Cell parameter determinations indicate there is a wide range of values depending on composition ($a = 9.45–9.70$ Å, $b = 8.78–8.89$ Å, $c = 5.16–5.27$ Å, $\beta = 106.5–106.9°$) The feasibility of determining the approximate compositions of omphacites from a knowledge of their cell constants is discussed.

CLEAVELANDITE AND THE SIGNS OF THE OPTIC DIRECTIONS

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Type cleavelandite from Chesterfield, Massachusetts is a relatively-pure variety of albite characterized by its occurrence in granitic pegmatites (especially in hydrothermal units) in masses of *warped* or curved generally coarse (010) lamellae, some of which form albite twins. Crystal faces and cleavages [except (010)] are not commonly evident. Platy albite lacking these qualities should not be designated as cleavelandite. By assigning signs to the optic directions and using the values of the Köhler angles among these, one can differentiate readily between twinning types in the albites.

CRYSTAL CHEMISTRY AND GEOCHEMISTRY OF SCANDIUM

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A dominant theme in the geochemistry of scandium, originally stated by Goldschmidt and Peters in 1931, has been the supposed diadochy of Sc^3 with Fe^2 and Mg. It was based on the ionic radius, 0.83 Å, attributed to Sc^3. Recent refinements of the structures of Sc_2O_3, $Sc_2Si_2O_7$, $LaScO_3$ and other Sc compounds have shown, however, that the radius of Sc^3 in 6-coordination is much smaller averaging near 0.73 Å.

Studies by the authors of the crystal chemistry of synthetic Sc compounds indicate that the trace-element geochemistry of this element is based on a diadochic relation to Al, and in particular, to Fe^3. Our syntheses include the Sc analogue of beryl, $Be_3Sc_2Si_6O_{18}$, together with solid solutions involving substitution of Sc^3 by Fe^3, Cr^3, V^5, Mn^3 and Ga; the Sc analogues of andradite, $Ca_3Sc_2Si_3O_{12}$, aegirine, $NaScSi_2O_6$, and kentrolite, $Pb_2Sc_2Si_2O_9$, with serial substitution of Sc^3 by Fe^3; and the Sc analogues of spodumene, $LiScSi_2O_6$, and hydrogarnet, $Sr_3Sc_2(OH)_{12}$. Further instances of the experimental substitution of Sc^3 and Fe^3 are cited from the recent literature. Most Sc compounds are isostructural with compounds of Al and Fe^3, and there are no close crystallochemical relations to Fe^2 or Mg. The geochemical enrichment of Sc in ferromagnesian silicates such as garnet, micas, allanite, pyroxenes is now interpreted as connected not with (Fe^2, Mg) but with the 6-coordinated (Al, Fe^3) positions. Attention also is drawn to the enrichment of Sc in Al and Fe^5 minerals, including phosphates, formed in the groundwater circulation.

STANFIELDITE, A NEW PHOSPHATE MINERAL IN STONY–IRON METEORITES

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The formula for this mineral from the Estherville mesosiderite is $Mg_3Ca_4Fe_2(PO_4)_6$. Weissenberg photographs indicate monoclinic, symmetry with $a = 17.16$, $b = 10.00$, $c = 22.88$ Å, $\beta = 100.25°$. Probable space groups are Pc or P2/c. Associated minerals

are enstatite, and olivine, both of variable composition, bytownite, tridymite, whitlockite, ilmenite, chromite, schreibersite, kamacite, taenite and troilite. Although this assemblage indicates disequilibrium, the high Ca–low Na content of stanfieldite is reflected in the composition of the plagioclase.

Stanfieldite has been found in the following pallasites: Santa Rosalia, Albin, Finmarken, Imilac, Mt. Vernon and Newport. The mineral in the pallasites is practically Fe-free, with Mg substituting for most of the Fe in the above formula. The x-ray powder patterns are practically identical except for slightly smaller d spacings due to this substitution.

THE CRYSTAL STRUCTURE OF KERNITE $Na_2B_4O_6(OH)_2 \cdot 3H_2O$

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Kernite is monoclinic, space group $P2_1/c$ with cell dimensions $a = 7.0172$ ($\pm.0002$) Å, $b = 9.1582$ ($\pm.0002$), $c = 15.6774$ ($\pm.0005$) and $\beta = 108.861°$ ($\pm.002°$). The crystal structure has been solved using the symbolic addition method of Karle & Karle. The x-ray diffraction intensities were measured using a single-crystal diffractometer and CuKα radiation monochromatized with a balanced pair of nickel and cobalt filters. All atoms including hydrogen have been located. The final R-factor with anisotropic thermal motion is .043. The structure consists of infinite chains, two per unit cell, of the borate polyanion $[B_4O_6(OH)_2]_n^{-2n}$ parallel to the b-axis.

These chains are composed of six-membered rings containing one boron-oxygen triangle and two boron-oxygen tetrahedra. The rings are linked through commonly shared boron-oxygen tetrahedra. The linkage between chains in the c-axis direction is through hydrogen bonds involving half of the $(O\overline{H})$ groups. The remaining $(O\overline{H})$ groups are not involved in any apparent hydrogen bonding. The cross bonding in the a axis direction is through hydrated sodium ions. One sodium ion is coordinated by $4O^{-2}$, OH^- and H_2O in a distorted octahedral arrangement, while the other is unusual in having only five coordinating neighbours, $2O^{-2}$ and $3H_2O$. Kernite can be formed from borax, $(Na_2B_4O_6(OH)_2 \cdot 8H_2O)$ by dehydration in agreement with Christ's rules, but the process seems to require breaking some B—O bonds.

FLUID CONTENTS OF APATITES FROM THE OKA COMPLEX, QUEBEC, AND POSSIBLE GENETIC IMPLICATIONS

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Apatite is common in rocks of the Oka complex or related to it. It occurs as anhedral to prismatic to definitely acicular crystals. It often contains inclusions of calcite, and also fluid inclusions. The latter are highly variable in shape, e.g. from acicular to perfectly spherical; changes in shape and in abundance, connected with the nature of the host-rock, are observed. Fluid inclusions often exhibit the following features: (1) when of elongated shape, elongation is nearly always parallel to the c axis; (2) inclusions are often preferentially located in families of planes parallel to prismatic faces; and (3) not infrequently, inclusions are preferentially located in the inner part of the crystals. Such inclusions are regarded as being of primary origin. Crystalline phases are often present in the fluid inclusions.

Some apatite contains as much as 1.2% by weight of fluids, as shown by heating from room temperature to 1,000 °C. Among the gases released, the most abundant