

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.

Particularly detailed studies were made of teeth from the gymnarthrid microsauro (*Hylerpeton dawsoni*), and the material was found to be crystallochemically identical with francolite, a carbonate fluorapatite. It is believed that the original "mineral" portion of the teeth was dahllite, and that it became francolite during the long period since its original formation. Average fluorine content of the fossilized dentin was 3.1%.

THE CHEMISTRY OF SOME NEW BRUNSWICK PYRITES

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A selection of pyrites from a range of sulphide occurrences in New Brunswick was analysed for major and minor elements. The presence of copper, lead and zinc was shown to be the result of included sulphide impurities, the pyrite being associated with these sulphides in the majority of occurrences. Arsenic was also present in all analyses even though arsenopyrite was absent from some of the samples. The chemistry of the minor elements was essentially the same as that of analysed pyrites from other parts of the world. The analyses of these New Brunswick pyrites were corrected on the assumption that all of the copper, lead, zinc and arsenic was present as chalcopyrite, galena, sphalerite and arsenopyrite. The Fe:S ratios of the pyrites, extending from 1:1.85–2.07, with the majority of them occurring between 1:1.98–2.01, included with the analyses in Table 3, were calculated after these corrections had been made.

The cell dimensions of the pyrites were obtained by measurement from x -ray diffraction traces standardised against silicon. The results were statistically processed by a computer program. The majority of the values fall within the range 5.4172–5.4178 Å. Two extreme values of 5.4158 ± 0.0001 Å and 5.4203 ± 0.0001 Å occur. The lowest value, obtained for a pyrite separated from a Pennsylvanian sandstone, is thought to be the result of lattice disorder. The largest value was obtained from the sample containing the high cobalt and nickel values.

AN IRON-TITANIUM OXIDE MINERAL FROM HEARST, ONTARIO

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A black, submetallic, weakly magnetic mineral found as a minor accessory in a quartz-kaolinite sand-clay deposit north of Hearst, Ontario, yields an x -ray diffraction pattern virtually identical to that of a mineral variously named proarizonite (Bykov; *Doklady Akademii Nauk SSSR* **156**, 567–570 (1964)) and pseudorutile (Teufer & Temple; *Nature*, **211**, 179–181, July 9th, 1966). Chemical analysis of hand-picked fresh grains indicates an ideal composition $\text{Fe}_2\text{O}_3 \cdot 3\text{TiO}_2 \cdot 0.6\text{H}_2\text{O}$, in close agreement with Bykov's findings. The brilliant, subadamantine grains have specific gravity, as determined on a Berman balance, of 4.03 ± 0.02 . In polished section, fresh grains of the mineral appear to be composed of one phase (up to $1500 \times$ under oil immersion), though most of the grains show alteration on surfaces and cleavage or parting planes, apparently to rutile or leucoxene. The mineral is very faintly anisotropic. In transmitted light, the mineral is opaque, even on thin edges. Streak is olive-gray.

The bulk of the deposit is made up of quartz, with irregular zones of kaolinite. The quartz grains are sharp and angular to subangular, showing no evidence of abrasion, and even crystal faces are undamaged. Minor accessories such as muscovite, staurolite and tourmaline (in euhedral prisms) are also fresh and unabraded. In short, the deposit is almost certainly not detrital, and may be the result of alteration in situ of a pre-existing highly leucocratic igneous rock. The Fe-Ti-oxide mineral gives every indication of being not an alteration or weathering product, but rather the product of primary crystallization.