FORTY-NINTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

1940

PART IX

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. ROBERT LAURIER, *Minister of Mines* | H. C. RICKABY, *Deputy Minister*

FORTY-NINTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

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Geology of the Mishibishu Lake Area

By

E. L. EVANS

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Geology of the Mishibishu Lake Area

By E. L. Evans

INTRODUCTION

The discovery of gold and iron in the vicinity of Michipicoten Harbour in 1897 and 1898 brought an influx of prospectors, whose search led many to travel the unexplored territory to the west. The immediate need of published information on the area became apparent. In 1898 Coleman and Willmott[1] on instructions from the Ontario Department of Mines explored the shore of Lake Superior from Sault Ste. Marie to Heron Bay, and later travelled down the Pukaskwa river.[2] In the same year Willmott explored the University (Dog) river, from its source to Lake Superior.[3] Two years later Dr. Robert Bell of the Geological Survey of Canada,[4] traced the rocks of the Michipicoten area northwest to Iron lake. But it was not until 1904, when J. M. Bell[5] made his survey of the "Iron Ranges of Michipicoten West," that the territory that is here referred to as the Mishibishu Lake area was geologically explored.

Since that time parts of the area have been thoroughly prospected, and mineralization is known to occur north of Mishibishu lake. Until recently, however, development has been restricted, possibly owing to the inaccessibility of the region. The building of the Trans-Canada highway, now under construction, will open up vast new territory and has made advisable the restudy of this section. The work for this report was begun early in June and finished late in September, 1939.

Mishibishu lake lies in the southeast corner of the district of Thunder Bay about 25 miles in a straight line northwest from Michipicoten Harbour and 170 miles north-northwest of Sault Ste. Marie, Ont. The area is roughly rectangular in shape, as shown on the accompanying map (No. 49j), and lies chiefly to the north and west of Mishibishu lake. With the exception of the Thunder Bay–Algoma boundary line along the eastern border, the country examined is unsurveyed. In making traverses it was necessary to tie in only on conspicuous topographical features such as outstanding points, bays of lakes, and bends in rivers.

Acknowledgments

The writer wishes to express his appreciation to the members of the Ontario Forestry Branch, Wawa, for their hospitality and co-operation and for valuable information concerning the area.

A. C. Freeze acted as senior assistant and rendered invaluable service throughout the whole season. The energetic and whole-hearted co-operation of D. P. Robertson and N. A. Paterson did much towards making the field season successful in this difficult area.

Means of Access

Mishibishu lake may be reached from Michipicoten Harbour, a terminal of the Algoma Central and Hudson's Bay Railway, by way of Lake Superior. The main route leaves Lake Superior at Dog Harbour and proceeds through a

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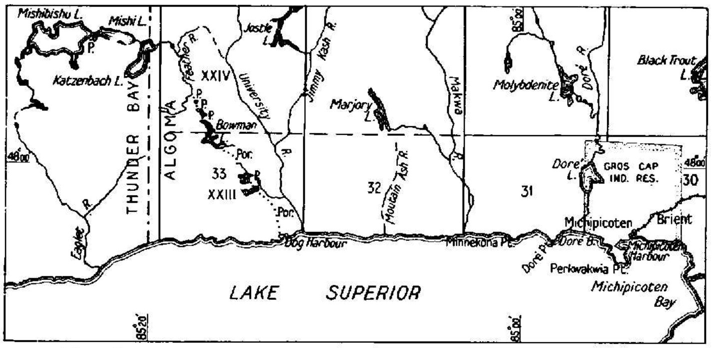
[1]A. P. Coleman, Ont. Bur. Mines, Vol. VIII, 1899, pt. 2, pp. 121-174.
[2]Ibid, pp. 137, 138.
[3]Ibid, pp. 140, 141.
[4]Robt. Bell, Geol. Surv. Can., Sum. Rept. 1900, pt. A, pp. 109-121.
[5]J. M. Bell, Ont. Bur. Mines, Vol. XIV, 1905, pt. 1, pp. 278-355.

chain of eight small lakes, including nine portages, to the Feather river. Only the first and fourth of these portages are long, 2¾ miles and less than 1¼ miles, respectively. The Feather river is then followed downstream for 2 miles to its



Sketch map showing the canoe route from Lake Superior to Mishibishu lake. Scale, 8 miles to the inch.

junction with the outlet of Katzenbach lake. Several short portages are necessary before this lake, a mile from the Feather river junction, is reached. A small creek connects the north end of Katzenbach lake with Mishi lake from which Mishibishu lake is reached by means of a short portage.

Topography

The general surface of the country with its high rock ridges alternating with deep valleys stands in marked contrast to the low undulating surface of the country north of the height-of-land. The ridges are for the most part re-

View across the northern lowland belt showing the contrast between hills of intrusive rocks and those of sedimentary and volcanic rocks.

markably continuous, and their slopes drop steeply into narrow ravines and valleys. Two converging belts of lower elevation cross the area, the northern one trending to the southwest and the southern one striking northwest. These are bounded and separated by intrusive rocks and underlain by tightly folded sediments and volcanics. The floors of these troughlike belts have considerable relief, but their hills are topped by those along the borders. Visible from Maiden's Leap mountain on the south shore of Mishibishu lake are the major uplands which rim the troughs. The knobs and ridges of the southern upland region are breached by Katzenbach lake and the deep bay at the southwest corner of Mishibishu lake. To the north are the granite and diabase hills of the Ellen lake region, separating the two troughs. To the west, 2 miles east of the East branch of the Pukaskwa and roughly parallel to it, are ridges that rise abruptly about 200 feet above the lower land. These ridges truncate the southern lowland belt.

Approximately one mile north of Ellen lake, the granite hills drop rapidly into a broad lowland about 4 or 5 miles wide, floored by the sediments and volcanics of the northern belt, and rise again steeply to the upland on the north side.

The highest hills and knobs are haphazardly distributed and are capped by diabase, which is apparently the most resistant rock in the region. From the summits of one of these ridges, which is less than half a mile northeast of

Diabase ridge near Ellen lake.

Ellen lake, it is possible on a clear day to see Michipicoten Harbour, some 25 miles distant.

Throughout most of the area, unconsolidated materials occupy only the ravines and valleys between the rock ridges, so that outcrops are well exposed and fairly continuous. In the upper part of the East branch of the Pukaskwa river, however, the valley widens and contains sandy material, through which small outcrops project. Muskegs are almost entirely lacking, though numerous small beaver meadows and ponds are found scattered in both uplands and lowlands.

Mishibishu lake drains eastward through Mishi and Katzenbach lakes to the Feather river, which flows northeastward to the University river, which empties into Lake Superior. The lake lies on a divide separating those streams that flow northeastward to the University river, those that flow directly south to Lake Superior, and those that flow westward to the Pukaskwa river. Consequently all of the streams entering the lake are short and none are navigable by canoe.

Across a 1¼-mile portage north from Mishibishu lake is Miron lake, the headwaters of a sluggish stream flowing northeastward. The stream meanders through a grassy meadow for some distance, then passes over a small falls to a stretch of narrow muskeg, which leads to a small, shallow lake. At this point, a tributary from Ellen lake joins it, and the combined waters continue over a straighter course, broken by many falls and rapids, to Eaglet lake and the University river. This stream is navigable from Miron lake in the spring, but later it is necessary to portage over the upper grassy meadow. The tributary from Ellen lake is also navigable, and from Ellen lake a number of portages between small lakes leads to the upper East branch of the Pukaskwa river.

Macassa creek drains the country west of Mishibishu lake. There are few quiet stretches in the course of this turbulent but small stream. It may be possible in the early spring to run its many shallow rapids by canoe, but later the exposed boulder beds prohibit travel over these stretches. Low falls are interspersed among the rapids in the meandering, upper part of the stream. As the stream approaches the East branch of the Pukaskwa river and the country

Grassy meadow east of Miron lake.

becomes more rugged, larger falls and steeper rapids, strewn with large angular boulders, are encountered. Portages were cut around the worst of the falls and rapids during the summer.

The East branch of the Pukaskwa river is the largest stream in the area. It rises in the vicinity of Iron lake and joins the main Pukaskwa river about 5 miles from Lake Superior. Its 30-mile course in a deep and, in many places, narrow valley consists of a succession of shallow rapids and low falls separated by short stretches of quiet water. About 9 miles above the junction of Macassa creek, the river drops over a series of falls, back of which the valley widens into a sand plain supporting a growth of jackpine. This river is seldom if ever used for travel, but portages are now cut for about 12 miles above Macassa creek.

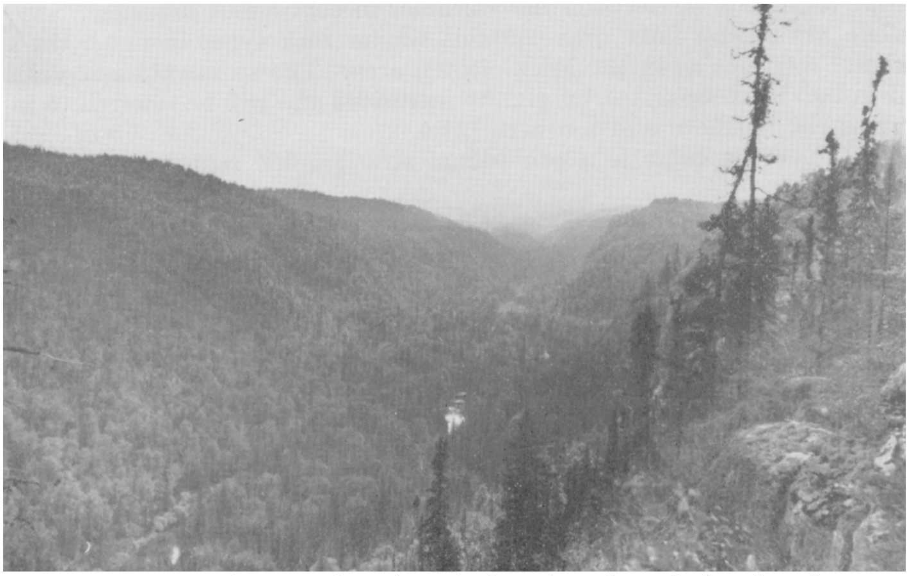
Natural Resources

Soil

Very little of the Mishibishu Lake area appears fit for cultivation. The wide sand plain in the upper valley of the East branch of the Pukaskwa is probably too sandy to support other than its natural growth. A number of dried marshes, however, are covered with a strong growth of grasses, which could be used for fodder. Approximately 50 acres of grassland occurs along the banks of the stream east of Miron lake. Similar stretches are found along Macassa creek, several of which are close to Mishibishu lake.

Timber

Virgin forests cover the area, though few of the trees reach sufficient size to be valuable as timber. Many stands are available, however, which may be utilized in preliminary mining development. The more common species of trees are spruce, poplar, birch, banksian pine, cedar, and balsam. Willow and mountain maple form a thick undergrowth, particularly on the north side of the hills. Spruce up to 15 inches in diameter occur in many of the hollows between the ridges. The most accessible are those found around Mishibishu lake. Thick growth was also observed along the upper part of the East branch of the Pukaskwa in the sand plain region. Here jackpine is fairly abundant. The largest trees grow along the northern belt of sediments, where a small stream flows in a wide valley. Along the valley, the flat-topped hills contain swamps with a growth of large cedar, balsam, and spruce.



Valley of the East branch of the Pukaskwa river above the junction of Macassa creek.

Very little of the timber has been destroyed by fire, and only one area of brulé was found. An old burn about half a mile wide extends slightly west of south from Ellen lake to Macassa creek.

Fish and Game

No fish other than sucker were found in any of the lakes. Brook trout, however, are very plentiful in the East branch of the Pukaskwa river. Spruce partridge and ruffed grouse are common. Few ducks other than fish ducks were seen.

Moose are numerous and may be frequently seen feeding in the grass meadows or among the lily pads of the shallow lakes. Woodland cariboo have been reported from this region in winter. No signs of deer were seen. Bear are not as common here as along the shores of Lake Superior. Signs of marten, mink, muskrat, and fox are rare. The most abundant of the small animals is the beaver. Their dams and ponds, surrounded by fresh cuttings, are found on almost all small streams.

GENERAL GEOLOGY

The sequence of pre-Cambrian rocks in the Mishibishu Lake area is essentially that of the Michipicoten area to the east. In that region the volcanic groups that lie on either side of the Doré series have been variously correlated by different men. Gledhill,[1] Moore,[2] and Frohberg[3] assign all the volcanic schists to the Keewatin and place the Doré series above it as equivalent to the Timiskaming. Collins and Quirke,[4] on the other hand, place the volcanics that contain the typical iron ranges above the Doré series. Burwash[5] adopts the same view, suggesting that these post-Doré volcanics may be equivalent to the Haileyburian. The former interpretation postulates, therefore, a synclinal structure of Keewatin volcanics enclosing the Doré series; whereas the latter view assumes that the sediments lie between the volcanics in continuous sequence.

The Mishibishu Lake area contains similar rock types in much the same structural relations as in the Michipicoten area. The sediments and volcanics occur in two belts separated by granite intrusives and will be referred to in this report as the northern and southern belts.

The following table is a provisional stratigraphic sequence of the rocks in the area.

Table of Formations

PRE-CAMBRIAN	
KEWEENAWAN:	Diabase dikes.
	Intrusive contact
ALGOMAN:	Dikes of quartz porphyry, quartz feldspar porphyry, pegmatite, aplite, and lamprophyre. Granite, granodiorite, and diorite. Syenite.
	Intrusive contact
TIMISKAMING:	Doré series of conglomerate, arkose, greywacke, quartzite, and slate.
KEEWATIN:	Basic and acid volcanic flows, agglomerate, and tuff.

Keewatin

Though no unconformity was observed between the volcanics and the sediments of the Doré series, all the volcanic rocks in the area are tentatively correlated with the Keewatin. The only outcrop that is known to underlie the sediments occurs half a mile north of Mishibishu lake. There an inlier of volcanics protrudes through the surrounding rocks. On the north shore of a small lake well-formed pillows indicate that the steeply dipping beds are overturned to the south. Grain size variations in sediments south of the lake also indicate overturning to the south. Dips and strikes in both rock types are the same. Away from the lake a thick covering of moss appears to have protected the surfaces of the lavas so that weathering did not bring out pillow structure. It is significant to note, however, that a series of grain size determinations in the sediments north of the lava indicated that the top of the beds is to the north. The

[1]T. L. Gledhill, "Michipicoten Gold Area," Ont. Dept. Mines, Vol. XXXVI, 1927, pt. 2, pp. 8, 10.

[2]E. S. Moore, "Goudreau and Michipicoten Gold Areas," Ont. Dept. Mines, Vol. XL, 1931, pt. 4, p. 4.

[3]M. H. Frohberg, "The Gold Deposits of the Michipicoten Area," Ont. Dept. Mines, Vol. XLIV, 1935, pt. 8, p. 41.

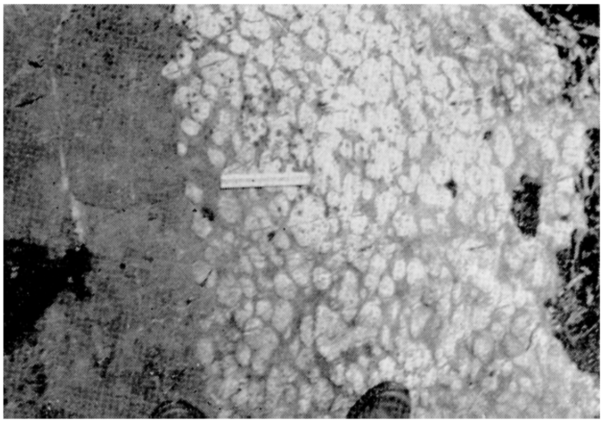
[4]W. H. Collins and T. T. Quirke, "Michipicoten Iron Ranges," Geol. Surv. Can., Mem. 147, pt. 1, 1926, p. 13.

[5]E. M. Burwash, "The Michipicoten-Missinaibi Area," Ont. Dept. Mines, Vol. XLIV, 1935, pt. 8, p. 7.

lava inlier, therefore, appears to be located along the axis of an anticline striking generally east-west.

The lava has a remarkably fresh appearance in outcrop with its macroscopic structure well preserved, but microscopic examination reveals an almost complete alteration of the original minerals. The material now consists of an intimate mixture of sericite, fragments of the original feldspar, and an abundance of clinozoisite. Scattered throughout are minor amounts of leucoxene, carbonate, and magnetite.

North of the sediments is a band of volcanics, in part acid pyroclastics and in part basic to medium acid flows. Excellent exposures were found along the southward-flowing part of Macassa creek, where the stream has uncovered pyroclastics containing bombs with a maximum diameter of 2 feet. In many places these rocks have been intensely metamorphosed to chlorite schists. Narrow bands of sericite schist containing ankerite, partly weathered to limonite, occur in a number of places interbedded with the volcanics.



Feldspar basalt porphyry (leopard rock) about half a mile northwest of Miron lake.

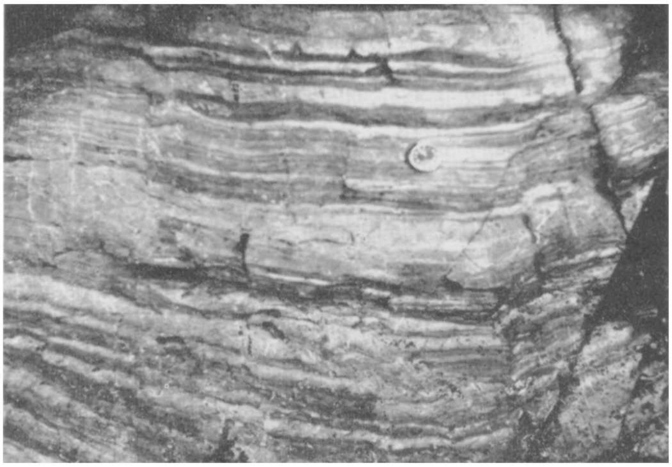
The more basic lavas were probably andesites and basalts but are now represented essentially by chlorite schists. The flows contain discontinuous lenses of feldspar basalt porphyry (leopard rock), consisting of many closely spaced feldspar phenocrysts as much as 2½ inches across, embedded in a dark-green chloritic matrix. The feldspars show considerable alteration to saussurite and are generally somewhat rounded as if attacked by the containing liquid before consolidation. A similar occurrence of feldspar phenocrysts in diabase dikes will be described later.

Along the granite contact to the north, the volcanics are intimately mixed with granitic material so that there is a gradational contact from hornblende and biotite schists into granite. *Lit par lit* injection is common in the contact zone. On the other hand, the syenite that intrudes the volcanics along Mishi and Katzenbach lakes seems to have had little effect on the intruded rocks, other than baking and recrystallization for a few inches beyond the contact.

Except for the absence of definite pillow lavas, the volcanics of the northern belt are essentially the same as those of the southern belt. A narrow zone of chlorite schists, resembling altered basic flows, rims the southern margin of the belt. The sediments of the Doré series separate these from a wider band of volcanics farther north. This band contains pyroclastics and basic and acid flows of schistose appearance, similar to those of the southern belt.

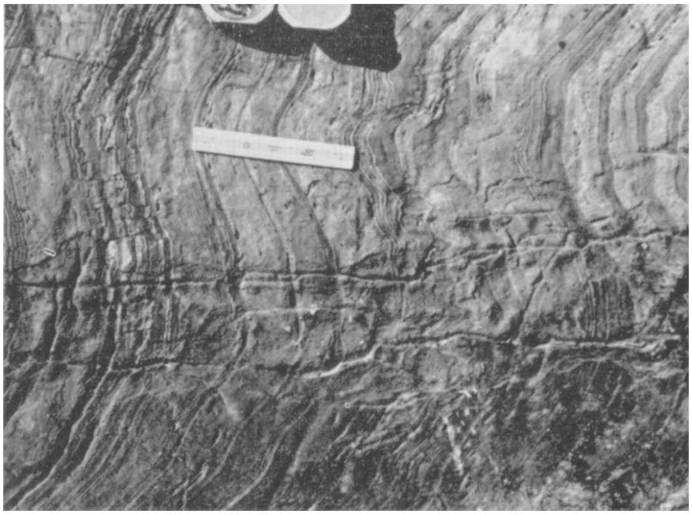
Timiskaming

The Doré series occupies the central part of the two synclinal belts, and the southern limb of the anticline north of Mishibishu lake. The character of the sediments of the southern belt changes considerably towards the west. The



Banded sediments near Mishibishu lake.

rocks along the north shore of Mishibishu lake are, for the most part, rather fine grained slates and greywacke. These rocks extend for some distance northward with a noticeable coarsening of texture towards the conglomerate. Some of the beds are rather distinctive and might be used as horizon markers in a more



Bedded and folded greywacke on Macassa creek.

detailed study of the structures. One such bed, close to the conglomerate, contains peculiar black quartz grains.

The conglomerate appears to be more sheared than any of the other sediments. It contains pebbles of quartz, black and red jasper, granite, and allied dike rocks in what appears to be a highly schistose matrix. Well-washed outcrops along Macassa creek reveal, however, that this matrix is composed of extremely flattened and elongated pebbles of material that was probably volcanic in origin. The conglomerate can be traced continuously from the point where it crosses Macassa creek eastward to the point where it is cut by the syenite near Mishi lake. The sediments enclosing the conglomerate are medium-textured arkoses.

Towards the west there is a decided change in both the character of the sediments and their structural orientation. The trend of the sediments changes from generally east-west to north-south and back to east-west again. Macassa creek crosses the structures at a slight angle in two places: west of Mishibishu lake and again near the East branch of the Pukaskwa. Between these points it follows closely the strike of the finer sediments. North from the creek, the section

Conglomerate near Macassa creek containing rounded jasper pebbles, elongated granite pebbles, and ribbonlike volcanic pebbles.

crosses coarser clastics enclosing conglomerate lenses difficult to trace. The boulders are almost entirely granite with a few scattered quartz and jasper pebbles in a quartzite matrix. These beds pass northward into coarse quartzite containing quartz grains as much as 5 millimetres across, with interstitial sericite, carbonate, and feldspar fragments. The grains are subrounded to angular. Close to the volcanics the quartzite becomes more arkosic and contains interbedded slates and fine greywacke. Elsewhere bedding can rarely be recognized.

The sediments in the northern belt are similar to those of the southern belt north of Mishibishu lake. Slates interbedded with greywacke make up most of the section with one rather continuous band of conglomerate. The conglomerate here contains granite boulders with a maximum diameter of 18 inches and fewer pebbles of volcanic material. The matrix is of medium-grained greywacke, and the total width of the band is greater than that north of Mishibishu lake.

Algoman

All the intrusives of the area, with the exception of diabase dikes, are correlated with the Algoman, although it is possible that more than one age occurs. Both the sediments and the volcanics are cut by the granite, which separates the two synclinal belts. The rock is, in most places, a medium-grained, grey hornblende granite. In places, it is somewhat gneissic, particularly close to the contact with the volcanics. Along the contact zones are a variety of hybrid rock types, which are the result of recrystallization, injection, and possibly assimilation. The greenstones have been converted chiefly to amphibolites, and fragments of this material are common in the granite for some distance away from the contact. The contact action along the East branch of the Pukaskwa river has produced a narrow zone of diorite, which roughly parallels the river but passes into granite a short distance westward.

An oval-shaped mass of syenite intrudes the sediments along the shore of Mishibishu lake and the volcanics along the shore of Mishi and Katzenbach lakes. The rock is a medium- to fine-grained pink syenite consisting chiefly of feldspar with minor amounts of chlorite, which imparts a crude gneissic structure in a number of places.

Cutting all other rocks are dikes of pegmatite, aplite, and lamprophyre. These are fairly common around Mishibishu lake, but are nowhere abundant. More frequently one encounters dikes of quartz and quartz feldspar porphyry, which may be genetically related to the syenite or the granite but have not been found cutting either. They generally intrude parallel to the bedding or schistosity. Some of them have been highly sheared and have developed a coarse platy cleavage. The dikes range in width from 1 to 6 feet. They consist of quartz or feldspar phenocrysts in a matrix of much the same material. The sheared dikes have been altered to sericite schists in which the quartz phenocrysts are very pronounced.

Keweenawan

Keweenawan diabase dikes, ranging from a few inches to 100 feet in width, are particularly abundant in the area. The texture of the diabase depends roughly on the size of the dike. Many of them have chilled margins. The surfaces of the dikes are, for the most part, remarkably fresh, but a few are highly weathered. One such dike occurs on the narrows between Mishi and Katzenbach lakes. The material composing the dike is quite friable and can be pulverized with the fingers.

Porphyritic diabases, though not common, were noted in a number of places. These dikes contain phenocrysts of a greenish feldspar up to 2 inches across in a medium- to fine-grained matrix. Thin sections reveal that the phenocrysts have been altered to sericite and epidote and that the borders of the crystals, never sharp, have been partially replaced by the groundmass. The matrix, in comparison, is remarkably fresh. It consists of approximately equal amounts of feldspar and pyroxene, the latter slightly altered to chlorite, with some magnetite and minor amounts of quartz and epidote. The macroscopic appearance of this rock is quite similar to that of the feldspar basalt porphyry described earlier. The chief difference between the two is the amount of alteration to which they have been subjected.

STRUCTURAL GEOLOGY

Rather strong evidence for two periods of diastrophism is present in the Mishibishu Lake area. The first period is indicated by the coarse clastics in the

Doré series. The increasing coarseness of the sediments from fine slates and greywacke in the south, culminating in conglomerate, indicates that the elevation of the land was increasing during sedimentation. The abundance of large granite boulders in the conglomerate to the west, together with the subrounded character of the quartzite grains, suggests a mountainous region and indicates that erosion must have reached considerable depth. The source of the material was obviously towards the west, since it is in that direction that the clastics thicken and become coarser. There is, however, no proof that this period of movement took place after the deposition of the volcanics of the area. On the contrary the sediments appear to be conformable in all places with the volcanic material. It is possible that the uplift culminated with outpouring of lava and pyroclastics, followed by erosion and deposition of the Doré series in adjacent troughs.

Time and the obscurity of the volcanic types in most places did not permit the establishing of horizons in these rocks. There is a suggestion that an unconformity may exist between the volcanics and the sediments, in as much as pyroclastics are exposed within 1,000 feet of definite sediments along Macassa creek. Although the rocks of the intervening area are of indeterminable character, they are clearly not basic volcanics; whereas along the east shore of Katzenbach lake more than 1,000 feet of basic flows are exposed within a few feet of the sediments.

The second period of diastrophism produced the present structures in the rocks, comprising two closely folded synclines and a minor anticline. Between the two synclines is the granite intrusion, and south of the anticline the syenite intrusion. The anticline has been definitely established on the basis of pillow lavas along its axis and the direction of the tops in the sediments on its flanks, as determined by grain size variations. The synclinal structures, on the other hand, are inferred from the presence of volcanic and jasper pebbles in the conglomerate. Banded jasper is found in volcanic rocks similar to those on the northern side of the two belts north of Iron lake and also a short distance west of the mouth of the Pukaskwa river.[1] If the jasper has come from rocks equivalent in age to those on the northern side of the belts, then they must underlie the sediments.

The strike of the rocks in the southern belt is generally east-west to the north of Mishibishu lake, and variable west of the lake. The strikes in the northern belt are southwest. Dips are consistently vertical or at high angles to the north. Thus, the folds are overturned to the south as illustrated by the pillow lavas north of Mishibishu lake.

The abundance of outcrop in the area made it possible to trace certain horizons, such as the conglomerate bands, for a considerable distance. It is, therefore, possible to state with some assurance that no faults of any great magnitude cross the structures on either belt north of Mishibishu lake. It is possible that faults occur parallel to the bedding or nearly so, and undoubtedly there has been considerable shearing in an east-west direction. In a number of places, shearing was observed at a slight angle to the bedding superimposed upon minor drag folds. West of the lake great faulting, though not observed, may have taken place, as horizon markers were not present in the massive quartzite.

ECONOMIC GEOLOGY

Gold is the only mineral of economic importance known to occur in the Mishibishu Lake area, as the iron ranges of the Michipicoten area do not extend

[1] J. M. Bell, Ont. Bur. Mines, 1905, pt. 1, p. 309.

into this territory. J. M. Bell[1] reported the occurrence of narrow bands of iron formation south of Mishibishu lake and near the mouth of the Pukaskwa river, but none of these are of commercial value.

Mineralized quartz veins containing gold are known to occur north of Mishibishu and Mishi lakes. The veins are confined chiefly to a schistose zone that extends from the conglomerate band in the sediments into the volcanics. The lenticular and irregular quartz veins parallel the bedding or schistosity and contain pyrite, chalcopyrite, and galena. Carbonate is a common constituent both in the veins and in the enclosing wall rock.

To the north of this zone, shearing has not been so intense, and the rock does not appear to be as favourable for ore deposition. It should not be neglected entirely, however, as quartz veins containing small amounts of sulphides do occur in this region. The coarse clastics towards the west are less likely to be mineralized, as the rocks, though more brittle, have not been so intensely altered by the deformation. Dike rocks are much less abundant, and no quartz veins were observed.

The conditions in the northern belt are similar enough to the southern belt to warrant further search for gold-bearing quartz veins. This region, lying between Iron lake and the East branch of the Pukaskwa river, does not appear to have received much attention by prospectors. The finer clastics associated with schistose volcanics are intruded by porphyry dikes. Quartz veins seem to be relatively scarce, but surface gossan and sheared zones were found in a number of places and the schists are impregnated with pyrite.

DESCRIPTION OF PROPERTIES

Macassa Property

Macassa Mines, Limited, holds a group of 9 claims north of the west end of Mishibishu lake. A number of trenches have been cut across the schistose zone from the conglomerate into the volcanics. In this zone are intruded quartz veins parallel to the bedding or schistosity. The veins form discontinuous lenses including fragments of the country rock. Adjacent to these lenses are quartz veinlets making *lit par lit* structures with the enclosing rock. Some of the veins occur next to rusty-weathering, heavily carbonated zones; others in highly carbonated and locally contorted greenstones or sediments. The vein material consists of quartz and carbonate containing varying amounts of pyrite, chalcopyrite, galena, and gold. Two kinds of quartz can be distinguished in the vein. One is a milky quartz containing visible gold associated with galena; the other is a dark, glassy variety containing pyrite, chalcopyrite, and small amounts of galena in fractures.

Hollinger Property

The best showings on the Hollinger group of claims occur north of Mishi lake, though the claims extend westward north of Mishibishu lake and adjoin the Macassa group. The veins occur chiefly in the schistose volcanics, which in this region are contorted and drag-folded. The veins follow the direction of schistosity and tend to thicken at the crests of the minor folds. The zone has has been trenched and stripped for a distance of about a mile. Some diamond-drilling was done during the summer of 1938. Mineralization consists of pyrite, chalcopyrite, and galena. No visible gold was observed.

[1]J. M. Bell, Ont. Bur. Mines, Vol. XIV, 1905, pt. 1, p. 316.

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