



GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

OPEN FILE 870

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GRENVILLE PROVINCE, ONTARIO

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OTTAWA

1982

GRAPHITE OCCURRENCES IN THE ALGONQUIN REGION, GRENVILLE PROVINCE,
ONTARIO.

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Occurrences of graphite in the Grenville Province of central Ontario (Algonquin Region) are currently receiving the attention of mining concerns, notably in Butt and Ryerson Townships (Northern Miner, 17 June 1982), respectively north-northeast and northwest of Huntsville. Reconnaissance geological surveys in this region have recently uncovered more occurrences of graphite-bearing rocks, and have determined the characteristics of the rocks with which the graphite is associated. The accompanying maps present the localities of graphite-rich rocks discovered to date, and a rough distribution of the geological unit in which they occur.

This region of the Central Gneiss Belt of the Grenville Province is geologically very complex, and has been divided into several domains and subdomains on the basis of differences in structural trend and style, grade of metamorphism, and gross lithological assemblages (Davidson et al., 1981, 1982). Boundaries between domains and subdomains are generally tectonic in nature; the various divisions are outlined and named on the accompanying maps. Briefly, Parry Sound Domain (maps 41H/NE, 31E/NW and SW) contains layered gneiss, chiefly mafic and containing minor amounts of marble, that encloses bodies of mafic to intermediate metaplutonic rock; granulite facies metamorphism prevails, except along the western margin where a broad ductile zone contains several bodies of deformed anorthosite and related metagabbro. Moon River and Seguin subdomains and their common southeastward extension (31E/SW), all part of Muskoka Domain, are composed of migmatitic gneiss, dominantly at amphibolite grade, many varieties of which are of uncertain parentage. Go Home and Rosseau subdomains and the southwestern part of Algonquin Domain (31E/NW, SW and SE) are in part composed of various metaplutonic rocks enclosed by gneiss of metasedimentary origin; much of this terrain is in or close to granulite facies metamorphism. Nearly all the rocks are extremely deformed, commonly with a high degree of

flattening that has produced fine grained, flaggy and straight-layered gneiss; the central part of Britt Domain (41H/NE, 31E/NW) has a similar geological signature. It is within the latter grouping that the graphite-bearing rocks occur. It is mentioned in passing that traces of graphite are present in some marble units in Parry Sound Domain, but none is known to be of potential economic interest. Graphite is known to be a minor constituent in the marbles of the Central Metasedimentary Belt (31E/SE).

The graphite occurrences of potential interest are within semipelitic and pelitic gneiss units within a larger paragneiss sequence. The carbon content of these rocks is considered to be of primary sedimentary origin, graphite having formed during metamorphism of carbonaceous shale, siltstone and wacke. Semipelitic gneiss in this region is generally medium to dark grey on fresh surfaces, and is composed mainly of plagioclase, quartz, biotite and variable amounts of red garnet, and commonly contains some hornblende. Associated with this rock type are layers of pelitic gneiss, lighter grey in colour and commonly having a faint bluish or violet hue on fresh outcrop surfaces, particularly noticeable in road-cuts. Pelitic gneiss characteristically contains distinctively pale pink or mauve garnet, and lacks hornblende. Such rocks almost invariably carry traces of graphite. Some are quartz-rich, and many contain appreciable amounts of pyrite, giving rise to friable, rusty-weathering material at the surface. Micaceous partings locally carry sillimanite, in places with muscovite. Also associated with pelitic gneiss are sillimanite-bearing quartzofeldspathic gneiss, fine grained biotite-quartz gneiss with minor pyrite, and an easily recognized white, granular gneiss composed of plagioclase and quartz and studded with equant garnets. Small quantities of graphite are generally present in all these rocks of pelitic affinity, and its presence along with pink to mauve garnet is a useful field guide for locating graphite-rich units, as is the

occurrence of rusty-weathering rocks. Closely associated semipelitic gneiss (with red garnet and some hornblende) may also locally carry traces of graphite. Other associated layered gneisses such as fine grained, sugary, pink or greenish grey quartzofeldspathic gneiss, and dark, amphibole and/or pyroxene gneiss, with or without garnet, are graphite-free.

Graphite is locally present in rocks of this association in amounts up to 10 per cent. Such graphite-rich rocks are generally lower in garnet content than the associated rocks, and may be notably richer in pyrite and quartz. Graphite grain size varies considerably, but locally attains 2 mm size, and has been noted at some localities as smears up to 1 cm in diameter on parting planes. In most occurrences noted to date, gneissic (compositional) layering is planar at outcrop scale, but commonly contains small isoclinal folds within the layering. Layering at many localities dips at moderate to shallow angles, and at map scale defines large folds with sub-parallel limbs that are themselves warped by open folds. In some places the semipelitic and pelitic gneiss assemblage is spatially associated with small bodies of dioritic or gabbroic rocks, also deformed and metamorphosed. In others it is adjacent to larger bodies of granitoid orthogneiss (quartz diorite, granodiorite, granite). Whether or not concentration of graphite is related to fold structures or to proximity of metaplutonic rocks has yet to be determined.

On the accompanying maps, observed occurrences of semipelitic and pelitic gneiss are shown with a stippled pattern, and potential extensions of these units are suggested by dashed lines. Occurrences rich in graphite are indicated with a solid star symbol; those with less but still notable (1 - 3 per cent) amounts of graphite, generally localized in thin layers, are noted by open stars. The latter type also occurs at graphite-rich localities. The main localities, or groups of localities, are numbered on the maps and are described briefly below.

1) Pointe-au-Baril; Harrison and Shawanaga Townships, map 41H/NE.

A narrow strip of rusty-weathering, graphite-rich gneiss is exposed along Highway 69 between 1 and 2 km southeast of Pointe-au-Baril. It is cut by a pegmatite dyke, and is in contact with structurally overlying, deformed orthogneiss composed of grey metatonalite, locally with white feldspar augen. Pink leucocratic quartzofeldspathic gneiss is adjacent to the southwest. This unit appears to be only a few metres thick. Several kilometres to the southeast, rusty-weathering, weakly graphitic pelitic gneiss is again exposed in road-cuts along Highway 69, as narrow layers in paragneiss that can be traced northward toward Brewery Lake. A probable continuation of this unit is exposed in several places along the road through Shawanaga Indian Reserve No. 17 to Skerryvore. At the graphite occurrence marked, rusty gneiss with graphite is interlayered with pink garnet-bearing migmatitic pelitic gneiss that locally contains both kyanite and sillimanite, and at one place is cut by white pegmatite containing red garnet and traces of molybdenite.

2) Arnstein; Mills Township, map 31E/NW

Three zones of semipelitic gneiss with pelitic interlayers are exposed along Highway 522 in the vicinity of Arnstein. At the locality marked just southeast of this village, traces of graphite and pyrite occur in pelitic gneiss with pink garnet and minor kyanite. Gneisses of similar affinity have been noted during regional reconnaissance in a zone that extends southwestward from Arnstein through Wilson, Brown and Burton Townships to Harrison Township, where they likely link up with the Pointe-au-Baril occurrences.

3) Burk's Falls; Ryerson and Armour Townships, map 31E/NW.

Two occurrences of graphite-rich gneiss a few kilometres southwest of Burk's Falls are currently being evaluated for possible production. The two are separated by a body of granitoid orthogneiss that narrows to the northwest, but may extend all the way to Magnetawan. The pelitic unit containing the southern of the two occurrences extends at least 8 km to the northwest, and may then become attenuated against the tectonic zone along the east side of Parry Sound Domain and Ahmic Subdomain.

The same unit probably also extends to the east; similar graphitic rocks are exposed along Highway 11 just north of Katrine. In the same vicinity, a zone of graphite-bearing pelitic and semipelitic gneiss is exposed along Highway 518 at the south end of Doe Lake.

4) Graphite Lake; Butt Township, map 31E/NW.

This occurrence has been known for some time, and may soon be prepared for production (Northern Miner, June 17, 1982). Graphite-bearing pelitic gneiss has been noted in another band 4 km to the north. Of note is the occurrence to the southwest, northeast of Sand Lake, of an extensive unit of semipelitic gneiss with graphite-bearing pelite layers that lies midway between the Graphite Lake occurrence and the Burk's Falls localities. Further exploration may show that these occurrences are linked.

5) Huntsville; Stisted, Chaffey and Brunel Townships, map 31E/SW.

A zone of semipelitic and pelitic gneiss, locally with traces of graphite, and carrying notable amounts at one place near its south edge, occurs along the southern shores of Lake Vernon, just west of Huntsville. Close to the southwest lies another zone of graphite-bearing gneiss of more pelitic affinity, whose southeast end is exposed on Highway 11. Both these zones are on the overturned northeast limb of a major fold that closes to the northwest, and probably continue to the east and northeast through northern Brunel and southern Chaffey Townships (Fairy Lake). Several occurrences of semipelitic gneiss are exposed along the country roads north of Lake Vernon.

6) Dwight; Sinclair, Franklin and McClintock Townships, maps 31E/SW and SE.

Several units of pelitic gneiss are disposed around folds in the vicinity of Dwight on Highway 60 east of Huntsville. It has yet to be determined whether or not these are part of a smaller number of units, or even of a single unit, repeated by folding. Graphite-rich rocks have been noted on Highway 60 at two places between Dwight and Oxtongue Lake, on a sideroad just west of Dwight village, and notably in the vicinity of South Portage, between Peninsula Lake and Lake of Bays. The rocks in this area are generally in granulite facies, very flaggy. Highly flattened granitoid orthogneiss in the same region is

also involved in the folding (as it is in the Lake Vernon area). Despite the usual fine grain size, some of the pelitic gneiss units contain coarse, mauve garnet porphyroblasts, and graphite flakes may locally attain 2mm diameter. The best place to see the varieties of layered gneiss typically associated with graphite-bearing rocks is the locality on Highway 60 close to Oxtongue Lake. Graphite-bearing pelitic gneiss also occurs at several localities to the southeast toward Dorset, but is generally in thin layers, and close to contacts with granitoid and charnockitic orthogneiss bodies. In all probability the pelitic units at Dwight and at Huntsville are part of the same package, but detailed mapping will be required before they can be joined.

7) Rosseau Lake; Watt and Medora Townships, map 31E/SW.

Garnetiferous and locally pyritic semipelitic gneiss occurs in a large fold in this area, and several units of similar affinity are recorded close by. Although none is known at present to contain appreciable amounts of graphite, the rock association is right for such to occur.

8) Lake Muskoka; Medora and Monck Townships, map 31E/SW.

A zone of semipelitic and pelitic gneiss extends along the peninsulas and islands of Lake Muskoka from Point Carling to Bracebridge, close to the northeast tectonic boundary of the Moon River Subdomain. Schist particularly rich in graphite occurs just south of Port Carling. Considerable resistance to exploration is likely to be met with in this prime cottage country! Pelitic gneiss, locally with graphitic layers, occurs inland northwest of Bracebridge in Monck Township. All of these rocks are folded along with granitoid and charnockitic orthogneiss of the Brandy Lake complex.

Two other localities, not in the area covered by the accompanying maps, are worthy of note because they represent the same rock association. One lies in Matchedash Township and is exposed along the road at and just south of the village of Severn Falls (map 31D/NW). The other is exposed in roadcuts on Highway 17 just east of Bissett Creek, Maria Township (map 31L/SE).

It is also noted that pelitic gneiss forms a major, traceable unit within the west marginal zone of the Parry Sound Domain. It is dominantly kyanite-bearing, contains pink or mauve garnets, and is locally quartz-rich. Graphite and pyrite, however, have not been observed in this unit.

References

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