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Petrographic Report on Rock specimens from the Soldiers Cap Area, Clancurry District, Queensland.

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PETROGRAPHIC REPORT ON ROCK SPECIMENS FROM THE SOLDIERS CAP AREA, CLONCURRY DISTRICT, QUEENSLAND.

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by W. B. DALLWITZ.

In the following report thirteen rock specimens from the Soldiers Cap area are petrographically described. The specimens were sent in for examination by R.A. Searl. Fifteen specimens are listed in his covering memorandum, but only thirteen were received; specimens with Nos. 4749 and 4805 did not arrive.

Some of these rocks present problems in petrogenesis. To solve these problems more detailed collections will have to be made; such collecting should preferably be done by a petrologist in co-operation with the field geologists.

The presence of scapolite in some of the rocks is an obvious pointer to the operation of strong metasomatic processes. Scapolite and albite have also been formed in some of the rocks from Mt. Elliott mine, which have been examined from time to time.

The presence of clear albite oligoclase, and microcline, and of cloudy orthoclase in most of the carbonate-bearing rocks described below may simply be due directly to sedimentation, or to diagenesis, or, less likely, to the subjection of the rocks to metamorphism in the oligoclase zone, but, when these minerals appear in carbonate veinlets in virtually non-metamorphosed rocks the possibility that low-temperature alkali-metasomatism has been operative on a large scale must be considered. The formation of abundant scapolite is a pointer in the same direction, though the temperature may have been fairly high in the rock (No. 4922) in which this mineral is most coarse-grained and most abundant.

A detailed-petrogenetic study of systematically collected specimens would help in the solution of the problems indicated. Little can be concluded from the study of isolated specimens whose relationship, if any, to each other in the field is not known to the petrologist. It is not suggested that systematic collection has not been carried out by the field officers; attention is merely drawn to the fact that a set of more or less unrelated specimens has been dealt with. Perhaps the geologists in the field could look for evidence of possible metasomatism in favourable areas; this evidence may take the form of scapolite and/or alkali-felspar veins. Some of the latter have already been noted, on a small scale, in at least two of the rocks (Nos. 4801 and 4920).

Specimen No. 4708:

This is a breccia or agglomerate containing subangular to angular fragments of at least two different kinds of rocks; the size of these fragments ranges to more than an inch in the specimen at hand.

It is difficult to decide what some of the fragments were originally, as they are now heavily altered. Most of them are fine-grained intermediate or basic volcanic rocks; some of these are porphyritic, and have probable original ferromagnesian phenocrysts altered to chlorite or chlorite and carbonate. Other fragments are of fine-grained arkose. Grains of black iron ore are common in both rock-types, especially in the volcanic.

The matrix in which the rock fragments are set consists of dolomite, calcite, quartz, chlorite and/or bleached biotite, albite, and rare muscovite. Hematite staining, both in the matrix and in the fragments, is general, but of varying intensity. Rhombs of dolomite are of common occurrence. A few dolomite rhombs and grains of clear albite are to be seen well within some of the rock fragments also.

Specimen No. 4753:

This is a fine-grained, banded rock consisting largely of quartz and felspar. Its average grainsize is 0.02 to 0.03 m.m. Although a fairly thorough search was made, no potash felspar could be distinguished, so that as far as is known now, the only felspar present is oligoclase. The oligoclase is rarely twinned. No directional structure is developed in the quartz and oligoclase, the grains being subangular and equidimensional.

The only other minerals present are biotite, muscovite, black iron ore, and rare zircon. Biotite is mostly concentrated in layers from 0.5 to 1 m.m. thick, and the flakes show random orientation within the layers. Although at first sight this rock appears to be a metamorphosed sediment, the high content (about 40 per cent) of oligoclase is unusual in a rock of such fine grain.

More must be found out about its field setting and genesis before a name can be given. Considered as an isolated specimen, it is just possible that the rock is an ultra-mylonite, derived from a granite or acid gneiss, for example, and recrystallized, with obliteration of any parallel alignment of minerals, under conditions of thermal metamorphism. It may also be a sediment which has undergone soda-metasomatism. Perhaps the best petrographic name that can be given at present is quartz - oligoclase - biotite granulite.

Specimen No. 4754:

The principal minerals in this rock are sericite and quartz. What appears to be sedimentary banding on a fine scale is outlined by small clots of limonite granules. Granules of limonite are also scattered throughout the slide.

The rock is a low-grade sericite-quartz schist, probably derived from an argillaceous sediment.

Specimen No. 4757:

The general impression is that this rock was originally a dolerite. It now consists principally of oligoclase, dolomite, or siderite, or some carbonate other than calcite, black iron ore, limonite derived therefrom and chlorite. Antigorite and sericite are accessory.

The arrangement of the plagioclase crystals is similar to that found in dolerite. Whether the oligoclase is an original constituent of the rock, or whether a formerly existing plagioclase has been metasomatically changed to oligoclase, is not determinable. Some of the plagioclase appears to have been replaced by carbonate. Several vein-like concentrations of carbonate also occur in the slide; these contain oligoclase and a little quartz. Original ferromagnesian has been completely replaced by carbonate, chlorite and possibly iron oxides as well. The rock is a carbonated oligoclase dolerite.

Specimen No. 4756:

This is a slightly schistose, fine-grained rock in which the cleavage is parallel to the banding (probably bedding). Sericite and quartz form the main bulk of the rock, and in this respect there is a similarity with specimen No. 4754. Small porphyroblasts of biotite with random orientation are scattered through the rock. Thin bands consisting almost entirely of biotite occur at intervals of 1 to 5 m.m. The biotite in these bands also has a somewhat random orientation, but many of the flakes have their cleavage - directions at right angles to the banding. A little of the biotite is altered to chlorite, and, in some bands fairly extensive alteration to limonite has taken place, suggesting that/limonite /the in No. 4754 may have a similar derivation.

Allowing for the fact that this rock, apart from the biotite, is finer grained than specimen No. 4753, and also that it contains sericite, there is a similarity between the two rocks, especially insofar as it is difficult to state whether the sericite has been derived from felspar or from argillaceous material, though I favour the derivation from argillaceous material just now.

The rock is a sericite - quartz - biotite hornfels or schist.

Specimen No. 4759:

I can not see why this rock is compared to No. 4708; there must be some mistake. The rock is grey and rather uniform, and has a chocolate-brown weathered crust, probably residual after leaching of carbonate. This crust makes a very sharp junction with the fresh rock.

The rock is medium-grained, and about 50 per cent is made up of carbonate, which is largely, if not entirely, calcite. Quartz and chlorite are next in order of abundance, and black iron ore oligoclase, sericite, apatite, leucoxene, and hematite are accessories. The quartz is not evenly distributed, but occurs in irregular pockets of varying size. Oligoclase occurs sparingly in and near these pockets.

The origin of the whole rock is problematical. The carbonate and chlorite may even be replacements of minerals existing in a former igneous rock; the mode of distribution of the grains of black iron ore and of the quartz are suggestive of this possibility. Without further information, naming of the rock is unwarranted. On the assumption that it is of sedimentary origin, which is doubtful, it could be described as a quartz - bearing chloritic limestone.

Specimen No. 4922:

This specimen was formerly a medium-grained gabbro or a dolerite. All of the plagioclase has been replaced by scapolite, which makes up about 60 percent of the rock. The original pyroxene has been recrystallized on a fine scale, and part of it has been converted to pale green, slightly pleochroic tremolite. Numerous small subhedral to euhedral grains of sphene are closely associated with the ferromagnesians. Black iron ore, in small grains, is sparsely distributed through the rock.

The specimen is a scapolitized gabbro or dolerite.

Specimen No. 4920:

The only similarity, apart from a superficial one, between this rock and No. 4759 is that it contains abundant carbonate. No. 4708 also contains carbonate, but otherwise is quite different. Possibly some mistake in reference to numbers has been made in Mr. Searl's note accompanying the specimens.

The principal minerals present are carbonate(probably dolomite as well as calcite), bright green pyroxene (possibly hedenbergite or aegirine-augite), scapolite, and hematite-stained and kaolinized orthoclase. The orthoclase occurs as introduced streaks and pockets clearly visible in the hand-specimen. Accessory constituents are chlorite, oligoclase, black iron-ore, and rare limonite, epidote, and sphene. Scapolite occurs as both large and small grains, and pyroxene as abundant small grains.

The rock is a (?) hedenbergite - and scapolite - bearing (?) dolomitic marble.

Specimen No. 4801:

This is a fine-grained rock consisting of granular calcite, felspars and quartz set in a very fine-grained matrix which appears to consist largely of those minerals also. Felspars present are albite, orthoclase, and microcline, but as the albite and orthoclase are generally not twinned it would be a very time-consuming operation to determine the proportions of each of these minerals and of quartz. Thus it is difficult to name the rock correctly.

Veinlets less than 1 m.m. wide, and consisting of calcite, hematite-stained microcline, albite, and orthoclase traverse the rock; in one vein, very little calcite occurs. Hematite-staining is general, and black granules of hematite and/or magnetite are scattered throughout. Tourmaline and chlorite are rare accessories.

The occurrence of microcline, albite, and orthoclase in veins in a rock which is otherwise unmetamorphosed raises the query as to how much of the felspar owes its origin to alkali-metasomatism during diagensis or at some later stage.

Assuming that the rock can be taken at its face value it would be called a hematitic calcareous arkose siltstone. The question of metasomatism must be left in abeyance.

Specimen No. 4806:

One part of this rock is much richer in muscovite than is the portion that has been sectioned.

The rock is medium-grained, and consists of quartz, heavily kaolinized felspar, of which only a few fragments remain, bleached biotite, and minor muscovite; slight staining by limonite is general. It has the aspect of a sediment, but could, just conceivably, be an altered, fine-grained granitic rock, as suggested by the name "aplite" given by A.G.G.S.N.A. Field evidence will be the most important deciding factor.

Assuming a sedimentary origin, the name; altered arkose, would be applicable.

Specimen No. 4807:

Quartz and basic plagioclase are the most abundant minerals; ragged poekiloblastic porphyroblasts of hornblende, and fewer of garnet, are conspicuous. Black iron ore, hematite, and sericite in plagioclase are accessories. The plagioclase,

on the extinction angles obtainable from the few grains that are twinned, is found to be at least as basic as An_{65}, but the sign (negative) indicates a more basic composition. Time did not permit a more detailed determination, so the plagioclase is tentatively designated bytownite, but it could be anorthite.

Apart from the porphyroblasts, the rock has a medium-grained granoblastic texture. The quartz is generally of coarser grain than is the plagioclase; both appear to have been slightly granulated.

The rock is a quartz - bytownite - hornblende - garnet granulite, possibly derived from an impure limestone.

Specimen No. 8408:

This rock is a medium - to fine-grained quartz - oligoclase granulite with noticeable parallel orientation of the long axes of grains of the two principal minerals. It is impossible to state whether it has been derived from an acid igneous rock, or whether it owes its origin to soda-metasomatism.

Other minerals make up only about two per cent of the rock. By far the most abundant of these is black iron ore, probably ilmenite. Others are apatite, garnet, calcite, chlorite, biotite, sphene, leucoxene, and sericite.

Specimen No. 8409:

This rock consists of angular fragments up to nearly three inches across embedded in a matrix which has been partly dissolved away by weathering, thus causing the more resistant fragments to stand out in relief.

The rock fragments visible in thin section consist of a dolerite-like rock, but they may be porphyrite, as the felspar is oligoclase-andesine. Original biotite remains, probably in a recrystallized form, and some is converted to chlorite. Pockets of iron-bearing carbonate are common in the rock, and clear albite and microcline are associated with some of them. Limonite staining, probably resultant on the weathering of the carbonate, is general; a little black iron ore and hematite are also present.

The matrix consists largely of carbonate - probably dolomite with inclusions of a more ferriferous variety. Orthoclase, limonite, biotite, clear albite and microcline, chlorite, black iron ore, and apatite are enclosed in the carbonates. Most of these minerals are unevenly distributed. The orthoclase, particularly, occurs in irregular pockets up to about 2 m.m. across; the mineral is lightly stained with hematite and also slightly kaolinized.

In view of the facts that the rock fragments are of a hypabyssal type, and that the cement is carbonate, this rock is probably best described as a sedimentary breccia. Of course, only a few rock fragments have been studied in detail; volcanic rocks may also be present - in fact, the porphyrite could have formed in a thick flow - but if the rock is to be called an agglomerate the carbonate cement must be considered somewhat unusual; either the volcanic plug giving rise to the agglomerate was drilled through an extensive carbonate bed, or the original matrix has been replaced by carbonate.

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