Experiments in the system magnetite-fluorapatite indicate a eutectic at a composition of approximately two-thirds by volume of magnetite and one-third apatite, which explains the common occurrence of rocks with this composition. Experiments indicate that eutectic mixtures of magnetite and apatite form immiscible liquids with silicate melts having the composition of the dioritic dike rocks commonly associated with oxide-apatite deposits. Mixtures of magnetite, diorite and apatite, containing apatite in excess of thirty percent form three immiscible liquids on melting, an apatite rich one, a magnetite-apatite melt and a silicate melt.

Analysis of coexisting magnetites and ilmenites from naturally occurring oxide-apatite rocks indicate temperatures of formation in the range of 850 to 1000 °C.

Oxide-apatite rocks are concluded to have formed as immiscible liquids that separated from magmas that underwent strong differentiation. It is postulated that high sodium contents in the silicate magmas play an important role in forming these immiscible liquids.

MELTING RELATIONS IN ALKALINE ROCKS

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Sixteen samples of analysed undersaturated alkaline rocks from Canada, Africa and Greenland have been examined petrographically and their liquidus temperatures determined at one atmosphere in air, at one atmosphere in an argon atmosphere and at water vapour pressures up to 1,000 Kg/cm^2. These samples are believed to be igneous in origin and consist of plutonic types (litchfieldites, nepheline syenites, melteigites, naujaites, ijolites, pulaskites and foyaites) and volcanic types (phonolites, melanonephelinites and nephelinites). In air at one atmosphere pressure, the liquidus temperatures range from 1125 °C for nepheline syenites to 1230 °C. for melanonephelinite. Under an argon atmosphere, the liquidus temperatures are similar but iron-bearing minerals remain in the same oxidation state as in the unheated rock. Water vapour pressure lowers the liquidus temperatures, in some cases by a few hundred degrees.

The dominant crystallization sequence for these rocks is nepheline, feldspar and pyroxene (excepting minor amounts of iron oxides which crystallize first); in most cases the crystallization sequence takes place over a relatively small temperature range, similar to the trends found for basalts (Yoder & Tilley, 1962). *X*-ray methods have been used to determine the changes in composition of some mineral pairs during cooling. For a number of rocks, tie lines between feldspar and nepheline have been determined in the SiO_2-$NaAlSiO_4$-$KAlSiO_4$ system and compare favourably with the slope of the tie-lines suggested by Tilley (1957) for rocks from volcanic and plutonic environments.

PETROGRAPHY AND DIAGENESIS OF RELICT EVAPORITE BEDS FROM THE PERMIAN RANGER CANYON AND MOWITCH FORMATIONS OF THE SOUTHERN CANADIAN ROCKY MOUNTAINS

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The Ranger Canyon and Mowitch Formations, of Upper Permian age, comprise a feature-forming "chert" varying in thickness from 20 feet to 150 feet, persisting from the United States border to the Northwest Territories, then probably to the Arctic Ocean.

The beds are composed of sandstones (with a considerable percentage of both detrital and matrix phosphate), sandy or silty carbonates and silty phosphatic cherts.

Evaporitic conditions appear to have been superimposed on these sediments during lithification resulting in a series of reactions between iron-rich dolomite, detrital silica, phosphate, penecontemporaneous cherty silica and celestine. Dessication features are commonly present such as contraction fracturing resulting in mosaic breccias and sand and celestine-filled Neptunean dykes. Sheet and fissure cracks, with quartz-phosphate

infill form spectacular black and white, "Zebra" cherts and breccias. Negative cube and ghost chevron structures are probably indicative of the former presence of fluorite or halite.

NICKEL DISTRIBUTION IN SERPENTINITES FROM PUDDY LAKE, ONTARIO

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Nickel in a serpentinite body at Puddy Lake is distributed in variable amounts in magnetite, sulphides, and silicates. Zones where nickel is concentrated in magnetite are notable for the near absence of sulphides. However in zones where the magnetite is nickel-poor the following sulphides were identified, namely chalcopyrite, pentlandite, sphalerite, siegenite, millerite and pyrite. Sulphur content of serpentinite is an important factor in nickel distribution at Puddy Lake, the petrogenetic implications are discussed.

THE ACCURACY OF QUANTITATIVE ELECTRONPROBE MICROANALYSES

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When the electron-microprobe is used for identifying minerals quantitative determinations of the constituent elements are desirable. If as usual pure elements or samples of widely differing composition are used as standards, a correction must be applied to the measured intensity ratio which only as a first approximation is equal to the concentration ratio. Thus the accuracy of the final results is dependent upon the individual accuracies of both measurement and correction.

The conditions under which the instrument is operated influence the precision of the measurements that can be reached. In the present work various factors have been investigated. The findings indicate what degree of accuracy can be achieved in normal laboratory practice.

The physical processes of electron and x-ray scattering that take place in the target are not readily amenable to exact mathematical treatment and the currently available formulae for correcting the effects of absorption, fluorescence and atomic number differences are approximations with a limited accuracy. For the present work the various correction methods discussed in the literature have been utilized. Mathematical complexity was no hindrance as an electronic computer could be used. Corrections were applied to minerals of a known composition. In the examples shown the concentrations derived from microprobe measurements are compared with wet chemical analyses and the results illustrate how much confidence can be placed in compositions obtained with a microanalyser.

FRANCOLITE FROM MICROSAUR TEETH, JOGGINS, NOVA SCOTIA

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Because the Joggins formation, exposed along several miles of sea coast on the Bay of Fundy, contains the earliest fauna of truly terrestrial vertebrates, the teeth of these animals are of special interest. Whereas most Carboniferous localities are swamp and pond deposits, the specimens at Joggins represent a terrestrial environment, and were collected from the bases of upright lycopod stumps, into which the animals had apparently fallen. The age of the deposit, determined by plant remains, is Westphalian B (Upper Carboniferous).

In connection with a comprehensive study of the Joggins vertebrates being made by Carroll, the fossil teeth are being studied by mineralogical methods and, so far as is known, these are the oldest teeth to be so analyzed.