COEXISTING FELDSPARS FROM SOME CHARNOCKITE-LIKE ROCKS IN NEW JERSEY, U.S.A.

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Dominant lithologies of the New Jersey Precambrian Highlands include (1) a quartz two-pyroxene, plagioclase gneiss, and (2) a granite which contains pyroxene and/or hornblende. The feldspars studied are from a small area where these two rock types are interlayered and otherwise intimately associated.

Feldspars in the granite consist of two primary phases, perthitic microcline and plagioclase which is not antiperthitic. The amount of albite in the microcline, as determined by Orville's 1967 method, ranges from 19 to 28 mole percent, averaging Ab_{23}. Essentially no albite remains in solid solution within the microcline. Nearly all of the plagioclase from the granite has 23 to 27 mole percent anorthite. X-ray spectrographic analyses for potash show that the plagioclase contains from 2.4 to 6.7 mole percent orthoclase and averages $Or_{4.6}$.

In most thin sections of the gneiss, antiperthitic plagioclase is the only primary feldspar phase. Its composition ranges either between An_{33-37} or An_{41-47}. Microcline occurs primarily as laths or blebs in the plagioclase grains, the distribution being controlled by twin lamellae, inclusion of other minerals and grain boundaries. Almost all free microcline observed partially mantles antiperthitic plagioclase grains. The distribution of microcline within the grains is sporadic. *X*-ray spectrographic analyses of plagioclase separated from the gneiss show that the calculated orthoclase content is 3.9 to 7.0 mole percent. In contrast, when all of the feldspars from the gneiss are separated, rather than just the plagioclase, the orthoclase content ranges from 3.9 to 16.0 mole percent. These analyses are on gneisses in which the microcline is unquestionably related to the antiperthitic plagioclase.

X-ray diffraction methods indicate that the microcline from antiperthitic plagioclase is perthitic (although optically it is homogeneous) and ranges from 13 to 25 mole percent albite.

Although much more potash was available in the granite than in the gneiss, the plagioclase of the former is not antiperthitic as it is in the latter. Assuming similar PT histories for these two rocks, these and other data are interpreted as indicating a replacement origin for the antiperthite, with the granite as the source of the potash, rather than exsolution from a homogeneous plagioclase.

REGIONAL METAMORPHISM OF THE PALAEOZOIC STRATA-BOUND SULPHIDE ORE DEPOSITS OF NORWAY

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Strata-bound, pyritic, base metal sulphide deposits (Kieslagerstätten) of various sizes occur along most of the exposed length of the Paleozoic geosynclinal belt in Norway and adjacent parts of Sweden—a distance of about 1,500 kms.

The ores occur in basic greenstone, greenschist, amphibolite, phyllite, and mica schist. These rocks were involved in the Caledonian orogeny and subjected to varying degrees of regional dynamothermal metamorphism. The regional metamorphic facies varies from lower greenschist to almandine amphibolite.

The ores, which have been assigned variously to sulphide injection, hydrothermal replacement, and sedimentary-exhalative activity, appear to be genetically connected with the initial magmatism of the Caledonian orogeny in Ordovician time. It has long been recognized that they were in place at least before the culmination of that orogeny.

The metamorphic effects in the orebodies appear to correspond closely to those in their enclosing rocks, and systematic changes may be traced from rocks of one regional metamorphic facies to the next. Recrystallization of the ores during progressive regional metamorphism has resulted in changes in mineralogy, fabric, and grain size. Deformational effects vary from zero, through a brittle fracturing of the sulphides, to a thorough plastic "Durchbewegung" of the whole ore mass.

At higher grades of metamorphism, mobilization of certain mineral components may produce irregular pegmatitic-looking bodies of vein quartz and ore minerals either within the massive ores or in their immediate country rocks.

HEMIHEDRITE. A NEW MINERAL FROM ARIZONA

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Hemihedrite is a new species discovered at the Florence Lead–Silver Mine in Pinal County, Arizona. A second locality is the Pack Rat claim near Wickenburg, Maricopa County, Arizona.

Hemihedrite is named in allusion to its morphology. Crystals exhibit triclinic hemihedral symmetry with $\alpha = 120°1'$, $\beta = 91°40'$, $\gamma = 55°55'$, $a{:}b{:}c = .8345{:}1{:}.9360$. Four twin laws have been found. The refringence is $n_\alpha = 2.105$, $n_\beta = 2.32$, $n_\gamma = 2.65$; optically (−) with $2V_{calc.} = 85°$. Dispersion is strong and unsymmetric.

Crystals are orange to almost black and have a saffron yellow streak. The Mohs hardness is 3 and the specific gravity is 6.42 (meas.) and 6.32 (calc.).

Unit cell data are as follows: $P1$: $a = 9.497 \pm .001$ Å, $b = 11.443 \pm .002$ Å, $c = 10.841 \pm .002$ Å; $\alpha = 120°30'$, $\beta = 92°6'$, $\gamma = 55°50'$. The reduced cell is $a' = 9.954$ Å, $b' = 10.841$ Å, $c' = 9.497$ Å; $\alpha' = 92°6'$, $\beta' = 107°58'$, $\gamma' = 123°16'$. Transformation (morphology to reduced cell) is $1\bar{1}0/001/\bar{1}00$.

Chemical analyses by atomic absorption ion specific electrode and x-ray fluorescence suggest the composition $ZnPb_5(CrO_4)_3F_4O$ with $Z = 2$. The infrared spectrum indicates (CrO_4^{--}).

Hemihedrite forms in the oxide zone of lead-bearing veins. Associated minerals may include the following: cerussite, phoenicochroite, vauquelinite, willemite, and wulfenite.

A COMPUTER PROGRAM CONCERNED WITH STATISTICS OF ROCK FABRICS

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An ellipsoid whose axes represent the principal moments of inertia of a sheaf of non-directed axes (homopolar directions) passing through a common origin, can represent the distribution of a set of observed directions such as lineations, normals to foliation planes, c-axes in a quartzite, etc. The shortest ellipsoid axis X_1 is normal to the plane of an equatorial, or girdle-like concentration; the longest axis X_3 is the direction of maximum density of concentration. The length of the intermediate axis X_2 relative to X_1 and X_3 can of course be used to distinguish between the two kinds of concentration, axial and equatorial. The lengths of these three axes can be used to estimate statistical significances of the two kinds of concentration.

Dimroth and Bingham independently derived similar ellipsoids, but different statistical criteria for evaluation of confidence that can be placed upon (a) the directions, and (b) the magnitudes of these axes, used as a means for measuring concentration tendencies in the original data.

A FORTRAN IV program has been used to determine the ellipsoid and to attempt practical evaluations according to Dimroth's and to Bingham's criteria, using sets of observed data, and of the same data mixed with "noise" consisting of randomly directed lines whose distribution is uniform over the whole sphere (or hemisphere).