THE AGE OF THE CHATHAM-GRENVILLE INTRUSIVE, QUEBEC*

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ABSTRACT

The Chatham-Grenville intrusive, which is composed largely of syenite and granite, intrudes Precambrian rocks north-east of the village of Grenville. Although the intrusive is younger than any of the Precambrian rocks in this part of the Shield, it is impossible to determine its upper age limit with the present field evidence. Because many structural and petrological features suggest that the intrusive might be associated with the Cretaceous Monteregian Hills, absolute dating was carried out by the potassium–argon method to determine its age. A result of approximately 642 million years was obtained for the body, making it the youngest Precambrian intrusive yet recorded from this part of the Shield.

INTRODUCTION

The Chatham-Grenville intrusive is located on the southern boundary of the Canadian Shield approximately 50 miles west of Montreal, and lies between the villages of Grenville and Brownsburg. It consists of a roughly circular nucleus of quartz-syenite which is bounded to the north-east by two younger, but related, arcuate bodies of granite. To the west there is a second, smaller nucleus of quartz-syenite which is joined to the main body at Rawcliffe. Bodies of breccia occur within the intrusive and are most abundant in the western nucleus. Grenville paragneisses, granite gneiss, Pine Hill syenite and diabase dykes are all cut by the intrusive. The southern boundary of the body is marked by the escarpment which separates the Precambrian rocks from the Palaeozoic sediments of the St. Lawrence Lowlands. This contact appears to be a fault (Osborne 1936, p. 8; Philpotts 1961, p. 7).

AGE OF THE INTRUSIVE

The Chatham-Grenville intrusive is clearly younger than the diabase dykes which occur in the area, but the present field evidence does not permit the determination of its upper age limit. Osborne (1934, p. 50) believes the intrusive to be Precambrian, because no dykes of syenite or granite are found to cut the Palaeozoic rocks. However, since very few outcrops of Palaeozoic rocks occur near the intrusive, and those that do are separated from it by a fault, it is very unlikely that any such dykes would be found.

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The intrusive shows many petrographic similarities to some of the Monteregian Hills. Osborne (1934, p. 63) pointed out that the quartz-syenite closely resembles the nordmarkites of Brome and Shefford and the amphiboles in the Chatham-Grenville rocks are almost identical with many of those found in the Monteregian rocks. The breccias that occur with the intrusive are of a diatreme nature and resemble many of those associated with the Monteregian Hills. Also the fact that the intrusive lies on the prolongation of the line followed by the Monteregian Hills suggests that it might be of Monteregian age. For these reasons it was decided that absolute dating of the intrusive was necessary to settle the question.

Two amphiboles from the western nucleus were used for the absolute dating by the potassium-argon, isotope dilution method. The first of these is from the pink quartz-syenite in the Gaboriault-Nevers quarry, located 3000 feet south of Rawcliffe. This amphibole is a sodic variety containing 2.25 per cent Na_2O and is pleochroic from a brownish green to a deep green with a tinge of blue. The second is from a one foot wide pegmatite dyke which cuts the quartz-syenite 6000 feet south-east of Rawcliffe. The pegmatite has the same mineralogy as the quartz-syenite in which it occurs, the only difference being the coarser grain size and slightly larger amount of quartz. The amphibole occurs as crystals up to an inch long and is pleochroic from a deep green to a bluish green. It contains 5.63 per cent Na_2O. The results of the absolute dating are given in Table 1.

TABLE 1

	% K_2O	% atmos. argon	Vol. of radiogenic A-40 (mm^3)/gm of sample	Age and error in m. yrs.
Amphibole 1	.775	21.0	0.02038	663±45
Amphibole 2	1.020	5.4	0.02488	622±42

$\lambda_\beta = 4.72 \times 10^{-10}\ yr^{-1}$. $\lambda_e = 0.584 \times 10^{-10}\ yr.^{-1}$
Argon analysis by J. A. Miller at Cambridge University.

The results obtained from these two amphiboles differ by approximately 6.5 per cent of each other, but agree within the experimental error.

Amphiboles have been used previously for dating by the potassium-argon method and have been found to give ages that agree well with those obtained from co-existing micas (Hayden & Wehrenberg, 1960; Miller & Green, 1961; Miller & Brown, in press). These results therefore indicate that the Chatham-Grenville intrusive was emplaced at the close of the Precambrian; it is definitely not of Monteregian age. The intrusive is considerably younger than any of the igneous rocks associated with the

Grenville orogeny or any of the Morin series rocks, all of which give ages in excess of 850 million years. Ellsworth (1932) has recorded the only age from the Grenville subprovince comparable with that found for the Chatham-Grenville intrusive. He determined the age of a pegmatite in Cardiff township, Ontario, by the U/Pb ratio to be 627 million years. However, other pegmatities in the same region all have much older ages and it is possible that this single determination is in error.

The age of the Chatham-Grenville intrusive is therefore unique amongst the ages of igneous rocks so far recorded from the Grenville subprovince. Other intrusives that may be of the same age have been mentioned by Osborne (1934, p. 63). They include the Rigaud stock (LeRoy, 1901), the syenite from Boischatel township near Rouyn (Gunning, 1927) and the syenite at the Beattie Gold Mine in Duparquet township (O'Neill, 1932).

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A NICKEL HYDROXIDE MINERAL FROM ROCK CREEK BRITISH COLUMBIA

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A nickel hydroxide mineral associated with annabergite and garnierite was found by the second author while investigating the oxidation of nickel minerals in the serpentinized bodies in the Rock Creek area of British Columbia. Rock Greek is in the Similkameen District of British Columbia some 15 miles southwest of Greenwood.