U.B.C

012963

Vancouver 8
24th Feb. '70.

Dear Sir,

I enclose hand specimen and thin section descriptions of the following rocks:

1	TR1	- 200-300
2	TR1	- 200-300
3	TR4	- 0 - 300
4	TR4	- 600 - 900
5	TR4	- 2 (?).
6	TR5	- 0 - 200
7	TR5	- 600 - 800
8	TR5	- 1000 - 1200
9	TR6	- 0 - 200
10	TR7	- 200 - 400

The charge will be 10 $ per thin section giving a total of 100 $.

Yours faithfully,

Ian Paterson.

Alteration:

Regarding alteration of the specimens, note the following points

(i) specimens 1, 4, 7, 8, 9 show varying degrees of hydrothermal alteration or propylitization.

(ii) specimens 2, 3, 5, 6, 10 are essentially unaltered.

(iii) optical identification of alteration products and textures is often difficult and highly subjective. For instance, the "sericite" identified as an alteration product of plagioclase could also be sericite, paragonite or one of the clay minerals.

SPECIMEN NUMBER: (1) - T.R 1 - 200 - 300

HAND SPECIMEN: The specimen is medium grained, hypidiomorphic granular and contains phenocrysts of white plagioclase felspar (5 mm) and greenish mafics set in a fine grained grey matrix. Disseminated pyrite is also present and gives the gossan on the weathered surface.

MICROSCOPIC PETROLOGY: MODE

Plagioclase: zoned euhedral phenocrysts – cores $An_{25 \pm 3}$ – slightly altered to a microgranular aggregate of sericite(?), epidote and iron oxides. 45

Biotites: euhedral to subhedral (av. 5 mm) – totally altered to chlorite + sphene + iron oxides + pyrite. 10

Epidote: anhedral, forms in small fractures. 1

Matrix: microcrystalline granules of K-Felspar and minor quartz and plagioclase 40

Accessories: sphene, pyrite – limonite rims pyrite and is formed in pervasive cracks throughout the slide. 3

HISTORY AND ALTERATION:

a) crystallization of biotite granodiorite porphyre

b) slight deuteric or hydrothermal alteration resulting in
   (i) alteration of biotites to chlorite + sphene + iron oxides + pyrite
   (ii) slight alteration of plagioclase phenocrysts
   (iii) crystallization of epidote in fractures.

NAME:

propylitized biotite - granodiorite porphyre.

SPECIMEN NUMBER: (2) - TR.1 - 200-300 (2)

HAND SPECIMEN: The specimen is course grained, hypidiomorphic granular and contains euhedral phenocrysts of black hornblende and biotite (av. 6mm), smoky granular quartz (av. 2mm) and white euhedral felspars (av 7mm) set in a fine grained buff coloured matrix. A vein, 3mm wide containing quartz traverses the specimen

MICROSCOPIC PETROLOGY:

		MODE
Plagioclase	: euhedral, zoned, albite twinning, - $An_{34 \pm 3}$ - slightly sericitized	25
K-Felspar	: euhedral, zoned, perthite stringers - quartz, biotite and plagioclase inclusions - essentially unaltered	25
Quartz	: rounded granules	10
Biotite	: subhedral - slightly chloritised	5
Hornblende	: subhedral and "ragged" - slightly chloritised, inclusions of sphene, plagioclase and apatite.	4
Matrix	: fine grained equigranular quartz, K-Felspar and plagioclase	
Vein	: granular unstrained quartz with magnetite and chlorite inclusions	

HISTORY AND ALTERATION:

a) crystallization of plagioclase, biotite, hornblende, quartz and K-Felspar respectively

b) sudden cooling (chilled border phase of intrusive?); crystallization of matrix quartz and felspar and slight deuteric alteration of plagioclase

c) introduction of late quartz magnetite vein along fracture.

NAME:

quartz monzonite perphyre.

SPECIMEN NUMBER: (3) - TR4 -0 -306

HAND SPECIMEN: The specimen is medium grained, hypidiomorphic granular and is fawn in colour. It contains phenocrysts of biotite in a quartz-felspathic matrix. An alteration vein containing small cavities cross cuts the specimen.

MICROSCOPIC PETROLOGY: texture: hypidiomorphic equigranular.

		MODE
Plagioclase:	subhedral to subhedral, zoned — An_{36} — plagioclase becomes turbid & sericitised (?) near fracture zone	60
K.-Felspar:	subhedral phenocrysts with inclusions of plagioclase, — perthitic in places	20
Quartz	- generally interstitial	10
Biotite	- variety green biotite but chloritised near fracture zone	4
Hornblende	- subhedral & 'ragged' - partly replaced by K-felspar, quartz & magnetite. — probably late magmatic replacement.	5
Accessory	- sfene, magnetite	1

HISTORY AND ALTERATION:

① Crystallization of: a) plagioclase & K-Felspar, bt, hbl
b) interstitial quartz.

② Slight alteration along vein ie sericitisation of Plagioclase and chloritisation of biotites in immediate vicinity.

NAME: leucocratic monzonite.

SPECIMEN NUMBER: (4) - T.R. 4 - 600 - 900

HAND SPECIMEN: is medium grained, hypidiomorphic granular and fawn in colour. It contains altered phenocrysts of buff coloured felspars (av. 1mm) and biotites in a quartzitic matrix

MICROSCOPIC PETROLOGY: MODE

Plagioclase: euhedral, originally zoned, highly altered to a mixture of a white micaceous mineral (paragonite or sericite), brown granules (limonite?) and albitic felspar. 45

K-felspar: subhedral - slightly altered along fractures (limonite) 15

Matrix: unstrained granular quartz, occasional large (2 mm) quartz grains 35

Biotites: totally altered to aggregates of muscovite + limonite 3

Accessories: magnetite, apatite - magnetite is often associated with altered biotites 1

HISTORY AND ALTERATIONS:

(1) crystallization of plagioclase, biotite, K-felspar and finally interstitial quartz.

(2) alteration of plagioclase ⟶ albite + (sericite, paragonite) + limonite

" " biotite ⟶ muscovite + limonite, magnetite?

NAME: granodiorite porphyre.

SPECIMEN NUMBER: (5) - T.R. - 4 - 2

HAND SPECIMEN: The hand specimen is course grained, hypidiomorphic granular and weathers fawn and white. It contains dark phenocrysts of hornblende (7 mm max) and white phenocrysts of felspar in a fawn coloured granular quartzo-felspathic matrix.

MICROSCOPIC PETROLOGY: MODE

Plagioclase: euhedral, zoned, $An_{40 \pm 5}$ - incipiently sericitised - slight turbid alteration in places 45

K-Felspar: large zoned subhedral phenocrysts with plagioclase inclusions 17

Hornblende: euhedral to subhedral - slightly chloritised and contains ragged inclusions of K-felspar. - note associated magnetite granules 15

Quartz: interstitial, unstrained 20

Biotite: interstitial, slightly chloritised 1

Accessories: magnetite, sphene, apatite. 2

HISTORY AND ALTERATION:

(1) crystallization, in respective order of plagioclase, hornblende, K-felspar, biotite and quartz

(2) minor deuteric or hydrothermal sericitization of plagioclase and chloritization of biotite and hornblende.

NAME: hornblende quartz monzonite.

SPECIMEN NUMBER: (6) T.R - 5 - 0 - 200

HAND SPECIMEN: The specimen is medium grained, hypidiomorphic granular and buff weathering. It contains approx 10% biotite phenocrysts set in a finkish quartz - felspar matrix.

MICROSCOPIC PETROLOGY: MODE

Plagioclase: euhedral, well zoned - cores $An_{38 \pm 5}$ - development of sericite along fractures — 30

K-felspar: subhedral phenocrysts - occasionally turbid appearance due to stringers of opaque granules (hematite?) developed along cleavage, occasional perthitic blebs. — 40

Biotite: subhedral with 'ragged' edges, slightly chloritised, associated with magnetite + hematite + limonite in glomeroporphyritic aggregates — 10

Quartz: occurs interstitially or along margins of K-felspar grains — 20

Accessories: magnetite, hematite, sphene and apatite. — 2

HISTORY AND ALTERATION:

① crystallization of plagioclase, biotite, K-felspar and quartz.

② late stress and slight hydrothermal alteration of plagioclase to sericite and biotite to chlorite.

NAME: biotite quartz monzonite.

SPECIMEN NUMBER: (7) - TR 5 - 600 - 800

HAND SPECIMEN: The hand specimen is medium grained, hypidiomorphic and contains whitish phenocrysts of felspar (5 mm max), biotites and grey quartz. Occasional vugs ~~or~~ were also seen.

MICROSCOPIC PETROLOGY: MODE

Plagioclase: subhedral - originally An_{30} (?) - grains are now totally altered to white mica with limonite at the edges. 47

K-felspar: large subhedral phenocrysts - blotchy with limonite granules along microfractures. - some indication of "two growth periods" but interpretation is subjective. 23

Quartz: unstrained granules - generally interstitial - possibility of recrystallization during hydrothermal alteration. 20

Biotite: totally altered to sericite + chlorite + iron oxides. 5

Accessories: sphene, chlorite & white mica (muscovite). magnetite 5

HISTORY AND ALTERATION:

(1) crystallization of plagioclase, biotite, K-felspar and quartz respectively

(2) pervasive hydrothermal alteration note as:
   a) almost total alteration of plagioclase to white mica
   b) biotite is almost totally altered to muscovite + chlorite + iron oxides
   c) <u>possible</u> secondary growth of K-felspar and recrystallization of quartz - but second opinion strongly suggests primary growth.

NAME: altered biotite-quartz-monzonite.

SPECIMEN NUMBER: (8) - TR 5 - 1000 - 1200

HAND SPECIMEN: The hand specimen is medium grained, hypidiomorphic granular and buff weathering. Grey quartz, pinkish felspar and a greenish ferromagnesian mineral are identifiable. The specimen also contains small cavities or vugs.

MICROSCOPIC PETROLOGY:

		MODE
Plagioclase:	subhedral - $An_{20} \Rightarrow An_{30}$ - slight dusting of alteration minerals (re white mica + granules and needles of a crypto-crystalline material)	80
K-felspar:	anhedral with inclusions of quartz and plagioclase. - only slightly altered.	
Chlorite:	interstitial, pale green pleochroism - perhaps replacing hornblende	5
Quartz:	granules occur in K-felspar or interstitially	12
Clinozoisite:	associated with chlorite - note pleochroism and anomalous interference colours	1
Allanite:	generally associated with epidote	1
Accessories:	sphene + apatite.	1

HISTORY AND ALTERATION:

(1) crystallization of plagioclase, hornblende, (?) K-felspar and quartz.

(2) hydrothermal alteration or propylitization — slight alteration of felspars and formation of interstitial chlorite, clinozoisite and allanite

NAME: altered quartz monzonite.

SPECIMEN NUMBER: (9) - T.R. - 6 - 0 - 200

HAND SPECIMEN: The hand specimen is medium grained, and hypidiomorphic granular. Dark biotite, grey quartz and pinkish felspar can be identified.

MICROSCOPIC PETROLOGY: MODE %

Plagioclase: euhedral - $An_{35 \pm 5}$ - highly altered to white mica especially along cleavages. 42

K-felspar: subhedral phenocrysts - perthitic - essentially unaltered but has slight turbidity due to the presence of unidentifiable cryptocrystalline granules 27

Biotite: forms clusters - alters to chlorite + limonite + magnetite 5

Quartz: generally intergranular and unstrained. 25

Accessories: magnetite, sphene, apatite. 1.

HISTORY AND ALTERATION:

(1) crystallization of plagioclase, biotite, K-felspar and quartz.

(2) deuteric or hydrothermal alteration of plagioclase (partly replaced by white mica) and biotite (partly altered to chlorite + iron oxides.

NAME: quartz monzonite.

SPECIMEN NUMBER: (10) - T.R-7-200-400

HAND SPECIMEN: The specimen is medium grained, hypidiomorphic granular and weathers buff or white. It contains white phenocrysts of felspar, dark phenocrysts of hornblende and biotite, and quartz.

MICROSCOPIC PETROLOGY: MODE

Plagioclase: zoned subhedral to euhedral grains - essentially unaltered except for very minor alteration along fractures - composition (cores An_{42}) 45

K-felspar: large subhedral crystals, well zoned, slightly perthitic occasional patches of turbid alteration 25

Quartz: late, interstitial, unstained 17

Biotite: subhedral - almost unaltered. 3

Hornblende: subhedral - "ragged with inclusions of K-felspar, magnetite + biotite 10

Accessories: magnetite, sphene, apatite.

HISTORY AND ALTERATION:

① crystallization of plagioclase, biotite, hornblende, K-felspar & quartz.

② Very minor late magmatic alteration

NAME: quartz monzonite.