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FIELD WORK, 1957

by

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FIELD WORK, 1957

The following notes describe briefly, by provinces, the sixty-nine field projects undertaken by the Geological Survey of Canada during 1957, indicate progress made, and briefly summarize some of the results. The main purpose of most Geological Survey field work is to obtain basic data concerning the geology of Canada. These data, when assembled, interpreted, and published as appropriate maps and reports, guide those engaged in the search for and development of metallic and non-metallic mineral deposits, fuels, and construction materials. From time to time, however, as an incidental product of the field work, geological features or mineral occurrences are noted that may be of immediate or direct economic interest. Some of these warrant prompt release, in advance of the more formal preliminary reports of the Survey's Paper Series. A few such economic items are included in the following notes.

All statements concerning the results of field work are subject to confirmation by office and laboratory study, and by publication by the officer concerned through Geological Survey or other media.

Map-areas are designated according to the National Topographic System in effect up to and including 1957[1].

DISTRICT OF FRANKLIN

R.G. Blackadar completed a coastal reconnaissance, commenced in 1956, of that part of northwest Baffin Island lying between latitudes 69°30' and 71°30', and longitudes 76°00' and 88°00'. This survey is an extension of a previous reconnaissance[2] of the Admiralty Inlet area.

The oldest formations are schists, quartzites, and a little iron formation. The next youngest rocks are granite

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[1] Surveys and Mapping Branch: Index Map of Canada according to the National Topographic Series. Obtainable from The Map Distribution Office, Department of Mines and Technical Surveys, Ottawa.

This system has since been modified. An index map showing the resulting National Topographic System (Revised 1957) may also be obtained from the Map Distribution Office.

[2] Blackadar, R.G.: Geological Reconnaissance of Admiralty Inlet, Baffin Island, Arctic Archipelago, Northwest Territories; Geol. Surv., Canada, Paper 55-6 (1956).

and granite gneiss that underlie most of the area examined. The granitic rocks are overlain by gently inclined Proterozoic sandstones and slates which outcrop mainly on the shores of Fury and Hecla Strait. The Proterozoic strata are cut by gabbro sills and dykes, and a few similar dykes cut older rocks. Ordovician and/or Silurian limestone presumably underlies the islands of Foxe Basin, and outcrops on the adjoining low coasts, particularly on the east side of Melville Peninsula.

Massive magnetite, and banded iron formation composed of magnetite and hematite interlayered with quartzite, occur in a mile-wide, steeply dipping assemblage of biotite-amphibole schist, biotite-garnet schist, and similar meta-sedimentary rocks that outcrop on the southeast side of Isortoq Fiord[1]. These strata extend inland, northeasterly, for at least 20 miles. They are bounded on the northwest and southeast by granite and granite gneiss. Small dykes and sills of granite intrude the meta-sediments. The massive magnetite occurs as a body about 100 feet thick and was traced for a length of about 1,000 feet before becoming obscured by talus. Several units of banded iron formation of similar thickness were traced for more than a mile along strike.

R.L. Christie, attached to Defence Research Board's Operation Hazen for logistical and administrative purposes, made a geological reconnaissance in the Hazen Lake area, northern Ellesmere Island. The reconnaissance included the area immediately surrounding the lake, and extended about 20 miles to the northwest, and about 50 miles to the southeast, to the southeast shore of Archer Fiord. Coal, occurring within strata of the Tertiary, Eureka Sound group, was found to outcrop continuously for about 10 miles along the northwest shore of Lake Hazen. As many as five seams were noted, commonly 2 to 4 feet thick. In one place an 8-foot seam was seen.

R. Thorsteinsson made a coastal reconnaissance, commenced in 1956, of parts of Canyon Fiord, Eureka Sound, Greely Fiord, Nansen Sound and tributary fiords, and the west coast of Axel Heiberg Island, as far south as Li Fiord. He also visited Meighen Island west of Axel Heiberg Island.

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[1] Surveys and Mapping Branch: Foxe Basin North, National Topographic Series, Sheets 37 S.W. and 37 S.E. (1950).

E.T. Tozer, taking advantage of facilities afforded by a Shoran station on Cornwall Island and travelling by dog-team, was able to explore Ekins and Table Islands to the south. He also examined southern Eureka Sound, thereby linking his 1957 survey with observations made there in 1956 in the company of R. Thorsteinsson.

Exmouth and Table Islands were found to be underlain by rocks forming a nearly complete Triassic section. These strata are about 1,500 feet thick and gently folded.

DISTRICT OF MACKENZIE

R.J.W. Douglas commenced and completed a helicopter-supported reconnaissance survey of about 100,000 square miles of the Upper Mackenzie River drainage basin (85 A to H and J to N, exclusive of northeast parts of A, H, J, and N; 95 A, B, C, F to K, N, O, and P). The following officers of the Geological Survey staff accompanied Dr. Douglas: W.B. Brady, B.G. Craig, P. Harker, D.J. McLaren, A.W. Norris, D.K. Norris, B.R. Pelletier, and D.F. Stott. The remainder of the party comprised nine survey assistants, three aircraft pilots, three aircraft engineers, a boatman and a crewman, a radio operator, and two cooks. This reconnaissance, which was known as Operation Mackenzie, was the seventh such operation whereby the Geological Survey has utilized helicopters to survey large relatively inaccessible regions of Canada. The cost of the operation was approximately $184,000, exclusive of wages of permanent staff. The area examined includes much of that part of District of Mackenzie currently being actively explored for oil and gas.

A particular effort was made to obtain stratigraphic information, to establish the sequence of formations as represented from place to place throughout the area, to correlate these strata, to study their variations and mode of origin, and to determine the geological structure. About 250,000 feet of stratigraphic sections were measured, described, and sampled, and their contained fossils collected. In addition to the stratigraphic and related data expected to result from the forthcoming office studies, geological maps will be prepared, probably on a scale of 1 inch to 8 miles for the plains areas, and on a scale of 1 inch to 4 miles for the mountainous areas.

B.G. Craig participated in Operation Mackenzie as officer responsible for the surficial (Pleistocene and Recent) geology. It was found that the Pleistocene ice flowing west southwest from the Canadian Shield was parted

by the Horn Mountains. Thus the northern part of the ice stream was deflected until it flowed north-northwest along Mackenzie River at latitude 64°; and the southern part of the stream flowed about southwest where it crossed latitude 60° between Great Slave Lake and Liard River. The western limits of glacial Great Slave Lake, about 900 feet above sea-level (or nearly 400 feet above the present lake level), were mapped. Gravel beaches commonly mark the former lake shores.

J.A. Fraser completed all but the northwest quarter of Fort Enterprise (86 A) map-area. Probably the unmapped part is underlain mainly by granitic rocks.

The mapped area is underlain mainly by granite gneiss, porphyritic massive granite, and muscovite granite with pegmatite. Sedimentary and volcanic rocks of the Yellowknife group cross the northeast corner of the map-area, where they occupy a belt 3 to 6 miles wide lying a mile or two southwest of Lake Providence and west of Point Lake. The other main area of these rocks is bounded by Credit, Beauparlant, and Newbigging Lakes, and a point 8 miles northeast of Grizzlebear Lake. Gossans, derived from pyrite and/or pyrrhotite, are particularly common in the latter area. They occur at the contacts of Yellowknife volcanic and sedimentary rocks, and at the contact of Yellowknife volcanic rocks with granitic intrusions. Field work did not disclose the presence of valuable metals.

YUKON

L.H. Green completed field work within Scougale Creek (106 D/2) and McQuesten Lake (106 D/3) map-areas.

The strata are mainly sedimentary schists and quartzite of the Precambrian(?) Yukon group. Also included in the Yukon group are basic sills that intruded the sedimentary rocks. A small area of Ordovician dolomite underlies the northeast corner of Scougale map-area, and a minor area of Mesozoic granodiorite was mapped in the extreme southwest corner of McQuesten Lake map-area. A westerly-trending southerly-dipping thrust fault crosses the southern part of Scougale map-area and extends into McQuesten Lake map-area. Yukon group strata south of this fault lie in a recumbent fold, overturned towards the north, and have been thrust northerly over presumably younger strata of the Yukon group.

Many of the silver-lead deposits of Keno and Galena Hills occur in fault zones in or close to quartzite. Similar massive quartzite was found to outcrop in the southeast corner of McQuesten Lake map-area, on the first ridge

north of Keno Ladue River, and was traced in a nearly direct line to and beyond the extreme northwest corner of that map-area. This band of quartzite averages about 2 miles wide.

J.E. Muller completed the geological field study and mapping of the north half of Teepee Lake (115 F E½) map-area for publication on the scale of 1 inch to 4 miles. Because of rugged topography and general inaccessibility it has been decided, for the present, not to extend this project into the south half (115 F SE¼) of this map-area.

BRITISH COLUMBIA

H.H. Bostock spent the summer studying a group of granitic dykes[1] that outcrop about 4 miles southwest of Penticton (part of 82 E/5 E½). The dykes appear to have reached the surface at the time of intrusion and to have given rise to flows and pyroclastic rocks that have since escaped erosion. The project is expected to form the basis for a Ph.D. thesis by Mr. Bostock and is under the immediate supervision of J.E. Reesor of the Geological Survey staff who has been assigned a much broader study of granitic rocks of Canada.

H. Frebold continued his long-term study, commenced in 1955, of the stratigraphy and palaeontology of the Jurassic formations of British Columbia. About one month was spent in the Nelson West Half (82 F W½) map-area studying Jurassic strata previously mapped by H.W. Little[2]. These studies resulted in significant revisions of the Jurassic stratigraphy and therefore in a much better understanding of the general geology, structure, and historical geology of the map-area.

W.L. Fry continued his study, commenced in 1954, of the Tertiary flora and stratigraphy of southern British Columbia, paying particular attention to the Princeton-Coalmont area. Field work on this project has been discontinued for the time being because of the resignation of Dr. Fry after the close of the field season.

J.G. Fyles continued, and nearly completed, the field study and mapping of the unconsolidated deposits of the

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1 Bostock, H.S.: Okanagan Falls, Similkameen and Osoyoos District, British Columbia; Geol. Surv., Canada, Map 627A, Map-unit 10 (1941).

2 Little, H.W.: Nelson (West Half), Kootenay and Similkameen Districts, British Columbia; Geol. Surv., Canada, Map 3-1956 (1957).

lowland parts of the east coast of Vancouver Island between the towns of Cumberland and Campbell River (lowland parts of 92 F/10, 11, 13, and 14, and K/3, 4). The precise data obtained concerning the order of deposition and composition of the various unconsolidated materials will be of practical assistance to those concerned with various engineering, construction, and planning projects, including damsite problems and ground water supply.

H. Gabrielse nearly completed geological field work in Cry Lake (104 I) map-area, which had been partly mapped by Operation Stikine in 1956[1]. A granitic stock, about 25 square miles in outcrop area, was mapped during the 1957 field season. The centre of the stock, which is nearly circular in plan, is about 5 miles northwest of the junction of Cassiar and Turnagain Rivers. The stock intrudes limestone, dolomite, quartzite, and argillaceous rocks of lower Palaeozoic, mainly Cambrian age, and near the contact the strata have been altered to coarse-grained dolomite, crystalline limestone, and hornfels. Quartz veins are abundant here and there near the contact. Base metal deposits occur in similar strata near similar intrusions in the adjacent McDame (104 P) map-area and may, therefore, occur near the stock mapped in 1957.

A little stratigraphic work and preliminary reconnaissance was done in the nearby Kechika (94 L) and Rabbitt River (94 M) map-areas preparatory to further work planned there for 1958.

E.C. Halstead, working from the British Columbia office, continued and completed a ground water survey of the Lower Fraser Valley (Hope to Gulf of Georgia).

E.J.W. Irish completed field work within Charlie Lake (94 A) map-area which includes the Fort St. John gas field. The formations trend northwesterly. Mainly marine Lower Cretaceous shales and sandstones outcrop within the southwestern third of the map-area. These are conformably overlain by mainly marine Upper Cretaceous sandstones and shales that outcrop within a belt trending northwesterly through the central part of the map-area. The northeastern third of the map-area is nearly devoid of outcrops. The Cretaceous strata occupy open folds that commonly plunge southeasterly.

G.B. Leech completed field work within most of the northeast half of the Fernie (82 G W½) map-area. Current

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[1] Stikine River Area, Cassiar District, British Colimbia; Geol. Surv., Canada, Map 9-1957.

plans are that further work in this map-area will be deferred until after 1958.

Stocks and numerous dykes of monzonitic and syenitic composition intrude lower Palaeozoic shales, limestones, and dolomites well inside the west front of the Rocky Mountains near latitude 49°45'. A syenitic stock on the divide between the east fork of Wild Horse River, the north fork of Tanglefoot Creek, and a creek draining into Summer Lake, is about 2 miles long and ½ mile wide. It is surrounded by a hornfelsic aureole up to ½ mile wide, locally pyritiferous, formed from limy shales and shaly limestones. A monzonitic stock or igneous-sedimentary complex on the divide between Wild Horse and Lussier Rivers is about 1½ miles long and 1/3 mile wide. It intrudes dolomite and limy shales. The adjacent dolomite is recrystallized and partly converted to lime silicates, and the shales are hornfelsic and rusty. Half a mile to the west a smaller stock or an extension of the main complex intrudes dolomite and the underlying Precambrian argillite.

In the Bull River Valley near Sulphur Creek a conglomerate composed mainly of granitic rocks and gneisses reminiscent of the Canadian Shield occurs in basal Devonian strata. The conglomerate is absent to the west and northwest. Its occurrence in the upper Bull River Valley suggests the presence there of a local "high" of pre-Purcell basement rocks.

A major north-dipping fault was traced from the Rocky Mountain Trench[1] near latitude 49°36' easterly to the Bull River. The strata on the north side of the fault include Upper Purcell, Cambrian, Ordovician, and probably Silurian formations; whereas on the south side of the fault Devonian formations rest directly on Lower Purcell beds.

Greenstones and water-lain tuffs and breccias of post-Ordovician, possibly Devonian, age occur in the Rocky Mountains on the divide between Wild Horse River and a tributary of Summer Lake.

J.E. Reesor spent about 2 months of the field season completing his study of Lardeau East Half (82 K E½) map-area. The results of work within this area to the end of 1956 have been published[2]. The 1957 field investigations

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[1] Cairnes, C.E., and Rice, H.M.A.: Cranbrook Sheet, Kootenay District, British Columbia; Geol. Surv., Canada, Map 396A (1938).

[2] Reesor, J.E.: Lardeau (East Half), Kootenay District, British Columbia; Geol. Surv., Canada, Map 12-1957.

involved the stratigraphic and structural revisions of the Lardeau series near the north end of Kootenay Lake, and of the undivided Upper Purcell strata in that area north of Dutch Creek. Mineral properties were also examined.

The remainder of the field season was devoted to reconnaissance required to select, in southern British Columbia, granitic bodies most suitable for the first phase of a continuing exhaustive study of the geological aspects of Canadian granitic rocks. Evidence was obtained during this reconnaissance to suggest that the Kuskanax batholith (in 82 K W½) is older than previously indicated, and that it should be shown as map-unit 3 on the 20-mile geological map of British Columbia[1].

J.G. Souther spent most of the field season completing and refining the reconnaissance mapping done the previous year by Operation Stikine in Telegraph Creek (104 G) and Iskut River (104 B) map-areas[2]. Field work in the Telegraph Creek map-area was completed to 4-mile standard; but a little more field work may be required in the Iskut River map-area to bring that part of the project to the same standard. Permian limestones were found to be overthrust over mid-Triassic shales and siltstones, mid-Triassic rocks having been identified for the first time in northwestern British Columbia. Many of the known mineral properties were examined, including the "porphyry copper" type of deposits to which exploration companies have recently devoted much attention.

In addition, an aerial reconnaissance was made of the Sumdum (104 F) map-area in the expectation that mapping of the Canadian parts of the Sumdum and adjacent Tulsequah (104 K) map-areas will commence after the Iskut River map-area has been completed. The reconnaissance indicated the presence of very substantial areas of Permian limestone and other sedimentary and metamorphic rocks.

H.W. Tipper, during part of the field season, completed mapping the southeastern corner of Anahim Lake (93 C) map-area[3]. The predominate rocks were found to be gently folded early Tertiary, mainly acid, lavas.

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[1] Geological Map of British Columbia; Geol. Surv., Canada, Map 932 A (1948).

[2] Stikine River Area, Cassiar District, British Columbia; Geol. Surv., Canada, Map 9-1957.

[3] Tipper, H.W.: Anahim Lake, Coast District, British Columbia; Geol. Surv., Canada, Map 10-1957.

The remainder of the field season was devoted to the geological study and mapping of the adjacent Quesnel (93 B) map-area, field work being completed in the southern third of this area. The west half of the area mapped is underlain mainly by Tertiary lavas, through which folded Mesozoic volcanic rocks project here and there. The eastern part of the area mapped (Alexis Creek to longitude 122°; Granite Mountain to latitude 52°) is underlain mainly by limestone, ribbon chert, argillite, and minor andesite of the Permian, Cache Creek group. These strata have been intruded by at least three granitic stocks. A granitic stock underlies Granite Mountain and extends 5 miles east from Cuisson Lake, 7 miles south from Granite Mountain, and at least 1 mile north from that mountain. Chalcopyrite occurs near this intrusion in Cache Creek strata about 3 miles northeast of McLeese Lake[1]. Gneissic granite intrudes Cache Creek strata at the east end of Williams Lake, and a little nickel is reported[2] to have been found near the border of the intrusion. Coarse-grained granite intrudes Cache Creek formations at the northwest end of Drummond Lake and extends about 2 miles northwest and northeast of the lake.

BRITISH COLUMBIA AND ALBERTA

R.A. Price, a student pursuing his doctorate studies at Princeton University, continued and completed the field study and mapping of Flathead North, East Half (82 G/7 E½) map-area. This investigation is expected to provide data for Mr. Price's doctorate thesis, and an appropriate geological map and report for publication by the Geological Survey.

ALBERTA

H. Frebold and E.W. Mountjoy obtained additional information concerning the fauna, stratigraphy, age, and correlation of the Jurassic, Green beds. Contained fossils have, for the first time, made possible a subdivision of the Green beds, which, as previously established are mainly of Oxfordian age (lower part of upper Fernie group).

E.W. Mountjoy, a graduate student pursuing his doctorate studies at the University of Toronto, commenced the geological study and mapping of Miette (83 F/4) map-area. The results of this project are expected to provide data for Mr. Mountjoy's doctorate thesis, and for an appropriate map and report by

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[1]Minister of Mines, Province of British Columbia: Annual Report for the Year Ended 31st December, 1956, p. 33 (1957).

[2]op.cit., p. 34.

the Geological Survey. Field work was completed in the west half of the map-area.

A.M. Stalker completed the geological study and mapping of the surficial deposits of Fort MacLeod (82 H W½) map-area. Although the area contains the zone of meeting of the Cordilleran and Laurentide ice-sheets, it was not glaciated in the extreme southeast and southwest corners, nor near the northwest corner. Five distinct tills are exposed in one section on the Oldman River. Several buried valleys containing pre-glacial gravel and sand, a potential source of ground water, were mapped, some for stream lengths of many miles.

ALBERTA AND SASKATCHEWAN

W.F. Fahrig commenced a comprehensive study of the rocks of the Athabasca series exposed between Athabasca, Wallaston, and Cree Lakes. This project was commenced in 1952 by D.A.W. Blake, and temporarily abandoned shortly thereafter. A summary of the results of that initial work has been published[1]. The 1957 field investigations were confined mainly to the Trout Lake (74 K) map-area and to the northern edge of the area underlain by the Athabasca rocks (74 L, N, O, and P). It is anticipated that another field season will be required to complete the current study.

The Athabasca rocks were laid down by waters flowing about southwest. They appear to be overlain by the Trout Lake limestone[2] which is in the form of an abrupt dome. The age of the limestone is not known; it contains "algal structures" but diligent search afforded no recognizable fossils.

SASKATCHEWAN

C.K. Bell continued the detailed study and mapping of Milliken Lake (74 N/7) map-area. This map-area, which contains the Gunnar Mine, was commenced in 1954. About two-thirds of the field work has now been completed for publication on the scale of 1 inch to 800 feet. This completed area comprises Crackingstone Peninsula south of latitude 59°25' and west of longitude 108°40', plus a belt about 3 miles wide surrounding Milliken Lake.

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[1] Blake, D.A.W.: Geological Notes on the Region South of Lake Athabasca and Black Lake, Saskatchewan and Alberta; Geol. Surv., Canada, Paper 55-33 (1956).

[2] op. cit., map-unit 2

The most widespread rocks are those of the Tazin group. These comprise quartzose sediments and minor volcanic rocks, and their metamorphosed and granitized equivalents including the Gunnar granitoid gneiss and other gneisses. The Tazin rocks are unconformably overlain by conglomerate, sandstone, arkose, and siltstone of the Athabasca series. A number of major faults have been recognized.

L.P. Tremblay completed a six-year project of detailed mapping in the Beaverlodge uranium area. This area adjoins on the north that currently being mapped by C.K. Bell, and includes the Beaverlodge operation of Eldorado Mining and Refining Limited. It also includes Donaldson, Fredette, and Martin Lakes, and most of Beaverlodge Lake. Five maps[1] on a scale of 1 inch to 800 feet, each including about 5 minutes of latitude and longitude, have been issued, a sixth is in press, and the seventh is in preparation. It was found that pitchblende deposits commonly occur in partly granitized limy shales where these occupy the crest or trough of a fold near a major fault.

MANITOBA

K.H. Owens completed an aeromagnetic survey of the following map-areas in northern and northwestern Manitoba: 54 M, and 64 F, K, N, O, and P. The survey located a prominent magnetic anomally (in 64 P/1) north of Seal River, and an aeromagnetic map showing this anomally was released on 19 December 1957[2].

G.W. Sinclair commenced and completed a detailed study of the Ordovician fauna and stratigraphy of the west shore of Lake Winnipeg and vicinity. The red shale of the Stony Mountain formation at Stony Mountain was found, subject to confirmation by office studies, to be of the same age as dolomite on the west shore of Lake Winnipeg north of Grand Rapids.

F.C. Taylor commenced and completed field work in Shethanei Lake (64 I) map-area. About two-thirds of the area

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[1]Tremblay, L.P.: Uranium City, Saskatchewan; Geol. Surv., Canada, Paper 54-15 (1955), Paper 55-28 (1957), and Map 18-1956.

[2]Geological Survey of Canada: Magnetic Anomaly North of Seal River, Manitoba, Map 550G (1957).

was found to be essentially devoid of outcrops. Minor scattered areas of quartzite, greywacke, and basaltic lavas comprise the oldest recognized formations. The most widespread rocks, and the next youngest, are granite, granite gneiss, and paragneiss. In the northeast corner, and presumably younger than the granitic rocks, are Proterozoic-type quartzites, shales, and minor dolomite. Dips in these latter strata commonly exceed 45 degrees. A manuscript for a preliminary map has been received for editing.

ONTARIO

M.J. Frarey completed field work within the eastern half of Echo Lake (41 J/12) map-area. The northern two-thirds of the mapped area is underlain by Precambrian gneiss, the southern one-third mainly by Huronian formations. Much of the conglomerate in the map-area, previously mapped[1] as Mississagi, is now thought to be much younger, and of Gowganda age (Cobalt series).

N.R. Gadd spent much of the field season at Chalk River investigating geological factors governing the disposal of radioactive wastes generated by nuclear reactors.

O.L. Hughes completed the geological study and mapping of the surficial deposits of Timmins East Half (42 A E½) map-area. An old till was found to be overlain by varved clays of Lake Barlow-Ojibway which, in the northwest corner of the map-area, are overlain by a till laid down during the Cochrane ice-advance. The southern limit of this ice-advance was mapped.

B.A. Liberty completed the geological study and mapping of Manitoulin Island (part of 41 G, H). The work has demonstrated the presence of features favouring the accumulation of oil and gas; the occurrence of high-purity Precambrian sandstone and quartzite between Sheguindah and Killarney; and the presence of high-purity Silurian dolomite. These features are described in further detail on a preliminary map[2] recently published on the scale of 1 inch to 4 miles.

S.M. Roscoe nearly completed the field phase of a subsurface study of the origin and distribution of the uranium ores of the Blind River district. A summary of the results

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[1]Collins, W.H.: Bruce Mines, Algoma District, Ontario; Geol. Surv., Canada, Publication No. 1969 (1925).

[2]Liberty, B.A.: Manitoulin Island, District of Manitoulin, Ontario; Geol. Surv., Canada, Map 20-1957.

of this investigation to the end of the 1955 field season has been published[1]. Much recent effort has been devoted to obtaining a true picture of the pattern of the uranium and thorium distribution through the ore beds and in nearby basement rocks. It is expected that these data will aid in determining whether the deposits are of placer or hydrothermal origin, or both; and that they will afford further information concerning the thorium potential of the district.

P.J. Pienaar, a post-graduate student at Queen's University, commenced and completed a field study of the sedimentary features of the Blind River district and of their relation to ore shoot control. It is anticipated that the data obtained from this work will form a basis for Mr. Pienaar's doctorate dissertation, and that they will be incorporated in a final report on the district by Dr. Roscoe.

H.R. Wynne-Edwards commenced the revision of the geological mapping of Westport (31 C/9) map-area. The results of work done in this area many years ago by M.E. Wilson and G.M. Brownell were not published. The current study is expected to provide the basis for a doctorate dissertation by Mr. Wynne-Edwards, and an appropriate map and report for publication by the Geological Survey.

Field work in the west half of the map-area was completed during the 1957 field season. This part is underlain almost entirely by Grenville-type rocks. Particular attention was paid to the mode of emplacement of granitic bodies and to related structures. The east half of the map-area, scheduled for completion in 1958, is underlain by substantial areas of Palaeozoic strata in addition to Grenville-type rocks.

ONTARIO AND QUEBEC

N.R. Gadd, accompanied by E. Hall, continued the geological study and mapping of the surficial deposits of the Ottawa (31 G/5) map-area. Only part of the field season was available for this work because of the higher priority assigned to Dr. Gadd's work on the disposal of radioactive wastes at Chalk River, Ontario.

Good progress has been made towards establishing the stratigraphic succession, and the northeast one-eighth of

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[1] Roscoe, S.M.: Geology and Uranium Deposits, Quirke Lake-Elliot Lake, Blind River Area, Ontario; Geol. Surv., Canada, Paper 56-7 (1957).

the area has now been mapped. It appears that the "Ottawa" ("Rideau") clays, which are younger than the marine "Leda" clays of the Champlain Sea, are of non-marine rather than of marine origin as postulated in previous literature. The non-marine, non-calcareous Ottawa clays are used for brick making, and are stiffer and of much better load-carrying characteristics than the older Leda clays. Thus a satisfactory distinction between the Leda and Ottawa clays, now believed practicable, will be of considerable economic importance.

E.R. Rose examined deposits between Saguenay River and Georgian Bay suspected or reported to contain rare earths, except those of Blind River, Bancroft, and Oka districts. The object of this investigation is to obtain information on the occurrence of heavier rare earths, such as gadolinium. The deposits examined were mainly radioactive pegmatites in Grenville-type rocks. No significant concentrations of the heavier rare earths were recognized during the field season, although it is possible that additional information will be forthcoming from laboratory investigations now in hand.

J. Terasmae continued his study of the Pleistocene palynology of the region between Lake Erie and Cochrane, with the object of obtaining more precise data concerning the Pleistocene stratigraphy and chronology of that district. The past field season was spent mainly in the Champlain Sea area upstream from Ottawa. The immediate objective of this work is to obtain material from which to construct pollen diagrams indicative of conditions between the time of maximum invasion of the Champlain Sea and the present. The longer range objective is to compare these data with similar data collected to the east and to the west, and thus to correlate Pleistocene events of the St. Lawrence Lowlands with those of the Great Lakes region.

QUEBEC

T.E. Bolton commenced a stratigraphic and palaeontological study of the Ordovician and Silurian strata of Anticosti Island.

In 1942 J.F. Caley and F.H. McLearn studied the stratigraphy and palaeontology of the Silurian strata (exposed on the southwest side of the Island) by examining outcrops on the lower Jupiter River. During the past season T.E. Bolton completed similar studies of the Ordovician strata (exposed on the northeast side of the Island) by working along the Salmon River. Thus a complete section across the

middle of the Island has now been studied in the field. Particular attention was paid, during 1957, to the Ordovician-Silurian transition zone. The boundary between Ordovician and Silurian strata is marked, not by a change in lithology, but by a change in faunal content. The field work also demonstrated that the Ordovician Ellis Bay formation, which at Cape James comprises sandstone overlain by shale, consists entirely of shale where exposed on the Salmon River 12 miles to the northwest.

A.S. MacLaren completed a three-season study of the correlation of aeromagnetic data with geology in the Eastern Townships. The project has involved the study of thirty-one, 1-mile map-areas for which Geological Survey aeromagnetic maps are available, and for most of which conventional geological maps on the scale of 1 inch to 1 mile are also available. The purpose of the study is to obtain and present data concerning the interpretation of aeromagnetic maps. Incidentally, here and there, the field work resulted in the refinement of the geological maps.

E.I.K. Pollitt continued a ground water survey of that part of Lachine (31 H/5) map-area lying south of St. Lawrence River and through which passes the St. Lawrence Seaway. The survey of the east half of this area was completed.

Throughout most of the surveyed area overburden is thin and the useful aquifers are in bedrock. The Delson fault[1] trends east-southeast nearly through Delson village in the northeast corner of the surveyed area. The rocks northeast of the fault are mainly Utica-Lorraine shales which generally afford only small quantities of poor quality water. Southwest of the fault are Chazy limestones and Beekmantown dolomites, both of which constitute aquifers capable of yielding substantial supplies of water. The differences in quantities of ground water available from aquifers on opposite sides of the fault are of such magnitude that industries seeking sites for development should consider locating southwest of the fault, if substantial quantities of ground water are required.

Gravel underlies a topographic ridge that trends north-northeast and lies about midway between Ste. Philomene village and St. Isidore Station. Although this gravel is capable of yielding substantial quantities of good quality water it has been ignored by much of the drilling done to date.

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[1] Clarke, T.H.: Montreal Area, Laval and Lachine Map-areas; Department of Mines, Quebec, Geol. Rept. 46 (1952).

C.H. Smith, after completing a mapping project in New Brunswick, commenced a comprehensive study of the ultrabasic rocks of Canada. It is anticipated that this project will continue for some years. That part of the 1957 field season available to the project was spent in central Gaspé, where the Mount Albert, South Mountain, and adjacent ultrabasic bodies were mapped and sampled as a basis for detailed petrographic and geochemical studies.

A hill about 1 mile long and more than ¼ mile wide, on the east side of Mount Albert between Lac Au Diable and the Trans-Gaspesian highway, was found to be formed of remarkably fresh dunite. A preliminary laboratory report on a 50-pound sample of this rock indicates that it is forsterite, suitable for use as a refractory.

Small sheared serpentinite bodies and chromite-bearing carbonate zones were found to occur intermittently along the south side of the Shickshock Mountains for about 24 miles west of Mount Albert. They mark a major post-Silurian fault bounding the south side of the Shickshock meta-volcanic rocks.

NEW QUEBEC AND LABRADOR

W.L. Davison was attached to a Topographical Survey party operating helicopters between Ungava Bay and Hudson Bay (north half of NTS 34, and mainland part of NTS 35) in the expectation that some reconnaissance geological data could be obtained without detriment to the operations of the Topographic party. This proved impracticable, and it is now doubtful if the geological information gained will allow the compilation of a reconnaissance geological map. No examination of the Cape Smith-Wakeham Bay nickel belt was made, nor were substantial new bodies of non-granitic rocks found.

J.A. Donaldson commenced the geological study and mapping of Marion Lake (23 I/13) map-area. It is anticipated that the results of this project will provide a Ph.D. thesis for Mr. Donaldson, and an appropriate map and report for publication by the Geological Survey. Field work in the west half of the map-area was nearly completed.

S. Duffell commenced the geological study and mapping of Mount Wright (23 B W½) map-area, and completed field work within the north half of that area. Areas of intricately folded dolomite, quartzite, and iron formation occur within a northeasterly-trending belt that passes through the centre of the map-area. These areas are sur-

rounded by schist and gneiss that grades to granite and granite gneiss in the northwest quarter of the map-area.

K.E. Eade, accompanied by W.W. Heywood and H.A. Lee, commenced a geological reconnaissance of about 120,000 square miles (23 ½, 33) between James and Hudson Bays and the Labrador Trough. The project is known as Operation Fort George and was supported by a helicopter and a Beaver aircraft. The southwest part of the map-area was mapped during an earlier reconnaissance[1]. About 35,000 square miles were examined during 1957 - i.e., that part of the map-area lying north of latitude 53° and west of longitude 74°30'. It is anticipated that two more field seasons will be required to complete the project.

About 750 square miles of greenstone, with minor sedimentary rocks and quartz-magnetite iron formation, occur mainly as two easterly trending bodies in the southern third of the mapped area. Gossans were noted in the greenstone, some with a little copper stain. These and other features are shown on the preliminary geological map[2] recently published.

H.A. Lee was attached to Operation Fort George as officer responsible for the mapping and study of the surficial deposits.

The maximum elevation of marine submergence was found to be nearly 900 feet above present sea-level, in contrast to about 600 feet in the District of Keewatin[3] on the northwest side of Hudson Bay.

Although the latest ice movement was about west-southwest into the present James and Hudson Bays, evidence accumulated during 1957 suggests that, at an earlier time, ice moved inland from an ice-dome in what is now Hudson Bay.

Extensive gravel deposits, as beach benches, were mapped within a broad, coastal, belt of marine deposits. Other gravel deposits are numerous within an inland belt of "beach moraines", where the latter comprise a series of sand and gravel ridges paralleling the coast and separated by clay deposits.

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[1] Shaw, G.: Preliminary Map, Eastmain, Quebec; Geol. Surv., Canada, Paper 42-10 (1942).

[2] Eade, K.E., Heywood, W.W., and Lee, H.A.: Sakami Lake Area, New Quebec; Geol. Surv., Canada, Map 23-1957 (1958).

[3] Lord, C.S.: Geological Notes on Southern District of Keewatin, Northwest Territories; Geol. Surv., Canada, Paper 53-22 (1953).

NEW BRUNSWICK

F.D. Anderson completed the geological study and mapping of all but minor scattered gaps within Big Bald Mountain (21 O/1) map-area. About two-thirds of the map-area is underlain by a conformable succession of phyllitic and schistose sediments, porphyry, and acid and basic volcanic rocks. These formations have been intruded by five bodies of Devonian(?) granitic rocks which underlie most of the remainder of the map-area.

L.M. Cumming devoted most of the field season to a study of the stratigraphy and palaeontology of the Silurian and associated strata of the Bathurst-Newcastle-Tobique district. Most of this work was done within areas recently mapped or currently in hand by the Geological Survey, or within areas (21 O/2, 3, and 7) of previous field work for which maps are outstanding.

E.D. Kindle commenced field work within Waterford East Half (21 H/11 E½) and Salmon River West Half (21 H/6 W½) map-areas. The northeast half of the first named map-area was completed. The mapped area is underlain mainly by Precambrian sedimentary and volcanic rocks, nearly everywhere schistose. The initial field work suggests that a satisfactory subdivision of the Precambrian formations, not accomplished in maps of adjacent areas, will be practicable.

W.H. Poole commenced the geological study and mapping of the Napidogan (21 J/7) map-area, and completed field work in the southeast half.

Dark green chloritic rock, well mineralized with fine-grained magnetite and siderite, outcrops on a bulldozed road 3,000 feet east of a point on Rocky Brook 2.2 miles upstream from its mouth on Nashwaak River. Rocky Brook joins Nashwaak River 8.3 miles upstream from Stanley. The outcrop is about 4 feet in diameter and lies on the edge of a linear magnetic anomaly[1] that trends northeasterly across the map-area.

In the adjacent Hayesville (21 J/10) map-area, red and green chert and slate with nodules and lenticular beds of black-weathering, fine-grained, buff-coloured carbonate outcrop along the east bank of Southwest Miramichi River about 11 miles above Boiestown and from 6,000 to 7,000 feet downstream from the mouth of Trout Brook. The outcrop occurs

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1 Geological Survey of Canada: Aeromagnetic Map, Napadogan, York County, New Brunswick, Geophysics Paper 135 (1953).

on the edge of a weak linear magnetic anomaly[1]. The carbonate bodies consist of rhodochrosite, barite, and quartz.

C.H. Smith completed field work in California Lake (21 O/8) map-area.

C.H. Stockwell completed the detailed study and mapping, for publication on a scale of 1 inch to 1,000 feet, of about 8 square miles centred on the No. 12 orebody of Brunswick Mining and Smelting Corporation Limited.

A body of basic volcanic rocks, with iron formation, trends northerly through the centre of the mapped area. These rocks are flanked on the east by three parallel belts: rhyolites adjacent to the volcanic rocks, a central belt of greywackes with iron formation, and porphyries east of the greywackes. No. 12 orebody occurs on the flank of a strong magnetic anomaly in a drag-folded part of the central greywacke belt, and has replaced both greywacke and iron formation. This favourable group of rhyolite, greywacke, and porphyry belts was, for the first time, successfully traced for several miles. Other magnetic anomalies and abruptly folded areas found within the group suggest areas particularly favourable to the occurrence of other mineral deposits similar to No. 12 orebody. Furthermore, structural features suggest that similar geological conditions may be found in the western part of the map-area, west of the basic volcanic rocks.

NOVA SCOTIA

R.W. Boyle commenced and nearly completed a detailed geochemical investigation of the barite deposits near Walton (northwest half of 21 H/1 E½). This investigation included studies of the primary and secondary dispersion of barium, lead, zinc, copper, and manganese. The detailed work on the dispersion of the heavy metals suggests that some of the barite deposits may have associated base metal deposits. Soil analyses for barium were found useful for tracing underlying barite deposits where the cover is not too heavy. A more precise evaluation of the results must await the completion of several hundred analyses, including about 400 samples of rock from the Horton group and lower part of the Windsor group.

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[1] Geological Survey of Canada: Aeromagnetic Map, Hayesville, York, Northumberland, Carleton, and Victoria Counties, New Brunswick, Geophysics Paper 138 (1953).

R.H.C. Holman made a geochemical reconnaissance of most of that part of mainland Nova Scotia lying between a line connecting Windsor and Lunenburg and a line connecting Truro and New Glasgow. Approximately 3,000 samples of stream sediments were tested in the field for total heavy metal content (zinc, lead, and copper) using a simple colorimetric dithizone technique. A similar geochemical reconnaissance of most of the province southwest of the Windsor-Lunenburg line was completed by R.W. Boyle in 1956.

A preliminary evaluation of field data suggests that anomalies found in the following areas along the contact of Windsor and Horton strata warrant further investigation for base metals: in Hants County - Centre Burlington, Mill Brook, Bass Brook, Bills Brook (near Hennigar), and Lattie Brook (near Maple Grove); in Colchester County - Beaver Brook Village, Brookfield, Otter Brook, Pembroke, and Eastville; and in Antigonish County - Frasers Grant, Merland, and Eastville.

W.G. Smitheringale continued and almost completed the geological study and mapping of Bridgetown East Half (21 A/14 E½) and Gaspereau West Half (21 A/15 W½) map-areas. The results of this project are expected to provide data for Mr. Smitheringale's doctorate dissertation at Massachusetts Institute of Technology, and an appropriate map and report for publication by the Geological Survey.

I.M. Stevenson commenced the geological study and mapping of the Chedibucto Bay (11 F/6) map-area, and completed field work within the west half.

PRINCE EDWARD ISLAND

Two parties continued the geological study and mapping of the bedrock and surficial deposits of Prince Edward Island, commenced in 1953 by V.K. Prest. L. Frankel completed about two-thirds of the field work required in Montague (11 L/2 E½) and Orwell (11 L/2 W½) map-areas. G.H. Crowl continued and completed field work in Souris (11 L/8) map-area, and commenced the adjacent Mount Stewart (11 L/7) map-area. The survey of Prince Edward Island, when completed, will afford the first accurate classification of the unconsolidated materials from which the soils of the Island were derived, and will, therefore, afford vital information to those concerned with the agricultural industry of this province.

NEWFOUNDLAND

E.P. Henderson completed his second field season studying and mapping the surficial deposits of Conception Bay (1 N) map-area, which includes the city of St. Johns. Field work was completed in the northeastern two-thirds of the map-area. The area appears to have been covered by a local ice cap, from which ice flowed radially outward. The east coast was found to have undergone post-glacial submergence, rather than emergence as previously believed. An unexploited substantial deposit of sand and gravel was mapped 1½ miles north of Cape Broyle (40 miles south of St. Johns).

J.E. Jenness spent most of the field season completing a revision of earlier mapping[1] done in Bonavista (2 C) map-area. The remainder of the field season was devoted to the completion of field work in Gander East Half (2 D E½) map-area[2].

W.D. McCartney continued and completed the field study and mapping of Whitbourne (1 N W½) map-area. Outcrops of Ordovician strata, the host rocks of the Wabana iron deposits, are confined to Bell Island on the east boundary of the map-area.

E.R.W. Neale commenced mapping Baie Verte (12 H/6) map-area, and completed field work in the east half, which contains the asbestos deposit of Advocate Mines Limited.

This work showed the presence of hitherto unmapped ultrabasic rocks along the northern boundary of the map-area between Kings Bight and Baie Verte. These rocks are probably a southern extension of the Devils Cove Pond ultrabasic belt[3]. They warrant prospecting for asbestos and chromite.

The Baie Verte map-area includes the inactive Terra Nova copper mine, and numerous well-known gold and base metal prospects - all within strata of the Ordovician Baie Verte group. The 1957 field work showed numerous additional occurrences of sulphides within these strata. Occurences of

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[1] Christie, A.M.: Geology of Bonavista Map-area, Newfoundland; Geol. Surv., Canada, Paper 50-7 (1950).

[2] Jenness, J.E.: Gander Lake (East Half), Newfoundland; Geol. Surv., Canada, Map 3-1957.

[3] Baird, D.M.: The Geology of Burlington Peninsula, Newfoundland; Geol. Surv., Canada, Paper 51-21 (1951).

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pyrite and pyrrhotite are particularly widespread in pyroclastic rocks of this group between Mud Pond and Goldenville on the east and Baie Verte on the west. Scattered occurrences of pyrite and chalcopyrite are associated with the granite-Baie Verte group contact that extends from Flatwater Pond to Aspey Cove, Baie Verte. Sulphide minerals in and near the sheared marginal zones of serpentinized ultrabasic rocks of the map-area suggest that these localities warrant careful prospecting.

G.C. Riley commenced field work in Burgeo-Ramea (11 P/11, 12, 13, and 14) map-area. The mapping of area 11 P/12 was completed for publication on a scale of 1 inch to 1 mile, and similar mapping was commenced in area 11 P/11. It is anticipated that areas 11 P/13 and 14 will be mapped for publication on a scale of 1 inch to 4 miles. The map-area is underlain almost entirely by granitic rocks and gneisses.

GENERAL

C.H.R. Gauthier collected material in Eastern Canada from which to prepare suites of rocks and minerals for sale to the public.

J.W. Griffith examined radioactive deposits in Ontario (mainly in the Bancroft and Blind River areas) in order to obtain data required for a revision of "Canadian Deposits of Uranium and Thorium"[1], and for the maintenance of the confidential inventory of these deposits. In Creelman Township uraninite was found to occur in thin-bedded greywacke which is interbedded with Gowganda conglomerate. The uraninite occurs in the dark parts of each of many successive beds, as if of placer origin.

G.A. Gross commenced a study of the iron deposits of Canada, a project likely to require some years and to culminate in the publication of a report of the Geological Survey's Economic Geology Series. The field season was spent in Newfoundland, on the north shore of the St. Lawrence River between Seven Islands and Allard Lake, and in the Labrador Trough.

B.A. Latour continued to collect data required for an up-to-date estimate of the coal reserves of Canada. The

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[1] Lang, A.H.: Canadian Deposits of Uranium and Thorium (Interim Account); Geol. Surv., Canada, Economic Geology Series No. 16 (1952).