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SURVEY
OF
CANADA

PAPER 63-17

DEPARTMENT OF MINES
AND TECHNICAL SURVEYS

AGE DETERMINATIONS AND GEOLOGICAL STUDIES
(Including Isotopic Ages— Report 4)

(Report and 5 figures)

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#3398

Director
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1963

British Columbia

about 11 miles east of Nelson, and yields an age of 105 m. y. (GSC 62-31). Finally an age of 86 m. y. is reported by Little (1960, pp. 86-87) from a specimen collected west of Nelson.

Although much work remains to be done on this structurally and petrogenetically complex mass, a tentative suggestion as to the broad outlines of its formation and emplacement seem warranted at this time. This is particularly so since structural relations and K-Ar dates within this massif are not apparently contradictory. It may be suggested that Nelson batholith developed in three main stages:

1. Emplacement and consolidation of a large massif of hornblende-biotite granodiorite, at greater depth than now, before 171 m. y. These ages must be considered a minimum and this episode may well be considerably older. The older ages have been preserved only because the early granodiorite reacted to later structural events as a passive competent mass, and was not penetratively reformed.

2. Mobilization and re-intrusion of a relatively passive mass resultant upon an intense structural episode that affected the region generally. This might have taken place at, or later than 131 m. y. or latest Jurassic - earliest Cretaceous.

3. Further emplacement of both leucocratic quartz monzonite in, and around the fringe of the batholith. Still later emplacement of augite-hornblende monzonite and syenodiorite west and southwest of the main batholithic mass.

It is proposed to continue further structural and petrologic studies, as well as further isotopic age determinations by the Rb-Sr method, to test or to discard the above tentative hypothesis of the evolution of Nelson batholith.

Kuskanax Batholith

GSC 62-33

Biotite, K-Ar age 66 m. y.

K 7.60%, Ar^{40}/K^{40} .00394; radiogenic argon 100%. Concentrate; reasonably clean concentrate of reddish brown biotite. About 30% of the biotite flakes are slightly altered and contain very fine specks of quartz and epidote, and long needle-like inclusions. The total chlorite content is about 7%.

British Columbia

(82 K)

From quartz monzonite. 2 miles south, on roadside from Galena Bay, 117°53'W. Sample K-15RA-2. Collected and interpreted by J. E. Reesor.

(For interpretation see determination GSC 62-34)

GSC 62-34

Muscovite, K-Ar age 90 m. y.

K 8.99%, Ar^{40}/K^{40} .00542; radiogenic argon 100%. Concentrate; clean concentrate of muscovite. 50% of the muscovite flakes contain minor quartz and feldspar, and a few small euhedral crystals of biotite. Total feldspar content 3%. Chlorite not detected.

(82 K)

From quartz monzonite. 2 miles south, on roadside from Galena Bay, 50°41'N, 117°53'W. Sample K-15RA-2. Collected and interpreted by J. E. Reesor.

Kuskanax batholith is an extensive plutonic mass of Nelson batholith, within the concave, western side of the Selkirk Mountain arc. Kuskanax massif consists principally leucocratic pyroxene-hornblende monzonite. Variations occur from pyroxene monzonite and quartz monzonite to syenite and syenite. K-Ar determinations have so far not been possible. No age has not been found in some 50 specimens collected at regular intervals throughout the massif. Nevertheless the above specimen, E-15, a muscovite-biotite leucogranodiorite, from a small mass at the end of the batholith just south of Galena Bay on Upper Arrow Lake, yielded a muscovite-biotite pair giving ages of 90 m. y. (GSC 62-33) and 66 m. y. (GSC 62-34) on muscovite and biotite respectively. This specific conclusion as to emplacement of Kuskanax batholith was made as a result of this determination. However, the muscovite determination at 90 m. y. is comparable to the results in Batholith to the northeast.

Shuswap Metamorphic Complex

GSC 62-35

Biotite, K-Ar age 64 m. y.

K 7.69%, Ar^{40}/K^{40} .00384; radiogenic argon 100%. Concentrate; clean concentrate of brown biotite. Minor impurities (about 2%) consist of hornblende, zircon and quartz. About 10% of the biotite flakes are slightly altered to chlorite. The total chlorite content is about 3%.

British Columbia

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son.

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emplacement seem
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2 miles south, on roadside from Galena Bay; 50°41'N,
117°53'W. Sample K-15RA-2. Collected and
interpreted by J. E. Reesor.

(For interpretation see determination GSC 62-34).

GSC 62-34

Muscovite, K-Ar age 90 m.y.

K 8.99%, Ar⁴⁰/K⁴⁰.00542; radiogenic argon 100%.
Concentrate; clean concentrate of muscovite. About
50% of the muscovite flakes contain minor inclusions
of quartz and feldspar, and a few small euhedral
crystals of biotite. Total feldspar content is about
3%. Chlorite not detected.

(82 K)

From quartz monzonite.

2 miles south, on roadside from Galena Bay;
50°41'N, 117°53'W. Sample K-15RA-2. Collected
and interpreted by J. E. Reesor.

Kuskanax batholith is an extensive plutonic mass north
of Nelson batholith, within the concave, western side of the Purcell-
Selkirk Mountain arc. Kuskanax massif consists principally of a
leucocratic pyroxene-hornblende monzonite. Variations occur ranging
from pyroxene monzonite and quartz monzonite to syenite and quartz-
syenite. K-Ar determinations have so far not been possible as mica
has not been found in some 50 specimens collected at regular intervals
throughout the massif. Nevertheless the above specimen, K-15RA-2,
a muscovite-biotite leucogranodiorite, from a small mass at the north
end of the batholith just south of Galena Bay on Upper Arrow Lake,
yielded a muscovite-biotite pair giving ages of 90 m.y. (GSC 62-34)
and 66 m.y. (GSC 62-33) on muscovite and biotite respectively. No
specific conclusion as to emplacement of Kuskanax batholith may be
made as a result of this determination. However, the muscovite
determination at 90 m.y. is comparable to the results in Battle
batholith to the northeast.

Shuswap Metamorphic Complex

GSC 62-35

Biotite, K-Ar age 64 m.y.

K 7.69%, Ar⁴⁰/K⁴⁰.00384; radiogenic argon 100%.
Concentrate; clean concentrate of brown biotite.
Minor impurities (about 2%) consist of hornblende,
zircon and quartz. About 10% of the biotite flakes
are slightly altered to chlorite. The total chlorite
content is about 3%.

British Columbia

east of Nelson, and yields an age of 105 m. y. (GSC 62-34). An age of 86 m. y. is reported by Little (1960, pp. 10-11) for a specimen collected west of Nelson.

Although much work remains to be done on this petrogenetically complex mass, a tentative suggestion of the outlines of its formation and emplacement seems to be possible at this time. This is particularly so since structural features and K-Ar dates within this massif are not apparently related. It may be suggested that Nelson batholith developed in several stages:

Emplacement and consolidation of a large massif of orthogneiss granodiorite, at greater depth than now, before 171 m. y. must be considered a minimum and this episode may be considerably older. The older ages have been preserved only in orthogneiss granodiorite reacted to later structural events as a coherent mass, and was not penetratively reformed.

Mobilization and re-intrusion of a relatively passive mass upon an intense structural episode that affected the region. This might have taken place at, or later than 131 m. y. Jurassic - earliest Cretaceous.

Further emplacement of both leucocratic quartz diorite and around the fringe of the batholith. Still later emplacement of augite-hornblende monzonite and syenodiorite west of the main batholithic mass.

It is proposed to continue further structural and petrographic studies, as well as further isotopic age determinations by K-Ar method, to test or to discard the above tentative hypothesis for the history of Nelson batholith.

Batholith

Biotite, K-Ar age 66 m. y.

K 7.60%, Ar⁴⁰/K⁴⁰.00394; radiogenic argon 100%. Concentrate; reasonably clean concentrate of reddish brown biotite. About 30% of the biotite flakes are slightly altered and contain very fine specks of quartz and epidote, and long needle-like inclusions. The total chlorite content is about 7%.

British Columbia

(82 K) From quartz monzonite. 2 miles south, on roadside from 117°53'W. Sample K-15RA-2. Interpreted by J. E. Reesor.

(For interpretation see determination GSC 62-34)

GSC 62-34

Muscovite, K-Ar age 90 m. y.
K 8.99%, Ar⁴⁰/K⁴⁰.00542; radiogenic argon 100%. Concentrate; clean concentrate of muscovite flakes containing 50% of the muscovite flakes containing quartz and feldspar, and a few crystals of biotite. Total feldspar 3%. Chlorite not detected.

(82 K) From quartz monzonite. 2 miles south, on roadside from 50°41'N, 117°53'W. Sample K-15RA-2 and interpreted by J. E. Reesor.

Kuskanax batholith is an extensive part of Nelson batholith, within the concave, western side of Selkirk Mountain arc. Kuskanax massif consists primarily of leucocratic pyroxene-hornblende monzonite. Variations from pyroxene monzonite and quartz monzonite to syenite. K-Ar determinations have so far not been made. has not been found in some 50 specimens collected throughout the massif. Nevertheless the above specimen is a muscovite-biotite leucogranodiorite, from a small end of the batholith just south of Galena Bay on Upper Selkirk Mountain. It yielded a muscovite-biotite pair giving ages of 90 m. y. and 66 m. y. (GSC 62-33) on muscovite and biotite respectively. No specific conclusion as to emplacement of Kuskanax batholith made as a result of this determination. However, the determination at 90 m. y. is comparable to the result for the batholith to the northeast.

Shuswap Metamorphic Complex

GSC 62-35

Biotite, K-Ar age 64 m. y.
K 7.69%, Ar⁴⁰/K⁴⁰.00384; radiogenic argon 100%. Concentrate; clean concentrate of biotite. Minor impurities (about 2%) consist of zircon and quartz. About 10% of the biotite are slightly altered to chlorite. Total chlorite content is about 3%.

K-Ar

Sample Number(s) and Reference(s) material Date? 2 σ error
 Lab No: GSC 62-33 bi decay constants: (Bi) 66 \pm 8 Ma
GSC 62-34 ms \square 4.72/.584/1.19 (Ms) 90 \pm 8 Ma
 Ref: Wanless et al., 1963 \square 4.72/.584/1.18 (Bi) 68 \pm 8 Ma
 \square 4.96/.581/1.167 (Ms) 92 \pm 8 Ma
 Record No: K-15RA-2
 Suite No: \square not reported
 Sample Name:

Latitude: Longitude: (X $^{\circ}$ Y' Z" or X $^{\circ}$ Y.Y')
(50 $^{\circ}$ 41' " N, 117 $^{\circ}$ 53' " W (\pm)
 UTM Zone 11 437594 E 5614765 N; Province BC
 Sec. , T. , R. ; Co., State .
 (NTS 82K) Lardeau Map Area, Scale

Location: 2 mi. S of Galena Bay on rd.
 Source Type:
 Rock: qtz monzonite muscovite - biotite leucogranodiorite
 Geologic Unit: Kasloan Batholith, Galena Bay stock
 Geologic Age:
 Material Analyzed: bi + 70% chl, tr qz, cp
ms + 30% fp, some qz, tr bi

Analytical Data: (list duplicate analyses or indicate n = 2, n = 3, etc.)

| | | | | |
|---------------------------|--------------------------|----------------------------|----------------|-------------------------------|
| <u>bi</u> K = <u>7.60</u> | %; (Ar ⁴⁰ * = | x10 ⁻⁶ cc/gm) | <u>?</u> | % Σ Ar ⁴⁰) |
| K ₂ O = | % | x10 ⁻¹⁰ mol/gm) | (<u>100</u>) | |
| <u>ms</u> K = <u>8.99</u> | %; (Ar ⁴⁰ * = | x10 ⁻⁶ cc/gm) | (<u>100</u>) | % Σ Ar ⁴⁰) |
| K ₂ O = | % | x10 ⁻¹⁰ mol/gm) | | |
| K = | %; (Ar ⁴⁰ * = | x10 ⁻⁶ cc/gm) | | % Σ Ar ⁴⁰) |
| K ₂ O = | % | x10 ⁻¹⁰ mol/gm) | | |
| K = | %; (Ar ⁴⁰ * = | x10 ⁻⁶ cc/gm) | | % Σ Ar ⁴⁰) |
| K ₂ O = | % | x10 ⁻¹⁰ mol/gm) | | |

Comment on Analyses: 40 Ar / 40 K = bi 0.00394
ms 0.00542
No ³⁰Ar determined
 Interpretation: Analyses not reliable

Collected by: J.E. Reesor
 Dated by: GSC
 Listed by: Date:
 (name, institution)