and Coast region. Examined for Mr. J. C. Keith.

A massive pyrrhotite. Weight of sample, three ounces. It was found to contain:

Gold.....	.....0·117	of an ounce	o the ton of 2,000 lbs.
Silver.....	.....0·117	“	“ “ “

87.—From Gabriola Island, Strait of Georgia, Coast ranges and Coast region.

Gold and  
silver assays—  
*Cont.*

An association of a grayish-green serpentine rock with some white quartz and calcite, carrying galena and small quantities of iron-pyrites and copper-pyrites. The sample, consisting of five fragments, weighed six ounces. Assays showed it to contain :

Province of  
British Columbia—*Cont.*

Gold.....0·350 of an ounce to the ton of 2,000 lbs,  
Silver.....2·800 ounces “ “

### NICKEL AND COBALT.

Estimation of, in certain ores from the undermentioned localities in the provinces of Ontario and British Columbia—Continued from p. 29 R of the last Annual Report of this Survey, vol. viii., 1895.

Pyrrhotite  
and pyrite,  
from Dal-  
housie, Lan-  
ark county,  
Ont.

- 1.—From the east half of the eighteenth lot of the third concession of the township of Dalhousie, Lanark county, province of Ontario. Examined for Mr. T. B. Caldwell.

An association of white translucent quartz, with a little grayish-white hornblende, carrying large quantities of iron-pyrites and pyrrhotite. An analysis by Mr. Wait showed it to contain :

Nickel. .... 0·165 per cent.  
Cobalt..... trace.

The gangue constituted 29·35 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0·23 per cent of nickel.

Pyrrhotite  
and pyrite,  
from Quartz  
Creek, West  
Kootenay  
district, B. C.

- 2.—From Quartz Creek, a tributary of Salmon River, about twenty miles south of Nelson, West Kootenay district, province of British Columbia. Examined for Mr. W. H. Dixon.

An association of pyrrhotite and iron-pyrites, with small quantities of intermixed calcite and felspar. The pyrrhotite, free from all foreign admixture, was found by Mr. Wait to contain :

Nickel..... trace.

Pyrrhotite,  
chalcopyrite,  
and gers-  
dorffite, from  
Kootenay  
Mountain,  
West Kootenay  
district,  
B. C.

- 3.—From the Kootenay-Columbia property, Kootenay Mountain, a mile and a quarter north-east of the town of Rossland, West Kootenay district, province of British Columbia.

An intimate association of pyrrhotite and chalcopyrite, through which was disseminated a little gersdorffite, in a somewhat calcareous gangue. Weight of sample, six pounds ten ounces. Determinations by Mr. Wait gave :

Nickel..... 0·65 per cent.  
Cobalt..... trace.

The gangue constituted 29.03 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0.92 per cent of nickel. Nickel and cobalt—Cont.

- 4.—From the Queen Victoria claim, on the north side of the Kootenay River, and eight miles west of Nelson, West Kootenay district, province of British Columbia. Pyrrhotite, chalcopyrite, and pyrite, from the Queen Victoria claim, Kootenay River, West Kootenay district, B. C.
- It consisted of iron-pyrites and copper-pyrites, together with some pyrrhotite, in a gangue composed of an association of andradite with some quartz and a few scales of mica. Weight of sample, two pounds ten ounces. It was examined by Mr. Wait, and found to contain :

Nickel.....	0.43 per cent.
Cobalt.....	trace.

The gangue constituted 37.15 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0.68 per cent nickel.

- 5.—From the Evening Star mine, on the east slope of Monte Cristo Mountain, one mile north of the town of Rossland, West Kootenay district, province of British Columbia. Arsenopyrite, and chalcopyrite, from Monte Cristo Mountain, West Kootenay district, B. C.
- It consisted of arsenical-pyrites and copper-pyrites, together with some pyrrhotite, in a gangue composed of black hornblende and a little calcite. An analysis by Mr. Wait gave :

Nickel.....	0.25 per cent.
Cobalt.....	0.59 “

The gangue constituted 62.73 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0.67 per cent nickel, and 1.58 per cent cobalt.

A description and analysis of the cobaltiferous variety of arsenopyrite—danaite, which occurs accompanying ordinary mispickel, pyrrhotite, and pyrite, et cætera, at the above mentioned mine, will be found on p. 13 R, of the last Annual Report of this Survey, vol. viii., 1895.

## NATURAL WATERS.

*The analyses of these, were all conducted by Mr. F. G. Wait.*

- 1.—Water of the Bow River, district of Alberta, North-west Territory. Taken—2nd September, 1896—at low water, mid-stream, and mid-depth, underneath Langevin bridge, at Calgary. Approximate low water discharge 2,784 cubic feet per second. This, and the Water of the Bow River, district of Alberta, N. W. T.

Natural  
waters—Cont.

Water of the  
Bow River,  
district of  
Alberta,  
N.W.T.—Cont.

four following waters were collected by Mr. J. S. Dennis, D.T.S., chief inspector of surveys.

It contained a trifling amount of brownish, flocculent organic matter in suspension—this was removed by filtration. The filtered water was colourless, odourless, and devoid of any marked taste. Reaction, neutral; when evaporated to a small volume, however, it becomes very faintly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·26. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	trace
Soda.....	0·004
Lime.....	0·045
Magnesia.....	0·015
Ferrous oxide.....	trace
Sulphuric acid.....	0·016
Carbonic acid.....	0·131
Chlorine.....	0·001
Silica.....	0·002
Organic matter....	trace
	<hr/>
	0·214

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as mono-carbonates, and all the salts estimated as anhydrous.)

Chloride of sodium.....	0·002
Sulphate of soda.....	0·007
“ potassa.....	trace
“ lime.....	0·020
Carbonate of lime.....	0·066
“ magnesia.....	0·031
“ iron.....	trace
Silica.....	0·002
Organic matter.....	trace
	<hr/>
	0·128
Carbonic acid, half-combined.....	0·045
“ free.....	0·041
	<hr/>
	0·214

Total dissolved solid matter, by direct experiment,  
dried at 180° C., 0·115.

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallization.)



	Grains.	
Chloride of sodium.....	0·140	Natural waters— <i>Cont.</i>
Sulphate of soda.....	0·490	
“ potassa.....	trace.	
“ lime.....	1·400	
Bi-carbonate of lime.....	6·652	Water of the Bow River, district of Alberta, N. W. T.— <i>Cont.</i>
“ magnesia.....	3·291	
“ iron.....	trace.	
Silica.....	0·140	
Organic matter.....	trace.	
	12·113	
Carbonic acid, free.....	2·871	
	14·984	

2.—Water of the Elbow River, district of Alberta, North-west Territory. Taken—2nd September, 1896—at low water, mid-stream, and mid-depth, underneath Mission bridge, at Calgary. Approximate low water discharge, 210 cubic feet per second. Water of the Elbow River, district of Alberta, N. W. T.—*Cont.*

It was clear, bright, colourless, odourless, and devoid of any marked taste. Reaction, neutral; when evaporated to a small volume, however, it reacted very faintly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·36. Boiling produced a small precipitate, consisting of carbonates of lime and magnesia, with a trace of ferric hydrate.

One thousand parts, by weight, of the water, at 15·5° C., were found to contain :

Potassa.....	0·001
Soda.....	0·008
Lime.....	0·074
Magnesia.....	0·024
Ferrous oxide.....	trace.
Sulphuric acid.....	0·034
Carbonic acid.....	0·151
Chlorine.....	0·001
Silica.....	0·004
Organic matter.....	trace.
	0·297

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as mono-carbonates, and all the salts estimated as anhydrous.)

Natural waters— <i>Cont.</i>	Chloride of sodium .....	0·002	
	Sulphate of soda .....	0·016	
	“ potassa .....	0·002	
	“ lime .....	0·041	
Water of the Elbow River, district of Alberta, N. W. T.— <i>Cont.</i>	Carbonate of lime .....	0·102	
	“ magnesia .....	0·050	
	“ iron .....	trace.	
	Silica .....	0·004	
	Organic matter .....	trace.	
		<hr/>	0·217
	Carbonic acid, half-combined .....	0·071	
“ free .....	0·009		
	<hr/>	0·297	
	Total dissolved solid matter, by direct experiment, dried at 180° C., 0·212.		

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallisation.)

	Grains.
Chloride of sodium .....	0·140
Sulphate of soda .....	1·120
“ potassa .....	0·140
“ lime .....	2·871
Bi-carbonate of lime .....	10·294
“ magnesia .....	5·322
“ iron .....	trace.
Silica .....	0·280
Organic matter .....	trace.
	<hr/>
	20·167
Carbonic acid, free .....	0·630
	<hr/>
	20·797

Water of the  
Highwood  
River, district  
of Alberta,  
N. W. T.

- 3.—Water of the Highwood River, district of Alberta, North-west Territory. Taken—5th September, 1896—at low water, mid-stream, and mid-depth, underneath traffic bridge at High River. Approximate low water discharge, 667 cubic feet per second.

It was perfectly clear and bright, colourless, odourless, and devoid of any marked taste. Reaction, neutral; when evaporated to a small volume, however, it becomes very faintly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·29. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the water, at 15·5° C., were found to contain :

Potassa.....	trace.	Natural waters— <i>Cont.</i>
Soda.....	0·008	
Lime.....	0·063	
Magnesia.....	0·019	Water of the Highwood River, district of Alberta, N.W.T.— <i>Cont.</i>
Ferrous oxide....	trace.	
Sulphuric acid.....	0·020	
Carbonic acid.....	0·128	
Chlorine.....	0·001	
Silica.....	0·008	
Organic matter.....	trace.	
	<hr/> 0·247	

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as mono-carbonates, and all the salts estimated as anhydrous.)

Chloride of sodium.....	0·002
Sulphate of soda.....	0·016
“ potassa.....	trace.
“ lime.....	0·019
Carbonate of lime.....	0·098
“ magnesia.....	0·040
“ iron.....	trace.
Silica.....	0·008
Organic matter.....	trace.
	<hr/> 0·183
Carbonic acid, half-combined..	0·064
“ free.....	.....
	<hr/> 0·247
Total dissolved solid matter, by direct experiment, dried at 180° C., 0·178.	

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallization.)

	Grains.
Chloride of sodium.....	0·140
Sulphate of soda.....	1·120
“ potassa.....	trace.
“ lime.....	1·331
Bi-carbonate of lime.....	9·873
“ magnesia.....	4·271
“ iron.....	trace.
Silica.....	0·560
Organic matter.....	trace.
	<hr/> 17·295
Carbonic acid, free.....	.....
	<hr/> 17·295

Natural  
waters—*Cont.*

Water of  
Fish Creek,  
district of  
Alberta,  
N.W.T.

4.—Water of Fish Creek, district of Alberta, North-west Territory. Taken—26th August, 1896—at low water, mid-stream and mid-depth, underneath bridge on McLeod trail. Approximate low water discharge, 5 cubic feet per second.

It contained a trifling amount of brownish, flocculent organic matter in suspension—this was removed by filtration. The filtered water—which was perfectly clear and bright, was colourless, odourless, and devoid of any marked taste. Reaction, neutral; when evaporated to a small volume, however, daintly alkaline. Its specific gravity, at 15.5° C., was found to be 1000.38. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the filtered water, at 15.5° C., were found to contain:

Potassa ..	0.004
Soda ..	0.022
Lime ..	0.063
Magnesia ..	0.030
Ferrous oxide ..	trace.
Sulphuric acid ..	0.011
Carbonic acid ..	0.189
Chlorine ..	0.001
Silica ....	0.013
Organic matter ..	trace.
	<hr/>
	0.333

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination:

(The carbonates being calculated as mono-carbonates, and all the salts estimated as anhydrous.)

Chloride of sodium ..	0.002
Sulphate of soda ..	0.014
“ potassa ..	0.007
Carbonate of soda ..	0.027
“ lime ..	0.112
“ magnesia ..	0.063
“ iron ..	trace.
Silica ..	0.013
Organic matter ..	trace.
	<hr/>
	0.233
Carbonic acid, half-combined ..	0.093
“ free ..	0.002
	<hr/>
	0.333

Total dissolved solid matter, by direct experiment,  
dried at 180° C., 0.232.

An imperial gallon of the water, at 15.5° C., would contain:

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallization.)

	Grains.	Natural waters— <i>Cont.</i>
Chloride of sodium.....	0·140	
Sulphate of soda.....	0·980	
“ potassa.....	0·490	Water of Fish Creek, district of Alberta, N.W.T.— <i>Cont.</i>
Bi-carbonate of soda.....	2·661	
“ lime.....	11·274	
“ magnesia.....	6·723	
“ iron.....	trace.	
Silica.....	0·910	
Organic matter.....	trace.	
	<hr/>	
Carbonic acid, free..	23·178	
	0·140	
	<hr/>	
	23·318	

5.—Water of the Sheep River, district of Alberta, North-west Territory. Taken—6th September, 1896—at low water, mid-stream, and mid-depth, underneath Calgary and Edmonton railway bridge, near Dewdney. Approximate low water discharge, 257 cubic feet per second. Water of the  
Sheep River,  
district of  
Alberta,  
N.W.T.

It contained a trifling amount of white, flocculent organic matter in suspension—this was removed by filtration. The filtered water was perfectly clear and bright, colourless, odourless, and devoid of any marked taste. Reaction, neutral, but when evaporated to a small volume, decidedly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·33. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	0·001
Soda ..	0·011
Lime.....	0·069
Magnesia.....	0·022
Ferrous oxide.....	trace.
Sulphuric acid .....	0·030
Carbonic acid.....	0·140
Chlorine.....	0·001
Silica.....	0·005
Organic matter.....	trace.
	<hr/>
	·0279

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as mono-carbonates and all the salts estimated as anhydrous.)

Natural waters— <i>Cont.</i>	Chloride of sodium .....	0·002
	Sulphate of soda .....	0·023
	“ potassa .....	0·002
	“ lime .....	0·027
Water of the Sheep River, district of Alberta, N. W. T.— <i>Cont.</i>	Carbonate of lime .....	0·104
	“ magnesia .....	0·046
	“ iron .....	trace.
	Silica .....	0·005
	Organic matter .....	trace.
		0·209
	Carbonic acid, half-combined .....	0·070
	“ free .....	.....
		0·279
Total dissolved solid matter, by direct experiment, dried at 180° C., 0·200.		

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallization.)

	Grains.
Chloride of sodium .....	0·140
Sulphate of soda .....	1·610
“ potassa .....	0·140
“ lime .....	1·891
Bi-carbonate of lime .....	10·503
“ magnesia ..	4·902
“ iron .....	trace.
Silica .....	0·350
Organic matter .....	trace.
	19·536
Carbonic acid, free .....	.....
	19·536

The foregoing five river waters were, it may be mentioned, collected with a due observance of all the necessary precautions. The containers consisted of stoppered glass bottles of the kind technically known as “Winchester Quarts.”

6.—Water from a boring at Crescent Grove, Baddeck Bay, Victoria county, province of Nova Scotia. Examined for Mr. A. W. McCurdy.

Water from  
a boring at  
Baddeck Bay,  
Victoria  
county, N.S.

The sample received for examination contained a trifling amount of brownish flocculent matter in suspension ; this was removed by filtration. The filtered water was bright, colourless, odourless, and devoid of any marked taste. Reaction, neutral ; when evaporated to a small volume, however, decidedly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·96. The total

dissolved saline matter, dried at 180° C., amounted to 1.029 parts per 1,000—equivalent to 72.1 grains per imperial gallon. Natural waters—*Cont.*

A qualitative analysis indicated the presence of :

Soda .....	somewhat large quantity.	Water from a boring at Baddeck Bay, Victoria county, N.S.— <i>Cont.</i>
Lime .....	very small quantity.	
Magnesia ...	very small quantity.	
Sulphuric acid.....	small quantity.	
Carbonic acid.....	small quantity.	
Chlorine .....	rather small quantity.	
Silica.....	trace.	
Organic matter .....	none.	

Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

- 7.—Water from a well near Cantley post-office, lot nine, range thirteen, of the township of Hull, Ottawa county, province of Quebec. Examined for Mr. Robert Brown. Water from a well in Cantley, Ottawa county, Q.

The sample received for examination was slightly turbid, and contained a small quantity of white flocculent organic matter in suspension. This was removed by filtration. The filtered water had a faint yellowish colour; was odourless, and had a somewhat flat taste. Reaction, neutral; when reduced to a small volume, however, faintly alkaline. It contained 0.90 parts of dissolved saline matter, dried at 180° C., in 1,000 parts, by weight, of the water—equivalent to 63 grains per imperial gallon.

A qualitative analysis showed it to contain :

Soda .....	rather small quantity.
Lime.....	small quantity.
Magnesia ...	very small quantity.
Alumina .....	trace.
Ferrous oxide .....	trace.
Sulphuric acid.....	small quantity.
Carbonic acid.....	very small quantity.
Chlorine.....	rather small quantity.
Silica.....	trace.
Organic matter .....	faint trace.

Boiling produced a slight precipitate, consisting of carbonate of lime with some carbonate of magnesia and a very little sulphate of lime.

- 8.—Water from a spring on the north-east half of the thirteenth lot of the sixth range of the township of Litchfield, Pontiac county, province of Quebec. Examined for Mr. William Kelly. Water from a spring in Litchfield, Pontiac county, Q.

The sample received for examination contained a small quantity of brownish, flocculent organic matter in suspension; this was

Natural  
waters—*Cont.*

removed by filtration. The filtered water was bright, colourless, odourless, and devoid of any marked taste. Reaction, neutral—both before and after concentration. Its specific gravity, at 15·5° C., was found to be 1000·17. The total dissolved saline matter, dried at 180° C., amounted to 0·18 parts per 1000—equivalent to 12·6 grains per imperial gallon.

Water from a  
spring in  
Litchfield,  
Pontiac  
county, Q.—  
*Cont.*

It was found to contain :

Soda.....	very small quantity.
Lime .....	small quantity.
Magnesia .....	small quantity.
Sulphuric acid.....	very small quantity.
Carbonic acid .....	rather small quantity.
Chlorine .....	very small quantity.
Silica.....	trace.
Organic matter.....	none.

Boiling produced a small precipitate, consisting of carbonates of lime and magnesia with traces of sulphate of lime.

Water from a 9.—  
spring in  
Litchfield,  
Pontiac  
county, Q.

Water from another spring on the north-east half of the thirteenth lot of the sixth range of the township of Litchfield, Pontiac county, province of Quebec. Examined for Mr. William Kelly.

The sample supplied for examination contained a small quantity of brownish, flocculent organic matter in suspension, which was removed by filtration. The filtered water had a faint brownish-yellow colour, was devoid of odour, and any marked taste. Reaction, neutral—when evaporated to a small volume, however, alkaline. Its specific gravity, at 15·5° C., was found to be 1000·41. The total dissolved saline matter, dried at 180° C., amounted to 0·374 parts per 1000—equivalent to 26·18 grains per imperial gallon.

It contained :

Potassa.....	trace.
Soda.....	rather small quantity.
Lime .....	small quantity.
Magnesia .....	small quantity.
Sulphuric acid.....	small quantity.
Carbonic acid.....	somewhat large quantity.
Chlorine .....	small quantity.
Silica .....	trace.
Organic matter.....	trace.

Boiling produced a rather small precipitate, consisting of carbonates of lime and magnesia.

Water from a  
spring on  
Mount  
Baldur, West  
Kootenay  
district, B.C.

10.—Water from a spring on Mount Baldur, between Fosthall and Pingston Creeks, west side of upper Arrow Lake, West Kootenay



district, province of British Columbia. This, and the following water, were examined for Mr. W. D. McGee. Natural waters—Cont.

The sample sent for examination, contained a small quantity of brownish-yellow flocculent matter in suspension. This was removed by filtration. It consisted almost exclusively of hydrated peroxide of iron. The filtered water was clear, bright, colourless, odourless, and devoid of any marked taste. Reaction, faintly acid. The total dissolved saline matter, dried at 180° C., amounted to 0.196 parts per 1000—equivalent to 13.72 grains per imperial gallon. Water from a spring on Mount Baldur, West Kootenay district, B.C.—Cont.

A qualitative analysis showed it to contain :

Soda.....	trace.
Lime.....	small quantity.
Magnesia.....	very small quantity.
Ferrous oxide.....	very small quantity.
Sulphuric acid.....	somewhat large quantity.
Chlorine.....	trace.
Silica.....	trace.

Boiling produced a very slight precipitate, consisting of hydrated peroxide of iron with a trace of sulphate of lime.

- 11.—Water from another spring—some eight hundred feet distant from that from which the preceding water was taken—on Mount Baldur, between Fosthall and Pingston Creeks, west side of upper Arrow Lake, West Kootenay district, province of British Columbia. Water from a spring on Mount Baldur, West Kootenay district, B.C.

The sample received for examination, contained a trifling amount of white, flocculent organic matter in suspension—this was removed by filtration. The filtered water was found to be clear and bright, of a faint brownish-yellow colour, devoid of odour, and any marked taste. Reaction, neutral—when evaporated to a small volume, however, faintly alkaline. The total dissolved saline matter, dried at 180° C., amounted to 0.074 parts per 1000—equivalent to 5.18 grains per imperial gallon.

It was found to contain :

Soda.....	trace.
Lime.....	very small quantity.
Magnesia.....	strong traces.
Ferrous oxide.....	trace.
Sulphuric acid.....	very small quantity.
Carbonic acid.....	very small quantity.
Chlorine.....	trace.
Silica.....	trace.
Organic matter.....	trace.

Boiling produced but a trifling precipitate, consisting of carbonate of lime.

Natural  
waters—*Cont.*

12.—Water from a spring on Mayne Island off the south-east coast of Vancouver Island, province of British Columbia.

Water from a  
spring on  
Mayne  
Island, B.C.

The sample sent for examination, contained a very trifling amount of white, flocculent organic matter in suspension. This was removed by filtration. The filtered water was colourless; had a faint odour of sulphuretted hydrogen, and a somewhat flat taste. It reacted neutral; when evaporated to a small volume, however, distinctly alkaline. The total dissolved saline matter, dried at 180° C., amounted to 0.42 parts per 1000—equivalent to 29.4 grains per imperial gallon.

A qualitative analysis gave:

Potassa.....	very small quantity.
Soda.....	small quantity.
Lime.....	very small quantity.
Magnesia.....	trace.
Sulphuric acid.....	very small quantity.
Carbonic acid.....	very small quantity.
Chlorine.....	small quantity.
Silica.....	trace.
Organic matter.....	trace.

Boiling produced but a very slight precipitate.

Water from a  
spring on  
Cañon Creek,  
Alaska.

13.—Water from one of several springs on Cañon Creek, a tributary of Forty-mile River, about three miles west of the International Boundary, in Alaska; but springs of a similar water occur, according to Mr. William Ogilvie, in a south-easterly direction from this, on Glacier Creek, an affluent of Sixty-mile River, a short distance east of the International Boundary, in the Yukon district, North-west Territory.

The sample examined—which was collected by Mr. Ogilvie—was, apart from a trifling amount of white flocculent organic matter, clear and colourless. On removal of the stopper of the container, there was a brisk evolution of carbonic acid, the water became turbid, and deposited earthy carbonates. Reaction, acid; when evaporated to a small volume, however, alkaline. Its specific gravity, at 15.5° C., was found to be 1005.10. The total dissolved saline matter, dried at 180° C., amounted to 3.795 parts per 1,000—equivalent to 266.98 grains per imperial gallon.

A qualitative analysis showed it to contain;

Potassa.....	trace.	Natural
Soda.....	small quantity.	waters— <i>Cont.</i>
Lithia.....	faint trace.	
Strontia.....	faint trace.	
Lime.....	large quantity.	Water from a
Magnesia.....	large quantity.	spring on
Ferrous oxide.....	trace.	Cañon Creek,
Sulphuric acid.....	somewhat large quantity.	Alaska— <i>Cont.</i>
Carbonic acid.....	very large quantity.	
Chlorine.....	very small quantity.	
Silica.....	very small quantity.	
Organic matter.....	trace.	

Boiling produced a copious precipitate, consisting of carbonates of lime and magnesia.

This water recalls to mind that of Dougherty's so-called "Carbonic acid spring"—previously described as occurring in mountains between Clinton and Carguile's, but which is now known as the "Soda" spring, and would be more accurately described as being situate on the west side of the wagon road, about ten miles south of Clinton, in Lillooet district—the results of the examination of which are given in one of my previous reports. (Rep. Geol. Surv. Can., new series, vol. 2, p. 13 T, 1886).

#### MISCELLANEOUS EXAMINATIONS.

- 1.—Actinolite. A greenish-gray, fine-columnar, compact, massive actinolite, from Keisey's lot, township of Dalhousie, Lanark county, province of Ontario; and a light greenish-gray, fine-fibrous, massive variety of this mineral from the township of Potton, Brome county, province of Quebec, have been examined by Mr. Johnston and found to contain—the former, 3.02; and the latter, 4.71 per cent of ferrous oxide. Actinolite, \*  
from Lanark  
county, O.;  
and Brome  
county, Q.
- 2.—Clay. A sample of clay from Riding Mountain, province of Manitoba, received from Messrs. Munson and Allan, has been examined by Mr. Wait, and found to be impregnated with sulphates of magnesia, lime, alumina and iron—principally the first named. These, amounting in all to from three to four per cent of the whole, were readily removable by treatment of the material with water. The residue subsequently treated with hot dilute hydrochloric acid, yielded to this reagent rather large amounts of iron, alumina and magnesia, and a small quantity of lime. The clay proved to be highly plastic at all stages, namely, in its natural state, after treatment with water, as likewise after treatment with dilute acid. In its natural state, it burns light reddish. Clay from  
Riding  
Mountain,  
Man.

Miscellaneous  
examinations  
—Cont.

brown and is readily fusible; after treatment with water, it still burns pale reddish-brown and is somewhat readily fusible; after treatment with acid it burns perfectly white and is somewhat difficultly fusible. This material would appear to have resulted from the weathering of a highly pyritiferous shale.

Clay from  
junction of  
Coldwater  
and Nicola  
Rivers, B.C.

- 3.—Clay. This clay occurs in connection with the coal seams at the junction of the Coldwater with the Nicola river, Yale district, province of British Columbia. It is a bluish-gray—in the air-dried condition, dull yellow to brownish-yellow weathering, non-calcareous, plastic clay, which when burnt assumes a very pleasing light red, gray, or pale russet colour. It is somewhat readily fusible at an elevated temperature.

Clay from  
Marshall's  
Town, N.S.

- 4.—Clay. From what is said to be an extensive deposit situate about a mile south-east of Marshall's Town church, Digby county, province of Nova Scotia. A light gray—in the air-dried condition, non-calcareous, plastic, difficultly fusible clay, which when burnt has a yellowish-white tinge. It would appear to be well suited for the manufacture of ordinary building brick, stove linings, and would make a fairly refractory fire-brick.

Graphitic  
shale from  
French Vale,  
Cape Breton  
county, N.S.

- 5.—Graphitic shale. From near Guthro' Lake, French Vale, Cape Breton county, province of Nova Scotia. The results of a complete analysis of a sample of the material from this locality, together with full particulars in regard to the nature of the graphite contained in it, are given in the Report of Progress of this Survey for 1879-80, p. 1 H. The present specimen was received from the Rev. M. A. Macpherson, who stated that the deposit is now in course of development, and seems to turn out very well. It was found by Mr. Wait to contain 45.43 per cent of graphitic carbon.

Graphitic  
shale, from  
Thorns Brook,  
Kings county,  
N.B.

- 6.—Graphitic shale. From the east side of Thorns brook, parish of Havelock, Kings county, province of New Brunswick. Collected by Mr. H. P. H. Brumell, who describes the deposit—Report of Progress of this Survey for 1890-91, p. 71 ss—in the following words:—"It is about twenty feet wide, striking north-east, and is in altered slates which are very much jointed and broken up. The graphite is nowhere very solid where exposed, but can readily be dug with pick and shovel. It is said the deposit can be traced for over a mile on the strike of the vein." This material was found by Mr. Wait to contain not more than 7.51 per cent of graphitic carbon.

- 7.—Hematite. A fossiliferous red hematite from the mouth of Mabou Harbour, Inverness county, province of Nova Scotia, received from Mr. M. McFadyen, has been examined by Mr. Wait and found to contain ferric oxide 61.10=42.77 metallic iron; manganous oxide 0.14; phosphoric acid equivalent to at least 0.4 phosphorous, and insoluble residue 30.77 per cent. Miscellaneous  
examinations  
—Cont.  
Hematite  
from Mabou  
Harbour, N.S.
- 8.—Peat. A sample of peat received from Mr. Gideon Bower, of Vancouver, province of British Columbia, examined by Mr. Wait, was found to contain 49.05 per cent water, and to leave on incineration 15.23 per cent of a light brownish-yellow coloured ash. Peat from  
Vancouver,  
B.C.
- 9.—Tremolite. The percentage of ferrous iron in tremolite from the undermentioned localities in the province of Ontario, has been estimated by Mr. Johnston, and found to be as follows:—(a) A light faint greenish-gray tremolite from the west half of the twenty-sixth lot of the twelfth concession of the township of Bathurst, Lanark county, 0.92 per cent ferrous oxide: (b) a dark gray, radiating fibrous tremolite, from the township of Kennebec, Frontenac county, 1.13 per cent ferrous oxide: (c) a very pale greenish-gray, fine fibrous tremolite from the thirty-seventh lot of the seventh concession of the township of Clarendon, also in Frontenac county, 0.96 per cent ferrous oxide; (d) a grayish-white translucent tremolite, with a vitreous lustre, from the twenty-third lot of the fourth concession of the township of Ross, Renfrew county, 0.17 per cent ferrous oxide: (e) a light greenish-gray fibrous tremolite, found on the twenty-second and twenty-third lots of the fourth concession of the township of Blythfield, also in Renfrew county, 2.25 per cent ferrous oxide: (f) a massive faintly greenish-grayish-white, radiating fibrous tremolite from the thirteenth lot of the third concession of the township of Bagot, in the last mentioned county, 0.91 per cent, ferrous oxide.

