Province of Manitoba

DEPARTMENT OF MINES AND NATURAL RESOURCES

MINES BRANCH

PUBLICATION 50-4

GEOLOGY

of the

MYSTERY LAKE AREA

Cross Lake Mining Division

Manitoba

by

J. C. GILL

Winnipeg
1951

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DEPARTMENT OF MINES AND NATURAL RESOURCES

HON. J.S. McDIARMID
Minister

J.G. COWAN, K.C.
Deputy Minister

MINES BRANCH

J.S. RICHARDS
Director

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INTRODUCTION

LOCATION AND ACCESS

Mystery Lake area, comprising approximately 80 square miles, lies between latitudes 55 degrees 45 minutes and 55 degrees 55 minutes north and between longitudes 97 degrees 37 minutes and 97 degrees 50 minutes west. Not all of it was mapped during the field season.

Mystery Lake is 36 air miles north of Thicket Portage and is an expansion of a branch of the Burntwood River between Manasan Falls and Moak Lake. Aircraft can land on Mystery Lake and provide the best means of access. The main canoe route from Thicket Portage is long and entails 7 portages with a total length of 285 chains, the longest portage being 93 chains. This route extends northwest from Thicket Portage through Wintering, Paint, and Ospwagan Lakes. Mystery Lake can also be reached from Split Lake via the Odei River and Moak Lake. One 42-chain portage and several shorter ones are necessary on this route.

TOPOGRAPHY AND DRAINAGE

Mystery Lake is approximately five miles long and three-quarters of a mile wide at its widest part. It trends approximately north 20 degrees east, parallel to the topographic alignment of the country. Most of the shoreline is rocky, but in places the thick mantle of glacial clays and sand so prevalent inland extends to the shore. A shallow and weed-grown arm of the lake extends southwest. The south end of the lake is connected to the Burntwood River by a stream 2 miles long, which drains the lake southwards. In some spring seasons the lake is flooded by the backing up of the silt-laden Burntwood River.

Inland from the lake the bedrock is almost completely covered with clay. The country in general is flat, or gently undulating. Approximately half a mile west of the northwest shore of the lake, a series of well-defined level-topped moraines, little altered by erosion, trend northwest.

Timber suitable for building and mining operations is found only in small quantity, but there is considerable spruce and poplar of cordwood size. A small number of Indians hunt, trap, and fish in this area and have winter camps on the northeast shore of the lake. Fish are abundant, whitefish and pike are particularly common. Game is relatively scarce in summer, but caribou and moose are abundant in the autumn and winter.

PREVIOUS WORK

During the summers of 1928 and 1930, J. F. Wright of the Geological Survey of Canada made an examination of many mineral occurrences in northwest Manitoba, including the deposit of galena at Mystery Lake[1]. In 1941 A. S. Dawson of the Manitoba Mines Branch made a reconnaissance survey of the Partridge Crop Lake Area including Mystery Lake. The results of his work were published as Manitoba Mines Branch Map 41-1 on a scale of 1 inch to 2 miles.

PRESENT WORK

The present survey was conducted during a two-week period of the summer of 1950. The geology was mapped on a scale of 2 inches to 1 mile. Particular attention was given to the shores of the lake because of the extensive drift cover inland. Pace and compass traverses were run from the lake at various distances from 1300 to 4000 feet apart, being spaced more widely in the large areas of granite gneiss. Traverses are shown on the accompanying map.

The geology was plotted on a base map which was made by enlarging part of Dawson's Partridge Crop Lake Area Map, 41-1. All important contacts were mapped from shoreline work.

Larger areas of outcrop such as occur on shorelines are represented as being continuous; isolated outcrops in large drift-covered areas are represented by a symbol.

The writer was capably assisted in the field by L. S. Binda, R. D. MacPherson, and D. H. Anderson, all of the University of Manitoba.

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[1] Wright, J. F.: Geology and Mineral Deposits of a Part of Northwest Manitoba; Geol. Surv., Canada, Sum. Rept., 1930, pt. C, p. 117, 1931.

GENERAL GEOLOGY

All consolidated rocks within the Mystery Lake area are of Precambrian age and consist of interbanded volcanic and sedimentary types with gradational relationships to granite gneisses and are intruded by large masses of basic rock.

Following previous nomenclature, the volcanic sedimentary types are called the Assean Lake series which forms an almost continuous belt from Mystery Lake to Assean and Split Lakes about 50 miles northeast. This belt apparently splits into two branches at the north end of Mystery Lake, one of which extends along the southwest arm of the lake. The other continues approximately parallel with the trend of the lake, about north 20 degrees east. The belt has a known length of about 9 miles and maximum width of approximately 1 mile at Mystery Lake.

On the admittedly doubtful grounds of similar lithology, the Assean Lake series has been previously considered to be correlative with the Hayes River group and the Keewatin series.

Considerable effort was directed toward detailed description of the basic intrusives of the area which range in composition from peridotite to quartz diorite, in texture from coarse to fine-grained, and in structure from massive to highly schistose.

The accompanying table of formations gives a classification of the rock types in the area.

TABLE OF FORMATIONS

Recent and Pleistocene		River alluvium, peat, etc. Glacial lake clay Morainal sand, gravel
Unconformity		
ARCHAEAN or PROTEROZOIC	Intrusive Rocks	Peridotite, serpentinite, diabase, diorite, gabbro ----- Intrusive Contact ------- Diorite, derived feldspar-actinolite schist ----- Intrusive Contact ------- Pegmatite, flaser granite gneiss, medium-grained granite gneiss
	Intrusive Contact	
	Assean Lake Series	Sedimentary rocks Quartzite, arkose, greywacke, argillite, pebble grit, iron formation Volcanic rocks Basalt, andesite

DESCRIPTION OF ROCK TYPES

Assean Lake Series

The oldest exposed rocks in the area, the Assean Lake series, consist of interbanded sedimentary rocks and intermediate to basic volcanic flows. The sedimentary rocks include quartzite, argillite, arkose, greywacke, pebble grit, and iron formation. The volcanic rocks occur in two layers in apparent conformity with the sedimentary beds.

Sedimentary Rocks (1) [1]

Most of the sedimentary rock types are thinly bedded except for quartzite, some beds of which are 6 inches thick. All the component types are commonly interbedded and show some variation along the strike. They maintain fairly regular strike and dip, but in most places minute folds are present. No cross-bedding was seen in any of the rocks, although many thin strata in the quartzite were observed to pinch out along the strike.

The quartzite is variable in texture from coarse pebbly types to fine-grained cherty rocks. It is variable in composition, fairly pure in some places, in others grading into arkose and greywacke. Pure varieties consist of minute ovoid grains of quartz and considerable white mica, the latter in shreds aligned parallel with bedding planes. Clastic grains are apparently cemented by fine-grained quartz which contains numerous tiny grains of impurities. This type of rock may be described as orthoquartzite. Most impure varieties of quartzite are reddish, perhaps owing to the presence of brown biotite. Minute veinlets of carbonate are fairly common.

Argillites commonly occur throughout the sedimentary series but nowhere form thick formations. They are usually interbedded with quartzites, individual layers seldom exceeding a few inches in thickness. In colour they range from dark purple to black and in grain size from very fine to textures approaching that of arenaceous sediments.

Greywacke is thinly interbedded with quartzite and pebble grit on the east shore of the lake, and also on the northwest shore where it occurs in thicker discrete beds. The rock

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[1] Numbers in parentheses are those of the map units used on the accompanying map.

is dark grey in colour and in most places contains numerous small ovoid pebbles of white quartz. Biotite is abundant throughout.

Arkose was not found in well-defined strata as quartzite and greywacke are, but it is believed to form minor gradational phases of these types.

Pebble grit grades into impure pebbly quartzite and greywacke. Pebbles are as much as half an inch in diameter, and most have been somewhat elongated by movements roughly parallel with the bedding planes.

Thin-bedded sedimentary iron formation occurs on the north shore of the lake and can be traced along the strike for at least a mile northwards. The rock is black, thinly laminated, and fine grained. It consists of approximately 50 per cent quartz, 35 per cent brown biotite, and 15 per cent magnetite in small scattered grains. It causes local deflection of the compass needle.

In many places where these sedimentary rocks are in contact with granitic rocks they are altered to schists composed chiefly of quartz, biotite, white mica, and garnet.

Volcanic Rocks (2)

Volcanic rocks outcrop on the southernmost peninsula in Mystery Lake, on a nearby island, and in the northwest bay. They include both massive and ellipsoidal varieties and contain numerous amygdules. All are dark green in colour and some exhibit flow banding.

These rocks contain abundant actinolite, usually at least 50 per cent, and about 35 per cent of plagioclase. The actinolite occurs in sheaf-like masses of acicular crystals and has a peculiar wavy banded structure with Z $\wedge$ C = 20 degrees. The plagioclase is too fine-grained for precise optical determination, but its indices of refraction indicate a composition at least as calcic as andesine. Some of the flows are thus considered to be andesites, but others are presumed to be basalts because of higher density and darker colour.

Numerous small grains and masses of epidote replace the major constituent minerals and some of the actinolite has been

slightly altered to biotite.

The volcanic rocks on the peninsula near Location B pass into actinolite schists with very little change in mineral composition. Similar schists in the southwest bay are considered to be of volcanic origin and may represent the same member offset by faulting. Actinolite is slightly altered to biotite.

Intrusive Rocks

Rocks of plutonic origin ranging from gabbro to granite occur within the area. Crosscutting relationships indicate that the more basic rocks are younger than any of the granitic ones.

It is believed that the basic rocks were emplaced during two different periods of igneous activity, and that all the granitic rocks are related in origin to one another.

Most parts of the granitic rocks contain abundant inclusions of basic rock and sedimentary gneiss. The term "intrusive" may not be strictly accurate where parts of the sedimentary rocks have been granitized. A few dykes of whitish pegmatite intrude the sedimentary rocks and granite gneisses.

Granitic Gneisses (3)

Nearly all the granitic rocks of the area are gneissic in texture and are considered to be of the same age. Intrusive relationships between varieties of these gneisses were not observed. It is believed that most, if not all, of them have been formed by replacement of older rocks by granitic matter, for reasons discussed below.

Flaser granite gneiss: This rock forms a wedge between the two branches of the Assean Lake series and outcrops on the eastern shore of the long central peninsula. The rock is pink weathering, medium grained and is characterized by flat, elongate quartz grains. It consists of about 40 per cent potash feldspar which is chiefly perthite with some microcline, 5 per cent oligoclase, (An_{23}), and 35 per cent quartz.

Considerable chlorite (penninite) is pseudomorphic after biotite which is almost completely replaced. Epidote replaces chlorite, and in places sericite, epidote, and carbonate replace the feldspars. Ribbons of quartz usually consist of more than one grain. All grains have wavy extinction. Considerable white mica occurs in disseminated flakes.

The strong planar schistosity in this gneiss is considered to be due partly to bedding in the sedimentary rocks from which it has been formed by replacement, and partly to subsequent movement parallel or nearly parallel with the original bedding planes.

The rock is in contact with sedimentary rocks near the western shore of the peninsula. In some places the contact is sharp, particularly with the quartzite layers, and wherever the contact was observed the foliation of the gneiss is parallel with the layering of the sedimentary rocks. Like the latter, the gneiss has been subject to metamorphism, as evidenced by the elongation of quartz grains, serrated crystal boundaries between the quartz and feldspar, and some granulation. This is to be expected in a zone where much shearing, folding, and granitization have taken place.

Medium-grained granite gneiss: Medium-grained granite gneiss is the most common rock type of the area. Variations in composition and regularity of foliation were observed from place to place, but in general it is pinkish, fresh appearing, and equigranular.

The gneiss at the north end of the lake is distinguished from other gneisses in the area by poorly developed schistosity and the presence of considerable white mica and small pink garnets. It consists of about 45 per cent microcline, 25 per cent quartz, 20 per cent plagioclase, and 10 per cent white mica. The quartz and feldspar grains are up to 3 millimeters in diameter. The microcline has perthitic bands of plagioclase, and the larger grains of plagioclase have a few irregular inclusions of microcline. The plagioclase has a composition of about An_{28} and exhibits protoclastic structure in places, suggesting the possibility that the rock went through a molten stage and that some movement occurred while it was still a plastic mass. The white mica also shows some bending. It occurs in sub-parallel flakes up to 4 millimeters long. The garnets are sparsely disseminated in the rock and seldom exceed 0.5 millimeter in diameter.

Fairly continuous, but widely separated layers of quartzite are enclosed by this gneiss. Some of them are little more than an inch wide, and they are parallel in strike and dip and are found along the strike of the westernmost band of the Assean Lake series. It is evident that this band has been partly replaced by the granite gneiss, possibly in the magmatic stage. The garnets are believed to be due to contamination by sedimentary material. Eastward across a narrow bay of the lake, sedimentary rocks were observed which pass into crumpled garnet-mica schist.

The granite gneiss on the eastern shore of the lake and to the north, and along the Burntwood River, has a better developed schistosity and in most places contains considerable biotite. Inclusions of sedimentary gneiss, hornblendic gneiss and metagabbro are abundant in places, ranging in size from inches to several hundred feet. For several miles along the Burntwood River, large inclusions of sedimentary gneiss and schist have major planes of foliation roughly parallel to the bedding of Assean Lake rocks on the eastern shore of Mystery Lake. It therefore seems probable that many such inclusions are remnants of the Assean Lake series.

The contact of the granite gneiss and sedimentary rock on the eastern shore of Mystery Lake has an unusual appearance, similar in many respects to that of the flaser granite gneiss on the central peninsula. For a distance of several feet across the contact, layers of pink fine-grained granitic material ranging from extremely minute to a few inches in width occur, roughly parallel to the bedding of the greywacke and quartzite. Some of the granitic bands are irregular in shape.

A sample of sedimentary rock, part of which had been granitized, was selected for petrographic study. The sample is of dark, medium-to fine-grained, thinly layered rock containing some quartzitic layers. The rock has undergone high grade metamorphism. It consists of about 10 per cent staurolite, 20 per cent biotite, 30 per cent quartz, 30 per cent plagioclase, and 10 per cent carbonate, with minor amounts of actinolite, sillimanite, titanite, chlorite, and apatite. The plagioclase is andesine of composition An_{33}. Staurolite occurs as geniculated twins and crosses, with high relief, low birefringence, and yellowish pleochroic colours. Penninite replaces staurolite, biotite, feldspar, and amphibole, suggesting retrogressive metamorphism. Penninite is pseudomorphic after green and brown biotite, which replaces the actinolite. Sillimanite is of the

fibrolite variety and is later than staurolite. Small masses of epidote replace chlorite. All the feldspars are considerably altered to saussurite. Carbonate is the latest alteration product.

In a part of the same sample in which irregular tongues of granite occur, important differences were noted. No staurolite nor sillimanite was found. The rock consists of about 50 per cent feldspar, 30 per cent quartz, and 10 per cent biotite. Some of the feldspar is oligoclase of composition An_{27}, but most is microcline. Rounded patches of lower index occur within the microcline, probably due to replacement by chlorite. Microcline grains are larger than the plagioclase grains, some being 3 millimeters in diameter. They are also much less altered by epidote, chlorite, sericite, and carbonate and are subhedral. Quartz grains are elongate and serrated, and in places they are interleaved between the larger microcline grains. It is believed that this quartz formed a part of the foreign material introduced into the rock during granitization, and does not represent clastic grains, originally part of the sedimentary material.

Pegmatite: A few small bodies of pegmatite occur on Mystery Lake. They are irregular in shape, and none are of mappable size. They consist chiefly of coarse whitish feldspar, and grey quartz, with minor amounts of biotite and muscovite in small "books". This pegmatite intrudes rocks of the Assean Lake series and the flaser granite gneiss.

In a few isolated outcrops south of the Burntwood River a coarse pink granite or pegmatite was found. Owing to the surrounding drift cover its relationship to the granite gneisses of the area was not determined.

Diorite and Derived Feldspar-actinolite Schist (4)

Dykes of intermediate to ultrabasic rock are numerous throughout the area. They vary greatly in strike but most of them trend parallel with and are fairly concordant with the Assean Lake series. It is believed that they were probably emplaced during two different periods of time as they show differences in degree of metamorphism and intrusive relationships. On the other hand, it cannot be regarded as finally proven that they are of different age. None of the fresher appearing dykes positively crosscut the highly altered ones and some of the former have schistose borders.

The chief exposure of rocks of the older group occurs on the eastern side of the central peninsula where a large body

consisting of a complex of branching sills intrudes the sedimentary series. The sills range from a few inches to more than 40 feet wide, so that precise delineation was not possible on the scale used, and contacts as shown are to a considerable extent generalized.

At this location the sills vary somewhat in grain size, from fine to medium. They all contain about 60 per cent actinolite, and 35 per cent plagioclase which has the composition of andesine, An_{32}, and is considerably sericitized. The remainder of the rock is made up of minor amounts of apatite and ilmenite. The plagioclase seems to have been slightly altered with the formation of titanite, and the acicular actinolite was formed later than the plagioclase. No chlorite was seen in the section.

The rock is thus seen to have the composition of a diorite, grading into feldspar-actinolite schist, and has probably been derived either from diorite or gabbro. Other smaller dykes and sills were found in a similar state of metamorphism, but there is no evidence that they belong to either the younger or older group. One small diorite dyke which intrudes lavas of the Assean Lake series contains about 10 per cent pyrite and non-nickeliferous pyrrhotite.

Peridotite, Serpentinite (5a), Diabase (5b), Diorite and Gabbro (5c)

Most of the basic intrusives of the area are included with this group. Some of them cut the granite gneisses. Others form sills in the Assean Lake series like those of the older group previously described, but none are as altered and schistose as the latter although they occur in the near vicinity. They do not appear to have intruded the older group, but if they are of similar age it would be difficult to account for the lesser degree of metamorphism which they have undergone.

Peridotite, the only rock of economic interest in the area to date, is exposed along the south shore of the lake at Location B. The rock is dark grey on the weathered surface but brownish where sulphides are abundant. On the fresh surface it is greenish black, medium-grained and equigranular. The sulphides are massive in two small areas and uniformly disseminated in the remainder. The rock is massive and is cut by an irregular system of joints apparently due to contraction in cooling. The joints are filled with a variety of material: white and reddish chert, coarse white calcite crystals with coarse magnetite, and white fibrous serpentine. The rock consists of about

50 per cent serpentine pseudomorphic after rounded olivine crystals. Very little of the original olivine remains. Approximately 35 per cent of the rock is composed of augite and enstatite. Both types of pyroxene are extensively serpentinized and altered on the edges to tremolite. The remainder of the rock consists of magnetite, pyrite, and pyrrhotite which fill the interstices between olivine crystals. The magnetite is considerably oxidized to hematite.

Fine-grained serpentinite outcrops on the small island in the southeast bay. No textural features were observed, but a few remnants of enstatite and considerable red iron stain were noted. The rock is dark green and massive and has apparently undergone a stronger degree of hydrothermal alteration than the mineralized peridotite. No sulphides were found.

A dyke of medium-grained diabase was observed on the northwest side of the long central peninsula. It is approximately 100 feet wide, strikes east, and has a vertical dip. It cuts granite gneisses, but could not be traced along the strike to the opposite side of the peninsula.

The bulk of the rocks of this group are altered diorites and include dykes or sills as much as 100 feet wide. Several sills of medium-grained diorite outcrop at intervals along the eastern side of the central peninsula.

South of Location A a north-trending sill 40 feet wide is exposed along the shore. The western contact with sedimentary rocks is schistose. The rock consists of about 50 per cent greenish actinolite, 40 per cent andesine (An_{34}), and 10 per cent pyrite and pyrrhotite. A few grains of pyroxene remain from replacement by actinolite.

Near Location A a sill consists of about 55 per cent pyroxene, probably augite, and 40 per cent plagioclase of later crystallization with the composition of oligoclase-andesine, An_{28}. The pyroxene is about 50 per cent altered to uralite, some crystals being completely replaced by actinolite (or uralite). A few small grains of sulphide are present.

Other outcrops of similar appearance occur approximately along the strike and may well belong to the same sill. On the north shore of the lake a large sill of similar attitude has plagioclase of composition An_{40} (andesine) and considerable actinolite, some of which seems to be pseudomorphic after pyroxene, and is definitely later than the feldspar.

Other dykes were examined but no satisfactory diagnostic sections of feldspars were obtained. They are believed to have the composition of diorite or gabbro as the refractive indices of their feldspars are at least as high as those of andesine, 1.55. A small, rather fine-grained dyke that intrudes lavas of the southeast bay contains actinolite which has been considerably replaced by biotite. A similar dyke nearby has andesine, An_{42}. In the southwest bay a dyke or sill of unknown width intrudes the sedimentary series. It is dark grey and coarse grained, and contains about 65 per cent actinolite, 25 per cent plagioclase and considerable titanite, the latter occurring in numerous clumps. The plagioclase is extensively replaced by white mica and carbonate, but a few surviving remnants have a rather high refractive index. The rock may, therefore, be a gabbro, but it is included here with the more numerous diorites.

STRUCTURAL GEOLOGY

FOLDING

The Mystery Lake area has been subjected to several periods of folding and faulting. Owing to the extensive thick mantle of glacial drift, a final structural interpretation can not be made with certainty, but the observed facts suggest two simple possibilities:

(1) The Assean Lake series was first steeply tilted, then broken into two branches by a northeast-trending fault of considerable displacement accompanied by drag-folding along the fault plane.

(2) The two branches of the Assean Lake series represent the limbs of a major fold, probably an anticline.

Certain features of the folding favour theory (1).

Along the eastern shore of the lake the sedimentary rocks dip eastwards from 80 degrees at the south end of the lake to 60 degrees at the north end. On the eastern shore of the central peninsula dips are similar but steepen to nearly vertical near the granite contact to the west. The western branch dips steeply to the northwest. On the north shore sedimentary rocks dip vertically to steeply east.

Indications of tops of beds within the Assean Lake series are few, but grain gradation in pebbly quartzite on the east shore indicates that tops face east in the direction of dip. Attitudes thus suggest an anticline in rough outline, but more top determinations are needed at other locations, and it is not certain that isoclinal folding is not present.

Drag folds occur within the sedimentary rocks at several locations but are best displayed near Location A, where they plunge steeply to the southeast and indicate that the west side moved relatively southward, and that movement occurred chiefly in the horizontal plane. Vertical adjustments appear to have been slight, but the west side probably moved relatively downward. Minor crenulations throughout the central peninsula generally agree in attitude.

A quarter mile to the north of Location A, and at Location C, bedding in the quartzite changes direction into the northwest in broad arcuate folds pitching steeply southeast. If these folds represent the apex of an anticline, such a fold would then have to be overturned northward on its apex.

On the north shore of the lake, sedimentary beds are likewise warped into broad folds and converted into garnet-mica schist. The folds themselves are crumpled by intense compressive forces into a herringbone pattern with a density of about three per foot. Westward across a narrow channel are pink garnetiferous granite gneisses which contain a few narrow beds of quartzite. The channel is believed to contain a major fault.

Crenulations in the eastern and westernmost bands furnish no conclusive information as to movements.

SHEARING, FAULTING, FRACTURING

It is considered probable that the folds just described are related to a northeast-trending fault that underlies the southwest bay and passes just to the north of Location C, possibly splitting into a number of minor faults at the northern end of the lake. More direct evidence than the folding was found. At Location C on the central peninsula the quartzites are brecciated by a small northeast-trending fault, probably subsidiary to the fault in the bay. Breccias were also found immediately west of the creek at the north end of the lake.

An additional, although indirect indication of faulting is the non-matching of stratified rocks on the northwest and southeast sides of the postulated fault, together with a considerable difference in strike across the channel at Location C. The easternmost members of the Assean Lake series fail to reappear at the north of the lake. The volcanic members at the south end of the lake likewise disappear. It is thought possible that they were originally continuous with the actinolite schists in the southwest bay of the lake. All evidence thus points to a major dislocation underlying the southwest bay and the northern part of the lake with movement chiefly in the horizontal and displacement of the north side to the west.

Other movements probably took place along the direction of the main part of the lake and parallel with the strike of the formations. Schistosity, roughly parallel with the shoreline was found in some basic sills south of Location A, resulting in smooth vertical cliffs in places.

A strong shear zone also passes northwards through the volcanic rocks. Apparently these fine- to medium-grained rocks yielded to stress by acquiring schistosity, whereas the more competent quartzitic sediments had a greater tendency to become folded and faulted. Farther north along the eastward-jutting peninsula, sedimentary rocks are altered into mica schist along the shoreline.

Diamond drilling beneath the ice of the main lake also disclosed the presence of some open fractures. The direction of movement (other than vertical) and relative age of such structures is unknown.

ECONOMIC GEOLOGY

LEAD - ZINC

Time did not permit the examination of the galena deposit at Location A which was earlier described by J. F. Wright[1] in 1930 as follows:

> "A deposit of silver-bearing galena was discovered on the west shore of Mystery Lake by Mr. Gordon Murray

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[1] Wright, J. F.: Geology and Mineral Deposits of a Part of Northwest Manitoba; Geol. Surv., Canada, Sum. Rept. 1930, pt. C. p. 117, 1931.

"in the summer of 1927. In 1928 the deposit was taken up by Mr. J. G. Gordon, and Royden Mines, Limited, was organized to develop it. Surface trenching and diamond drilling were done in 1928 and 1929. .....

"The galena deposit is on the west shore of the lake, about 2 miles north of the outlet. It is at about the high-water level of the lake and has been exposed by seven trenches spaced at intervals along a distance of 450 feet, and a strike of north 5 degrees east. The rock west of the trenches is a grey, acidic rock that may be quartzose sediments recrystallized and injected by granitic matter. Granite outcrops on the side of the hill farther west. The acidic rock is followed to the east by pillow lava and thin beds of cherty quartzite and greywacke. The lava is schistose and the sediments exhibit fracture cleavage and some beds are drag-folded. The dip of the schistosity and cleavage is 75 degrees east. The lavas and sediments are cut by a few small bodies of gabbro.

"The sulphides occur in schistose andesite adjoining the grey, acidic rock. The schist zone varies from 2½ to 20 feet in width. It gradually narrows towards the north; to the south it passes under the boulder beach and lake. Small lenses of intermixed calcite and quartz carrying galena and sphalerite occur along the schist zone. One vein containing lenses and pockets of galena is 2 feet wide, but the majority of the veins are under 1 foot in width. The individual veins do not continue more than 100 feet along their strike. A few veinlets of quartz mineralized with pyrite, chalcopyrite, and galena occur in the same zone as the calcite-quartz-galena veins. A few narrow dykes of aplitic and pegmatitic granite cut the schist along the mineralized zone.

"In thin section the galena-quartz-calcite ore shows saussuritized feldspar, small fragments of albite, and abundant chloritic material representing the lava. This altered rock is cut by veinlets of calcite and quartz. Some of the calcite exhibits crystal form. The quartz is in small grains. The altered lava and vein-like calcite, and quartz are cut by veinlets of galena and sphalerite. The galena invades and includes

"grains of sphalerite. The altered lava first was injected by veinlets of calcite and quartz; these were penetrated first by sphalerite and then by galena. The relations of pyrite and chalcopyrite to galena and sphalerite were not shown in the specimens studied."

All claims have been allowed to lapse.

NICKEL

The outcrop of nickel-bearing peridotite on the south shore of the lake was known at the time that the galena deposit was drilled, but little interest was taken in the nickel until it was staked by Messrs. Johnson and Howell in 1949.

The peridotite is exposed along the shore only, and it outcrops for a distance of 425 feet with a maximum width of 50 feet.

The nearest outcrop inland is a ridge of granite gneiss 800 feet west of the discovery.

The peridotite is dark grey on the weathered surface but is brown in places where there is a higher sulphide content. On the fresh surface the rock is greenish black, medium-grained, and equigranular, and in practically all places on surface contains numerous specks of sulphide.

A polished section prepared from a specimen of massive ore shows that fine-grained pyrite was the first-formed sulphide, followed by numerous masses and grains of pyrrhotite and pentlandite. The latter two seem to be nearly contemporaneous, (PLATE I A). The two minerals were determined by the Gaudin[1] filming method. Small grains of chalcopyrite were found in a section of

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[1] Gaudin, A. M.: Identification of Sulphide Minerals by Selective Iridescent Filming; A. I. M. E. Tech. Publ. No. 912, pp. 1-16, 1938.

_____ Staining Minerals for Easier Identification in Quantitative Mineragraphic Problems; Econ. Geol., vol. 30, pp. 552-562, 1935.

disseminated ore. Sphalerite is the latest-formed mineral, replacing all earlier minerals. It occurs as discrete grains and masses and in a peculiar lattice-type of replacement along cleavages in pentlandite and pyrrhotite, (PLATE I B). An assay of the massive sulphide ore showed 3.44 per cent nickel, 6.31 per cent zinc and a trace of copper.

Massive sulphide occurs only as a few small local concentrations, surrounded by disseminated material.

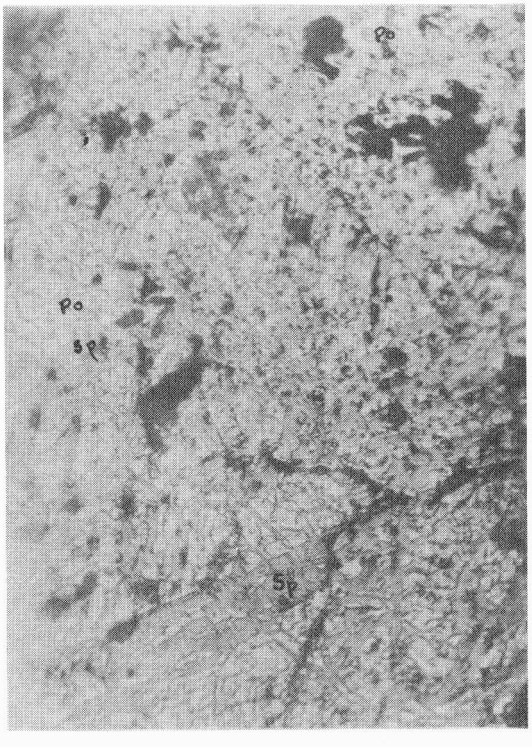
CONCLUSIONS

The nature of the mineral deposits in the Mystery Lake area suggests that prospecting should be directed to the younger basic intrusives of the district, namely peridotites and gabbroic rocks which seem to be, in general, favourable hosts for base metal ores. Owing to the extensive drift cover, the use of vertical aerial photographs is strongly advised in locating outcrops at any distance from lakes or streams. Geophysical methods would probably be useful but caution should be exercised in the interpretation of magnetic anomalies owing to probable concentrations of magnetite in these intrusives, and in sedimentary members of the Assean Lake series.

PLATE I

A. Photomicrograph of a polished specimen of ore from Mystery Lake showing replacement of pyrite (Py, white) by pyrrhotite (Po, light grey) and pentlandite (stained dark grey). Magnification - X 175.

PLATE I



B. Photomicrograph of Mystery Lake ore showing sphalerite (Sp, grey) replacing pyrrhotite (Po, whitish). Magnification - X 175.