are in contact they display excellent crystalloblastic, mosaic texture, clearly indicating metamorphic growth. The grain size of quartz is remarkably uniform, generally 0.1 to 0.3 mm in diameter, and rarely down to 10 microns. Out of all the thin sections studied, there are only one or two larger quartz fragments (about 0.5 to 1 mm long) and only a few oval polycrystalline aggregates (0.3 to 0.5 mm).

The remainder of the rock is mostly white micas (45 to 54 percent) and variable amounts of chlorite. The grain size of these minerals (generally less than 0.05 mm long) is so small that they cannot easily be distinguished, and they occur as ragged flakes. Rarely, larger (about 0.1 mm) crystals of chlorite and muscovite occur. Magnetite, as small, angular to rounded grains (0.1 to 0.01 mm in diameter), is the only other major component of the quartzite (as much as 5 percent). Additionally, trace amounts of hematite, epidote, and secondary goethite(?) occur.

Some samples of the unit are homogeneous and some are crudely banded, owing to nonuniform mineral content. Whether these bands reflect flow banding or a depositional feature is undetermined.

Conspicuous by their absence in the quartzite are feldspars (except in one sample) and any high-grade metamorphic minerals such as biotite, sillimanite, or garnet. The rock is clearly metamorphic, as indicated by the crystalloblastic texture of quartz; however, the rock was subjected only to low-grade metamorphism. As albite–epidote hornfels (or greenschist) facies metamorphism progresses, chlorite first increases in size and then converts to biotite. The fine grain size of chlorite, the presence of fine-grained white micas, and the nearly total absence of biotite imply that the metamorphism did not exceed the lower greenschist facies. It might be argued that chlorite has retrograded from original biotite, but no chlorite pseudomorphs after biotite occur.

The uppermost 25 cm of the Pratt Hill quartzite is darker than the rest of the unit. Two samples of this darker band were studied to determine its origin (ET–11, ET–12). One sample (ET–11) is unusually high in chlorite, but the other is chlorite-poor and has few dark minerals. Therefore, the dark color of the band remains unexplained.

The quartzite exposed near the "Hideaway" is brownish rather than grayish green. One sample of this rock (ETL–2) contains about 21 percent orthoclase, which is altered to clay minerals and rarely to white micas, and is clouded by hematite dust. Feldspar grains are generally smaller than quartz grains (0.2 mm to 10 microns) and occur mostly as single grains interstitial to quartz. Also interstitial are less abundant polycrystalline aggregates of feldspar (0.2 to 0.1 mm). Quartz grains are typical of those in the rest of the unit, in size and shape, except that they are commonly coated with hematite. The sample contains rare chlorite, muscovite, and biotite crystals as much as 0.2 mm long. The occurrence of biotite and feldspar, and the abnormally large grain size of chlorite, are anomalous in comparison with the rest of the unit. The origin of this rock is discussed below.

DISCUSSION

Data Interpretation

Partial alteration of feldspars to white micas and clay minerals demonstrates that the Carlton Rhyolite has been metamorphosed or hydrothermally altered, as discussed by Ham and others (1964). However, the abrupt changes in texture and mineral content suggest that the exposed contact on Pratt Hill also involves a lithologic change and not just a gradual increase in metamorphic grade.

Well-defined phenocrysts in the basal part of the Carlton Rhyolite do not occur below the contact, and thus the precursor of the Pratt Hill quartzite must have been aphanitic. Two obvious choices for this precursor are a fine-grained sedimentary rock or a volcanic tuff, perhaps an air-fall tuff. This latter possibility was mentioned briefly by Ham and others (1964). Air-fall tuff initially would have been glassy but would have devitrified to a fine-grained intergrowth of quartz and feldspar. Low-grade metamorphism could have converted the feldspar to white micas, producing the mineral assemblage of the quartzite. However, the presence of both phenocryst and matrix feldspar immediately above the contact, and absence of feldspar below the contact (except in sample ETL–2), argue against this interpretation. Moreover, the locally abundant chlorite in the quartzite also is inconsistent with this model, because Carlton rhyolite contains only trace amounts of chlorite and other ferromagnesian minerals (Ham and others, 1964). Presumably, tuffaceous equivalents of the Carlton Rhyolite would be similarly deficient in ferromagnesian minerals.

An alternative we prefer is that the quartzite was originally a sedimentary rock. Compositionally, it would have been a somewhat immature, fairly well-sorted clastic rock with a bimodal size distribution that included generally fine quartz sand (Wentworth scale) in a clay matrix. It might be argued that the rare occurrence of slightly larger fragments and oval polycrystalline aggregates of quartz is more consistent with a volcanic precursor for the quartzite. However, these features would not be unexpected in a clastic rock of the kind described. Lack of sedimentary structures in the quartzite, except possibly for relict cross-bedding, is not consistent with a clastic origin for the unit. However, the quartzite also does not preserve evidence of volcanic features such as flow banding, fiamme, and foliations which commonly occur in air-fall tuff.

Although the evidence is far from unequivocal, we prefer a sedimentary origin for the Pratt Hill quartzite. Slight discordance of the contacts with overlying and underlying units implies an erosional interval between their deposition.

Sample ETL–2 represents an anomaly, because biotite, orthoclase, and muscovite do not occur elsewhere in the quartzite. There are several ways to interpret this rock: (1) it could be a feldspar-rich sedimentary facies of the Pratt Hill quartzite; (2) it could represent normal quartzite that has been feld-