GEOLOGY OF THE SOUTHEAST HALF OF IRON MASK BATHOLITH (92I/9)

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Regional mapping of the Iron Mask batholith was resumed during the 1976 field season. Mapping has virtually been completed on the batholith (scale – 1:1320) and the next phase of the program will be to refine contacts, descriptions of rock units, and their relationships to one another. This will be done by carrying out detailed work on some of the mining properties.

REGIONAL SETTING

The Iron Mask batholith is a multiphase intrusion comprised of Iron Mask Hybrid, Pothook, Sugarloaf, and Cherry Creek units, each of which has several varieties. The rocks *are fine grained and fine porphyritic to coarse grained and are silica-poor ranging from* gabbro to syenite composition with diorite predominating.

Major systems of northwesterly, northerly, and northeasterly trending recurring fractures or faults controlled emplacement of various units of the Iron Mask batholith. The batholith was emplaced in a high level volcanic to subvolcanic environment, comagmatic with Nicola volcanic rocks and coeval with part of the upper Nicola succession. The batholith intruded volcanic and sedimentary rocks of the lower Nicola but the Cherry Creek unit occurs both as fragments within, and is in intrusive contact with, uppermost Nicola rocks.

The Nicola and Iron Mask rocks are unconformably overlain by Tertiary sedimentary and volcanic rocks of the Kamloops Group. In many places on and along the flanks of the batholith the pre-Tertiary erosion surface appears nearly to coincide with the present day erosion surface. Erosional remnants of Tertiary volcanic rocks cap the higher hills and occur in places along their flanks. This pre-Tertiary erosional surface appears to have been very irregular although post-Tertiary faulting may have accentuated this apparent irregularity and resulted in local preservation of post-batholith rocks within the batholith.

GEOLOGY

Rock descriptions are based on field observations of texture, composition, and type and intensity of alteration. These descriptions are subject to revision when petrographic studies are completed. Major rock units are shown on Figure 10.

Nicola Group

The southeast half of the batholith is flanked on both sides by Nicola volcanic and volcaniclastic sedimentary rocks which are lithologically quite dissimilar to overlying Tertiary volcanic and volcaniclastic rocks.

Nicola rocks on the southwestern flank consist predominantly of well-indurated, weakly metamorphosed, massive and bedded tuffs, breccias which are possibly lahars, and interbedded flows and monomictic flow breccias. Most of these rocks are a fairly uniform green-grey colour.

Nicola rocks on the northeast flank are mainly tuff and tuff breccia which are generally less well indurated than those on the southwest flank. They contain fragments of many different colours and in some places are abundantly hematitic. A well-indurated exposure of bedded tuff and breccia similar to those on the southwestern flank crops out between Knutsford and Knutsford Hill.

The Nicola rocks on both flanks of the batholith contain augite porphyry and augite porphyry breccia which, on the north side of Jacko Lake, has been metamorphosed along the intrusive contact. Nicola rocks along the southwestern flank and at the southeast tip of the batholith contain distinctive augite-hornblende porphyries which are identical to varieties of the Sugarloaf unit which also occurs predominantly along the southwest flank of the batholith.

Intrusive Rocks of the Iron Mask Batholith

All intrusive units with the exception of 'picrite' are thought to be genetically related. Most units everywhere show some degree of alteration and/or contamination which may be intense in some places. In most cases, however, original textures are still visible and are used as the main criteria for distinguishing among units and varieties.

Iron Mask Hybrid Unit

The Iron Mask Hybrid unit forms a margin about 1.2 kilometres wide along the southwest side of the southeast half of the batholith. An elongate pendant or screen of Iron Mask Hybrid rocks approximately 3.2 kilometres long occurs in Cherry Creek rocks and extends from east of Coal Hill southeasterly toward Knutsford Hill.

Most outcrops of the Iron Mask unit can best be described as a melange of intrusive rock varieties. The rocks range from fine to coarse melanocratic and mesocratic diorite, fine to coarse-grained hornblendite, coarse-grained magnetite-rich gabbro, and xenoliths of recrystallized Nicola. All of the rock varieties contain magnetite and are commonly cut by irregular, criss-crossing, fine to coarse-grained leucocratic dioritic dyke-like bodies and dykelets. Some of the dyke-like bodies are recognizable as Cherry Creek varieties, particularly in the vicinity of Iron Mask Hybrid and Cherry Creek contacts.

Mineralization is fairly ubiquitous in Iron Mask rocks with noteable concentrations of magnetite and copper. The Iron Mask mine is located in this rock unit.

Pothook Unit

The Pothook unit is not as prevalent in the southeast half of the batholith as it is in the northwest half. It appears as narrow, mafic-rich, gradational zones between Iron Mask Hybrid and Cherry Creek units. The rock is more uniform in texture and composition than Iron Mask Hybrid rocks. It is fairly coarse grained, generally dioritic but has varied K-feldspar content, is mafic-rich, and lacks the characteristic speckled appearance of Cherry Creek varieties.

At the northwest end of the batholith the Pothook unit is more extensive than to the southeast, is of dioritic composition except near Cherry Creek contacts, is medium to coarse grained, and is mafic-rich. Commonly coarse interstitial masses of biotite 2 to 3 centimetres across are visible in this unit.

There appears to be a gradation from the melange of Iron Mask varieties through Pothook diorite to the Cherry Creek unit showing an increasing degree of differentiation to more K-spar rich varieties. Intrusive contacts between these units are also evident.

Mineralization is prevalent in many places in the Pothook unit with noteable magnetite occurring in uniformly dipping veins south and southeast of the Afton deposit.

Picrite Units

The problem of the origin and age of the Picrite unit remains unresolved. The picrite is of basaltic composition with serpentinized olivine reported by Carr (1956), Preto (1967), and Carr and Reed (1976). Picrite bodies appear to be associated with recurring, northwesterly trending fracture systems and are found in many parts of the batholith commonly in association with mineralization (Carr, 1956; Carr and Reed, 1976). The unit is cut by clean fine-grained rocks akin to the Cherry Creek unit. Inclusions of picrite are reported in the Iron Mask unit (C. Godwin, personal communication).

Cherry Creek Unit

The name Cherry Creek is retained for the unit of rocks which extends along the north margin of the batholith (Preto, 1967) and is applied to equivalent rocks underlying Iron Mask Hill and brecciated, ankeritic rocks east of Galaxy. Mapping during the 1976 field season has shown that this same unit of Cherry Creek rocks forms the eastern half of the southeastern part of the batholith. A pendant or screen of Iron Mask Hybrid unit occurs within it extending from east of Coal Hill and projecting southeasterly toward Knutsford Hill. A body of Sugarloaf-like rocks extends up the north side of the Knutsford ski hill and heals brecciated fragments of Cherry Creek rocks.

There are a wide variety of Cherry Creek rocks which retain a characteristic speckled texture resulting from a clustering of fine-grained mafic minerals with indistinct outline. The rocks are commonly weakly porphyritic to porphyritic, fine grained, and range in composition from diorite to syenite. They include varieties which can be termed macrodiorite, microdiorite, micromonzonite, microsyenite, and Cherry Creek porphyry (Carr, 1956; Preto, 1967 and 1972). The wide variety of Cherry Creek rock types may be the result of tapping of magma of different stages of differentiation, and emplacement and crystallization under varied pressure-temperature-volatile content conditions existing in an intermittently venting subvolcanic to volcanic environment.

Copper and lesser iron mineralization is prevalent in the Cherry Creek unit particularly in zones of intense brecciation and K-feldspathization. Preto (1967) points out the significance of the brecciation and K-feldspathization. Similar brecciation to that reported by Preto (1967) and Northcote (1974) in Cherry Creek rocks along the north side of the batholith occurs in Cherry Creek rocks at the Kimberley copper property northwest of Knutsford (Preto, 1967). A breccia consisting largely of Cherry Creek fragments also occurs on the extreme southeast tip of the batholith.

Sugarloaf Unit

The Sugarloaf unit occurs mainly along the southwest flank of the batholith and as small bodies within the batholith including the north flank of Knutsford ski hill and at the southeast tip of the batholith. Several varieties were noted which are mainly the result of differences in grain size. Almost everywhere the unit is of fairly uniform andesitic composition and is medium green in colour. The distinguishing characteristic of this unit is the persistent presence of hornblende and/or augite phenocrysts. Identical rocks were observed in the Nicola although their relationship to Nicola rocks was not determined but they probably occur as dykes or sills.

Conflicting age relationships were observed where Cherry Creek rocks appeared to be cutting rocks of the Sugarloaf unit and breccia fragments of Cherry Creek rocks were healed by a matrix of Sugarloaf-like rocks.

Copper mineralization occurs within Sugarloaf rocks in several localities, including the Ajax property east of Jacko Lake where Sugarloaf rocks are brecciated and albitized (Preto, 1967).

Kamloops Volcanic and Sedimentary Rocks

Tertiary volcanic and sedimentary rocks unconformably overlie the batholith and Nicola rocks. The Kamloops volcanic rocks in the Iron Mask area are mainly of basaltic composition and occur as vesicular flows, flow breccias, and vent breccias. The present erosion surface closely approximates the pre-Tertiary erosion surface so that erosional remnants of Tertiary rocks are prevalent capping the tops of some of the higher hills on

the batholith, in former depressions on the pre-Tertiary erosion surface, and in downfaulted blocks both within and flanking the batholith.

DISCUSSION OF THE ENVIRONMENT OF EMPLACEMENT, ALTERATION, AND AGE OF THE BATHOLITH

Alteration

Most of the batholithic rocks show some degree of saussuritization which locally may be very intense. Some K-feldspathization is evident locally in most rock units but is most abundant in Cherry Creek rocks where the relatively high K-feldspar content is the result of magmatic differentiation. The K-feldspar was introduced into the rocks through processes of normal crystallization of potassium-rich magma and by alteration of previously crystallized dioritic to monzonitic rocks by introduction of potassium-rich solutions.

Environment of Emplacement

An increasing amount of evidence suggests a shallow volcanic to subvolcanic environment of emplacement especially for the Cherry Creek varieties and a comagmatic and partly coeval relationship between Nicola volcanic rocks and units of the Iron Mask batholith.

Cherry Creek rocks at the north end of the batholith occur as criss-crossing dyke-like bodies of varied grain size and composition. Their fine-grained texture suggests near surface conditions and, as noted by Carr (1957), the Cherry Creek unit had previously been mapped as volcanic rocks. Intrusive brecciation associated with K-feldspathization is prevalent in many places particularly in a narrow zone extending westerly from a point near Iron Mask Lake to the Afton orebody. This brecciation appears to involve mainly varieties of Cherry Creek although fragments of Iron Mask Hybrid or Pothook are also visible in core. The brecciation may have been the result of venting at a slightly higher level. Fragments of Cherry Creek rocks and other Cherry Creek-like rocks occur in tuff breccia of the Nicola which indicates that some of the Cherry Creek rocks are older than some of the Nicola. However, intrusive contacts between these same Nicola volcanic rocks and Cherry Creek rocks indicates the opposite relationship; that is, some Cherry Creek rocks are younger than some of the Nicola rocks they intrude. Intense epidotization of Nicola rocks which contained Cherry Creek fragments and some mineralization was noted in Nicola rocks at the north edge of the batholith, suggesting that volcanic-plutonic processes were going on simultaneously.

It is unnecessary to postulate three separate magmatic events: one for Nicola volcanism, a second to emplace the Iron Mask batholith, and a third for later volcanism to explain Cherry Creek fragments in volcanic rock described as being identical to Nicola (Cockfield, 1948). The observed geologic features and relationships would be consistent with a single but pulsating comagmatic and partly coeval volcanic-plutonic system operating in a subvolcanic to shallow volcanic environment.

Iron Mask Age Determinations

Sample No.	Age	Rock Type	Location
VP72KA–3	197±6 m.y.	Cherry Creek Micromonzonite Porphyry	Near east end of Iron Mask Lake
VP72KA–5	190±6 m.y.	Pothook	Afton
VP72KA–4	205±6 m.y.	Cherry Creek Micromonzonite Porphyry	Near Iron Mask Lake
VP72KA–1	201±6 m.y.	Iron Mask Hybrid	Gas pipeline north of Ajax property
VP72KA–2	198±6 m.y.	Hydrothermal Biotite Cherry Creek Microdiorite	Near Iron Mask Lake

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