ONTARIO

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. CHAS. MCCREA, *Minister of Mines* THOS. W. GIBSON, *Deputy Minister*

FORTY-FIRST ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XLI, PART III, 1932

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by Herbert H. Ball, Printer to the King's Most Excellent Majesty
1932

TABLE OF CONTENTS

Vol. XLI, Part III

ILLUSTRATIONS

SKETCH MAPS AND PLANS

COLOURED GEOLOGICAL MAPS
(In pocket at back of report)

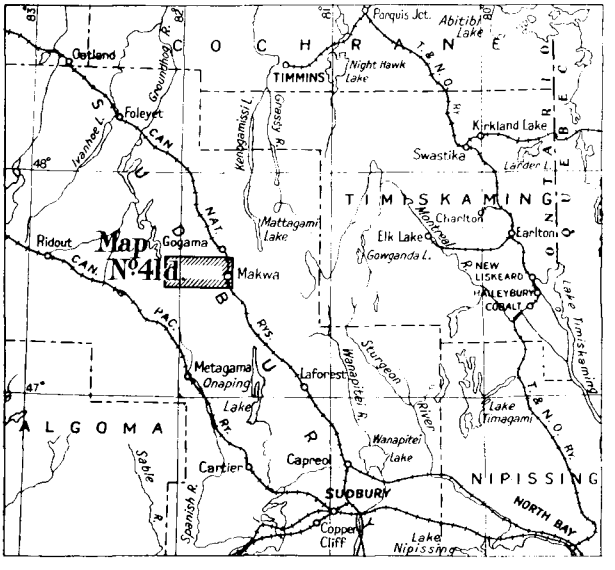
Map No. 41*c*—Swayze Area, District of Sudbury, Ontario. Scale, 1 mile to the inch.
Map No. 41*d*—Three Duck Lakes Area, District of Sudbury, Ontario. Scale, ¾ mile to the inch.

Geology of the Three Duck Lakes Area

By H. C. Laird

INTRODUCTION

In the summer of 1930, a spectacular discovery of native gold on the east shore of Three Duck lakes, Chester township, district of Sudbury, aroused new interest in an area that had seen prospecting in a quiet way at different times over a period of thirty years. This discovery, followed by others on the same lakes, caused an influx of prospectors during the summer of 1931, with the result that about 250 claims were staked along a favourable belt of rocks



Key map showing location of the Three Duck Lakes area. Scale, 60 miles to the inch.

between Mesomikenda[1] lake and Schist lake. Further prospecting has disclosed other gold-bearing quartz veins, located chiefly in the environs of Three Duck lakes and Clam lake. Although the veins thus far uncovered are narrow, they contain in places high values in gold.

The area dealt with in this report comprises the townships of Yeo, Chester, Benneweiss, the southern parts of Potier, Neville, St. Louis, and the southwestern part of Groves. It is bounded on the west by the Woman River area,[2] and on the east by the Canadian National railway. The principal gold discoveries occur in Chester township, which lies about 13 miles in a straight line southwest of Gogama, on the Canadian National railway, and about 80 miles northwest of Sudbury.

[1]This lake is more generally known as Beaver lake. The Ojibwayan name, Mesomikenda, is said to have been derived from an island shaped like a beaver house opposite the Mekami river fire ranger's tower.

[2]See Map 231A, Woman River sheet, accompanying Mem. 157, Geol. Surv. Can.

The area is comparatively easy of access, being conveniently reached in one day from Gogama with a power boat. Two routes are commonly in use, and there seems little to choose between them. The northern route via Poupore (mileage 101½, Canadian National railway) is served daily by a local train from Gogama. A good road about one and one half miles long connects Poupore with Mesomikenda lake, which extends south for 18 miles into the heart of the area. A shorter route to Mesomikenda lake, from mileage 94 on the Canadian National railway via the Mekami river and Mekami lake, is not recommended on account of its shallow rapids and strong eastward current. The southern route via Makwa station is likewise served daily by a local train from either Gogama or Sudbury. From this point a good water route, via the Mollie river, Mollie[1] lake, Dividing lake, and Dividing creek, leads directly to Three Duck lakes, with only three portages totalling 60 chains. The Mollie river may be reached directly from Gogama via Minisinakwa[2] lake and Sandy portage (112 chains). Dividing lake may also be reached from Makwa by the old Bisco road, which was used for many years by the Hudson's Bay Company in taking supplies from Biscotasing on the C.P.R. to the Mattagami Lake trading post. Prior to 1912 the main route into this area was by way of the Bisco road from the C.P.R., but since that time traffic has been principally from the C.N.R.

A wagon road extends from Makwa across the township of Benneweiss to a set of old camps on Lorry lake at the east boundary of Chester township. This road was built by lumber jobbers to serve their interests in Benneweiss, but since they have not used it for some years it has not been fit for other than winter use. Late in the fall of 1931 the Ontario Department of Northern Development improved and extended this road west to the Chester Shannon property on Clam lake; it crosses Mesomikenda lake by a bridge at the narrows and runs through the Beaver-Bethnal and Three Ducks groups of claims.

Within the area itself, good water routes and well-beaten portages make any section easy of access.

Acknowledgments

Throughout the field season the party had the full co-operation of the prospectors and residents of Gogama who were interested in the properties. The writer wishes to take this opportunity of acknowledging these courtesies. Special thanks are due Alfred Gosselin, of the Three Ducks Syndicate, Arthur Labbé, and Wm. Pigott, Chief Ranger, of Gogama, for their generous hospitality and continued interest in the welfare of the party. Russell Cryderman and J. A. Shannon, of Sudbury, have kindly provided an interesting résumé of the early events and development in this area.

The writer was ably assisted in the field by A. H. Stewart, J. L. Hough, and B. S. Crocker. In August, Mr. Hough resigned; his place was taken by David N. Ranger, of Gogama, who likewise performed his duties in a highly satisfactory manner.

Previous Work

In 1899, W. A. Parks travelled through the southeastern part of the area from Dividing lake to Mesomikenda lake, and from Mollie lake and river across Sandy portage to Minisinakwa lake. His report, published by the Ontario Bureau of Mines, is accompanied by the earliest geological map of the region.

[1]This was named Muskegogama lake on early maps and township plans.
[2]Meaning Draggy island in Ojibwayan.

In 1904, C. K. Leith examined for private interests the iron formation in Yeo township. In 1916, T. L. Tanton noted the occurrence of schistose rocks at mileage 81, Canadian Northern railway, north of Capreol. He also noted the occurrence of copper on Mesomikenda lake (the present Lawrence showing). In 1925, T. L. Gledhill examined prospects on Mesomikenda lake and Schist lake. R. C. Emmons and Ellis Thomson studied the geology of the Woman River area, which adjoins the present map-sheet on the west and includes Yeo and Potier townships.

In 1929, the results of several years' work in this area were published by the Geological Survey of Canada in a preliminary report, the accompanying map of which included only that portion of Yeo and Potier townships west of longitude 82°. The writer is indebted to the Geological Survey, Ottawa, for the use of the unpublished map material on the rest of the area, which was used in the map accompanying this report. In 1929, H. M. Bannerman reported on certain gold-copper showings in Chester township. The Lake Huron sheet, map No. 155A, Geological Survey, when used in conjunction with the accompanying map, presents an excellent picture of the general geological conditions in this part of Ontario. Although not a geological map, map No. 21C, Ontario Department of Surveys, is useful in showing the usual canoe routes into the area from either Gogama or Biscotasing.

Bibliography

W. A. PARKS, "Niven's Base Line, 1899," Ont. Bur. Mines, Vol. IX, 1900, pp. 126, 141.

T. L. TANTON, "Reconnaissance along the Canadian Northern Railway between Gogama and Oba," Geol. Surv. Can., Sum. Rept., 1916, pp. 180, 181.

T. L. GLEDHILL, "Grassy River Area," Ont. Dept. Mines, Vol. XXXV, pt. 6, 1926, p. 76.

R. C. EMMONS and ELLIS THOMSON, "Preliminary Report on Woman River and Ridout Map-Areas," Geol. Surv. Can., Mem. 157, 1929.

H. M. BANNERMAN, "Mineral Occurrences in the Woman River District," Geol. Surv. Can., Sum. Rept., 1929, pt. C, pp. 16-19.

History of Prospecting in the Area

As early as 1900, P. J. Phinlan, G. A. Phillips, and H. Phillips trapped and prospected in the Schist lake and Mesomikenda lake areas. The first staking is reported to have been done by J. A. Shannon and Charles Coté in 1908 in the iron formation on the south side of Schist lake. In 1909, James Hallock and John Handly staked five claims west of the portage between Schist lake and Moore lake. In 1910, J. A. Shannon staked claims at Yeo lake and found native gold. In the same year Percival Moore and his associates staked claims south of the east end of Schist lake. In the two succeeding years sufficient work was done to patent five claims now owned by the Porcupine Hecla Mines Company. At about this time the Lawrence copper showing on Mesomikenda lake was opened up, and several tons of ore were shipped to New York for testing purposes. For the following fifteen years there was little or no prospecting in the area except by Russell Cryderman and John A. Shannon, the latter of whom in 1927 discovered native gold on the northeast shore of Clam lake. In 1928, there was a mild influx of prospectors, who covered the area between Opeepeesway lake and Minisinakwa lake, but no discoveries were made until 1930, when Alfred Gosselin found a spectacular showing of native gold on the east shore of Three Duck lakes; it was this discovery that led to further activity throughout the whole area, with the result that more finds were made during the field season of 1931.

Topography and Drainage

In general, the topographic features of this area are those so often described as characteristic of the pre-Cambrian shield. The height-of-land passes through the southern part of Yeo township and lies close to the southern boundary of Chester township. On this account one might expect an area of very low relief with wide expanses of muskeg and sluggish streams. Such is not the case. The relief may be considered only moderately low; muskeg, though present, is not extensive; and most of the streams have a steep gradient and carry a considerable volume of water during most of the summer season. A few hills and ridges rise as much as 150 to 200 feet above lake level, but on the whole glacial debris has tended to smooth the topographic irregularities by filling in the hollows. At the same time, however, morainic material has formed prominent eskers and kames. Some of the more outstanding elevations may be mentioned. About half a mile south of Schist lake and running parallel to it there is a high ridge of hills composed of sedimentary rocks with iron formation on the north side. This ridge, though interrupted in places, may be traced westward from the northeast corner of Chester township across the northern part of Yeo township and beyond; it is most prominent, however, at the east arm of Schist lake and again just south of the falls in the creek flowing into the west arm of Schist lake. Another prominent ridge between Squawman lake and Schou lake follows a wide diabase dike trending northeast. A few chains south of Chester lake on the boundary between the townships of Smuts and Invergarry there is a prominent hill of granite gneiss rising gently above the surrounding sand plain, which itself is 100 feet or more above lake level. From this point of vantage an excellent view of the southwestern part of the area may be obtained. In Yeo township, less prominent hills occur near Moore lake and Potier lake; on the latter, the shores are commonly vertical cliffs of granite rising as much as 75 feet above lake level. Chester township, like Yeo township, is uniformly high, but there is little relief. The more prominent hills, unlike those of Yeo township, are composed for the most part of sand and gravel rather than rock, being morainic in origin. Among these may be mentioned the hill on the winter road close to A. Gosselin's south camp on Mesomikenda lake, which is at least 200 feet above lake level. In places the shores of Mesomikenda lake itself rise 100 feet above the lake, and except for a few outcrops on the east side they are composed of sand and gravel with the configuration of eskers and kames. A typical kame about 200 feet high occurs in the extreme southeast corner of Chester township at the mouth of the Mollie river; its perfect cone shape and general isolation make it an outstanding landmark and probably the most striking topographic feature in the whole area. The southern part of Benneweiss township is, for the most part, a comparatively level sand plain. Toward the northern part, however, there is a gradual elevation culminating in the high east-west trending brulé hills bordering St. Louis township. It may be noted that here, as in Yeo township, the more prominent ridges have originated in the belt of sedimentary rocks. This fact points to the remarkable stability of the sediments in withstanding the agents of erosion, particularly glaciation, since the ice moved at right angles to the trend of these ridges.

The waters in this area, except in that portion of Yeo township on the Lake Huron watershed, form a part of the Mattagami river system. Canoe lake, in the northwestern part of Yeo township, is the headwater of a chain of creeks and lakes flowing west into Opeepeesway lake. The central part of the area, however, drains eastward to Minisinakwa lake by way of Moore lake,

Chester lake, Three Duck lakes, Dividing lake, Mollie lake, and the Mollie river. These lakes are connected by easily navigable streams with short stretches of shallow rapids. Schist lake drains northward, its waters emptying into a bay of Mesomikenda lake over a 15-foot fall a few chains south of the north boundary of Neville township. Schist lake has two outlets, one in the deep bay on the north shore, the other at the east end. Only a small portion of the water flows into the chain of lakes consisting of Schou, Wolf, and Cross; the main portion flows east to Bagsverd lake and thence to Cross lake by way of a very meandering stream, which traverses the open sand plain of Neville township. Mesomikenda lake, a linear basin about 20 miles in length, extends south into Chester township a distance of 4 miles. Many small streams and trickles flowing into the lake have their source in bubbling springs in the adjacent sand areas. Bernice lake, on the west boundary of Benneweiss township, is near the head of a chain of lakes and streams flowing into the north end of Mollie lake and draining the southwestern part of the township. Benneweiss lake is the head of another chain of lakes and streams draining the northwestern part of the township and flowing into Minisinakwa lake in the southeast corner of St. Louis township. This chain is readily navigable by canoe to within 1½ miles of Minisinakwa lake, from which point the stream becomes almost impassable on account of rapids and numerous boulders.

Natural Resources

Timber

The usual forest types characteristic of the northern evergreen forest of Ontario occur here. Lumbering in Benneweiss township and near Mesomikenda lake have depleted this area of its valuable timber, and the timber rights have now reverted to the Crown. These operations were carried on largely by jobbers in association with the Poupore Lumber Company, Limited, of Gogama and Ottawa. As a result of these operations this part of the area is now largely covered with heavy slash, making travel very difficult. Small isolated stands of white pine, red pine, and jackpine still remain in parts of Benneweiss and Chester townships, and as yet the pulpwood has not been touched.

In recent years the area has escaped the ravages of forest fire. Patches of brulé are few and, with the exception of those burned areas along the boundary between St. Louis and Benneweiss townships, in central Neville township, and in southern Yeo township, they are not extensive. A fire, sweeping through this region in 1885, burned that part of the area west of Three Duck lakes, and to-day this is largely a clean hardwood forest. East of the same lake charred stumps 4 feet in diameter attest the ravages of fire that swept through this area probably a century or more ago.

Insect pests were again prevalent during the summer of 1931, and it was observed that considerable damage to the trees ensued. Some of these pests may be mentioned. After a brief respite the larch-saw fly (*Nematus erichsonii*) is once more attacking the young tamaracs which were only beginning to gain a foothold in the swampy places. The balsam is seriously threatened by a larva allied to the spruce bud worm. The most noticeable damage, however, was that caused to the birch trees by what is known as the birch leaf skeletonizer (*Bucculatrix canadensisella*), a name which is self-explanatory. It would appear that the dry season provided conditions that activated this pest more than usual. Furthermore, it was observed that those birches growing on a thin mantle of soil suffered most.

Fish and Game

The deeper waters are well stocked with the types of fish common in northern waters, namely, pike, pickerel, perch, sucker, and whitefish. Lake trout may be caught in Mesomikenda lake.

Deer and moose are fairly plentiful. Incessant trapping has depleted almost to extinction the stock of common fur-bearing animals of value. Fresh beaver work, however, was observed in several places; if given sufficient protection, these much-desired animals should once more gain a foothold.

Water Power

There are no important sites in this area suitable for the development of water power. It should be noted, however, that at the present time Mesomikenda lake is being used as a water-supply reservoir, which is drawn on regularly for the Wawaitin power development on the Mattagami river. The water is controlled by a dam at the mouth of the Mekami river, Somme township.

A freshly constructed beaver dam.

Agriculture

The area, being outside the clay belt, is not adapted to agricultural pursuits. Isolated patches of sandy loam, however, have produced some fine gardens.

Mapping Methods

In the compilation of the geological map accompanying this report the survey plans of township lines made by the Department of Lands and Forests, Ontario, were used as a base. The lakes and streams on the main routes of travel, which hitherto had been shown in a sketchy manner, were surveyed as accurately as possible with a split-lens micrometer and prismatic compass control and tied to known points on the township lines. The micrometer survey of Yeo and Potier townships was done by Ellis Thomson in his mapping of the Woman River sheet. Traverses by pace and compass methods were made at suitable intervals and tied to known points of the micrometer survey. Since none of the mining claims were surveyed by transit they have been placed on

the map in groups located as accurately as possible by the methods in use. That part of the Makwa road connecting Lorry lake and Clam lake, which was constructed since the writer left the field, has been located approximately by H. J. Brennan.

GENERAL GEOLOGY

The rocks in this area belong to the pre-Cambrian group and range in age from the Keewatin to the Keweenawan period. The Keewatin consists of two belts of basic volcanic rocks, one in the northern half of Yeo known as the southern volcanic belt, the other in the southern part of Potier known as the northern volcanic belt. Between these belts there lies an intermediate belt of sediments known as the Ridout series, thought by some to be Keewatin, but regarded by the writer as belonging to the Timiskaming series. These three belts trend in an east-west direction, and in the western part of the area they attain a total width of a little more than 4 miles. The volcanics are flanked on the north and south by wide areas of pink and grey granite gneisses, usually considered Algoman in age but possibly older. Toward the central part of the area the three older belts of rock are cut off in part by an extensive batholithic intrusion of granite, which occupies the greater part of Benneweiss and a large part of central Chester, and juts into central Yeo as far west as Ash lake. This granite is thought to be a late phase of the Algoman intrusion and largely responsible for the important mineralization in this area. Caught up in this intrusive are small areas of diorite and quartz diorite, which are pre-Algoman but post-Timiskaming in age. Lying between the older granite gneisses to the south and the younger granite batholith, there is a complex series consisting of diorite and granite in such close association that it may best be designated as a diorite-granite complex. This series has been mapped separately, but at no place were definite contacts with the adjacent rocks observed. In the Schist Lake area, numerous east-west dikes of quartz-feldspar porphyry follow the schistosity of the lavas.

Diabase dikes of the Matachewan period have intruded all the older rocks in greater profusion than has been observed by the writer in any other locality. The latest phase of igneous activity was that of the Keweenawan period. The geological record between the Keweenawan and the Quaternary periods has been removed by erosion; furthermore, the widespread processes of peneplanation have removed hundreds of feet of the pre-Cambrian. The unconsolidated sands and gravels of the Pleistocene and Recent have been deposited on this eroded surface.

The following table gives the probable age, character, and relationship of the rocks, the oldest being at the bottom:—

QUARTERNARY	
RECENT:	Sand beaches, peat, lake deposits, limonite.
PLEISTOCENE:	Sand, gravel, boulders.
	Great unconformity
PRE-CAMBRIAN	
KEWEENAWAN:	Olivine diabase dikes.
MATACHEWAN:	Diabase dikes.
	Intrusive contact
ALGOMAN:	Dikes of quartz-feldspar porphyry, feldspar porphyry; diorite, granodiorite, granite, alaskite, lamprophyre dikes, quartz veins; pink and grey granite gneisses; diorite breccia, granite-diorite complex (in part probably pre-Algoman or even Keewatin).

Intrusive contact

PRE-ALGOMAN (Haileyburian?): Diorite, quartz diorite.

Intrusive contact

TIMISKAMING: Schistose conglomerate, greywacké, arkose, quartzite, argillite, iron formation, sericite schist, mica hornblende schist.

Probable unconformity

KEEWATIN: Altered massive to schistose lavas basic to intermediate in composition, pillow lavas, amygdaloidal lavas, basic feldspar porphyry, coarse phases of the lavas, pyroclastics.

Keewatin

For the most part the Keewatin consists of a highly metamorphosed series of volcanic rocks, to which the common terms greenstone and greenstone schist may be aptly applied. The series may be divided into a northern volcanic belt and a southern volcanic belt, the more important features of which will be described.

Northern Volcanic Belt

The northern volcanic belt, in which schistose lavas predominate, may be traced without a break across the entire map-sheet from the southern part of Potier township east to Minisinakwa lake, where it appears to terminate. Whether or not the belt appears again east of this point has not been determined. The belt has a maximum width of 1 mile 34 chains on the west boundary of Potier township and at Schist lake and tapers gradually to the east; between Mesomikenda lake and Minisinakwa lake it is narrowest, varying from 30 to 40 chains in width.

Outcrops are not uncommon in spite of the fact that much of the area along this belt is heavily covered with drift. The finest exposures, however, may be seen on Schist lake, Bagsverd lake, and Mesomikenda lake. It is apparent that Schist lake has derived its name from the great development of that type of rock on the north and south shores as well as on the numerous islands. Except for local variations, the schist strikes east-west and dips at angles varying only 10 degrees south from the vertical; no dips to the north were observed.

Although much of the rock has been strongly metamorphosed to dark-green schist, sufficient evidence remains to determine their original basaltic character. In certain places, notably on some of the islands and on the south shore of Schist lake, there are narrow bands of unsheared rock composed of typical fine-grained basalt showing the development of pillow structure and often displaying a fine thread-like cross-checking, which is characteristic of the weathered surface of some basalts. Many of the pillows show amygdaloidal structures toward their peripheries. Furthermore, all gradations were observed between massive types showing good pillows or ellipsoids, schistose types with stretched and distorted pillows, and highly schistose types in which the pillow structures were completely obliterated.

On the north shore of the largest island in the eastern part of Schist lake, there is an outcrop of pillow lava characterized by the presence of rounded inclusions varying from a quarter of an inch to 2 inches in diameter and having no apparent relationship to the ellipsoidal structures. The smaller of these inclusions are known as *lapilli*, and the larger ones are more properly called bombs. They appear to be composed of a rather soft, crumbly, siliceous material,

which fact accounts for the somewhat pitted appearance of the surface of the enclosing rock when these structures have been completely removed by weathering. The *lapilli* and bombs are of volcanic origin, having been thrown from a volcanic cone at a time of violent eruption following closely the more quiet outpourings of basaltic lava.

Although not extensively developed, some of the Keewatin lava has undergone considerable recrystallization to coarse-grained hornblendite or amphibolite. In the field, this type is difficult to distinguish from later intrusions of diorite or from parts of the same lava flow where slower cooling conditions allowed the development of a coarse-grained phase. In general, however, those specimens, which are composed of large greenish-black crystals of hornblende with glistening faces, usually belong to the recrystallized type.

The microscopic examination of a few representative thin sections of the basalt and the schist establish the fact that the former has undergone extensive chloritization and, to a lesser extent, carbonatization, while the latter seems

Lapilli in pillow lava, Schist lake.

to have been subjected more severely to the carbonatization process. The schists resulting from this combination of alteration products may be better known as chlorite-carbonate schists, the type which, in general, is characteristic of the northern volcanic belt. On the east shore of Bagsverd lake, near the north boundary of Chester township, carbonate has been developed to such an extent that excesses of this material take the form of large masses of calcite 6 to 8 inches in diameter intercalated in the schist layers. Near the water's edge the waves have worn out the soft calcite portions leaving a very rough pitted surface. In the same locality some of the chlorite-carbonate schist has been silicified. On the weathered surface of certain less schistose outcrops a mottled appearance is noticeable, especially when wetted. The mottling is due to light-coloured spots of carbonate and silica disseminated throughout the dark chlorite matrix.

In the northern volcanic belt acid lavas, such as rhyolite, are conspicuously absent. Furthermore, lavas intermediate in composition, though present, occupy a very subordinate position as compared with that of the basalts. A few bands of greyish rock, andesitic in character and usually not more than a few feet in width, were observed on Schist lake and Bagsverd lake. These bands

of andesite probably represent portions of the basalt magma a little more feldspathic in character.

Near the tip of the prominent peninsula on the south shore of the eastern part of Schist lake, there is a small irregular vein of a peculiar pale-greenish, somewhat fibrous material cutting basalt. Under the microscope this material proved to be quartz intimately impregnated with a light-greenish fibrous hornblende, the properties of which were imparted in such a manner as to present an unusual homogeneous appearance in the hand specimen.

Southern Volcanic Belt

The southern volcanic belt extends across the northern part of Yeo township in a direction a little south of east, following the trend of the sedimentary belt and lying immediately to the south of it. The belt is terminated somewhat abruptly near the east boundary of the township by an extensive granite batholith. That this belt extended eastward at one time is strongly suggested by the character and location of certain small isolated greenstone areas in the central part of Benneweiss township. It seems probable that the continuity of the southern volcanic belt was broken by later intrusives as shown on the accompanying map. The belt is one mile wide where it crosses the west boundary of Yeo township and widens to a maximum width of about 2 miles in the vicinity of Ash lake.

Although the character of the lava does not differ essentially from that described in the section on the northern volcanic belt, there are, nevertheless, certain features that deserve some attention. The lava, for the most part, is composed of highly altered basalt. In the vicinity of Yeo lake and Moore lake, these rocks came within the influence of the same shearing movements that gave rise to the schists of the northern volcanic belt, and chlorite-hornblende-carbonate schists resulted. They strike east-west and, except for a few dips at high angles to the north, show a vertical attitude. Massive chloritized basalts devoid of pillow structures are more common in the southern portion of the belt. On Chester lake, they show both fine-grained and coarse-grained dioritic phases in the same outcrop. Just south of the narrows, toward the north end of this lake, fine-grained basalt intruded by granite dikes was observed in a primary stage of recrystallization to hornblendite, a process commonly attending granitic intrusions. As in the case of the northern volcanic belt, considerable difficulty was experienced in the field in attempting to differentiate between diorite phases of the basalt, recrystallized phases of the basalt, and true post-Keewatin diorite intrusives. As an example, the southern part of the area from central Yeo township to Benneweiss township is characterized by a broad belt of rocks that have been mapped separately as a granite-diorite complex. The diorite is definitely older than the granite, but whether it belongs to the post-Keewatin diorite intrusives or to a dioritic phase of the southern Keewatin belt has not been established with any degree of certainty.

Where the northern volcanic belt crosses the central part of Moore lake, particularly on the east shore, there is a zone of amygdaloidal lavas alternating in regular fashion with dikes of greyish-green feldspar porphyry ranging from 1 to 200 feet in width. These dikes are parallel to the schistosity of the lavas, which is east-west, and they themselves are sheared in the same direction. This fact points to the Keewatin age of the dikes. The lava is characterized by the development of many small rounded amygdules, some of which are completely filled with quartz, while others are only partly filled with this material. On the weathered surface of the porphyry the small fragmentary phenocrysts

of feldspar stand out prominently; they range in colour from grey to green, and, in some instances, pink ones were observed. In both colour and schistosity these types of rock resemble one another to such an extent that, at a distance, it is often difficult to say whether the rock is the amygdaloidal lava or the feldspar porphyry, but close examination of the phenocrysts or amygdules will usually distinguish between them. A microscopic examination of a thin section of the porphyry showed phenocrysts of orthoclase and plagioclase in a fine-grained matrix of feldspar, quartz, chlorite, limonite, and a little pyrite. The orthoclase has been altered to sericite, and the plagioclase to zoisite and epidote.

Agglomerate horizons were observed mainly in the region between Yeo lake and Ash lake, Yeo township. On the south shore of Yeo lake, narrow east-west bands of agglomerate occur in the schistose greenstone. The fragments are stretched in the direction of shearing, in some instances attaining a length of 8 inches. They often show a marked porphyritic texture. On the creek joining Yeo lake and Canoe lake, there is an outcrop of light-grey schistose rock, which is intermediate in composition and shows narrow bands of sheared agglomerate. In some cases, the agglomerates are associated with tuffs and ash rocks.

In Benneweiss township, there are isolated areas of Keewatin rocks. One of these areas, in the vicinity of Robitaille lake, consists chiefly of massive, highly altered, light-weathering greenstone, andesitic in general character. The other area extends from the Makwa road to the foot of Minisinakwa lake. On the west shore of the lake high cliffs of basalt are literally soaked with feldspathic material, as well as being intruded by dikes of quartz porphyry and feldspar porphyry. In the bay of the lake extending to the railway bridge, there is a notable interfingering of basalt and granite in dikes up to 40 feet in width.

Timiskaming

In this area, the Timiskaming series forms an extensive belt of sedimentary rocks lying, in part, between the north and south Keewatin belts described in the previous section. It trends in an east-west direction and has been traced almost without interruption from the west boundaries of Yeo and Potier townships to the Canadian National railway, crossing it 4 miles south of Gogama. It attains a maximum width of almost 1¾ miles west of Schist lake and, where it crosses the railway, is more than 1 mile in width. Along the boundary between St. Louis and Benneweiss townships, the belt is very narrow and averages about a quarter of a mile in width, and at one point it is almost severed by the granite. In this connection it seems reasonable to suppose that at one time the belt was much wider in this locality, a large part of it having been destroyed by a subsequent invasion of granite to the south. This supposition is strengthened by the finding of an isolated area of sediments within the granite in the vicinity of Benneweiss lake, Benneweiss township.

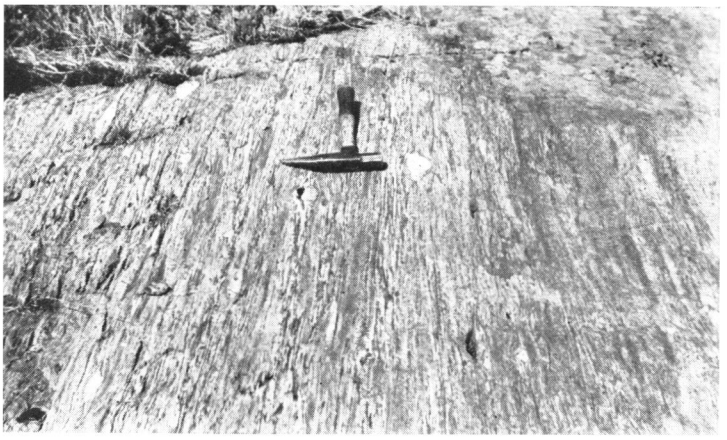
R. C. Emmons and Ellis Thomson,[1] working in the area immediately to the west, were the first to describe and map these sediments, which they called the Ridout series. They traced this series from Tooms township to Yeo township. Furthermore, on the authority of T. L. Tanton,[2] it is known that this series extends east of the present map-sheet to the foot of Mattagami lake. It would appear significant, therefore, that this area is associated with one of the longest

[1]R. C. Emmons and Ellis Thomson, "Preliminary Report on Woman River and Ridout Map-Areas," Geol. Surv. Can., Mem. 157, 1929, pp. 7-15.

[2]T. L. Tanton, "Reconnaissance along the Canadian Northern Railway between Gogama and Oba," Geol. Surv. Can., Sum. Rept., 1916, p. 180.

sedimentary belts known in Ontario, having been traced in an east-west direction for a total distance of 70 miles, with the possibility of its being extended at either end.

In this area, the Ridout series is composed of a variety of sedimentary rocks, of which the following are the chief types: conglomerate, greywacké, arkose, argillite, quartzite, sericite schist, mica-hornblende schist, banded iron formation. These occur in about the same order of decreasing abundance. Generally speaking, the sediments, except where they have been disturbed by batholithic intrusions or faults, strike in an east-west direction, and, with the exception of a few outcrops that showed dips varying from 5 to 10 degrees south from the vertical, they stand on edge. For the most part, they have been sheared by the same structural movement that developed the schists in the Keewatin. The shearing took place along the strike of the beds, with the result that many of their original features have been obliterated.



Closely sheared greywacké with occasional granite pebbles, west arm of Schist lake.

Conglomerate, Greywacké, Arkose

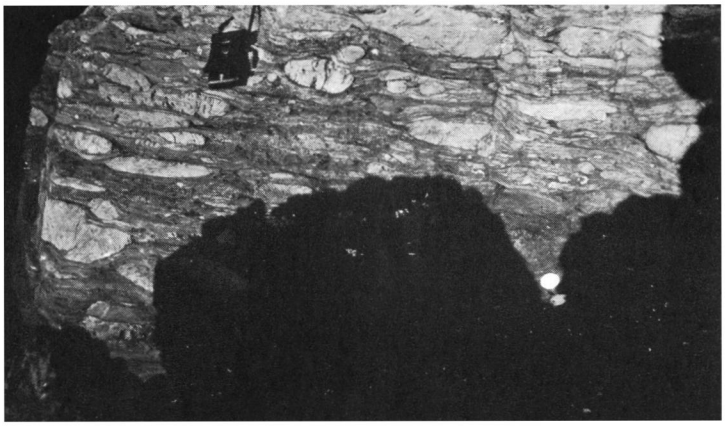
Conglomerate, greywacké, and arkose are so closely associated that it seems better to describe them under one heading.

The conglomerate occurs in relatively narrow discontinuous bands or lens-shaped masses at various horizons in the sedimentary series, but principally along its northern border. As one might expect, it varies somewhat in character in different places, owing to the conditions of its origin. For example, in the western part of the area where greywacké is the common matrix, the conglomerates are dark in colour, while toward the east they are reddish due to a reddish arkosic matrix.

Excellent exposures of conglomerate occur on the south shore of the west arm of Schist lake. These exposures form a part of a band that was traced from Felix lake in the southwestern part of Potier township to a point on the south shore of Schist lake just south of the boundary between Potier and Yeo townships. At this point the band disappears beneath the lake, but it reappears on one of the small islands a few chains to the east. Emmons and Thomson[1] state that the same band continues into the township of Huffman and beyond. The

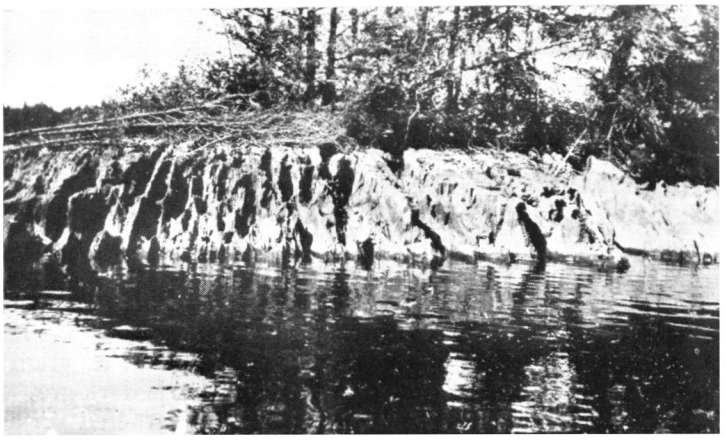
[1]R. C. Emmons and Ellis Thomson, op. cit., p. 9.

conglomerate consists of pebbles and boulders of various rock types, such as granite, schist, and diorite; but granite appears to predominate, especially among the larger boulders. Pebbles of banded chert, black chert, and quartz are common, and red jasper occurs in sparing quantities. The matrix is a dark, highly altered greywacké, which, under the microscope, is seen to consist



Stretched conglomerate, west arm of Schist lake.

largely of chlorite, carbonate, and quartz, with minor quantities of sericite, plagioclase, and epidote. As a result of the strong shearing and compression to which this assemblage has been subjected, a great majority of the boulders assume an oval, elliptical, or even flattened shape parallel to the schistosity. In some



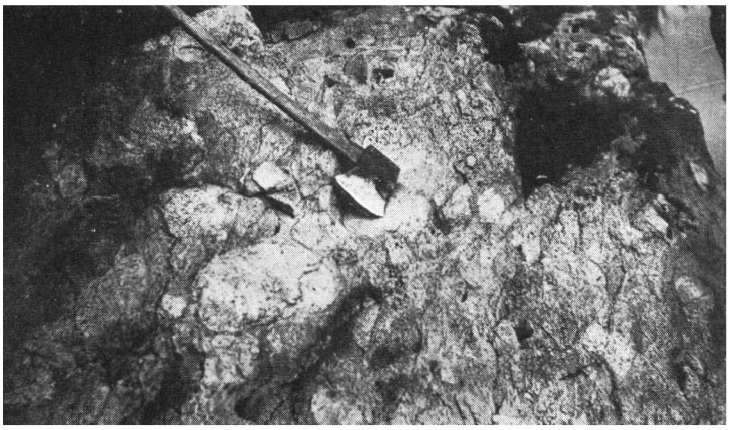
Characteristic surface of greywacké under the influence of wave action, west arm of Schist lake.

cases, stretched or elongated boulders up to 36 inches in length were observed, but the average length is about 12 inches. In this respect, it should be noted that the smaller pebbles have withstood the deformation better than the larger ones, having retained their original rounded or subangular forms. The soft greywacké matrix is strongly squeezed between the boulders and pebbles and

appears to flow around them. Under wave action, the soft greywacké wears away from the boulders and pebbles leaving a characteristic roughened and pitted surface. This feature is well shown on the flat outcrops along the south shore of the west arm of Schist lake and on some of the islands near by.

The conglomerate band passes gradually into greywacké on either side, the passage being marked by a diminution in the number and size of the boulders and pebbles rather than by a sharp contact. The greywacké has been closely sheared along the bedding planes, giving rise to very friable schists.

On the south shore between Bagsverd lake and its East arm, there is a conglomerate band exposed for a distance of half a mile along the strike and probably not more than 100 feet in width. It differs from the greywacké conglomerate described above in having small, well-rounded pebbles and cobbles, usually not more than 6 inches in diameter, lying in a highly cleavable, yellowish-green sericite schist matrix. As usual, the schistosity is parallel to the bedding. The strike varies from a few degrees north of east to a few degrees south of east,



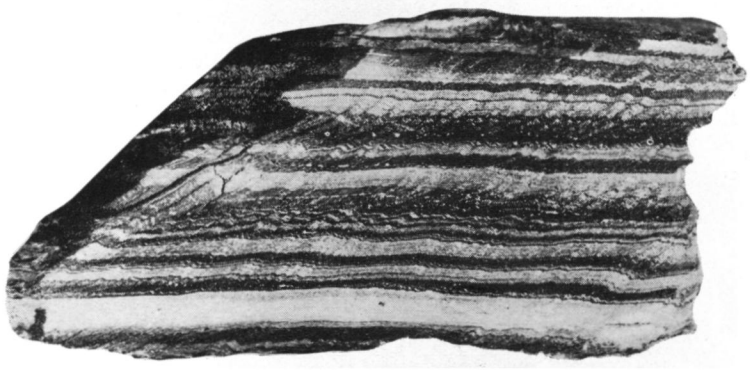
Conglomerate with an arkose matrix, Benneweiss creek, St. Louis township.

and, although the beds usually stand on edge, a dip of 5 degrees south from the vertical was observed in the East arm.

Small lenses of conglomerate were seen on the Chester Shannon claims between the South arm of Bagsverd lake and Little Clam lake. The rock is massive and presents a characteristic roughly weathered surface. At first glance, the pebbles can scarcely be discerned from the enclosing rock, but on close examination, especially on freshly broken or exfoliated surfaces, granitic pebbles up to about 4 inches in diameter are seen. The matrix is dark-grey to black in colour on fresh surfaces and reddish brown on the weathered surface, due to the presence of limonitic materials, which were formed by the alteration of certain ferromagnesian minerals. The matrix represents a strongly recrystallized greywacké, which is now composed chiefly of quartz, feldspar, and hornblende. In some cases, this process has gone far in obliterating the outlines of the pebbles and in rendering the rock more homogeneous than before. The outcrop on which the Shannon camp stands is of this nature.

The occurrence of conglomerate was noted at several points between Bagsverd lake and the chain of lakes in the extreme southwest corner of St. Louis township.

An extensive development of conglomerate and arkose occurs along the boundary line between St. Louis and Benneweiss townships, where it forms an almost continuous outcrop from the 3½-mile post to Minisinakwa lake. Benneweiss creek, just to the north of the township line, flows between high brulé hills composed of this type of rock. Although slightly sheared in some places parallel to the bedding, the conglomerate usually presents a massive appearance. It consists of pink to grey granite pebbles and boulders ranging up to 10 inches in diameter and almost invariably rounded. No other types of rock were noted among the boulders. The matrix is composed of a fine- to coarse-grained arkose, usually reddish in colour where orthoclase predominates. A microscopic examination of thin sections of the arkose shows that it is composed of fragments of orthoclase, plagioclase, quartz, and pyrite, in a fine-grained matrix of quartz, chlorite, and sericite. To the north, the arkose conglomerate band passes gradually into well-bedded arkose, the change being marked only by the failure of pebbles and boulders. Toward the south, the band appears to grade, without any sharp contact, into a coarse pink to grey granite, which is characterized by an abundance of blue quartz eyes up to the size of a pea.



Polished specimen (natural size) of banded argillite from an outcrop south of Schist lake.

The blue quartz eyes likewise characterize the arkose and its impure or greywacké phases farther east along the creek.

On Minisinakwa lake and along the railway between mileage 80 and 81, good exposures of the sediments may be observed. They consist mainly of schistose greywacké conglomerate, schistose greywacké, sericite schist, and narrow bands of quartzite, all of which have been intruded along the schistosity by narrow dikes of pink and grey aplitic material. Along the northern contact, the greywacké has been altered to micaceous hornblende schist, which in some places showed the presence of large granite boulders. On the whole, the sediments here resemble those observed in the vicinity of Schist lake.

A few outcrops of conglomerate, greywacké, and some quartzite occur on Benneweiss lake near its outlet, along the north shore, and on two islands at the west end of the lake.

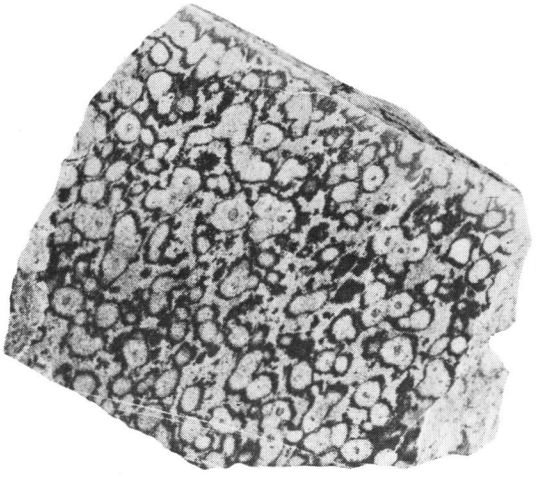
Argillite, Sericite Schist, Quartzite, Silt Rock

In addition to what has been already stated concerning the greywacké in the vicinity of Schist lake, it may be said that this rock, in some places at least, grades imperceptibly into massive and banded argillite. A good exposure of the latter type may be observed on the trail to Cryderman's east camp, about

20 chains from Schist lake. The argillite consists of alternating light- and dark-coloured bands up to a quarter of an inch in width. These bands show many tiny crenulations, which express in miniature the stresses to which the beds have been subjected. Some of the bands show the development of false or incipient cleavages running obliquely across the band.

Argillite conglomerate was noted in a few places south of Schist lake and in the argillites exposed along the south shore of the South arm of Bagsverd lake. A sheared argillite outcrops on the east shore of Moore lake a few chains south of the trail to Cryderman's east camp. A thin section of this rock showed it to be composed of very fine grained quartz, feldspar, sericite, carbonate, chlorite, and pyrite. A greenish-coloured argillite occurs on the south shore of the west bay of Bagsverd lake.

A strong band of sericite schist was traced from Trail lake, in the north central part of Yeo township, to the extreme northwest corner of Chester township. The best exposures are: on Trail lake, on the northeastern part of



Polished specimen (natural size) of silt rock from an outcrop on the Makwa road, showing the characteristic ring-like structures.

Moore lake, at various places along the high ridge between Moore lake and Bagsverd lake, on the south shore between Bagsverd lake and the East arm, on the east shore of Mesomikenda lake just south of the north boundary of Chester township, and along the creek flowing from the chain of lakes in the southwestern part of St. Louis township. In some cases the schist is very fissile, breaking into large slabs, while in others it tends to be friable. It is usually light yellowish-green in colour and often shows the development of augen quartz. In some places, crumpling movements have given the beds a corrugated appearance. There is evidence to support the assumption that this rock was originally an arkose.

Although it does not occur extensively in this area, quartzite may be found as narrow bands interbedded with all of the sedimentary types described above. Since this rock resembles and often grades into arkose, it is sometimes impossible to make specific determinations without a microscopic examination.

On the Makwa road, 6 chains east of the falls on the creek flowing out of Bernice lake, there is one small outcrop of an unusual type of rock, which, in the field, might readily be taken for a variety of the so-called spotted lava. The weathered surface is light-greyish in colour and has a somewhat mamillated

appearance, while the fresh surface is greenish-grey in colour and shows the development of dark-green, ring-like structures. Microscopic examination shows that the ring-like structures are composed of fine shreds of sericitic material and that the matrix is largely composed of very fine grained quartz and chloritized hornblende shreds. The origin of this rock is somewhat obscure, but it probably represents a silt deposit. If this be true, the development of the ring-like structures may be associated with certain colloidal properties of the fine sediment at the time of deposition.

Iron Formation

A belt of iron formation has been traced with only a few interruptions from the northwest corner of Yeo township to the trail leading from Schist lake to Cryderman's east camp, a distance of 5 miles. It ranges from a few feet to 200 feet in width, the average being about 100 feet. In many places, it grades

Banded iron formation showing light bands of chert and dark bands of limonitic material, including the wide one at the left, Cryderman group, Schist lake.

imperceptibly into the adjoining sediments, the passage being marked only by the failure of the chert bands.

The character of the iron formation varies considerably in different parts of the belt. For instance, where it outcrops on the south shore of Schist lake, it is composed mainly of banded chert with lenses of very fine iron sulphides. One mile west of this point, well-banded iron formation occurs, bands of grey chert up to 3 inches in width alternating with ferruginous bands from a few inches up to several feet in width. In the same locality, a small patch of chert breccia was observed in the iron formation. The breccia consists of rounded and cigar-shaped fragments of white chert up to 7 inches in length, oriented along the bedding planes, in a dark smoky quartz matrix. In the vicinity of Canoe lake, the iron formation is composed largely of iron and contains very little chert.

Age of the Ridout Series

Emmons and Thomson[1] in their report on the area to the west regard the Ridout series as Keewatin in age. In the area under consideration, the writer

[1]R. C. Emmons and Ellis Thomson, op. cit., p. 7.

could find no evidence to support this conclusion, but there is strong presumptive evidence that this series belongs to the Timiskaming period of deposition. In the first place, the character of the material composing the rock, the banding and vertical attitude of the beds, and the degree of metamorphism, as displayed by the Ridout series, show a remarkable similarity to other belts of sedimentary rocks in Ontario that have been correlated with the Timiskaming. Moreover, there is reason to believe that an unconformity exists between what are here regarded as the Keewatin and the Timiskaming series, although the actual break has not been observed. The apparent absence of the actual unconformity is not surprising when one considers that all evidence was no doubt destroyed by the strong deformation that the beds of both series have undergone. The occurrence of a conglomerate member with pebbles of greenstone, chert, and granite near the base of the Ridout series strongly suggests an erosion interval prior to its deposition, and hence an unconformity. Even without the evidence provided by the conglomerate, the fact that the Keewatin schists grade into the Ridout sediments with the apparent absence of an unconformity does not necessarily show that these rocks are of the same age, for this feature is commonly observed not only at the Keewatin-Timiskaming boundary at many places in Ontario and Quebec, but also at the boundaries of great systems in the Paleozoic and Mesozoic eras. Furthermore, it has been suggested by some that thick sedimentary deposits with a distribution of lens-like masses of conglomerate, such as occurs in the Ridout series, were of subaerial origin. According to this theory, the pebbles and boulders were carried down from adjacent high mountains to the basin of deposition by streams which, at times, reached torrential proportions. If this theory of origin of the conglomerate be accepted, and it is a very reasonable one, it must be assumed that an unconformity exists between the Keewatin and the Ridout series. The conglomerate provides further evidence that the Ridout series is post-Keewatin in age. The greenstone and chert pebbles no doubt represent the erosion products of the underlying Keewatin; but, if the series be regarded as Keewatin, it is necessary to postulate a pre-Ridout granite of Keewatin or pre-Keewatin age as a source of the granite pebbles. However, since granite of this age has not been generally recognized by geologists, and certainly not in this area, it seems more in accord with recognized pre-Cambrian correlation to regard the Laurentian granite as being the source of the pebbles, even though it has not been observed here.

Pre-Algoman (Haileyburian?)

Dikes and small irregular-shaped areas of diorite are common in this area, but only the larger of these have been mapped. Diorite dikes, cutting the Keewatin greenstone in an east-west direction, were noted along the north boundary of Chester township, west of Bagsverd lake, and in a few other places. A small mass, intruding the Keewatin, occurs on the creek between Schist lake and Bagsverd lake. Small areas of this rock intrude the Ridout series between Schist lake and Moore lake, and on Bagsverd lake, a fact which establishes their age as post-Timiskaming. Furthermore, small diorite masses occur within the "younger" granite area, but here tongues of the granite invade the diorite, a fact which determines the pre-Algoman age of the diorite.

The diorite is a greyish-green, highly altered rock, which, under the microscope, is seen to consist chiefly of hornblende, much altered plagioclase, chlorite, epidote, and some pyrite. In a few instances, a diabasic texture was noted. In general, the highly altered nature of this rock is sufficient to distinguish

it from the fresher diorite phases of the later granite described below; on the other hand, it is often hard to distinguish between it and the Keewatin amphibolite.

A relatively large mass of quartz diorite or gabbro lies within the granite area, between Mesomikenda lake and Benneweiss lake. That this rock is the same age as the diorite described above has not been definitely established in the field; and, although it may be a differentiate of the granite, it has been mapped with the pre-Algoman diorites. It differs from the diorite in having a more granitic texture as well as apparent porphyritic phases in some places. Microscopic examination shows that it consists dominantly of highly altered plagioclase, blue quartz, and hornblende altering to chlorite, with minor quantities of orthoclase, apatite, sericite, carbonate, magnetite, and pyrite. In the vicinity of Bernice lake, this rock resembles a basic feldspar porphyry, but thin sections show that this texture is not real, the porphyritic appearance being due to the fact that less altered portions of a feldspar crystal stand out in a matrix that is merely the broken-down portion of the same crystal. One thin section from the same locality shows that the quartz diorite has undergone crushing to some extent.

Algoman

Four types of acidic intrusives have been recognized and mapped in this area, namely, an older batholithic granite, a granite-diorite complex, a younger batholithic granite, and dikes of porphyry and felsite. It seems probable that these rocks belong to the Algoman period of intrusion.

Older Granite

The older granite occurs over wide areas lying to the north and south of the Keewatin volcanic belts. It consists largely of pink to grey hornblende and biotite granite, massive for the most part but often showing gneissic and porphyritic facies especially near the border of the Keewatin. As a rule, the contact with the Keewatin is not sharp, but rather in the nature of a zone which is characterized by alternating bands of fine-grained granite and greenstone. This zone ranges in width from a few feet up to several hundred feet, depending on the locality. The individual granite bands vary from a few feet in width to mere stringers, getting progressively smaller farther from the parent body. The invading granite followed the schistosity of the greenstone and seldom, if ever, cut across it. Under the influence of the heat and pressure attending this intrusion the greenstone was converted into a dense, baked material resembling slate. These relationships may be observed at various places along the contact, but notably as follows: on either side of Mesomikenda lake just north of the south boundary of Neville township; on the west shore of Minisinakwa lake, St. Louis township; and near the outlet of Bear lake, Yeo township.

Granite-Diorite Complex

A contact zone between the "older" granite and older rocks, quite different from that described in the previous section, is represented in the southern part of the area by a broad zone of transition rocks extending from the central part of Yeo township to Mollie lake and beyond. This transition zone is designated best as a granite-diorite complex from the fact that these rocks are associated in a most complex manner. In most places, the granitic material appears to have literally soaked into the older diorite; in other places, notably at Sawpeter lake, in the east central part of Yeo township, the invading granite produced

a diorite breccia with blocks up to 1 foot or more in diameter. The question, already raised in a previous section, as to whether the diorite is post-Keewatin or a dioritic phase of the southern Keewatin belt has not been answered satisfactorily for the reasons given in that section.

In an attempt to show its general outline the granite-diorite complex has been given a separate notation on the accompanying map. It should be noted, however, that in the absence of definite contacts the boundaries of this complex are of necessity only approximate.

Younger Granite

The central part of the area is occupied by a large batholith of granite extending from Ash lake, in Yeo township, to the eastern limit of the area. Although it has not been observed to cut the "older" granite, this granite is believed to be the younger of the two, mainly by reason of its fresher appearance in the field. The boundaries of the batholith, as fixed on the accompanying map, must be considered as purely arbitrary within certain limits, since, in most places, the granite grades into the adjacent older rocks without any sharp line of demarcation. The only exceptions occur in the vicinity of Ash lake and at the south end of Minisinakwa lake, where a definite interfingering of granite dikes and Keewatin greenstone was observed.

As might be expected in a granite mass of this extent, many variations in the type are found from place to place. Normal pink to grey granite and quartz syenite are the predominant types. Granodiorite outcrops on the east shore of the middle lake of Three Duck lakes. South of Cryderman's camp, on the southern lake of Three Duck lakes, this rock grades into a typical diorite. On the west shore felsitoid phases were observed. In a zone extending in an east-west direction from the south end of Moore lake to the northeast corner of Chester township, there is a characteristic and rather uncommon type of rock which is thought to be closely associated with the granite, if not, indeed, a phase of it. Along this zone, it is well exposed at the north end of Clam lake, on the northern lake of Three Duck lakes, and near the bridge at the narrows on Mesomikenda lake. In most cases, the rock is almost white on the weathered surface, and yellowish-grey on fresh surfaces. The texture varies from granulose to porphyritic. In some places it bears a strong resumblance to a highly metamorphosed arkose, while in others it has the appearance of a quartz porphyry phase of the granite. For this reason some difficulty was experienced in the field in trying to decide whether this rock was of sedimentary or igneous origin. Even under the microscope this distinction is not always clear on account of the crushed and highly altered nature of the constituent minerals. The wide resorption areas in certain quartz fragments, however, is one feature that strongly suggests an igneous origin. Some thin sections show little other than quartz and orthoclase, the latter of which is largely altered to sericite. In addition to these minerals other sections show minor quantities of plagioclase, hornblende, chlorite, ilmenite, leucoxene, and pyrite. In general, therefore, it may be said that this rock borders on a type of granite known as alaskite.

Field observations seem to indicate that the granodiorite, granite, and alaskite are contemporaneous, and that they represent differentiation phases of the same granite magma. Furthermore, it is the opinion of the writer that a suite of specimens carefully selected at intervals between the south end and north end of Three Duck lakes would show a gradual transition from the basic to the acid type, that is, through diorite, granodiorite, biotite granite, to alaskite.

Everywhere the granite types are characterized by a great excess of blue quartz in the form of blobs, which, in north Benneweiss township, often attain the size of a bean.

Dike Rocks

The end of the Algoman was marked by the intrusion of both acid and basic dikes, the latter of which probably represent complementary phases of a common granite magma. Two kinds of acid dikes were noted, namely, reddish quartz syenite and grey felsite. Among the basic dikes, trap and lamprophyre are most common. The former is a very dark, fine-grained rock about the composition of a basalt; the latter is a black, coarse-textured, shiny rock, rich in biotite and hornblende, the presence of which allows it to be called more precisely a hornblende minette. These dikes seem to be confined largely to the "younger" granite area. In the northern part of Chester township there are many schistose patches of greenstone and diorite assuming the form of narrow dikes; these are merely inclusions of older rocks that have been caught up in the granite.

On Schist lake, dikes of coarse quartz-feldspar porphyry, ranging from a few feet up to 50 feet or more in width, intrude the greenstone schists in an east-west direction, that is, parallel to the schistosity. In some dikes orthoclase is the dominant feldspar phenocryst, but, in most cases, plagioclase predominates and the rock is more properly called a dacite porphyry. Thin sections show large phenocrysts of plagioclase and smaller phenocrysts of quartz and orthoclase in a fine-grained matrix of quartz, feldspar, carbonate, sericite, and pyrite. A few dikes of feldspar porphyry, less striking in appearance than those just described, were found cutting the Keewatin on Minisinakwa lake near the south end. At one place on the west shore a feldspar porphyry dike cuts across an older quartz porphyry dike. All these rocks appear to be closely related to the granite, but it is not known whether this relationship is with the "older" or the "younger" granite.

Matachewan

Diabase dikes occur abundantly in all parts of the area, intruding all the older rocks. As a rule they are not more than a few feet wide. They show a considerable variation in direction between north-south and east-west, but the majority seem to have a northerly trend.

These dikes have been assigned to the Matachewan period of intrusion on account of their being similar to dikes of this age in other parts of Northern Ontario. It may be, however, that some of them belong to the Keweenawan period, although this is difficult to prove in the absence of the Cobalt series. Some dikes exhibit large yellowish-green phenocrysts of huronite, a mineral often observed in the pre-Cobalt or Matachewan diabase.

Keweenawan

An olivine diabase dike cutting across the western part of the area attains a width of 350 feet. This dike is very persistent, having been traced in a northeast direction from Windy lake to a point on the east shore of Wolf lake, a distance of 7 miles. At the western extremity of Schist lake, it shows a gradation from coarse gabbro in the centre to fine-grained diabase near the margin. At some points magnetite is present in such quantities as to seriously affect the compass.

Pleistocene and Recent

Glacial striae, fluting, chatter marks, and smoothed surfaces on the rocks attest the presence of an advancing ice-sheet in Pleistocene time. From the direction of the striae it would seem that the ice moved almost due south. On the retreat of the ice the topography was greatly modified by the dumping of glacial debris in the form of ground moraines, terminal moraines, eskers, and kames, consisting, for the most part, of unsorted sands and gravels. Eskers are common, especially in the eastern part of Chester township, and they trend in a north-south direction. A typical kame in the extreme southeast corner of the same township has already been mentioned above in the discussion on topographic features. Stratified clay is notably absent, and boulder clay is not commonly observed. Gently rolling sand plains, dotted with kettle lakes, characterize a large part of the townships of Neville, Benneweiss, Invergarry, and Smuts. They are composed of well-stratified sand and gravel representing beach deposits of post-glacial lakes. Those deposits exposed on Mesomikenda lake, Neville township, probably denote the southern shoreline of Lake Barlow-Ojibway, and those in the townships of Invergarry and Smuts denote the northern shoreline of Lake Algonquin, the fourth stage in the development of the Great Lakes system. The position of the height-of-land argues in favour of this interpretation of the origin of these deposits.

Deposits of the Recent consist mainly of sand beaches, lake deposits, and peat. A reddish-brown, flocculent, jelly-like precipitate of hydrated iron oxide or limonite is forming at the present time where spring water issues from the sand. Deposits of this nature were observed at two places in the eastern part of Chester township on the road between Mesomikenda lake and Lorry lake and on the second portage east of the north end of Dividing lake. These deposits are small and quite unimportant.

Structural Geology

Apart from the general relationships of the rocks themselves the structural geology of this area is revealed mainly by such features as folding, shearing, and faulting movements.

The first important deformation appears to have taken place in post-Timiskaming time when the Keewatin volcanics and the Ridout series were closely folded into a major syncline, whose axis lies in the sedimentary belt and extends across the area in an east-west direction parallel to the strike of both series. This folding was followed by strong shearing movements also parallel to the strike of both series. Since the shearing is definitely pre-Algoman in age, it follows that the folding is likewise pre-Algoman and was caused by forces other than those attending the great batholithic intrusions of granite. Furthermore, the age of deformation may be fixed even more closely by a consideration of the pre-Algoman diorite intrusives. These rocks are definitely known to be later than the folding and shearing, since they intrude the older highly folded and sheared series and are not sheared themselves. Therefore, the shearing and folding is post-Timiskaming but pre-Algoman in age.

Evidence in support of a major synclinal structure is to be found mainly in the western half of the area, where the full width of the Ridout series is exposed. The beds of this series commonly stand on edge over much of the region, and consequently they offer little in the way of tangible evidence. In a few places, however, variations in the dip of the beds, as much as 10 degrees from the vertical, were noted, and in every instance this dip was such as to

strongly suggest a synclinal structure; that is, the beds to the south of the supposed axis dip at high angles to the north, and the beds to the north of it dip at high angles to the south.

The stratigraphic position of the conglomerate in the Ridout series is important as a key to the main structure. In this area, conglomerate occurs close to both edges of the Ridout series, but it is developed more strongly near the northern edge. In the area to the west, Emmons and Thomson[1] state that the opposite is the case, conglomerate being more strongly developed near the southern edge of the Ridout series. This is to be expected, since the conglomerate, which occurs as elongated lenses, may be present in one locality but absent at the same horizon in another. If then, both areas be considered, for they undoubtedly have the same structure, the observations would seem to argue strongly in favour of a basin-like or synclinal structure with the conglomerate toward the outer margins and the progressively younger sediments, including the iron formation, occupying the central portion. Furthermore, since the Keewatin volcanics and the Ridout series were folded at the same time and by the same compressional forces, it seems reasonable to suppose that the Keewatin flows adjacent to the sediments would form the outer limbs of the same synclinal structure; but no evidence of this was observed. In general, the Keewatin lavas have been metamorphosed to such an extent that they give little or no evidence as to their structure. It should be noted, however, that pillow lavas, observed only on Schist lake and Bagsverd lake, indicate that the flows of the northern volcanic belt face southward.

A glance at the map shows that the area is divided into segments by three distinct parallel regional fault lines that strike in a north-south direction. These fault lines are now represented by the linear basins of Minisinakwa lake, Mesomikenda lake, and Moore lake and Chester lake. The actual horizontal displacement of the beds is well shown where these fault lines intersect the east-west trending Ridout series and the north contact zone between the greenstone and the granite. The approximate displacements are as follows: on Minisinakwa lake, 6,600 feet; on Mesomikenda lake, 2,000 feet; on Moore lake, 1,000 feet. In every case, the beds on the east shore have moved northward relative to the beds on the opposite shore. The age of this faulting is definitely known to be post-Algoman, but whether it is earlier or later than the Matachewan diabase dikes could not be determined. Other adjustment faults of less significance occur throughout the area.

ECONOMIC GEOLOGY

During the past summer, interest in this area was confined chiefly to the environs of Three Duck lakes and Clam lake, Chester township, where several showings of native gold were uncovered. The development work to date has not gone beyond the preliminary stages of stripping and test-pitting, but on three of the larger properties an intensive development programme has been outlined.

Gold is the most important mineral in the area; in some places it is accompanied by appreciable quantities of copper. There are no other minerals of economic importance, with the possible exception of a small low-grade iron deposit in the iron formation band in the northern part of Yeo township.

[1]R. C. Emmons and Ellis Thomson, op. cit., pp. 11, 12.

Gold Veins

The main showings of gold occur within the area mapped as "younger" granite and close to the contact with the Ridout sediments. From this association it seems obvious that the gold is genetically associated with the more acid phases of this intrusive, the nature of which has been noted in a previous section. The gold occurs in narrow quartz veins occupying well-defined fractures or "breaks" in the intrusive rock, or in quartz veins along the contact between the acid intrusive and a basic dike, commonly lamprophyre. The majority of the fractures strike in a direction a few degrees south of east, and, in general, they show a regional parallelism. Although the fractures for the most part seem to be rather persistent in length, the vein material occupying them in any one place often pinches out after having been traced for a short distance. This condition is not unexpected, since in fissure veins of this kind the vein material commonly occurs at intervals separated by barren stretches. Under these conditions, the writer wishes to point out that work should not be abandoned because of the discontinuance of vein matter, but rather that the fracture should be followed as far as possible in the hope of locating other gold-bearing quartz lenses.

The quartz veins, especially the very narrow ones, often show crustification and comb structure, and vugs with quartz comb structure are common. In one vein on the property of the Three Ducks Syndicate, vugs of this nature are lined with nests of tremolite. Much of the quartz presents a somewhat dull granulated appearance, which is probably due to the fact that it has been strongly crushed and later recrystallized. Black tourmaline is one of the commonest vein minerals, and in some instances it is present in such quantities as to constitute the greater part of the vein material. Clinochlore, a dark-green mineral with a micaceous habit, occurs in many of the veins at Three Duck lakes.

Although the gold commonly accompanies pyrite and chalcopyrite, it occurs in the native state and is seldom found in intimate association with these sulphides. Other minerals observed in the veins are as follows: sphalerite, galena, bornite, covellite, malachite, azurite, molybdenite and its yellow oxide molybdite, and tetradymite (bismuth telluride). Closely associated with tetradymite on the Shannon property, Bannerman found a black mineral with a bluish-brown tarnish, which he believed to be a mixture of two or more tellurides (gold, silver, mercury).[1] In addition to the quartz and silicate minerals already noted, the ordinary gangue minerals consist of calcite, ankerite, and sericite.

An important feature of the veins here is the fact that both gold and sulphides commonly penetrate the wall rock for several feet. The gold is in too fine a state of subdivision to be seen, but its presence has been determined by assays. The ore minerals were introduced into the wall rock by a replacement process associated with hot ascending ore-bearing solutions in the fractures. In addition to alteration by replacement, the wall rock in some places was extensively silicified; in other places sericitization was the dominant type of alteration.

A noteworthy feature of several showings in this area is the close association of gold-bearing quartz veins with lamprophyre dikes. This fact at once leads to the presumption that the latter played not only an important chemical rôle in the precipitation of the gold, but also provided a suitable structure for the localization of the deposit.

[1]H. M. Bannerman, "Mineral Occurrences in Woman River District," Geol. Surv. Can., Sum. Rept., 1929, pt. C, p. 18.

That the veins belong to the deep-seated type and were formed under conditions of high temperature and high pressure is indicated by the presence of tourmaline, by the granular character of the quartz, and by the irregular, lenticular, and vuggy nature of some of the veins.

In 1922, T. L. Tanton[1] examined a gold showing a short distance southeast of Makwa in rocks that correspond to what the writer has called the granite-diorite complex. He states that the gold occurs in limonite along joint-planes in the rock, and he describes it as the lower 3 feet of a rich secondary deposit and the roots or lower parts of what was, perhaps, a large primary gold deposit. The auriferous limonite yielded $160 in gold per ton. No deposits of this nature have yet been found in the granite-diorite complex to the west of the railway, but the example serves to show that this part of the area is worthy of being prospected.

Another type of gold mineralization occurs in the Ridout sediments, particularly along the south shore of Schist lake. This type consists of gold, arsenopyrite, and fine iron sulphides in a highly silicified, carbonatized, and sericitized schist. The deposits form lens-shaped bodies that are very much longer than they are wide. The origin of the mineralization is not always immediately apparent, but it is believed to be associated with porphyry dikes that occur in the vicinity.

Rusty-weathering quartz-ankerite veins carrying small quantities of pyrite occur in the Ridout series, but they seldom give any values in gold.

Iron

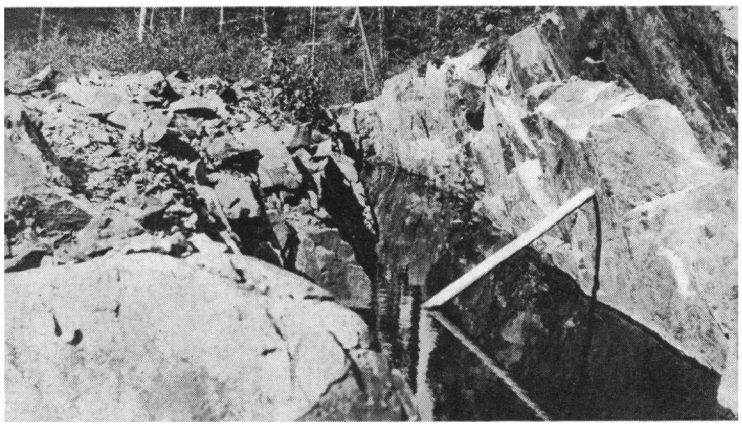
Several years ago, the iron formation belt in the northern part of Yeo township was investigated as a possible source of iron ore. Although development work disclosed a considerable quantity of ore, its grade was too low to permit profitable mining operations under the conditions existing at that time, and the venture was abandoned.

Toward the eastern part of the belt the iron formation is lean in its iron content, and it might justly be called a banded ferruginous chert. On the other hand, in the western half of the township the iron formation is characterized by the presence of lens-shaped pyrite bodies, which on the surface are composed largely of limonitic material. These bodies often attain a considerable length and width. A specimen of massive iron pyrite taken from a prospect pit in a lens of this kind on the east shore of Canoe lake gave 45.04 per cent. iron, according to the Provincial Assayer. Although no estimate of the quantity of this low-grade ore is made, it seems probable that a considerable tonnage could be proved. Furthermore, it should be stated that, with new metallurgical methods to eliminate the sulphur, ore of this grade can be utilized, but to mine it at the present time in competition with higher grade ores already on the market is unthinkable.

About half a mile from Gosselin's south camp on Mesomikenda lake, north of the winter road between the camp and Three Duck lakes, there is an interesting occurrence of specular iron (hematite) in irregular veins up to 1 inch in width. The country rock is diorite containing much feldspathic material. In the wider veins the hematite crystals are quite large, often extending from the wall to the centre of the vein, where they show a characteristic intergrowth. This occurrence is of no economic importance, being mentioned only because of its mineralogical interest.

[1]T. L. Tanton, "Gold Occurrence at Makwa," Geol. Surv. Can., Sum. Rept., 1922, pt. D, p. 11.

A small deposit of ilmenite was found in a low outcrop of granite a few chains east of a point midway on the portage between Clam lake and Chester lake. This mineral occurs as irregular-shaped masses in the granite, some of which are several inches in diameter. It is confined to a zone 10 feet wide by 30 feet long. A narrow dike of lamprophyre cutting across the outcrop appears to have exercised a considerable influence on the localization of the ilmenite, since on one side of it this mineral attains its greatest concentration, while it is entirely absent on the other side, as far as could be ascertained at the time of examination. From this fact it seems clear that the dike itself did not bring the mineralization, but rather acted as a dam against which heated igneous solutions containing ilmenite and chalcopyrite were induced to deposit their loads. It should be pointed out that this occurrence is rather unusual, since the home of ilmenite is commonly in the basic rocks poor in silica. In the field the associations of this mineral were such as to strongly suggest wolframite, but tests made by the Provincial Assayer establish it as ilmenite.



Main prospect pit, Lawrence claims, Mesomikenda lake.

Description of Properties

None of the properties in this area have been surveyed. The claims are shown on the accompanying map in groups, the location of which must be regarded as approximate. With the exception of certain patented claims in Yeo township, the following descriptions are concerned only with those groups of claims on which development work was performed during the summer of 1931.

F. Lawrence

The Lawrence group consists of 21 claims held by Gogama interests. The main showing, which occurs about 14 chains east of the two cabins on the east shore of Mesomikenda lake, was discovered in 1910 by H. Phillips. In 1916, the property attracted attention as a copper prospect, and it was optioned by Joseph Errington. The main showing was opened for a length of almost 200 feet and to a depth of 8 feet. Mr. Errington reports that 60 tons of copper ore were taken from this pit and shipped to New York. The average values contained in this lot were 7 per cent. copper and $3.50 in gold per ton.

At the time of the writer's visit, the excavation was filled with water, but there was considerable ore on the dump. The ore occurs in a lens about 200

feet long and 3 feet wide, which occupies a well-defined fracture striking E. 62° S. and dipping slightly to the northeast. The country rock is a quartzose phase of the "younger" granite, a type that is characteristic of the northern border of the younger granite batholith. The vein minerals observed on the dump and in the exposed part of the vein were: pyrite, chalcopyrite, malachite, azurite, bornite, covellite, calcite, and quartz. Thin sections show chalcopyrite replacing chlorite. The mineralization impregnates the wall rock for a few inches. A specimen from the dump showing average mineralization assayed 20.44 per cent. copper, 6.02 ounces silver per ton, and no gold.

What is thought to be the same zone of fracture has been traced southward from the main pit for a distance of 16 chains. At this point a pit, which has been opened to a depth of 5 feet, shows a 2-foot calcite vein containing quartz, pyrite, and chalcopyrite. A few chains farther south a pit has been opened in a rusty-weathering carbonated and quartzose schist occupying a zone 25 feet in width. It contains sparsely disseminated pyrite and chalcopyrite.

Beaver-Bethnal Syndicate

This syndicate holds 21 claims lying between Mesomikenda lake and Three Duck lakes and located on the contact between the Ridout sediments and a quartz porphyry phase of the "younger" granite. In 1930, test-pitting and trenching in quartz sericite schist on the east shore of Mesomikenda lake just south of the north boundary of Chester township revealed a mineralized lens containing small quantities of cubical pyrite, chalcopyrite, and iron carbonate (ankerite). In the open pit assays are reported to have given $2.70 in gold per ton. On claim S. 7,398, just north of the small lake on the winter road between Mesomikenda lake and Bagsverd lake, there is some sulphide mineralization in a gash vein of quartz.

During the latter part of the past summer six men were engaged in prospecting the southern part of the group. On claim S. 20,037, a few interesting sulphide zones were uncovered, and on claims S. 20,015 and S. 20,016 several rusty-weathering quartz veins occur; the rusty nature of these veins is due to the weathering of ankerite. Tourmaline is a common gangue mineral in the quartz.

Late in the season, a discovery was made on the line between claims S. 20,016 and S. 20,017. H. J. Brennan, field manager, reports a "break" 11 feet in width containing two parallel quartz veins that strike a little south of east and dip 60° S.; the north vein is 1½ feet wide, and the south vein is 2½ feet wide. Samples from this showing indicate appreciable quantities of chalcopyrite but no visible gold. Assays, however, are said to have yielded high values in gold. In general, it may be said that the geological conditions on this property are such as to warrant surface exploration.

A. Brennan

This group consists of 7 claims on the west side of Mesomikenda lake, adjoining the Beaver-Bethnal group on the east. Just south of the small lake on the winter road between Mesomikenda lake and Bagsverd lake, a sulphide lens has been uncovered. It is about 4 feet in width and is exposed for a length of 60 feet. The country rock is sericite schist belonging to the Ridout series. For the most part, the sulphides consist of pyrite, but small quantities of chalcopyrite, bornite, covellite, and sphalerite are present. There is no visible gold, but a well-mineralized specimen, assayed by the Provincial Assayer,

showed $8.40 in gold per ton, and 1.04 ounces silver per ton. Late in 1931, the Sudbury Diamond Drilling Company optioned the property, and they are reported to have made preparations to carry on development work.

H. J. Brennan

This group consists of 12 claims, none of which have disclosed any important mineralization. Some work has been done on a mineralized zone in the northwest corner of claim S. 19,968, near the north end of the portage connecting Three Duck lakes and the East arm of Bagsverd lake. This zone is about 20 feet in width and contains notable quantities of pyrite and pyrrhotite. Assays gave a trace of gold but no nickel. At the northeast corner of a small island in Bagsverd lake, claim S. 20,676, veinlets of quartz in a greenstone inclusion showed small quantities of chalcopyrite, malachite, azurite, and pyrite. This mineralization probably had its origin in a quartz-feldspar porphyry dike near by.

The Gosselin camp, Three Ducks Syndicate, Three Duck lakes.

A. Labbé

The Labbé group comprises 12 claims, the most important of which adjoin on the east the holdings of the Three Ducks Syndicate. During the past summer, work was largely confined to a showing on claim S. 19,991, located just a few chains south of the winter road between Three Duck lakes and Gosselin's south camp on Mesomikenda lake. A sheared zone 3 feet in width was followed by stripping for nearly 100 feet. The main fracture strikes E. 12° S. and is interrupted toward the east by a north-south diabase dike several feet in width. The country rock shows an abundance of quartz phenocrysts and has the appearance of a quartz porphyry, but it is closely related to the alaskite phase of the "younger" granite. The mineralization consists of pyrite, chalcopyrite, and copper stain. Low values in gold are reported. This particular showing does not seem to hold much promise, but the location of the group as a whole is such as to warrant further prospecting.

Three Ducks Syndicate

The holdings of the Three Ducks Syndicate comprise 25 claims lying in the north central part of Chester township. Native gold was discovered in the summer of 1930 by Alfred Gosselin on the east shore of Three Duck lakes,

claim S. 20,095. Since that time native gold has been found at other places on the property. In 1931, the Consolidated Mining and Smelting Company optioned the property, but after sampling two of the veins they dropped the option. Development work to date has not gone beyond the preliminary stages of trenching and test-pitting.

With the exception of two claims in the extreme northwest corner of the group, which are on the Ridout series, the claims lie within the area mapped as "younger" granite. Only on those claims adjoining the Shannon group and on the west shore of Coté lake, however, was typical pink to grey granite observed. For the most part, the claims are underlain by a light-weathering rock having the appearance of quartz porphyry in some places and resembling arkose in other places. The microscopic examination of several thin sections, however, indicates that this rock is igneous in origin and that it varies somewhat from a porphyritic to a granitic texture. Furthermore, thin sections show a preponderance of quartz and alkali feldspar, the latter of which is strongly altered to sericite. This composition would suggest a type of granite approaching alaskite. In this connection it should be pointed out that the presence of alaskite may be considered to be as favourable to gold deposition as quartz porphyry; indeed, the difference between them is largely a matter of texture, not composition.

The original discovery, known as No. 1 vein, occurs on claim S. 20,095 on the shore of the lake a few chains north of the camp. The vein is a lenticular body following an east-west fracture zone and exposed by stripping for a distance of about 100 feet. The lens consists of mineralized quartz and highly altered country rock, in which sulphide replacement has been extensive. The quartz carries spectacular quantities of visible gold. No gold was observed in the wall rock, but assays show that it does occur. A chip sample of the quartz gave the following values: gold, $8.30 per ton; silver, none; copper, 0.25 per cent. A channel sample is reported to have assayed $16.60 in gold per ton over a width of 10 feet.

Considerable stripping and trenching has been done on No. 2 vein, which is located a few chains north of the south line of claim S. 19,971. About 2 chains east of Coté lake there are three parallel quartz veins close together, striking east-west and dipping 45° N. The largest of these is 4 feet in width and contains minute specks of visible gold. A few chains farther east, a 2-inch quartz vein occupies a fracture running parallel to the veins just described. This vein contains visible gold and telluride (tetradymite), as well as molybdenum and molybdite. A sample of this quartz assayed $53 in gold and 0.60 ounces silver per ton. What may be the continuation of this fracture has been located by trenching at intervals east of this point.

No. 3 vein, which is located on the west shore of Coté lake on the line between claims S. 19,977 and S. 19,998, is a quartz vein and occurs along the contact between pink granite and a 2-foot lamprophyre dike. On the south side of the dike, that is, on the side opposite the granite, coarse hornblendite occurs. Quartz stringers extend into the granite but not into the dike. The vein averages about 12 inches in width and has been traced for about 125 feet from the lake shore into low ground. Coarse gold occurs here in notable quantities, not only in the quartz but in the adjacent wall rocks. Vugs in the vein are commonly lined with tremolite crystals on which specks of native gold were observed. Some telluride occurs. A chip sample assayed $27.40 in gold per ton and 0.53 ounces silver per ton.

Further occurrences of gold are reported in two prospect pits on the north shore of Three Duck lakes, but little work has been done on these showings.

Another vein occurs in the southeast corner of claim S. 20,138, about 4 chains from the South arm of Bagsverd lake, and is composed largely of rusty quartz showing strong mineralization across 7 feet. No gold is reported from here.

It must be admitted that the veins exposed to date are narrow, but the wide distribution of the gold and the high values obtained seem to be factors that warrant further intensive examination of the property.

J. Laflamme

This group consists of 3 claims lying to the north of the holdings of the Three Ducks Syndicate. No discoveries have been made.

R. S. Sheppard

The group consists of 17 claims adjoining the Three Ducks Syndicate group on the south. The claims are underlain by granodiorite, alaskite, and quartz porphyry phases of the "younger" granite, similar to those exposed on the Three Ducks group. The most important showings occur on the west shore of Three Duck lakes at the northeast corner of claim S. 20,655. Two parallel "breaks" about 50 feet apart strike into the lake at E. 13° S. The north one is 2 feet wide and contains a 10-inch quartz vein in which native gold was observed. The south one shows a mineralized zone about 5 feet wide containing pyrite and chalcopyrite. A chip sample from this zone is reported to have assayed $5.60 in gold per ton.

J. H. Collins

The group consists of 5 claims lying east of Chester lake. In the southwest corner of claim S. 20,659, two narrow mineralized fractures were investigated, but they proved to be unimportant.

James R. Cryderman

James R. Cryderman, representing Sudbury interests, staked 12 claims which are located on either side of Three Duck lakes toward the south end. In the northwest corner of claim S. 20,575, on the north shore of a small lake east of Three Duck lakes, a 2-foot quartz vein has been traced eastward from the water's edge for 325 feet. It is of the fissure type and occurs in a quartz porphyry phase of the "younger" granite. It strikes N. 73° E. and dips slightly north. A 2-foot lamprophyre dike that forms the hanging wall of the vein near the lake seems to have been a factor in causing a concentration of metallics at this point, since farther east, where the dike fails, the mineralization is scantier. The quartz is dull and granulose in appearance and contains specks of visible gold, as well as notable quantities of pyrite, chalcopyrite, zinc blende, and galena. The sulphide mineralization extends into the wall rock at least 4 feet on either side of the vein. A chip sample gave the following values: gold, $25.20 per ton; silver, 0.95 ounces per ton.

Russell Cryderman

Russell Cryderman holds 3 groups of claims, namely, the Three Duck Lakes group (9 claims), the Moore Lake group (13 claims), and the Schist Lake group (8 claims).

The Three Duck Lakes group thus far has disclosed no important mineralization. Trenching on claim S. 20,561, only a few hundred feet west of the James R. Cryderman vein, has failed to pick up its westward extension.

The Moore Lake group lies between Moore lake and Schist lake and is underlain by sedimentary rocks of the Ridout series. These claims were originally staked in 1910 by Percival Moore, who, in 1912, sank several test-pits and a 30-foot shaft in highly carbonated and pyritized sericite schist on claim S. 5,787. At present the shaft is not safe to descend, but samples on the dump indicate the presence of a quartz vein containing ankerite and a little pyrite. Assays of these samples are said to yield values up to $2.40 in gold per ton. The mineralization, however, does not impress one as being important.

The Schist Lake group lies in the north central part of Yeo township and is underlain by sediments of the Ridout series. A few chains south of the west arm of Schist lake, toward the centre of claim S. 16,453, there is a mineralized lens in schistose greywacké conglomerate. No. 1 vein has been traced in an east-west direction for a distance of about 450 feet, and 5 test pits have been sunk on it at suitable intervals. The west pit is 24 feet wide and shows 13 feet of highly mineralized schist, which, in thin section, is seen to be strongly silicified, carbonated, and sericitized. The minerals consist of pyrite, chalcopyrite, and

Prospect pit in schistose greywacké, No. 1 vein, claim S. 16,453, the Cryderman group on Schist lake.

arsenopyrite. There is no visible gold, but a specimen from this pit yielded on assay $4 in gold per ton. On the east side of the creek, a test pit on the same vein exposes 12 feet of schist containing pyrite and an abundance of small glistening crystals of arsenopyrite. This pit is reported to have yielded $4 in gold per ton across 4 feet. On No. 2 vein, located 130 feet north of No. 1, there is one foot of quartz containing notable quantities of sulphides. A specimen of this quartz yielded 60 cents in gold per ton, but higher values are said to have been obtained from this vein.

Claims S. 16,132, 16,133, 16,134, and 5,792 were staked on the iron formation band, the nature and economic possibilities of which have been discussed previously in this report.

Chester Shannon Syndicate

The holdings of the Chester Shannon Syndicate consist of 15 claims situated in the vicinity of Clam lake, near the western boundary of Chester township. The claims were staked in 1927 by J. A. Shannon, but very little development work has been done owing to certain restrictions that prohibited assessment

work in this area. With the lifting of these restrictions in the spring of 1931, plans were made to test thoroughly a promising gold-copper showing exposed on a rocky point at the northeast corner of Clam lake, on claim S. 8,995. During the summer the property was optioned by C. T. Young, of Toronto, and the results obtained from preliminary open-cut work are reported to be of such a nature as to encourage larger-scale operations. In January, 1932, the Young-Shannon Gold Mines, Limited, was incorporated for the purpose of developing the Chester Shannon option, together with 8 adjoining claims held by C. T. Young.

The north claims of the group are underlain by greywacké, conglomerate, and argillite; the south claims, which lie within the "younger" granite area, show outcrops of diorite, pink to grey granite, and a quartz porphyry phase of this granite, which is similar in many respects to the quartz porphyry and alaskite phases of the granite already noted in the discussion on the Three

The main showing, claim S. 8,995, Chester Shannon Syndicate, Clam lake.

Ducks Syndicate group. This rock is of considerable importance, since the mineralization at the main showing on claim S. 8,995 is associated with this type. H. M. Bannerman[1] describes this rock as follows:—

> The rock . . . is a granulose, even-textured type, composed largely of quartz and light-coloured feldspar, with a little mica and chlorite. The fresh surface has a drab grey colour, and it weathers to a dusty brown or buff. . . . In part it looks like a sheared quartz porphyry, but in part it displays many of the characteristics of a highly metamorphosed arkose. . . .
>
> In thin section the rock is found to consist of over 40 per cent. quartz, much of which is so crushed as to present a granulose texture between crossed nicols, and it is commonly found to be surrounded by a meshwork of sericite and chlorite. The feldspars, which originally comprised more than 50 per cent. of the rock, are apparently largely of the potash species, but they have been so altered by sericitization as to make positive identification difficult. Many of them are broken, and some are irregular in form.

The main showing occurs on the south side of a narrow peninsula near the outlet of Clam lake. Stripping has exposed for more than 200 feet a well-defined shear zone in the type of rock described in the previous paragraph. It lies parallel to the lake shore, striking E. 30° S. and dipping 45° to 60° N. Sulphides consisting chiefly of pyrite and chalcopyrite occur along this zone in quantities sufficient to produce a notable gossan. These minerals are not confined to the fractures alone, but are widely disseminated in the wall rock as a replacement

[1]H. M. Bannerman, op. cit., p. 17.

deposit. Toward the east end of the outcrop a less prominent shear zone striking E. 58° S. converges with the main one. At this point there is a considerable concentration of sulphides occurring over a width of 24 feet. Within this width one 9-foot channelled section is reported to have yielded $2.80 in gold per ton, and 5.32 per cent. copper; a 46-inch channelled section yielded $22.40 in gold per ton. In the main shear zone toward the western end of the outcrop there is a 14-inch quartz vein which is exposed for about 30 feet before it disappears into the lake. Near the lake it is cut and slightly offset by a 1-foot irregularly north-south trending diabase dike. The vein matter scatters 25 feet east of this dike and disappears. The quartz carries visible gold, telluride (tetradymite), pyrite, chalcopyrite, azurite, malachite, bornite, and covellite. Assays were made of 2 chip samples taken by the writer. The first sample gave: gold, $36.60 per ton; copper, 12.85 per cent. The second sample assayed: gold, $70.60 per ton; silver, 1.97 ounces per ton; copper, 4.88 per cent. The wall rock contains gold values, some samples having yielded as high as $20 in gold per ton.

A picket line across the ice has located on the west shore of Clam lake what is thought to be the westward extension of the quartz vein. A few feet to the northwest of this point, another rusty shear zone paralleling that on the east shore has been stripped for several feet. What may be the eastward extension of the main shear zone on the peninsula has been located 20 chains along the strike in the southwest corner of claim S. 9,221. A test pit shows disseminated sulphides, chiefly pyrite and chalcopyrite, over a width of 7 feet. No native gold was observed, but high gold values are said to have been obtained here. Other showings on the property do not seem to be important at this time, but further testing of these may disclose more promising mineralization.

J. A. Shannon

This group consists of 11 claims lying between the south end of Moore lake and the east boundary of Yeo township. It is underlain by rocks similar to those exposed on Clam lake. No discoveries have been made.

C. T. Young

In addition to 8 claims which lie to the south of the Chester Shannon Syndicate group and form a part of the holdings of the recently incorporated Young-Shannon Gold Mines, Limited, C. T. Young staked a group of 13 claims lying between Schist lake and Bagsverd lake. For the most part, this group is underlain by rocks of the Ridout series, but Keewatin pillow lavas occur on the north. A trail leads eastward from the cabin on the south shore of Schist lake to an old 35-foot shaft where some work was done during the past summer. Sheared impure arkose or greywacké from the bottom of this shaft displayed small quantities of finely disseminated pyrite and chalcopyrite, and on assay this material yielded 60 cents in gold per ton. On the trail to the Cryderman camp, 26 chains south of Schist lake, there is a prospect pit in the iron formation band from which low values in gold are said to have been obtained.

C. Coté

The holdings consist of 6 claims in Chester township and 6 claims in Yeo township. In the former group, visible gold associated with telluride (tetradymite), pyrite, and chalcopyrite was observed in a 2-inch quartz vein on claim S. 10,375. A chip sample yielded $132.80 in gold per ton. No further discoveries have been made either on this group or on the claims in Yeo township.

P. E. Hopkins

P. E. Hopkins holds 3 claims in Yeo township 20 chains west of Clam lake. These claims were staked and prospected by K. G. Miller, who reports 3 quartz veins ranging from 2 to 6 inches in width, all of which panned gold. At the north end of White Owl lake, Yeo township, a trail leads west to a showing on which some work has been done. It consists of a lens of quartz occurring in a mineralized "break," which is 18 inches wide at one point and traceable for about 100 feet. An assay of the mineralized quartz yielded $4.80 in gold per ton. This claim was not recorded.

Porcupine Hecla Mines Company

This company owns 5 patented claims, S. 2,406-2,410, lying south of Schist lake. Prospect pits and stripping a few chains west of Moore lake on the portage to Trail lake attest to the activity of the company in this area several years ago, but no work has been done recently. Although wide quartz veins occur, they display no important mineralization.

Economic Possibilities of the Area

From the descriptions of the properties presented in the foregoing paragraphs, it will be observed that gold has a rather wide distribution in this area. The gold-bearing veins are admittedly narrow, but the high values obtained from them encourage the hope that deposits of commercial importance will be proved. Development work has not yet gone beyond the preliminary stages of surface exploration, and the future possibilities can only be decided by further investigation.

The area as a whole possesses certain geological conditions that have long been known to be associated with the great gold belts of Ontario and Quebec. They consist of a long belt of structurally disturbed Timiskaming sediments (the Ridout series), which are deeply infolded in Keewatin greenstones and with which are associated granite and porphyry intrusives of Algoman age. The widespread occurrence of gold in Chester and Yeo townships under these very favourable conditions at once marks this field as one deserving of most careful exploration.

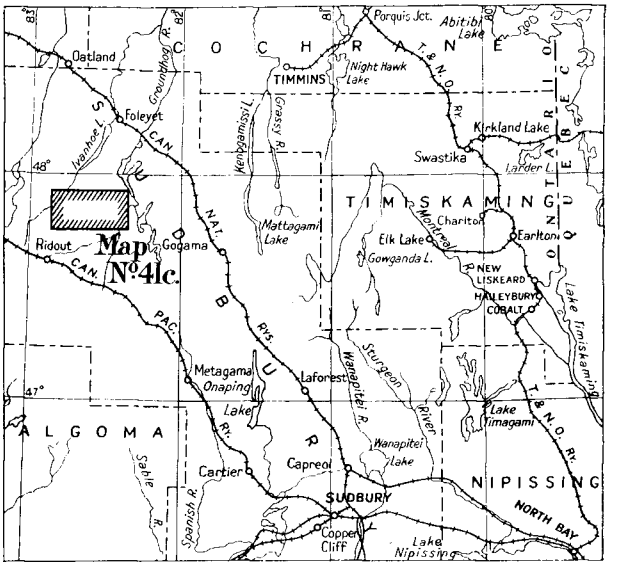
In prospecting this field some attention should be given to the schistose sediments, for they have often proved to be the home of low-grade gold deposits. It seems reasonable to suppose that somewhere along this belt, either in this area or in the Woman River area to the west, large commercial deposits of this nature will be located.

Geology of the Swayze Area

By Geo. D. Furse

INTRODUCTION

During the summer of 1931 the writer made a geological examination of the Swayze area, which includes the townships of Raney, Rollo, Coppell, Newton, Denyes, Swayze, Dore, and Heenan, in the district of Sudbury. The area lies about 30 miles southwest of Foleyet on the Canadian National railway and about 120 miles northwest of Sudbury.



Key map showing location of the Swayze area.
Scale, 60 miles to the inch.

Compass and micrometer surveys were made of all navigable water routes, and pace and compass traverses spaced about half a mile apart were made across the greater part of the area. Most of the traverses were tied to known points at each end so that they could be adjusted. Where this was impossible, as in the centre of some townships, the locations were based upon pacing. Sketches were made of all lakes and ponds and most of the small streams that could not be surveyed.

Acknowledgments

The writer wishes to acknowledge the many courtesies that were extended to the party during the season. Special thanks are due to A. C. Bouchey, chief ranger of the Ontario Forestry Branch at Foleyet, and his staff; to Messrs. Crossley and McNeill, of the Ontario Forestry Branch air patrol, for information about the area; to the Geological Survey of Canada and H. M. Bannerman for

maps of Coppell, Newton, and Heenan townships; to C. K. Leith for maps of part of the Woman River iron range; and also to T. Fraser and Mr. Lefevre. Assistance in the field was rendered by J. D. Wright, V. Ben Meen, and Geo. R. Gibson. Half the area was traversed by Mr. Wright, and the geology of such portions is taken from his notes or field map.

Location and Access

The area lies quite close to the Canadian Pacific railway, Woman River station being 22 miles directly south of the area. Good canoe routes reach the area from both railroads. Those from the Canadian Pacific railway are as follows: Ridout river, which flows north, is followed from Ridout station to Ridout lake, which lies 8 miles southwest of Cree lake; there are four portages. From Ridout lake, the route follows the Wakami river, which flows through Bayly lake in Swayze and Dore townships and joins the Woman river in Benton township about 10 miles farther east. This is probably the best route. Another route follows the Woman river from mileage 80 on the Canadian Pacific railway to the eastern boundary of the area and necessitates 10 portages. This route is good in spring and poor in autumn.

There are two good routes from the Canadian National railroad. One from Groundhog crossing ascends the Groundhog river to Horwood lake, and thence up Swayze river, through Lesage, Hanson, and Rollo lakes to Brett lake. On this route there are 10 portages totalling approximately 190 chains. A chain of lakes and portages forms a route to Engineer lake in the southeastern part of Denyes township and continues to the east end of Ridout lake on the Wakami river. The eastern part of the area can be reached by ascending the Woman river from Horwood lake. This route has 7 portages totalling 80 chains; all are in good condition. The other route from the Canadian National railway starts from Foleyet. A good wagon road extends to Ivanhoe lake 6 miles to the southwest. There are no portages until the north boundary of Ivanhoe township is reached. Since the water has been lowered about 15 feet below the level shown on the Lake Huron sheet,[1] of the Geological Survey of Canada, the lake now consists of a small, narrow stream with the stretches of fast water and broad, very shallow ponds, emptying into a remnant of the former lake in northern Ivanhoe township. The road was improved and extended during the latter part of the summer.

Previous Work

In 1899, W. A. Parks made a reconnaissance trip along the Woman, Groundhog, and Ivanhoe (Pishkanogama) rivers. In 1909, R. C. Allen examined the iron range in the eastern part of the area. In 1916, T. L. Tanton made a reconnaissance along the Canadian National railroad between Gogama and Oba and ascended the Swayze (Doré) river as far as Hanson lake. The Geological Survey of Canada conducted a survey of the Woman River and Ridout areas from 1923 to 1927, inclusive, and of the Sahkatawich (Rush) Lake area from 1928 to 1930, inclusive. The latter survey included the townships of Heenan, Newton, and part of Coppell.

Bibliography

W. A. Parks, "Nivin's Base Line, 1899," Ont. Bur. Mines, Vol. IX, 1900.

R. C. Allen, "Iron Formation of Woman River Area," Ont. Bur. Mines, Vol. XVIII, pt. 1, 1909.

T. L. Tanton, "Reconnaissance along Canadian Northern Railway between Gogama and Oba, Sudbury and Algoma Districts, Ontario," Geol. Surv. Can., Sum. Rept., 1916.

[1]Map No. 155 A.

E. LINDEMAN and L. L. BOLTON, "Iron Ore Occurrences in Canada," Vol. 2, Mines Branch, Dept. of Mines, Can., No. 217, 1917, pp. 91-93.

R. C. EMMONS and ELLIS THOMSON, "Preliminary Report on Woman River and Ridout Map-Areas, Sudbury District, Ontario," Geol. Surv. Can., Mem. 157, 1929.

H. M. BANNERMAN, "Mineral Occurrences in Woman River District, Ontario," Geol. Surv. Can., Sum. Rept., pt. C, 1929.

Additional references on the adjacent region are given in the above-mentioned report by Bannerman, and also in his report in the same publication for the previous year.

Topography and Drainage

The relief within the area is moderate. Along the Ivanhoe river in the northern part of Raney township, the drift hills rise to a height of 75 feet or more above the stream, and a few granite knobs to a height of 200 feet. The northern central part of Raney is rocky and rises about 100 feet above the broad, swampy valley through which Ridley lake drains into the Ivanhoe river. In the northwestern part of Rollo township, an east-west ridge rises about 275 feet above Ridley lake; in the central and eastern parts of the township a few prominent hills rise 150 feet above Rollo lake. Southeast of the lake an area of basic lava has an equal elevation. In the southeastern part of Heenan the hills of iron formation reach a height of 100 to 300 feet above the adjacent area, or 400 feet above the Woman river on the northeast corner of claim W. S.6. In the southwestern part of Heenan, greenstone hills rise abruptly 75 feet or more above the adjacent areas. The topographic features usually trend east-west following the structure, or else along other lines of weakness caused by intrusive contacts or zones of deformation.

The Lake Huron–Hudson Bay divide lies about 25 miles south of the southern edge of the area; consequently the streams are small. The general slope is northward, but the drainage deviates considerably in detail, as shown by the accompanying map. The western end of the area drains into the Ivanhoe river and its tributaries. The central and northeastern parts drain into the Swayze river and Horwood lake. The southeastern part drains into the Wakami and Woman rivers and also into Horwood lake.

The Ivanhoe river is from 100 to 200 feet wide and, owing to its depth, the current is slow, except at a short shoal and several rapids. Where the Ivanhoe river leaves Raney township, there is a stretch of fast water extending from the portage to a point about half a mile beyond the boundary of Hellyer township. If Ivanhoe lake is restored to its former level, this rapid will be greatly shortened, if not obliterated.

Swayze river is quite slow throughout the upper part. The section in Newton township is narrow, about 50 feet wide, and flows at a rate of about 1½ miles an hour.

The current of Wakami river in Swayze township runs about a mile an hour. Below Bayly lake there are five short rapids. Emmons states that this river is broken by rapids in Cunningham and Garnet townships, with numerous shallows and stretches of fast water, particularly in the latter township. "Near the eastern margin of Garnet township, the river is 150 to 200 feet wide, about 6 feet deep, and flows at a rate of 2 to 4 miles an hour." Eastward to its junction with the Woman river, the Wakami is narrower and deeper, and flows at a rate of half a mile to 2 miles an hour.[1] Along the eastern boundary of the area, the Woman river is 75 to 200 feet wide and the current is one-half to one mile an hour, except at a few narrows and numerous rapids.

[1]R. C. Emmons and Ellis Thomson, Geol. Surv. Can., Mem. 157, 1929, p. 3.

Natural Resources

Timber

The whole area is covered with forest, but there is very little, if any, timber of commercial value. Many localities, however, might furnish enough for small mines. The areas of the various types of forest are shown on maps prepared by the Ontario Forestry Department. There have been no large fires in the region for many years. Parks mentioned a "recent brulé" in 1899.[1] Most of the trees are about 10 inches at the base and 30 feet high. Small clumps would furnish logs 24 inches in diameter at the base and 40 feet long, having a minimum diameter of 8 inches. A few such clumps were found in the southwestern part of Denyes township, northwest and south of Sylvanite lake; large cedars occur in the swamps in the central part of the township. A few small patches of Red and Norway pine occur on Brett lake, and clumps of 10-inch spruce grow near by. Where lakes, such as Cree lake, lie in thick drift, the forest is small poplar and birch with a fringe of small cedar along the water's edge. The eastern part of Cree lake is bordered by spruce forest, and coniferous forests and swamps lie inland. Cedar is common in the swamps, especially in those south of Brett lake.

The oldest growth of timber lies half a mile west of the south end of Rollo lake. Here birch and cedar attain a diameter of 3 feet. South of the trail between the north ends of Rollo and Lesage lakes, 18-inch spruce is plentiful. The western third of Coppell township is covered by deciduous trees, but clumps of large pine occur along the shores of the western part of Lesage lake. The remaining part of the township is covered by coniferous forest with small areas of Banksian pine, which would produce logs of commercial size. Considerable spruce grows in the northeast corner of the township. The shores of Coppell lake are low and covered by small spruce. The greater part of Dore is covered by mixed and deciduous forest, except in the southeastern corner, where coniferous forest predominates and cedar grows in the swamps. In the northern part of Newton, there are extensive areas of deciduous forest and sand plains covered with Banksian pine. In the central part, spruce swamps occupy the depressions. The western part of Heenan is covered by deciduous forest, which changes to coniferous in the central part. An extensive sand plain covered with Banksian pine traverses the western and central parts of this township. A large spruce swamp lies in the central and northern parts, and an area of Banksian pine containing logs of commercial size lies southeast of mile-post 1 on the north boundary. Tamarac grows in some swamps throughout the area; it ranges in height from 10 to 20 feet.

Game and Fish

There is a great variety of game in the area. The following animals were observed: moose, bear, wolves, muskrat, mink, and otter. Only a few sites of fresh beaver cuttings were found; formerly nearly every pond supported a colony.

Pickerel and pike were caught in the larger lakes. Trout were reported in Rollo lake, and brook trout in some of the smaller streams in Raney township.

Agriculture

Good soil is found in parts of the area, and some farming is done in the vicinity of Foleyet. Mr. Lefevre has an excellent garden at the lower end of the portage connecting Swayze river with Horwood lake.

[1]W. A. Parks, Ont. Bur. Mines, Vol. IX, 1900, p. 135.

GENERAL GEOLOGY

The geological column is as follows:—

QUARTERNARY

PLEISTOCENE AND RECENT: Till, gravel, sand, and peat.

PRE-CAMBRIAN

KEWEENAWAN: Olivine diabase dikes.

ALGOMAN(?): Feldspar porphyry. Granite.

HAILEYBURIAN(?): Quartz diorite, quartz diabase, and gabbro.

KEEWATIN:
- Upper volcanics: Acid lavas, pyroclastics, conglomerate, and sediments, arkose, quartzite, etc. Iron formation. Basalts, andesites, some pyroclastics, and minor amounts of acidic lavas.
- Swayze-Ridout series: Conglomerate, greywacké, etc.
- Lower volcanics: Acid lavas, acid schists. Iron formation. Greenstone, basalt, andesite, quartz-hornblende schist.

Keewatin

Lower Volcanics

Basic Group.—With the exception of small areas of granite along the northern and western edges, and some diorite and porphyry within the area, Keewatin rocks predominate. The lower volcanics occur in Raney, Rollo, and Coppell townships, and on either side of Speight's line at the southern edge of the area. Near the granite contacts the rocks are quite schistose and appear to be composed of quartz and chlorite, or quartz and hornblende. In Coppell township, an outcrop 60 chains south of mile-post 2 on the north boundary shows a coarse dioritic texture, but this is believed to be due to recrystallization caused by the body of granite that underlies Whigham township to the north. Although numerous observations of schistosity were taken, no definite relation of that structure to the granite contact was found. Locally the granite cuts the schistosity, proving its intrusive relation to the schist phase of the volcanics.

Where the Ivanhoe river crosses the west boundary of Raney township, the greenstone shows a lamination striking S. 70° E. and dipping 38° N. From a distance it exhibits a regularly banded structure, which is drag-folded and dips north. A short distance south along the shore, streaked granitic and syenitic rocks occur. Similar structures were observed along the east shore of Horwood lake in Dale township. They appear to be contact phases developed in the greenstone.

In Raney and Denyes townships, the original nature of the schists is uncertain. The greenstones show small areas of pillow structure and narrow vesicular bands, as on the northeast island in Raney lake. These bands strike approximately through the length of the island. The greenstones are composed of aggregates of carbonate and chlorite with small amounts of kaolin, quartz, epidote, and pyrite, and traces of limonite and uralite. Minute veins are filled with quartz, carbonate, and chlorite.

Pillow lavas occur sparingly in the central and western parts of the area. They are found on Rollo, Hanson, Coppell, and Crossley lakes, along the east boundary of Coppell township, in the southeastern part of Dore, in the adjacent part of Heenan, and west and north of the Woman River iron formation. The lavas in the first three localities only belong to the lower volcanics. From

field observation the andesites have more highly developed pillow structure than the basalts. The attitude of the pillows was noted frequently, and occasionally the structure suggested by them agreed with that determined by other means. But in cases where reversals of dip were suggested, no reliable structural criteria were found.

The lower volcanics are more altered than the upper volcanics; and the lavas in the western part of the area are more altered than those in the eastern part.

Iron Formation.—The lower iron formation in the southwestern part of Dore township is about 4 feet thick, strikes approximately east-west, and dips about 30° S. The base of this formation consists of thin layers of chert, a quarter of an inch thick, interlayered with basalt 2 to 3 inches thick. It lies on a basalt which has been weathered for a quarter of an inch. About a foot above the base, there is a thin band of magnetite 4 inches thick. The upper part of this formation is a dark-grey chert. The outcrop is strongly magnetic. In the southwestern part of Swayze the iron formation, according to J. D. Wright, is about 8 feet wide, strikes east-west, and dips vertically. It consists of thin bands of chert and jasper, 1½ to 5 inches wide, lying in a medium-grained, quite acid, non-porphyritic rock. The lavas to the east of the iron formation are quite acidic.

Acidic Group.—The rhyolites are very fine grained, grey, massive lavas with very minute phenocrysts of feldspar and quartz. Where the phenocrysts are larger and conspicuous, the rocks are classed as rhyolite porphyries. Some light-grey schistose lavas composed of remnants of quartz grains and a felt of minute plagioclase laths in a matrix of chlorite, kaolin, carbonate, and a trace of sericite, are included in this group. The only occurrences of these lavas large enough to map lie in the southern part of Raney township.

Swayze-Ridout Series

The Ridout series consists of greywacké and argillite and lenses of conglomerate, arkose, and quartzite, which are prominent locally. It extends from the northern boundary of Tooms township in an east-southeasterly direction into Chester township, a distance of 45 miles or more. The width usually ranges between a half and one mile, but near Opeepeesway lake the band increases to a width of 4½ miles. The dip is 80° to 85° N.[1]

The western end of this belt of sediments lies near or immediately south of the area and is faulted into it by displacements of 100 to 170 chains. The belt of conglomerate in the southwestern part of Denyes may be part of this series.

The sediments along the southern boundary of Swayze township are fine-grained, dark-coloured, schistose and bedded greywackés. Some are light-grey to dark-greenish in colour. The bedding strikes east-west and dips about 70° S. The truncation of the bedding at a small angle indicates that the tops of the beds lie on the north and that a slight overturning has occurred. The cleavage is too poor to indicate the structure. These beds are finely laminated, and some contain small pebbles up to 1 inch in size. At 25 chains east of mile-post 2, coarse diorite intrudes the sediments. Near mile-post 2, basalt occurs within the sediments, and Emmons reports similar conditions farther west on the same band.[2]

[1]R. C. Emmons and Ellis Thomson, op. cit., p. 8.
[2]R. C. Emmons, personal communication.

Banded greywacké outcrops along and near the Wakami river between the south boundary of Swayze township and the rapids 30 chains north. Since basic lavas intruded by diorite and diabase lie to the north and east, these sediments are probably fragments lying along the direction of the fault. The main belt of sediments lies about a mile north of the south boundary of the township. It consists of conglomerate, arkose, and schistose greywacké. Near the mouth of the outlet of Cree lake, there is a finely bedded light-grey arkose. A body of conglomerate, occurring 30 chains south, contains felsite, chert, and greenstone pebbles up to 12 inches in diameter. Along the western part of Bayly lake, the sediments are quartzite, schistose greywacké, and greywacké conglomerate. The conglomerate contains pebbles of felsite and felsite porphyry with a maximum size of 2 by 6 inches; most of the pebbles have the same ratio of dimensions. Bedding is poorly developed and shows alternation of short bands of arkose and greywacké. Eastward in Dore township, conglomerate predominates in the outcrops found; the pebbles are chiefly chert and felsite.

About 25 chains southeast of mile-post 19 on Speight's line, a rock resembling conglomerate consists of oval chert fragments in a matrix of quartz and carbonate grains, the latter predominating. The long axes of the pebbles lie in a plane whose strike is S. 60° E. and dip vertical. In thin section the chert pebbles show a fine irregular edge and appear to replace the carbonate matrix, which is composed of very small and slightly coloured anhedral grains. A clear carbonate in euhedral crystals replaces the chert. Since there is considerable transverse faulting in this sedimentary belt, the rock in question may be a fault breccia, in which the chert fragments have been rounded and later oriented by movements parallel to the bedding.

The outcrops along the Wakami river northwest of Bayly lake may be sediments interbedded with the lavas, as pillow lava occurs just north of the portage.

Emmons found conglomerate containing granite pebbles west of the Wakami river on the south boundary of Dore.[1]

The northern band of sediments, provisionally designated as the Swayze series, has been traced through the central part of the area for a distance of 15 miles. It is faulted in a manner similar to the Ridout series. The continuation of the belt westward from Raney lake is unknown at present. The conglomerates northwest of this lake are almost identical with those in the southwest corner of Rollo township. Small outcrops of conglomerate and arkose occur along the Kinogama river in Denyes township above Raney lake, and also 45 chains south of the northwest corner of Denyes. Along the west shore of Raney lake, thin-bedded arkose and chert bands occur with the acidic lavas. Arkose and rhyolite occur on an island immediately north of the narrow entrance to the lake. Here the schistosity and bedding are parallel in strike (northeast) and they dip 80° S. and 50° N., respectively. A cross-fracturing strikes N. 15° E. This relation indicates that a thrust from the north has caused the north side to move upward to the east. The structure was too complex to solve in the time available, but it is probable that these sediments continue into Halcrow township and join the Ridout series.

Arkose, quartzite, and conglomerate are conspicuous on Denyes lake and along the outlet, but were not identified on the traverse immediately west of the southern part of this lake. The arkose along the north shore consists of medium- to fine-grained fragments of quartz, plagioclase, and rhyolite with a small amount of sericite, epidote, and kaolin in the matrix, and some carbonate

[1]R. C. Emmons, personal communication.

and quartz in minute veins. The rhyolite fragments constitute about 10 per cent. of the sample, and all the grains are oriented parallel to the bedding. The strike in general is east-west, but a few exposures show great deviations from this direction. The dip is usually 75° to 80° N. In two outcrops, evidence of overturning was found. A small island in the northeastern part of the lake shows conglomerate, arkose, and slate beds. The conglomerate beds are a few feet wide and contain felsite or porphyry pebbles. The larger pebbles lie at the north edge of the beds, and the finer at the south with a fairly uniform gradation between. These pebble beds are overlain by arkose and grey slate. The arkose beds show gradation of grain, and the slates show bedding as well as cleavage. All these structures indicate that the tops of the beds lie on the south. Gradation of grain in a fine arkose in the southwestern part of Denyes lake supports this conclusion.

Where the sediments follow the boundary between Rollo and Swayze, pebbles constitute about 30 per cent. of the rock. They appear to be chiefly a light-grey porphyritic felsite with some chert. The matrix is a very fine grained, grey, schistose aggregate of quartz and feldspar. Greywackés and conglomerate occur farther east, but the extension of the sediments east of the lake on the south boundary of Rollo is shown merely to indicate the general structure more clearly. The relation of cleavage to bedding in an arkose in the southwestern part of Rollo township indicates that the top of the beds lies to the north; and in this case there appears to be no overturning since the rocks dip north. If the folding were caused by the intrusion of granite in the vicinity of Ridley lake, the existing relation would be expected. An alternative hypothesis is that there is an intervening band of sediments not yet found.

Conglomerate occurs on both shores of the west bay of Brett lake. It is similar to that in Rollo township, and the matrix appears to be a greywacké. Along the north shore arkose shows thin bedding on the weathered surface and contains a few small pebbles of slate and chert. Small rock particles constitute a considerable part of the outcrop, and, although it is light-coloured, the rock may be a greywacké. At the north bay the sediments are faulted northward to the position shown. Conglomerate outcrops at this point, and quartzites occur along the south shore of the east bay. Thirty chains west of the small island near the south shore of this bay, gradation of grain in a fine-grained arkose indicates that the top lies to the south. Therefore the structure here also is overturned, if the criterion is reliable. The conglomerate was found again on both shores of the small lake southwest of mile-post 23 on Speight's line. Here angular fragments up to 14 inches were found. On the north shore the conglomerate is sparingly represented and is bounded on the north by a very finely bedded quartzite.

The sedimentary band was found again about a mile west of Crossley lake and was traced eastward to mile-post 4 on the north boundary of Dore. West of the lake the sediments are finely laminated, thin-bedded arkose with some cherty layers. In the immediate vicinity of the lake, conglomerate occurs, and near the west end of the lake it is intruded by quartz porphyry. At the east end of the sedimentary belt, the pebbles, which constitute about 70 per cent. of the rock, are subrounded, half an inch to 4 inches in diameter, and composed chiefly of grey felsite, chert, and greenstone. The matrix contains fine particles of similar material. There is a large amount of carbonate with small amounts of sericite, chlorite, and a trace of kaolin and epidote in the matrix. Quartzite and arkose occur near the southern edge of the belt. Near the northern edge a highly altered dacite was found within the sediments, indicating an overlapping

of the periods of volcanic activity and sedimentation. No bedding was found in this belt of sediments. Although the area to the east was traversed with the same regularity, no continuation of the sedimentary band was found.

The relation of the Swayze series to the lavas above and below is not known. Collins found a similar combination of lavas and sediments in Michipicoten[1] and grouped the sediments with the Timiskaming series.[2]

On the east arm of Horwood lake, Bannerman found chloritic quartzites and agglomerates; but judging from the descriptions given above, he concluded that they do not belong to the Swayze series.[3]

A few sediments occur near the northern edge of the area. Thin-bedded cherty arkose occurs on an island in the west end of Lesage lake. A small outcrop of sediments lies at the north end of Rollo lake, and there is a narrow band about 60 chains west of the north end of the lake.

Emmons states that nearly all the boulders in the conglomerate larger than 3 inches are granite.[4] No granite pebbles were found in the Swayze series. This marked difference in lithology suggests that the sediments may be different in age, or, at least, were derived from different terrains.

Upper Volcanics

Basic Group.—The composition and character of the upper volcanics are similar to those of the lower volcanics, but there is less alteration. The lavas in the western part of the area are more altered than those in the eastern part. A lava occurring on the south shore of Crossley lake in the centre of the band of rhyolite shows in thin section lime-soda plagioclase and destroyed ferromagnesian minerals in a matrix of sericite, kaolin, and limonite, which is cut by minute veins containing quartz, carbonate, and pyrite. The rock is probably an altered andesite. An andesite occurring 90 chains south of mile-post 3 on the north boundary of Dore shows a few remnants of pyroxene in an aggregate of epidote, chlorite, quartz, kaolin, and a trace of carbonate. Other basic lavas show a similar composition. In the eastern part of the area the lavas are less altered, and most of the basalts studied microscopically show unaltered augite crystals. Pillow structures are quite common, and their chief occurrences have been mentioned under the lower volcanics.

Basic volcanic fragmental rocks occur along the shores of Cree lake and northeast of it, among the pillow lavas in the southeastern part of Coppell township, and on the central part of Crossley lake north of the large island.

A narrow band of clastic rock in the eastern part of Denyes, near mile-post 3, appears to be an agglomerate carrying fragments of rhyolite and fine syenite in a chloritic matrix. Locally the fragments have a definite elongation, trending N. 80° E. and dipping 80° N. This may be due to original deposition. The matrix contains feldspar phenocrysts(?), a few hornblende remnants, a few fragments containing quartz and feldspar in a microcrystalline aggregate, and some epidote, zoisite, and chlorite. There are small unoriented needles of hornblende throughout the matrix, which appear to be due to recrystallization. There is no evidence of schistosity in thin section. The orientation of the fragments, therefore, is probably due to original deposition rather than to folding of the rocks.

[1]W. H. Collins, T. T. Quirke, and Ellis Thomson, "Michipicoten Iron Ranges," Geol. Surv. Can., Mem. 147, 1926.

[2]Lake Huron Sheet, Geol. Surv. Can., Map No. 155 A.

[3]H. M. Bannerman, personal communication.

[4]R. C. Emmons and Ellis Thomson, op. cit., p. 9.

An agglomerate from Cree lake shows altered felsite inclusions consisting of acidic oligoclase in a matrix of sericite, secondary plagioclase, chlorite, carbonate, and kaolin. A fragmental andesite occurring 90 chains north of mile-post 2 on the south boundary of Swayze is similar to the agglomerate; basic oligoclase and altered hornblende crystals were identified in it. An agglomerate found along the north shore of Crossley lake shows fresh augite in minute laths and a small amount of pyrite replacing the chlorite matrix.

Acidic lavas occur chiefly in the northeastern part of Heenan and the central part of Swayze township. They are very fine grained, massive or porphyritic, and weather to a light-grey colour. The colour on the fresh surface ranges from light- to dark-grey. A brown schist from the north shore of the lake northeast of Cree lake appears to be an altered dacite. It shows a faint porphyritic structure, due to frayed plagioclase and broken quartz grains, in a matrix of sericite, carbonate, chlorite, kaolin, limonite, and pyrite. The rhyolites in the central part of Swayze are fine-grained, schistose, and slightly porphyritic. The acidic lavas north of the iron formation in Heenan township appear to be chiefly rhyolites. Some are porphyritic flows, which contain quartz grains 4 mm. in diameter. The matrix appears to be that of an ordinary rhyolite. A thin section of a specimen taken a few chains from the north boundary of the rhyolite band and 40 chains west from the east boundary of Heenan shows the rock to be an altered trachyte.

Iron Formation.—According to Allen[1] the iron formation west of Woman river occurs in three main belts.

> Belt 1 begins in the southeast corner of claim W.S. 10, runs northeastward to W.S. 12, across the northeast corner of W.S. 12 into W.S. 11, and then north 700 paces where it is lost in a marsh and completely cut off on the north, east, and west by hills of ellipsoidal greenstone. . . .
>
> Belt 2 begins on the east border of W.S. 10 about 1,320 feet north of the southeast corner of the claim, and runs northward and eastward along the crest and flanks of a high ridge in W.S. 9 and 8 to the north side of W.S. 8, where the ridge ends abruptly in a swamp underlain by greenstone. The maximum width of this belt is about 1,400 feet.
>
> Belt 3 begins north of the marsh in the southeast corner of W.S. 8 and runs north along the east side of this claim and into W.S. 7 for a distance of about 400 paces, where it is cut out by ellipsoidal greenstone and volcanic breccia. The iron formation reappears about 75 paces west and 1,100 paces north of the southeast corner of W.S. 7, and forms a continuous belt thence northeastward to within about 400 paces of Woman river, where it is again cut out by greenstone.
>
> East of Woman river the iron formation extends in a more or less continuous belt to the northwest arm of Rush (Sahkatawich) lake.
>
> The rock succession, as developed on that part of the range west of Woman river, from the youngest to the oldest, is indicated in the following table:—

Basic igneous dikes. Mica porphyry.	Relative ages not known but believed to be as shown.
Acid igneous rocks.	Extrusve and intrusive.
Iron formation.	
Basal greenstones.	

Upper Group.—The above column begins at the base of the upper volcanics, as given in the legend. The basal greenstones are the basalts. The acid igneous rocks include rhyolite, rhyolite porphyry, and rhyolite breccia; conglomerate, greywacké, and arkose. The rhyolite breccia contains subrounded fragments of rhyolite and chert in a rhyolite matrix. In the conglomerate chert and rhyolite, pebbles predominate. The conglomerates are interbedded with flows of basalt and some rhyolite and were found chiefly in W.S. 9. A short distance south of the iron formation, basalt flows contain pebbles of the underlying

[1]R. C. Allen, "Iron Formation of Woman River Area," Ont. Bur. Mines, Vol. XVIII, pt. 1, 1909, pp. 254, 255.

conglomerate. The matrix of the conglomerate is chiefly greywacké. Greywacké and agglomerate were reported above the iron formation near the east boundary of the township. A thin section shows this agglomerate to be arkose.

Altered feldspar porphyry and diorite were found cutting the rhyolite southeast of claim W.S. 9. The mica porphyry was not found. The intrusive igneous rocks found by Allen may be feeders to the overlying flows.

Structural Relations

The accompanying map shows the Swayze series dipping 60° to 80° N., with the tops on the south side. The Ridout series dips 80° to 85° N., and the tops are believed to be on the north side. The regional structure, therefore, is a syncline whose axial plane dips 70° N. and plunges east. The structure of the Woman River iron range confirms this. On claim W.S. 8 the grünerite-magnetite-chert rocks are considerably drag-folded. The chert has been brecciated, and the fragments have assumed the **S**-shaped arrangement typical of drag folds. The magnetite-grünerite layers have become schistose and show a uniform direction of elongation regardless of the chert fragments. The schistosity strikes about N. 60° E. and dips vertically. The limbs of the drag folds are parallel to this, but the offsets are to the north as the beds are followed eastward. The plunge of the axes of these folds is 80° E. These observations show the regional structure to be that of a broken syncline plunging steeply east.

Considerable north-south faulting occurs within the area, but mapping was too general to locate the faults accurately.

Haileyburian(?)

Quartz Diabase, Diorite, and Gabbro

The quartz diabases are medium- to fine-grained, dark-grey, massive rocks showing a fine diabasic structure. The feldspars have a greenish colour, and some pyroxene is recognizable megascopically. Microscopically, these diabases show considerable alteration. Most of the plagioclase is extensively altered to sericite, so much so that tests are indefinite. The augite is slightly altered to uralite and chlorite. There may be some original hornblende. Quartz and micropegmatite occur interstitially and may have been the last constituents to crystallize. Magnetite, apatite, and some pyrite are accessory constituents.

The diorite varies greatly in texture and character. It is usually fairly massive; but some bodies are quite fine and equigranular. Some dikes show minute needles of black hornblende a quarter of an inch long in a very fine matrix. Locally, there is considerable finely disseminated pyrite. The colour on the fresh surface is usually dark-greenish, but occasionally it is a light-greenish grey. Where hornblende comprises practically all the rock, it becomes an amphibolite. The diorite occurs as sills, stocks, and dikes. The larger bodies lie in an east-west direction along the median axis of the area. The largest stock extends from the eastern boundary of Heenan township for a mile and a half into Dore township. The width varies from 40 to 120 chains, excluding the irregular lobe in the southern part of Newton township. Though some coarse diorite occurs in this projection, most of it is very fine grained and megascopically appears too fresh to be a greenstone.

A thin section from the southerly prong of the diorite mass in the western part of Heenan township shows the rock to be a quartz-augite diorite with some micropegmatite. About a mile farther east, near the southern boundary of the diorite, quartz occurs interstitially and diabasic structure is discernible. In

other parts of this mass the border phases show a basaltic texture and a faint pillow structure. In a few small areas a slightly altered diorite appears to grade into a fairly fresh andesite. This suggests that some of the rocks described as upper volcanics may be related to the diorite intrusions, but the case is not proved by the evidence gathered by the writer. The alteration minerals of the diorite are sericite, epidote, uralite, chlorite, and carbonate. Pyrite in small quantities is widely distributed.

At a point 26 chains south of mile-post 3 on the north boundary of Swayze township, the quartz diorite is intruded by feldspar porphyry. Here the diorite is fine-grained and has a diabasic structure. The original minerals are quartz, micropegmatite, and andesine, along with chlorite and carbonate. Magnetite and pyrite are accessory minerals. The ferromagnesian minerals are completely destroyed, and the plagioclase is scarcely determinable.

An intrusive in the upper volcanics above the iron formation contains quartz, orthoclase, oligoclase, biotite, augite, and magnetite, along with the alteration minerals of a diorite. The rock is probably an augite granodiorite. The great variation in the physical properties and the amount of alteration in the diorite have made its recognition difficult and caused uncertainties in mapping it.

The gabbro southeast of the east end of Cree lake is massive and medium-grained with some poikilitic and ophitic structures developed on a microscopic scale. The plagioclase is so completely kaolinized that identification is impossible. Augite is easily recognizable. There are small areas of chlorite, but they do not appear to be alteration products of olivine.

Emmons grouped the quartz diabase and gabbro with the diorite, and the writer found no reason for changing this classification. Augite is common to all three rocks.

The basic intrusives included in this group are of uncertain age. Relations with major formations other than the Keewatin were not observed in the area mapped. In Cunningham township to the south, rocks which appear similar are reported to intrude the granite. However, much of the basic rock is difficult to distinguish from coarse phases of the Keewatin lavas, or from intrusives that are related to the lava flows or that may be older than the granite.

They are placed provisionally with the Haileyburian rocks, which they resemble. On further work such rocks may be placed more definitely, and some may be found to be higher up in the geological scale.

Algoman

Granite

The granite in the northwestern part of Raney township is a medium-grained, pink, biotite-bearing variety. The colour varies from light-pinkish to dark-greyish, and the texture from fine to coarse. In places along the Ivanhoe river the granite disintegrates readily. Biotite usually comprises about 15 per cent. of the rock, but in small exposures hornblende occurs instead. In other areas biotite becomes very abundant and the quartz granular. Granodioritic phases are present. The granite is usually massive, but occasionally is schistose, especially in the northwestern part of Raney township. Muscovite was found in the granite at two points near the Ivanhoe river. North of Ridley lake and on it the granite is relatively coarse-grained, contains orthoclase phenocrysts, and occasionally shows considerable chloritization of the biotite. Orthoclase is

abundant here as in Raney township. Locally the granite exhibits a slight gneissoid structure.

Feldspar Porphyry

The feldspar porphyry is well exposed along the shores of Brett lake, particularly the central and eastern parts. On the fresh surface this rock is reddish and shows phenocrysts of plagioclase and hornblende. It weathers to a pink colour with prominent grey phenocrysts. In thin section rounded areas of very fine grained quartz are visible. They may be granulated phenocrysts. Andesine is the only feldspar identified; a trace of hornblende is found. The matrix is so finely crystalline that no minerals could be identified. Sericite, epidote, chlorite, and carbonate are the alteration products.

Keweenawan

Olivine Diabase

The olivine diabase varies in texture from very fine to quite coarse. The diabasic structure is prominent even in the hand specimen. The colour varies from dark-grey through brownish-grey to light-grey. The darker colours predominate in the smaller dikes, and the lighter colours in the larger dikes. They range in width from a few inches to 4 chains. The surface weathers brownish, and the material disintegrates so readily that it is difficult to obtain a fresh specimen. The constituent minerals are labradorite, augite, olivine, magnetite, biotite, and apatite, with a trace of their alteration products. The augite is slightly coloured in thin section and may be titaniferous. Magnetite occurs in sufficient quantities to cause local attraction. Many of the dikes trend a few degrees west of north, but the larger ones strike northeast or east-west. Bannerman's observations in the Sahkatawich Lake area indicate a similar dominant trend.[1]

Pleistocene and Recent

The area is covered by drift of varying thickness, which is locally sorted. In the northwestern part of Raney the drift is quite thick and forms hills of considerable relief along the old tote road. Small drumlins southwest of Ridley lake show a north-south trend. The northerly expansion of Ivanhoe river in this township is bordered by steep gravel slopes rising abruptly from the water's edge, and the islands are too narrow to furnish a tent site. The southerly expansion is bordered by banks of fine sand 20 feet high. This sand, as well as that in other areas, is very fine, angular, and greyish-yellow or brownish-yellow in colour. The most extensive area of sand plain lies in the southwest central part of Heenan township. It shows low terraces, which may be due to wave action on a small lake. An esker about 15 feet high lies near the southern edge of the plain in the central part of the township. In the north central part of Newton township, smaller areas of sand plain covered with old sand dunes occur. In southwestern Dore a ridge of gravel, sand, and drift, probably an esker, is reported to extend from the township boundary to the vicinity of Bayly lake. No doubt many eskers occur within the area. Several drift-covered ridges trending northeast across the east boundary of Coppell township are believed to be eskers. In the western part of Coppell township the narrow hills rise to a height of 50 feet or more, are quite steep, and enclose many small ponds. The relief suggests a temporary halt in the retreat of the ice-sheet.

[1]H. M. Bannerman, Geol. Surv. Can., Sum. Rept., 1928, pt. C, p. 22.

Boulders appear to have been transported only short distances. Where most of the boulders along a lake shore were granitic, a source was found within a mile. Glacial striae were found at several places. The directions vary as much as 53 degrees, but the average direction is S. 5° W. No evidence indicating more than one advance was seen.

With the exception of a few bogs, no extensive deposits of recent origin were found. A delta of sand and gravel about half a mile long was built in the south end of the former Ivanhoe lake. It now stands 5 to 8 feet above the surface of the present stream.

ECONOMIC GEOLOGY

The Drummond-Dobie claims, which lie on either side of Speight's line along the southern boundary of the area, have been described by Lindeman and Bolton. They contain bands of iron formation, which were not found during the survey. Claims W.S. 8 to 12 on the Woman River iron range, which are held in trust by C. K. Leith of Madison, Wis., have been described by Allen and also by Lindeman and Bolton.

Woman River Iron Range

Where the iron formation was traversed on the eastern part of claim W.S. 8, it consists of a thin-bedded magnetite-grünerite rock and some thin bands of chert, or interbedded iron oxides and magnetite-grünerite rock between rusty conglomerate and chert beds. In other places it is a thin-bedded magnetite and chert. The central and northern parts of this band are chiefly conglomerate quartzite, brecciated chert, thinly laminated chert, and a very fine, dark-greyish sediment, probably a greywacké. There is a belt of banded magnetite and chert about 250 feet wide in the midst of these sediments. Near the west end of claim W.S. 8 the iron-bearing sediments are confined to a belt about 600 feet wide, which consists of bands of chert in a matrix of magnetite-grünerite rock. Owing to the intense folding in the area, the rocks have been drag-folded and shortened. The magnetite-grünerite bands have become schistose, and the chert layers have been brecciated. The rocks immediately north are laminated chert, cherty conglomerate, brecciated chert, banded chert and magnetite, very fine quartzite, and some basalt flows.

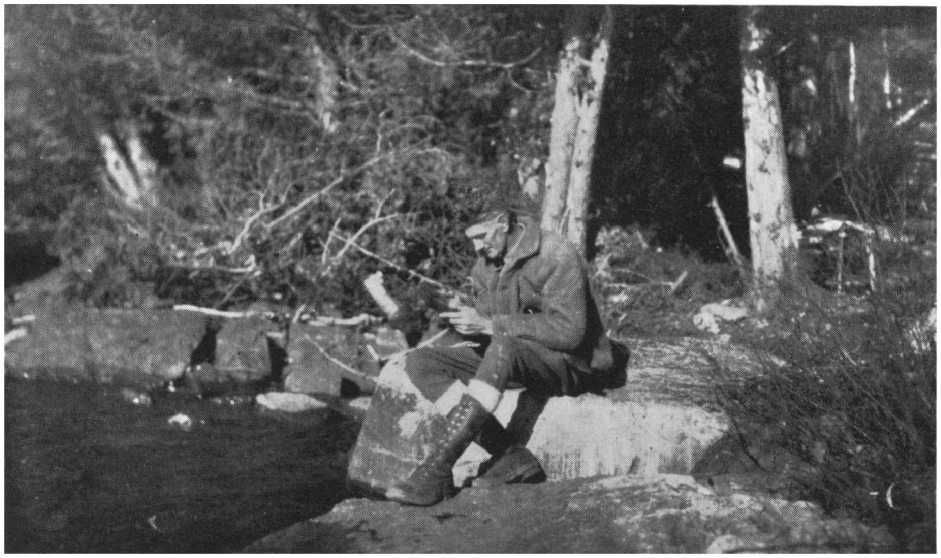
The westerly belt of the iron formation is essentially red jaspilite. It is very thinly laminated, slightly fractured, and is cemented by minute grains of pyrite and quartz. The jasper bands range from a tenth of an inch to 2 inches in width and alternate with dark-grey cherty bands containing pyrite, magnetite, and some limonite. The west end of the belt is a fractured dark-grey chert containing some specular hematite. Where the belt crosses the south boundary of Heenan township, the bedding in the jaspilite is marked by bands carrying more magnetite. A trace of pyrite occurs. The strike is about S. 50° E., and the dip is vertical. Bannerman has traced this belt southeastward to the Woman river.[1]

Allen[2] gives the following description of the range:—

> The iron formation is made up of finely banded cherty iron carbonate rocks, hematitic, magnetitic, and pyritic cherts, black and red jaspilites, a unique amphibole-magnetite-chert rock, and iron ores. . . .

[1]H. M. Bannerman, personal communication.
[2]R. C. Allen, op. cit., pp. 255, 258, 259.

Locally, particularly in claims W.S. 11 and 12, iron ores occur. On these claims the ore is low grade, running as high as 43 per cent. iron and, as shown by an average of 16 analyses,



Jay Kenty panning gold at the Kenty discovery, October, 1931.

carrying a phosphorus content of 0.018. On claim W.S. 8 the most highly ferruginous areas coincide with those that are abundantly amphibole-bearing.

No. 3 vein, Kenty claims.

The range may be divided into several areas, each of which is characterized by the relative prominence of one of the various phases of the formation. In general, ferruginous cherts are

dominant toward the southwestern end, and the jaspilites are prominent toward the northeast in claims W.S. 4, 5, and 6. The amphibole-magnetite rocks are abundant in claim W.S. 8, while the unaltered iron carbonate rocks have been found only in claim W.S. 6 and in a few places east of Woman river.

Courtesy of R. E. Hore

Trenching among the trees, Kenty claims, Swayze township, June, 1932.

An area including most of claims W.S. 4, 5, and 6 is held in the name of J. Jackson, Sudbury.

Courtesy of R. E. Hore

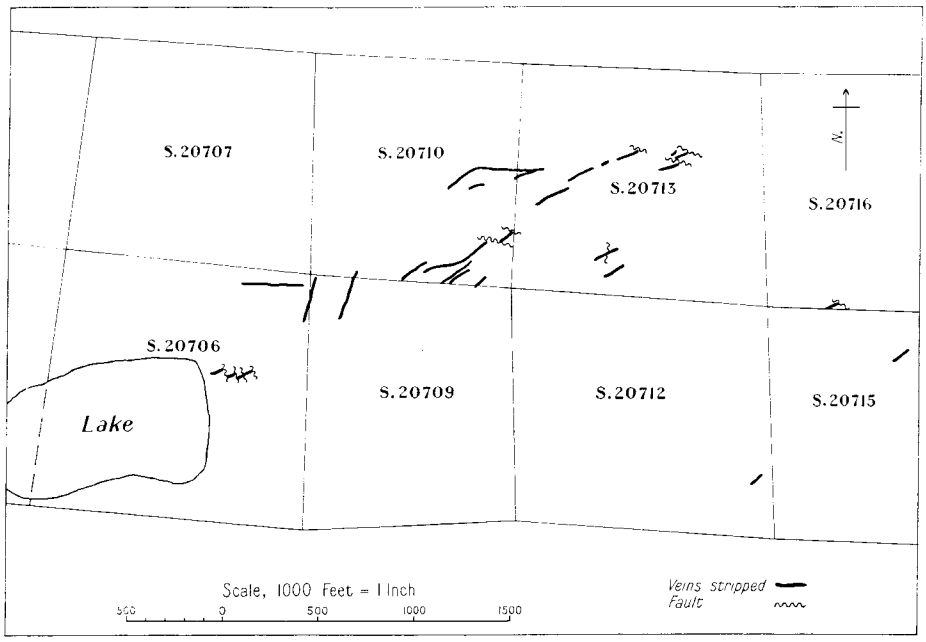
Kenty No. 2 vein, looking southwest along the strike, June, 1932.

Origin of the Iron Formation

The physical development of the Woman River section may be briefly stated as follows: Extrusions of basic lava on the floor of a submerged area were quickly followed by the precipitation

of the iron formation. Thus is explained the absence of mechanical sediments between these formations; and the apparent absence of such sediments within the iron formation itself may be accounted for by a relatively rapid precipitation, since this would tend to obscure the presence of very minute amounts of intermixed silt. It is also possible that it may be due in part to physiographic conditions which were unfavourable to the deposition of mechanical sediments. The deposition of the iron formation was probably terminated by the recurrence of extrusive processes, which produced the rhyolite porphyry and breccia formations.[1]

Some of the fragmental rocks immediately above the iron formation in claim W.S. 9 contain rounded pebbles of rhyolite. Consequently there may have been an interval of erosion between the deposition of the iron formation and the extrusion of the later volcanics, or at least very soon after the deposition of the iron formation.



Plan of the Kenty claims showing faults and the veins that have been uncovered by stripping.

Gold

In August, 1931, J. G. and J. L. Kenty discovered gold in Swayze township northeast of Brett lake. The following description of the discovery is taken from a special report by H. C. Rickaby, who visited the area after the writer had left the field.

Kenty Gold Mines, Limited[2]

The Kenty group comprises 15 claims, being 3 claims wide and 5 claims long, in an east-west direction, and tying on to the east boundary of Swayze township. Five showings had been uncovered at the time of the writer's visit, disclosing quartz veins occurring along fractures in greenstone. The veins, which have been stripped for lengths up to 135 feet, show strong fractures with widths from 3 to 10 feet striking from N. 50° E. to N. 70° E., and dipping 60° to 70° S.E. Along the fractures the basalts have been silicified and heavily mineralized with pyrite. Very minor amounts of chalcopyrite, galena, sphalerite, and molybdenite were noted. The quartz occurs as small stringers and veins up to 2 feet in width parallel to the fracturing.

No. 1 showing occurs at the east end of a small lake near the west boundary of claim No. 20,709. The vein had been stripped for a distance of 120 feet showing widths up to 5 feet.

[1]R. C. Allen, op. cit., p. 261.

[2]The Kenty Gold Mines, Limited, was incorporated in Ontario, on September 21, 1932, with a capital of $3,000,000, for the purpose of holding and operating the Kenty group of claims.

It strikes N. 55° E. and dips 65° S.E. It appears to have been faulted in two places, the fault planes being approximately at right angles to the vein. Coarse native gold was visible in one place. Grab samples from this vein assayed as follows:—

Quartz	$0.40
Pyrite schist	7.80

No. 2 showing occurs in the southern part of claim No. 20,710, about 300 feet west of No. 2 post. It has a northeast strike and dips to the southeast, but insufficient work had been done to determine its attitude accurately. The fracturing extends over a width of 8 feet in one place. Grab samples assayed as follows:—

Quartz	$2.80
Pyrite schist	5.00

No. 3 showing occurs near the west boundary of claim No. 20,713, about 600 feet north of No. 3 post. The vein has been stripped for a distance of 135 feet, and some shallow trenches

No. 1 vein, Kenty claims.

have been blasted out. It shows a width of from 5 to 8 feet at the east end, where it passes into low ground. The strike is N. 70° E., and the dip 65° S. Assays of samples were as follows:—

1.	Chip sample across 8 feet at east end of vein	$0.60
2.	" " " 5 " 35 feet west	1.00
3.	Grab sample of quartz at east end	Nil
4.	" " " pyrite schist east end	5.40
5.	" " " pyrite " near west end	9.00

No. 4 showing occurs on the south boundary of claim No. 20,713, about 450 feet east of No. 3 post. The vein had been stripped for a distance of 100 feet, showing a width of 10 feet in places. It strikes N. 50° E. and dips 60° S.E. Small dikes of felsite intrude the fracture in this showing. A grab sample of pyrite with some quartz assayed $2.40.

No. 5 showing occurs on claim No. 20,716, about 300 feet east of No. 3 post, and shows a quartz vein from 2 to 2½ feet wide, striking N. 55° E. and dipping 70° S.E. It had been stripped for a distance of 75 feet, but no blasting had been done and no samples were taken.

It is not possible to form an estimate of the important of this discovery at this early stage of its development. A favourable feature, however, is the strength of the fractures and the heavy pyritization. The samples assayed above point to a close connection between the pyrite and the

gold values. As a prospect, this property would appear to have more than ordinary merit. Data for the accompanying plan of veins uncovered by trenching were supplied by the developing company, Brett-Trethewey Mines, Limited. Additional work will doubtless connect a number of these veins.

Other Prospects

The approximate positions of gold discoveries, some of which were made in 1932, are shown on the map. In addition to the Kenty in Swayze township, they are as follows: Dyment and Derraugh in Denyes township, Thorne-Greaves in Raney, and that of the Cyril Knight Prospecting Company in Rollo township.

Index, Part III