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NOTE

Note on the age of the Giant Mascot ultr[illegible] near Hope, [illegible]

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K/Ar ages from the Giant Mascot ultramafic body (119–95 m.y.) suggest that it is slightly older than adjacent diorite and tonalite (79–89 m.y.), which are shown to be members of the mid-Cretaceous Spuzzum Intrusions.

Les âges au K/Ar du massif ultrabasique de Giant Mascot (119–95 Ma) suggèrent qu'il est légèrement plus âgé que la diorite et la tonalite adjacentes (79–89 Ma) qui sont reliées aux intrusions de Spuzzum au cours du Crétacé moyen.

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The purpose of this note is to report new data on the Giant Mascot ultramafic body, located near Hope, B.C., about 160 km east of Vancouver. The body, which is about 3 by 1.5 km, is surrounded by schist, diorite, and tonalite (Fig. 1). The Giant Mascot Nickel mine (formerly the Pacific Nickel Mine) produced nickel and copper concentrates from pyrrhotite–pentlandite–chalcopyrite bearing, massive and disseminated ore bodies enclosed in the ultramafic rocks. The mine closed in 1974.

The main body of ultramafic rock (Aho 1956) is crudely zoned, with coarse hornblendite developed along parts of the margin, and pyroxenite forming intermediate zones around several peridotite to dunitic cores. Mine exposures suggest that some of these cores are steeply plunging, pipe-like bodies and that some of the ore-shoots lie along the axes of these bodies.

Units of the Late Cretaceous Spuzzum batholith (Richards 1971; Richards and White, 1970; Monger 1970) consist of diorite surrounded by somewhat younger tonalite. Three main kinds of diorite occur in an irregular zoned pattern (Fig. 1), with core regions of hypersthene–augite diorite succeeded by augite–hypersthene–hornblende diorite, and marginal hypersthene–hornblende–biotite diorite. Hornblende-rich phases ranging from diorite to hornblendite form stringers, veins or dykes, blocks, and irregular bodies up to 10 m across in diorite throughout the pluton. Mapping by Vining in 1975 has shown that diorite and tonalite that surround the Giant

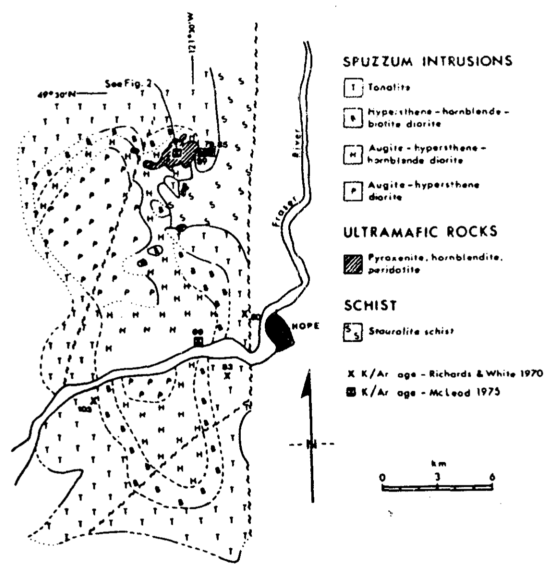

FIG. 1. Ultramafic rocks and Spuzzum Intrusions near Hope, B.C.

Mascot ultramafic rocks are typical of and clearly belong to the Spuzzum Intrusions to the south as mapped by Richards (1971). This correlation is supported by K/Ar dates obtained from diorite and tonalite adjacent to the ultramafic body.

The relationship of the ultramafic body to the Spuzzum diorite and tonalite that adjoins it along much of its periphery is a vexing problem. Some investigators (Cockfield and Walker 1933;

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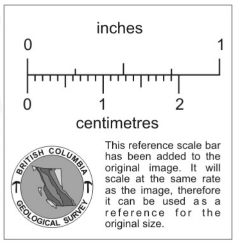
TABLE 1. K/Ar age determinations from the Giant Mascot ultramafic body and from the Spuzzum Intrusions near Hope, B.C.

Spec. no.	Lat. N	Long. W	Material	Rock	% K	Ar^{40*}/Ar^{40}	Ar^{40*}: 10^{-5} cm^3(stp)/g	Age, m.y.
1	49°28′	121°31′	Hb	Hornblendite	0.183	0.64	0.07043	95 ± 4
2	49°28′	121°31′	Whole rock	Hb pyroxenite	0.130	0.43	0.06357	119 ± 4
3	49°28′	121°31′	Hb	Hornblendite	0.258	0.64	0.1093	104 ± 4
4	49°28′	121°31′	Hb	Hornblendite	0.258	0.61	0.1154	108 ± 4
5	49°28′	121°30′	Hb + px	Diopside	0.334	0.43	0.1214	89.6 ± 3.1
6	49°28′	121°29′	Bi	Tonalite	5.860	0.836	1.881	79.4 ± 2.5
6	49°28′	121°29′	Hb	Tonalite	0.464	0.580	0.160	85.1 ± 2.8
7	49°23′	121°30′	Hb	Diopside	0.536	0.580	0.1945	89.5 ± 2.8

Constants used in calculations: $\lambda_e = 0.585 \times 10^{-10} y^{-1}$; $\lambda_\beta = 4.72 \times 10^{-10} y^{-1}$; $K^{40}/K = 1.19 \times 10^{-4}$.



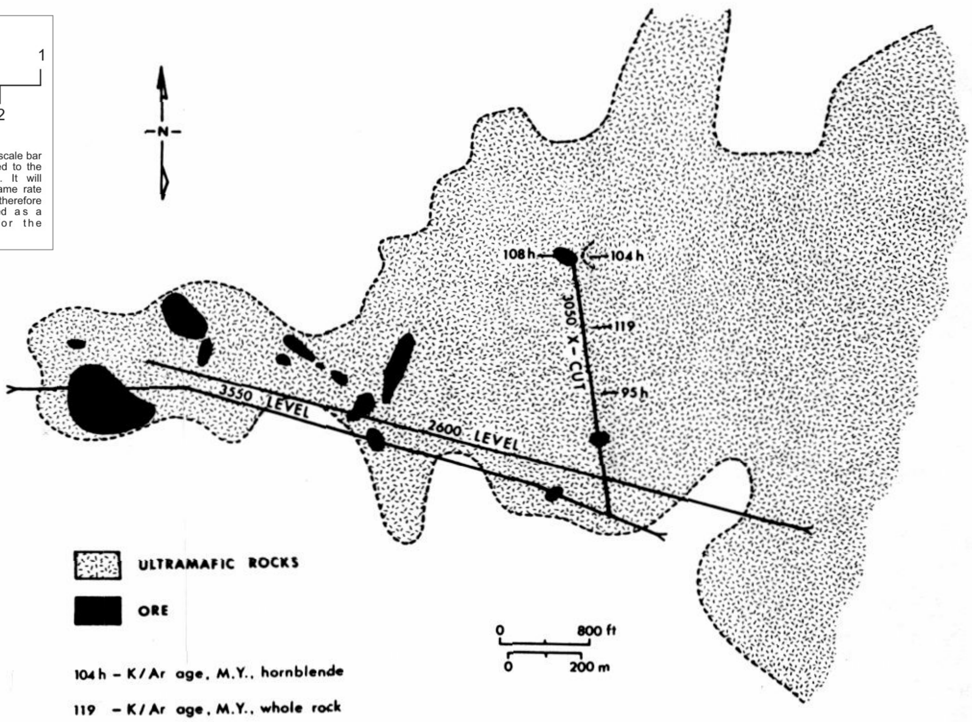


FIG. 2. Location of K/Ar age determinations in the Giant Mascot ultramafic body.

Horwood 1936) concluded that the diorite intruded the ultramafite, but Cairnes (1924) reached the opposite conclusion. Aho, who has provided the most comprehensive account of the geology, concluded that, although the evidence was somewhat contradictory, the ultrabasic body intruded the main bodies of diorite.

Structural relations are complicated by the presence of two kinds of hornblendite—the one type described above, associated with the Spuzzum Intrusions throughout the area; and the other, occurring at the margins and within the ultramafic body, apparently genetically related to it. Unfortunately, hornblendite of the first type is found in the diorite up to the contacts of, and perhaps also within, the ultramafic body, and it has so far been impossible to distinguish the two types. Such complexities are probably responsible for the controversy as to which is the older, the ultramafic rocks or the surrounding diorite–tonalite complex. The present authors have mapped mainly the periphery of the ultramafic body and can only agree that the evidence is ambiguous. For example, in at least two places diorite encloses what appear to be hornblendite xenoliths at contacts with the main ultramafic body. On the other hand, in several places, tabular bodies of hornblendite clearly cut diorite, although whether these are related to the diorite or to the ultramafic body has not been determined.

Although the present authors agree that the structural evidence bearing on the ages of the Spuzzum and the ultramafite is contradictory, new K/Ar dates suggest that the Spuzzum diorite and tonalite are younger than the main ultramafic body. K/Ar dates from the Spuzzum Intrusions are shown in Fig. 1 and Table 1. Most determinations range from 73 to 89 m.y. (6 determinations), with one exceptional date of 103 m.y. that cannot be explained. K/Ar dates from the Giant Mascot mine (Fig. 2; Table 1) are 119, 108, 104, and 95 m.y. The youngest date of the four is from a fine grained hornblendite dyke. These data suggest that the Spuzzum Intrusions are younger than the ultramafic body.

Aho (1955, p. 478) considered the possibility that some of the pyroxenes and olivines of the ultrabasic rocks were formed by metasomatism by hydrothermal fluids. One of the present authors (McTaggart 1971) has argued that metasomatism has been an important process in the formation of the zoned Alaskan type of ultramafic complexes. Although certain of the marginal rocks at Giant Mascot, such as the discontinuous rim of hornblendite, might be explained by metasomatism, Mg–Fe partitioning suggests that most of the pyroxenes of the middle part of the ultramafic body (along the 3050 crosscut, Fig. 2) equilibrated at temperatures higher than those at which hydrothermal fluids would be expected to exist. Temperatures of equilibration of 15 ortho- and clinopyroxene pairs from the interior of the ultramafite body (McLeod 1975) determined by the method of Wood and Banno (1973), yield an average temperature of 990 ± 50 °C. In addition, the distribution coefficient (K_D) relating Mg and Fe distribution between coexisting Ca-rich and Ca-poor pyroxenes (K_D average: 0.729) is magmatic rather than metamorphic (Kretz 1961).

Acknowledgements

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