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NEW MINERAL NAMES

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Ureyite

CLIFFORD FRONDEL AND CORNELIS KLEIN, JR., Ureyite, $NaCr_2Si_2O_6$, a new meteoritic pyroxene. *Science* **149,** 742–744 (1965).

An emerald-green mineral, found as an accessory constituent in the iron meteorites Coahuila, Toluca, and Hex River Mountains, has been found to be the chromium analogue of jadeite. Electron probe analyses of these 3 gave, resp., SiO_2 55.5, 56.0, not detd.; Al_2O_3 none, none, not detd.; Fe_2O_3 0.2, 0.4, ~0.9; Cr_2O_3 30.6, 22.6, ~26.4; MgO 0.8, 5.4, ~1.2; CaO 1.7, 3.7, ~2.1; Na_2O 11.6, 11.6, ~11.0; sum 100.4, 99.7, —%, corresponding to $Na(Cr, Fe, Mg)_2 Si_2O_6$. The mineral was also synthesized by fusion.

Indexed *x*-ray powder data are given for natural ureyite and synthetic $NaCrSi_2O_6$; the former has strongest lines 2.961 (10) $(22\bar{1})$, 2.877 (7) (310), 2.181 (7) (112), 4.381 (6) (020), 2.517 (6) (002), 2.455 (6) (221), 6.316 (5) (110). Monoclinic, *C* 2/*c*, *a* 9.560±0.016, *b* 8.746 ±0.008, *c* 5.270±0.006 Å, β 107.38±0.10°, G 3.60 (calc. for pure $NaCr_2Si_2O_6$).

Optically biaxial, (−), 2V 60–70° (Toluca), (Toluca) α 1.740, β 1.756, γ 1.762 (all ±0.001), $X \wedge c = 22°$; (Coahuila) α 1.748, β 1.756, γ 1.765 (all ±0.001), $X \wedge c = 14°$. Cleavage (110) well-defined at an angle of 87°23′, parting on (001) pronounced.

Ureyite occurs in Coahuila and Hex River Mountains meteorites as polycrystalline aggregates in daubreelite and in Toluca embedded in cliftonite rims of troilite nodules.

The material resembles the mineral kosmochlor, found by Laspeyres in 1897 in the Toluca meteorite, whose analysis (on 3.3 mg) indicated a chromium silicate with some Al, Mg, and Ca.

The name, for Nobel Laureate Harold Clayton Urey, was approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Merrihueite

ROBERT T. DODD, JR., W. RANDALL VAN SCHMUS AND URSULA B. MARVIN, Merrihueite, a new alkali-ferromagnesian silicate from the Mezö-Madaras chondrite. *Science* **149** (3687), 972–974 (1965).

The mineral occurs as rare inclusions up to 150 microns in diameter in twinned clinoenstatite and clinobronzite (En 80–95) in the Mezö-Madaras chondritic meteorite. It is usually separated from the pyroxene by narrow selvages of olivine (Fo 10–30). Analysis by electron probe of 5 grains within a single chondrule gave SiO_2 61.8, Al_2O_3 0.3, FeO (total Fe) 23.7, MgO 4.4, MnO 0.5, CaO 0.3, K_2O 3.8, Na_2O 2.0, sum 96.7%, corresponding to

$$(K_{0.94}Na_{0.76}Ca_{0.06})_{1.76}(Fe_{3.85}Mg_{1.27}Mn_{0.08}Al_{0.04})_{5.24}Si_{12}O_{30.11}$$

or

$$(K, Na)_2(Fe, Mg)_5Si_{12}O_{30}.$$

Partial analyses of grains from several chondrules showed variation of Fe from 10.5 to 24.8%.

X-ray study showed the mineral to be hexagonal, isostructural with osumilite, with *a* 10.16±0.06, *c* 14.32±0.06 Å, G calc. 2.87. Indexed *x*-ray powder data are given; the strongest lines are 3.73 (100) $(20\bar{2}2)$, 2.774 (100) $(20\bar{2}4)$, 3.23 (90) $(12\bar{3}1)$, 7.13 (80) (0002), 2.92 (60) $(11\bar{2}4, 30\bar{3}0)$, 2.530 (50) $(42\bar{2}0)$.

Merrihueite is greenish-blue, pleochroic from colorless to greenish-blue. Optically uniaxial, or biaxial with 2V 5–10°. *n*s variable with Fe content, ranging from 1.559 to 1.592;

interference colors anomalous blues to purples in normal thin sections, suggesting low to moderate birefringence.

The name is for the late Craig M. Merrihue of the Smithsonian Astrophysical Observatory. Pronounced mĕŕ-ĭ-hū-īt. The name is restricted to members of the osumilite group with $K > (Na+Ca)$, $(Fe+Mn) > Mg$, and $Al/(Al+Si)$ less than 0.2. The name was approved prior to publication by the Commission on New Minerals and Mineral Names, IMA.

Borcarite

N. N. Pertzev, I. V. Ostravskaya and I. B. Nikitina, The new mineral borcarite. *Zapiski Vses. Mineralog. Obshch.* **94,** 180–186 (1965) (in Russian).

Analyses by I.B.N. of 2 samples gave B_2O_3 24.70, 24.83; CO_2 15.80, 15.49; CaO 41.32, 41.30; MgO 7.46, 7.34; FeO 0.48, 0.44; Fe_2O_3 0.05, none; Al_2O_3 0.21, 0.31; H_2O^+ 10.10, 10.31; H_2O^- 0.15, none; SiO_2 trace, none; Cl none, sum 100.27, 100.02%. Spectrographic analysis by A. S. Dudykina also showed thousandths of a per cent of Mn, Al, Ti, Sr, and ten thousandths of a per cent of Cu. The Al was deduced as spinel, giving the formula $4CaO \cdot MgO \cdot 2B_2O_3 \cdot 2CO_2 \cdot 3H_2O$, or $Ca_4MgH_6(BO_3)_4(CO_3)_2$, or $Ca_4Mg(HBO_3)_4(HCO_3)_2$. The mineral is not soluble in water, easily soluble in acids, even acetic, effervesces in HCl. DTA shows a strong endothermal effect at 470–550° (10% loss in weight $= H_2O$), an endothermal effect at 690–750° (15.8% loss in weight $= CO_2$), and small endothermal effects at 650–680° (admixed szaibelyite) and at 780–830°. The mineral melts at 1020°.

Laue and oscillation diagrams on cleavage fragments showed borcarite to be monoclinic, a 17.52 ± 0.04, b 8.40 ± 0.02, c 4.46 ± 0.02 Å, β $92°30' \pm 30'$, $a:b:c = 2.86:1.0:0.532$. No piezo-effect was found, so the symmetry class is $2/m$. Indexed x-ray powder data are given (57 lines); the strongest are 7.57 (10) (110); 2.67 (10) (321, 230, $\bar{5}11$); 1.886 (10) (440, $\bar{1}41$); 2.91 (9) (600, $\bar{2}21$); 2.27 (9) (231, 521); 2.21 (9) ($\bar{3}31$); 1.610 (9) (350); 3.22 (8) (510, 600β); 2.73 (8) ($\bar{3}21$), 2.39 (8) (601, 620, $\bar{6}11$, 710); 2.09 (8) (040, 440β); 1.812 (8) ($\bar{3}41$), 1.699 (8) (640); 1.196 (8); 1.902 (7) (721, 222); 1.103 (7); 1.091 (7). Cleavages perfect on (100) and (110) and in several directions (hkl) and (h0l) with angle β 50–70°. The cleavage plane (100) is always smooth; the cleavage plane (110) is very often striated parallel to c.

Borcarite is greenish-blue to bluish-green, sometimes nearly colorless. Luster vitreous to slightly pearly or cleavages. Colorless in section. Hardness 4, G 2.77 ± 0.01 (measured), 2.765 calc. Optically biaxial, (−); *ns* for analyzed material α 1.590, β 1.651, γ 1.657 (all ± 0.002), for more deeply colored material 1.594, 1.653, 1.660 (all ± 0.002), 2V $30 \pm 2°$. Orientation, $Z = b$, $Y \wedge c = 28 \pm 4°$, $r < v$ noticeable.

The infrared absorption spectrum shows (OH) bands, as at 3280 cm^{-1}, but no bands for molecular water. Other absorption bands indicate the presence of the $(BO_3)^{3-}$ group.

The mineral occurs in kotoite marbles in Siberia, formed in dolomites near the contact with granodiorite. The mineral forms dense masses up to 0.5 m in diameter and as veins in kotoite marble and in ludwigite-szaibelyite-magnetite rock. It contains inclusions of szaibelyite, calcite, serpentine, magnetite and spinel.

The name is for the composition.

Tundrite

E. I. Semenov, Mineralogy of the rare earths. *Izdatelstvo Akad. Nauk SSSR, Moscow,* 1963, 209–210 (in Russian).

The name tundrite (for the Lovozero tundra) is given to material previously referred to as titanorhabdophane. The analysis given has been quoted as (c) in *Am. Mineral.* **47,** 419 (1962); the composition is given as $Ce_2Ti(Si, P)(O, OH)_7 \cdot 4H_2O$. New data given: Spectrographic analysis shows the presence of Sr, Zn, Zr. The rare earths have the composition La_{21} Ce_{53} $Pr_{6.2}$ Nd_{18} $Sm_{1.1}$ $Eu_{0.1}$ $Gd_{0.3}$. X-ray study by V. V. Ilokhin shows the mineral to be triclinic (misprinted as trigonal), space group C_1^1-$P1$, *a* 4.94, *b* 7.57, *c* 14.05 Å, α 105°20′, β 102°45′, γ 70°48′. Z=2. The *x*-ray powder diagram shows 11 lines: 3.06 (8), 2.78 (10), 2.72 (10), 2.50 (3), 2.37 (3), 2.02 (3), 1.927 (3), 1.881 (2), 1.794 (3), 1.709 (3), 1.602 (3).

A DTA curve shows a small endothermal break at 820°. The heated material gives a cubic pattern of the CeO_2 type. The mineral forms fine acicular crystals up to 5 mm long and spherulites of diameter up to 15 mm. Color brownish-yellow to greenish-yellow, luster vitreous. Brittle, H about 3. G 3.70. Optically biaxial, (+), *ns* α 1.743, β 1.80, γ 1.88, $Z \wedge c = 14°$. Pleochroic from pale yellow on X to greenish yellow on Z.

Tundrite occurs in 3 nepheline syenite pegmatites of Mt. Nepkha, Lovozero tundra, Kola Peninsula, associated with aegirine, lamprophyllite and ramsayite. It alters to rhabdophane.

Discussion.—Further work is needed.

Antarcticite

Tetsuya Torii and Joyo Ossaka, Antarcticite, a new mineral, calcium chloride hexahydrate, discovered in Antarctica. *Science* **149** (3687), 975–977 (1965).

The mineral was found in acicular aggregates up to 10 cm long, crystallizing from the brine of Don Juan Pond, Victoria Land, Antarctica. Three analyses of the pond waters show that it is a concentrated solution of $CaCl_2$ with minor Na, K and Mg and sp. gr. up to 1.38. Analysis of antarcticite gave Ca 17.5, Mg 0.41, Na 0.34, K 0.008, Cl 32.7, H_2O 49.2, sum 100.1%, corresponding to $CaCl_2 \cdot 6.25\ H_2O$. The presence of Sr was found spectroscopically.

X-ray study showed the mineral to be hexagonal, *a* 7.89, *c* 3.95 Å. The strongest lines of the *x*-ray pattern are 3.44 (24) (011), 2.80 (23) (111), 2.16 (23) (121), 2.60 (22) (021), 3.98 (18) (110), 2.28 (13) (300). Except for some differences in intensities, these agree well with the ASTM data for synthetic $CaCl_2 \cdot 6H_2O$.

The mineral is optically uniaxial, (−), ω 1.550, ϵ 1.495.

The name is for the continent in which it was discovered, surely one of the few places where this highly hygroscopic salt could persist. The name was approved prior to publication by the Commission on New Minerals and Mineral Names, IMA.

Tinaksite

Yu. G. Rogov, V. P. Rogova, A. A. Voronkou and V. A. Moleva, Tinaksite, $NaK_2Ca_2TiSi_7O_{19}(OH)$, a new mineral. *Doklady Akad. Nauk SSSR*, **162,** 658–661 (1965) (in Russian).

Analyses by V. A. Moleva and K. P. Glebova gave, respectively; SiO_2 55.82, 55.96; TiO_2 10.12, 10.36; Al_2O_3 tr., tr.; Fe_2O_3 0.91, 1.59; FeO 0.92, not detd.; MnO 0.40, 0.52, MgO 0.04, not detd.; CaO 14.20, 14.06; Na_2O 4.30, 4.36; K_2O 12.55, 12.85; H_2O^- 0.08; 0.20; H_2O^+ 1.20, 1.00; Cl none, not detd.; F none, not detd.; sum 100.54, 100.86%, corresponding to

$NaK_2(Ca, Fe^{2+})_2\ (Ti, Fe^{3+})_2\ Si_7\ O_{19}\ (OH)$. The mineral is insoluble in acids.

Laue and oscillation photographs showed the mineral to be triclinic, space group $P1$ or $P\bar{1}$ (test for piezo-electricity negative), *a* 10.35±0.04, *b* 12.17±0.05, *c* 7.05±0.03 Å, α 91°00′±30′, β 99°20′±30′, γ 92°30′±30′, Z=2. Unindexed powder data are given (39 lines); the strongest lines are 3.03 (100), 3.25 (80), 2.331 (56), 3.09 (52), 2.952 (52), 2.865 (52), 2.674 (44), 2.002 (44), 2.551 (40).

Tinaksite occurs in well-bounded prismatic crystals from tenths of a mm to several cm, often grouped in radiating fibrous aggregates and rosettes up to 3–5 cm in diameter.

Color pale yellow. Hardness 646–762 kg/sq mm = 6. G 2.82 measured, 2.85 calc. from *x*-ray data. Cleavages {010} perfect, {110} imperfect, angle between cleavage planes 131.5°. Luster on cleavage planes vitreous. Optically biaxial, (+), *ns* α 1.593, β 1.621, γ 1.666, 2V 74–78°, dispersion strong, pleochroic with Z pale orange-yellow, X and Y colorless. Orientation $X' \wedge (010) = 1\text{–}4°$, $Y' \wedge (010) = 16\text{–}18°$.

The mineral occurs as an accessory in K-feldspar metasomatites in the border part of the Murunsk massif, northwestern Aldan; at the contact of the massif with limestones. The metasomatites consist of K-feldspar, aegirine, quartz, canasite and xonotlite.

The name is for the composition.

DISCUSSION.—The composition (except for Ti) and mode of occurrence are similar to those of miserite from Arkansas, but the minerals are distinct.

Cerphosphorhuttonite

A. S. PAVLENKO, L. P. ORLOVA AND M. V. AKHMANOVA, Cerphosphorhuttonite, a mineral of the monazite group. *Trudy Mineralog. Muzeya Akad. Nauk SSSR*, **16**, 166–174 (1965) (in Russian).

Analysis of the mineral gave ThO_2 40.56, Ce_2O_3 11.85, La_2O_3 4.51, Pr_2O_3 1.47, Nd_2O_3 5.64, Sm_2O_3 1.19, CaO 0.67, U_3O_8 1.63, PbO 0.34, Fe_2O_3 3.35, $(Nb, Ta)_2O_5$ 0.11, SiO_2 10.05, P_2O_5 10.00, CO_2 1.59, F 0.67, H_2O^+ 4.43, H_2O^- 2.03, sum 100.09 $(-0=F_2\ 0.28) = 99.81\%$. The rare earths were determined by *x*-ray spectroscopy by N. V. Turanskaya. After deducting parisite (calculated from Ca), this gives the formula

$$[Th_{0.51}(Ce, La, Nd)_{0.41}U_{0.02}Fe_{0.14}]_{1.08}(Si_{0.55}P_{0.46})_{1.01}(O_{3.34}(OH)_{0.63}F_{0.03})_4(OH),$$

almost exactly midway between huttonite and monazite. The role of the water is in doubt; the infrared spectrum shows bands of water in the regions 1550–1650 and 2800–3700 cm^{-1} which disappear after the mineral is heated. Bands of (OH) are not present. The water is therefore probably trapped in the metamict mineral and the formula can be simplified as

$$[Th_{0.48}(Ce, La, Nd)_{0.39}U_{0.02}Fe_{0.13}]_{1.02}(Si_{0.53}P_{0.44}C_{0.01})_{0.98}O_{3.98}(OH)_{0.02} \cdot 1.5H_2O$$

or $ThCeSiPO_8/3H_2O$.

X-ray powder data are given (23 lines); the strongest lines are 3.09 (10), 2.86 (8), 3.28 (6), 1.75 (6), 4.69 (5), 3.52 (5), nearly all identical with those of monazite and huttonite.

The mineral occurs as individual, well-formed crystals up to 2 cm in size. Color pale yellow to reddish-brown, luster resinous to dull, H not above 5, G 5.06 (micropycnometer). Under the microscope partly isotropic with *n* 1.820–1.823, partly anisotropic with α 1.821, γ 1.825, positive, 2V 20–21°, dispersion $r < v$ slight. The mineral is partly replaced by parisite (identified by optics and *x*-ray).

The mineral occurs in amazonite pegmatite, southeastern Siberia, associated with columbite, fergusonite and zircon.

DISCUSSION.—There has been no discussion of the problem of naming a double substitution series such as this one: $ThSiO_4 \rightarrow CePO_4$. For ease in indexing it might be called cerian phosphatian huttonite.

Hydrochlorborite

CHIEN TZU-CHIANG AND CHEN SHU-CHEN, Brief note on preliminary results of study of a new borate mineral—hydrochlorborite: $(Ca_4B_8O_{15}Cl_2 \cdot 22H_2O)$. *Scientica Sinica* **14,** 945–946 (1965) (in Russian).

Analysis by Chang Chang-Mei gave CaO 23.31, MgO none, Na_2O trace, K_2O none, B_2O_3 29.50, Cl 7.62, SO_4 trace, H_2O 41.91, insol. trace, sum $102.34 - (0=Cl_2) = 100.62\%$. This corresponds to $CaO:B_2O_3:Cl:H_2O = 1.94:1.97:1:10.84$, $Ca_4B_8O_{15}Cl_2 \cdot 22H_2O$. The mineral loses 31.60% H_2O at 58–165° and 10.05% from 158 to 765° C. DTA curves (not given) are stated to show endothermal effects at 183°, 293°, 363° and 959° C., and an exothermic effect at 513° C. Not dissolved by cold water, readily soluble in hot water and by cold acids.

The mineral is colorless, transparent, with vitreous luster. G 1.83, H 2.5. Optically biaxial, (+), *ns* (Na) α 1.5008, β 1.5036, γ 1.5199, all ± 0.001, 2V measured 45°48. The mineral is in dense masses; "the development of crystal forms is poor." Symmetry not given. Unindexed *x*-ray powder data are given (37 lines); the strongest lines are 8.40 (10), 5.98 (9), 2.605 (8), 2.445 (8), 3.57 (6), 3.365 (6), 6.53 (5).

The mineral occurs in Tertiary sediments, China, associated with ulexite, halite and gypsum in crusts overlying boron-containing clays.

The name is for the composition.

Discussion.—The composition is similar to that of hilgardite and parahilgardite, but they contain much less water.

Hydrougrandite

Tsao Yung Lung, Hydrougrandite, a new variety of hydrogarnet from Hsiaosungshan. *Acta Geol. Sinica* **44,** 219 (1964); from an abstract in *Bull. Soc. Franc. Mineral. Crist.* **88,** 359 (1965).

Analysis gave SiO_2 34.01, TiO_2 0.12, Al_2O_3 8.45, Cr_2O_3 0.20, Fe_2O_3 18.28, FeO 1.72, MgO 9.96, MnO 0.12, CaO 21.47, K_2O 0.10, Na_2O 0.30, H_2O^+ 5.29, H_2O^- 0.18, P_2O_5 0.17, Cl 0.06, sum 100.43%, corresponding to

$$(Ca_{1.93}Mg_{1.24} \cdots)_{3.37}(Fe_{1.15}Al_{0.83} \cdots)_{2.00}(SiO_4)_{2.26}(OH)_{2.96}.$$

Cubic, with *a* 12.063±0.005A. The strongest lines of the *x*-ray pattern are 2.705 (10), 1.614 (10), 3.02 (8), 2.48 (7), 1.677 (6), 1.967 (5). Color green, luster vitreous. H greater than 5, G 3.45. Isotropic, *n* 1.825–1.830. DTA shows an endothermic break at 705°, 2 exothermal breaks at 440° and 900°. Occurs in peridotites with olivine, augite and plagioclase.

Discussion.—A member of the hydrogrossular group.

Hoshiite

Yue Chu-Siang, Fuo Kuo-Fun and S. Chen-Ea, Hoshiite, a new mineral. *Acta Geol. Sinica* **44,** 213 (1964), from an abstract in *Bull. Soc. Franc. Mineral. Crist.* **88,** 358–359 (1965).

The name hoshiite (origin not stated) is given to a nickeloan magnesite. Five analyses are given; one of these gave NiO 29.64, CoO 0.08, MgO 21.64, CuO 0.23, MnO 0.03, CaO 1.79, CO_2 40.69, SiO_2 1.20, H_2O^+ 2.48, H_2O^- 0.90, Al_2O_3 0.09, Fe_2O_3 0.66, Na_2O 0.20, P_2O_5 0.01, sum 99.64%, corresponding to $(Mg_{0.58}Ni_{0.43}Ca_{0.03})(CO_3)_{1.00} \cdot 0.15H_2O$. Hexagonal, with *a* 4.637, *c* 5.004Å., both ±0.001 Å. The strongest *x*-ray lines are 2.7393 (10), 2.1033 (9), 1.6979 (8), 1.6847 (7), 1.4849 (5). Color emerald-green, streak pale green, luster vitreous. For material with NiO 13.55%, G 3.15, ω 1.711, ϵ 1.519; with NiO 29.31%, G 3.36, ω 1.728, ϵ 1.534. Occurs in uniform masses in veins of huntite, with garnierite, aragonite and zaratite in the oxidation zone of a Cu-Ni sulfide deposit east of the Yellow River, China.

Discussion. Should not have been named, but the name may be used if a mineral with Ni>Mg is found.

Strontiumthomsonite

A. F. Efimov, S. M. Kravchenko and E. V. Vlasova, Mineralogy of alkalic pegmatites of the Inagli massif. *Trudy Inst. Mineral. Geokhim i Kristallokhim Redk. Elementov* **16,** 141–179 (1963) (in Russian).

Analysis by Z. T. Kataeva gave SiO_2 44.05, Al_2O_3 26.38, Fe_2O_3 0.22, MnO 0.06, MgO 3.05, CaO 4.45, SrO 5.76, BaO 0.16, Na_2O 5.86, K_2O 0.56, H_2O 9.65, sum 100.20%, corresponding to $(Na_{1.51}K_{0.09})(Ca_{0.63}Sr_{0.44}Ba_{0.01})(Al_{4.14}Fe_{.02}Mg_{0.60}Mn_{.01})Si_{5.86}O_{20.46}\cdot 4.28H_2O$. Rose-colored, H 5, G 2.43, optically biaxial (+) with *ns* α 1.525, β 1.530, 2V 60°. *X*-ray powder data and a DTA curve are given.

It is stated that other samples contain up to 8.8% SrO.

Discussion.—In the analyzed sample, Ca>Sr, and this is a magnesian strontian thomsonite.

Rhombomagnojacobsite

Fan De Lian, A new mineral, rhombomagnojacobsite. *Acta Geol. Sinica* **44,** 343 (1964), from an abstract in *Bull. Soc. Franc. Mineral. Crist.* **88,** 361–362 (1965).

Analysis gave MnO 54.25, MgO 7.65, CaO 1.08, Fe_2O_3 33.52, Al_2O_3 1.59, SiO_2 2.46, sum 100.55%, corresponding, after deducting impurities, to the formula $Mn^{2+}{}_{0.59}Mg_{0.42})(Mn^{3+}{}_{1.07}Fe_{0.93})O_4$. Orthorhomobic, *a* 8.288±0.024, *b* 8.458±0.020, *c* 8.789±0.039 kX. The strongest *x*-ray lines are 2.539(10), 2.495(10), 2.980(8), 1.494(8), 1.626(6), close to those of jacobsite. Black with semi-metallic luster; in reflected light gray with yellow-brown reflections. Polysynthetic twins. Reflecting power, 16.8–20.6% (green), 14.3–20.4% (orange), 13.2–17.2% (red). H 708 kg/mm² (Mohs 6). G 4.432.

Discussion.—A badly chosen and confusing name, even if correct, for an orthorhombic analogue of magnesian hausmannite (not jacobsite). Further study of the symmetry and of the chemistry, including direct determination of active oxygen, is essential.

Thoro-aeschynite, Alumo-aeschynite

E. M. Es'kova, A. G. Zhabin and G. N. Mukhitdinov, Mineralogy and geochemistry of the rare elements of Vishnevye Gor. *Inst. Mineral., Geokhim., Kristallokhim. Redk. Elementov* 1964, 319 pp., esp. p. 150–159 (in Russian).

This monograph describes the famous alkalic complex at Vishnevye Mt., Urals. Analysis by Z. N. Burova of the material called thoroaeschynite gave CaO 2.73, FeO none, MnO none, MgO 0.10, rare earth oxides 15.94, U_3O_8 0.95, ThO_2 29.56, TiO_2 29.55, Nb_2O_5 16.15, Ta_2O_5 0.55, Al_2O_3 0.60, Fe_2O_3 1.50, SiO_2 0.29, H_2O^+ 2.28, H_2O^- none, F 0.20, sum $100.40-(0=F_2)\ 0.08=100.32\%$. *X*-ray spectrographic analysis by R. L. Barinskii gave for the rare earths ($\Sigma RE_2O_3=100$) La_2O_3 10, Ce_2O_3 33, Pr_2O_3 6.1, Nd_2O_3 18, Sm_2O_3 4, Eu_2O_3 0.5, Gd_2O_3 3, Tb_2O_3 0.5, Dy_2O_3 2.6, Ho_2O_3 0.5, Er_2O_3 1.8, Tm_2O_3 0.3, Yb_2O_3 1.4, Lu_2O_3 0.2, Y_2O_3 (by difference) 8–10%, sum 89.9–91.9% (?? M.F.). DTA study showed a sharp exothermic peak at 790° (recrystallization ?).

The mineral is metamict, but after being heated at 1100° gives an *x*-ray pattern (not given), "permitting it to be identified with the standard pattern of aeschynite." G 5.25. H 714 kg/mm² = 5.7 (Mohs). *n* 2.16.

The mineral occurs in irregular reddish-brown grains 10×20×3 mm. Fracture nonchoidal, luster resinous. It was found in microcline veinlets in the contact zone of biotite syenites and gneisses.

Discussion.—Recalculation gives

$$(Ca_{0.18}RE_{0.71}Th_{0.40}U_{0.01})_{1.30}(Ti_{1.33}Nb_{0.44}Ta_{0.01}Al_{0.04}Fe_{0.07})_{1.89}(O, OH, F)_6,$$

so this is a thorian aeschynite. The content of thorium is considerably higher than in any previous analysis.

Analysis of carefully selected alumo-aeschynite by M. E. Kazakova gave CaO 7.15, MnO 0.36, rare earth oxides 18.89, ThO_2 1.83, TiO_2 10.76, Nb_2O_5 45.48, ZrO_2 none, Al_2O_3 7.37, Fe_2O_3 7.68, H_2O^+ 0.89, H_2O^- 0.07, total 100.48%. The DTA curve shows an exothermic peak at 720°. It occurs with titanian columbite in quartz veinlets in fenitized rocks as irregular grains up to 0.5×1 cm in size. The unit cell has *a* 5.352, *b* 11.01, *c* 7.051 Å, close to data for other aeschynites.

Discussion.—Unnecessary name for aluminian aeschynite. The ratio Nb/Ti is 2.5, whereas it is less than 1 in nearly all aeschynites.

Ferrolizardite

Ping-Wen Chia and Che Cheng, Ferrolizardite—a new variety of the serpentine mineral group. *Ti Chih Hseuh Pao* **44,** 86–98 (1964) (Chinese with Russian summary).

Analysis gave SiO_2 40.37, TiO_2 0.02, Al_2O_3 0.32, Fe_2O_3 7.99, FeO 6.22, MgO 31.33, CaO 0.73, MnO 0.15, K_2O 0.34, Na_2O 0.15, P_2O_5 0.03, H_2O^+ 12.70, sum 100.35 (given as 100.42%), corresponding to $(Mg_{4.6}\,Fe^{2+}{}_{0.5})Fe^{3+}{}_{0.6}Si_4O_{10}(OH)_8$. *X*-ray study by the rotation method gave *a* 5.35, *b* 9.2, *c* 7.3 Å, β 90°. Indexed *x*-ray powder data are given; the strongest lines are 7.300 (10)(002), 3.650 (10)(004), 2.503 (9)(202), 1.534 (6)(060), 1.506 (6)(208).

The mineral is dark green. H 2, G 2.653. Uniaxial, (−), α 1.568, $\beta=\gamma$ 1.586. Cleavage on (001) perfect, parting on (010). The DTA curve shows two small endothermal breaks at 570° and 760° and a large exothermal break at 819°. The mineral occurs near Peiping as pseudomorphs after pyroxene in intensely hydrothermally altered pyroxenite.

Discussion.—An unnecessary name for ferroan lizardite.

Jouravskite

C. Gaudefroy and F. Permingeat, La jouravskite, une nouvelle espèce minérale. *Soc. Franç. Minéral. Crist., Bull.* **88,** 254–262 (1965).

Jouravskite, a basic hydrous calcium-manganese sulfate-carbonate (or calcium sulfate-carbonate-manganite), was discovered on the dumps of the Tachgagalt No. 2 vein (Anti-Atlas, Morocco), from which the new minerals gaudefroyite and marokite have recently been described (*Am. Mineral.* **49,** 817; **50,** 806–807). It is hexagonal, $P6_3$ or $P6_3/m$, with $a=11.06\pm0.03$, $c=10.50\pm0.03$ Å. The strongest lines of the 29-line indexed powder pattern are (d in Å, relative intensity for FeKα, hk*l): 9.6, very very strong, 10*0; 5.53, strong, 11*0; 3.81, strong, 11*2; 3.42, moderately strong, 21*1; 2.73, moderately strong, 30*2; 2.52, moderately strong, 10*4; 2.17, moderately strong, 40*2+22*3. The diagram is very similar to that of thaumasite.

The mineral occurs as greenish-yellow to greenish-orange spots 1–5 mm across in a dark mass of Mn minerals. The individual grains are several tenths of a millimeter in diameter and rarely show crystal faces; only the prism (10*0) and dipyramid (10*2) were observed. It is intimately associated with calcite and contains very tiny inclusions of manganite. Cleavage is good parallel to 10*0. The density is 1.95 ± 0.01 gm cm^{-3}. $H=2\frac{1}{2}$. In thin section, the mineral is bright yellow with barely perceptible pleochroism. $\omega=1.556\pm0.002$; $\epsilon=1.540\pm0.002$. The interference colors are very abnormal, alternating shades of green and russet being observed in favorable sections up to the 17th order, rather than the ordinary colors. Some grains with lower indices of refraction and paler yellow color probably represent variations of composition.

Analysis of carefully prepared material gave CaO 25.67, MnO 12.33, O 2.45, SO_3 10.20, CO_2 7.45, H_2O 41.90, sum ("by pure chance") 100.00, which, after correction for a carefully estimated 1.3% manganite impurity and assignment of the excess oxygen to convert Mn^{2+} to Mn^{4+}, corresponds to the empirical formula $Ca_6Mn_2{}^{4+}S_{1.7}{}^{6+}C_{2.3}H_{60.6}O_{50}$. This results in a structural formula for the unit-cell contents of

$$Ca_6Mn_2{}^{4+}[SO_4/(S_{0.7}C_{0.3})(O,\,OH)_4/(CO_3)_2/(OH)_{12}]\cdot 24H_2O,$$

which leads to a calculated density of 1.93 ± 0.02, in satisfactory agreement with the measured value. A structural formula analogous to that of thaumasite, while structurally appealing, leads to the rather low calculated density of 1.88 ± 0.02:

$$Ca_6H_4[SO_4/(S_{0.7}C_{0.3})(O, OH)_4/(CO_3)_2/(MnO_4)_2{}^{4-}] \cdot 28H_2O.$$

Structural studies to resolve the uncertainty are under way at the crystallographic laboratory of the CNRS, Bellevue, France, under the direction of J. Protas.

Attempts to synthesize jouravskite from cold and boiling aqueous solutions were unsuccessful.

The name is in honor of the late Georges Jouravsky (1896–1964), chief geologist of the Division de la Géologie du Maroc. The type material is in the mineralogical collections of the École Nationale Supérieure des Mines, Paris. The name was approved before publication by the IMA Commission on New Minerals and Mineral Names.

P. Toulmin

Guilleminite

R. Pierrot, J. Toussaint and T. Verbeek, La guilleminite, une nouvelle espèce minérale: *Soc. Franç. Minéral. Christ. Bull.* **88**, 132–135, (1965).

The mineral occurs in the oxidized zone of the copper-cobalt deposit of Musonoï, Katanga. It forms canary-yellow coatings and silky masses up to 1 cm^2 and, in geodes, tablets up to 0,4×0.2 mm. Guilleminite is orthorhombic, probably *Pncm*, with $a=7.25$, $b=16.84$, $c=7.08$ Å, relative to $\lambda_{CuK\alpha_1}=1.54051$ Å. An indexed 29-line powder diagram has the following strong lines (d in Å, intensity, hkl): 8.39, strong, 020; 7.29, strong, 100; 3.55, moderately strong, 210; 6.68, medium, 110. The fragile, brittle crystals have a perfect (100) and good (010) cleavage, the latter parallel to the flattening of the crystals. The measured density is 4.88 ± 0.02 g cm^{-3}. Guilleminite is biaxial (−) with $2V \cong 35°$, dispersion $r > v$ strong. The other optical properties: $X=c$, bright yellow, $\alpha = 1.805 \pm 0.005$; $Y=b$, yellow, $\beta = 1.798 \pm 0.002$; $Z=a$, colorless, $\gamma = 1.720 \pm 0.002$.

Wet chemical analysis by M. Barbelet gave the following results in weight per cent on a 35-gm sample of guilleminite crystals and a 100-gms ample of powdery guilleminite, respectively: SeO_2 16.8, 16.1; BaO 10.8, 11.5; UO_3 64.5, 65.2; H_2O 7.1, 6.4. Both analyses are reasonably well represented by the formula $Ba(UO_2)_3(OH)_4(SeO_3)_2 \cdot 3H_2O$. Thermogravimetric studies tend to support the assigned ratio of hydroxyl to H_2O.

The name is for C. Guillemin, chief engineer of the B. R. G. M., and was approved before publication by the I.M.A. Commission on New Minerals and Mineral Names. The type specimens are in the mineralogy collection of the École Nationale Supérieure des Mines, Paris.

P. Toulmin

Barringtonite

Beryl Nashar, Barringtonite—A new hydrous magnesium carbonate from Barrington Tops, New South Wales, Australia. *Mineral. Mag.*, **34** (Tilley Volume), 370–372 (1965).

The mineral occurs as nodular encrustations on the surfaces of olivine basalt under Rainbow Falls, Sempill Creek, Barrington Tops, New South Wales. The magnesium in the mineral is produced by the leaching of the basalt by cold (~5°C) meteoric water. The nodules consist of colorless radiating fibers or needles averaging 0.01×0.03 mm. A small amount of nesquehonite is present.

Barringtonite is optically biaxial, 2V(+) 73°44′ (calc.), α 1.458, β 1.473, γ 1.501, $\gamma - \alpha = 0.043$, length slow, extinction angles (for slow ray) fall into three groups: 17°, 23° and 34°.

Two analyses (R. Basden analyst) gave the following results: MgO 31.8, 33.5; CO_2 34.8, 36.5; H_2O 33.4, 30.0; total 100.0, 100.0. The molecular ratios for $MgO:CO_2:H_2O$ are given respectively as 1:1:2:2 and 1:1:2. (There are two typographical errors in the calculations dealing with "relative no. mols." Correction of these errors gives the following molecular ratios: 1.00:1.00:2.35 and 1.00:1.00:2.00 (J. A. M.) The analytical results indicate a composition of $MgCO_3 \cdot 2H_2O$. The higher water content in the first analysis is attributed to a small amount of admixed nesquehonite.

Due to the nature of the material, a single crystal x-ray study was not possible. The *x*-ray powder data were indexed, by Ito's method and yielded the following information: crystal system triclinic, *a* 9.155, *b* 6.202, *c* 6.092, α 94°00′, β95°32′, γ108°72, Z=4. The density calculated from the unit cell is 2.825. Although the unit cell constants were obtained from indexed powder data, only unindexed data are listed. The strongest lines (For Ni—filtered Cu radiation) are: 8.682 vs, 3.093 vs, 2.936 vs, 6.087 s, 5.816 s, 2.495 s, and 2.309 s.

The name is for the locality.

Discussion.—Further work is needed to reconcile the various physical data. The optics are very close to those of lansfordite, and the calculated specific gravity seems rather high for a mineral of this composition. It appears that the two analyses have been recalculated to total 100.0. It would be most advisable to give the original summations.

J. A. Mandarino

Rustumite

S. O. Agrell, Polythermal metamorphism of limestones at Kilchoan, Ardnamurchan. *Mineral. Mag.* **34** (Tilley Volume), 1–15 (1965).

Study of the metamorphic assemblage at Kilchoan, Ardnamurchan, Scotland, resulted in the discovery of a new mineral, kilchoanite (*Am. Mineral.* **46,** 1203, 1961). Now, two more new species have been found, rustumite and dellaite (see following abstract).

Rustumite occurs as crudely tabular crystals up to 2mm in length. Associated minerals are: åkermanite, merwinite, larnite, spurrite, rankinite and kilchoanite. The crystals are colorless with a faint hazy turbidity. Cleavage (100) poor, (010) and (001) very poor. Lamellar twinning on (100) is common. Rustumite is optically biaxial, $2V(-)=80°$, α 1.640, γ 1.651, $\beta=b$, $\alpha\wedge c=4$–$6°$. The density calculated from the refractive indices is 2.86.

Electron-probe analysis (J. V. P. Long, analyst) of material in a polished thin section using pure wollastonite as a standard gave the following results: SiO_2 33.8±1, CaO 61.6±1, H_2O 4.6 (by difference). These results are in good agreement with the theoretical composition of $Ca_3 Si_2 O_7 \cdot Ca(OH)_2$: SiO_2 33.14, CaO 61.89, H_2O 4.97. Electron-probe determinations indicated less than 0.2% Fe_2O_3, Al_2O_3 and MgO. Microchemical tests for CO_2 were negative.

Single crystal data are: space group *Cc* or *C* 2/*c*, *a* 7.62, *b* 18.55, *c* 15.51 Å (all ±0.05 Å), β 104°20′±10′, twin axis [001], Z=10 (The specific gravity calculated from these data and the theoretical composition is 2.835 J. A. M.), Unindexed *x*-ray powder data (42 lines plus three due to an impurity) are listed. The strongest lines are (in Å): 3.03 s, 2.89 s, 3.19 s, 2.52 ms, 1.907 ms, and 1.752 ms.

The name is for Rustum Roy, Penna. State Univ. It was approved before publication by the IMA Commission on New Minerals and Mineral Names.

J. A. Mandarino

Dellaite

S. O. Agrell, Polythermal metamorphism of limestones at Kilchoan, Ardnamurchan. *Mineral. Mag.* **34** (Tilley Volume), 1–15 (1965).

A new mineral has been found in the late stage veins which cut the metamorphic assemblage at Kilchoan, Ardnamurchan, Scotland (see abstract of rustumite). The mineral is similar to phase Y($6CaO\cdot 3SiO_2H_2O$) which was synthesized by Della M. Roy in 1958. It has been named dellaite and assigned the chemical formula, $Ca_{12}Si_6O_{22}(OH)_4$.

A single crystal gave an oscillation pattern identical to that obtained from phase Y synthesized by J. D. C. McConnell. McConnell's unpublished cell constants for the synthetic material are given as follows: a 6.80, b 6.91, c 12.85 Å (all ±0.05 Å), a^* 88.42° (It is not clear to me whether a^* is a misprint for β or if the data given are actually partial data for a triclinic cell J. A. M.). No x-ray powder data are given.

Dellaite is optically biaxial, $2V(-)$ 65°, α 1.650, γ 1.660, $\gamma' \wedge$elongation = 20°. Analytical results are not given, although preliminary Ca and Si electron-probe determinations " . . . give compositions differing somewhat from that suggested by Roy. The (OH) content, determined by difference, was significantly lower at 1–2%". The author states that the mineral may contain some fluorine or the (OH) content may vary with the temperature of formation.

The name is for Della M. Roy, Penna. State Univ. It was approved before publication by the Commission on New Minerals and Mineral Names, I.M.A.

DISCUSSION.—There is little doubt in my mind that this substance is a new mineral. The data presented, however, are of such a preliminary nature that I question the advisability of naming the mineral. Certainly more information is needed on the crystallography and, if an analysis is not possible, a comparison of the x-ray powder data of the natural and analyzed synthetic material would be desirable.

J. A. MANDARINO

Noonkanbahite

REX T. PRIDER, Noonkanbahite, a potassic batisite from the lamproites of Western Australia. *Mineral. Mag.*, **34** (Tilley Volume), 403–405 (1965).

A mineral found as an accessory in very coarse-grained lamproites on the Noonkanbah Sheep Station, West Kimberley District, Western Australia, is considered to be new. The mineral is reddish brown and has a rose colored streak. It has one good cleavage. Optically it is biaxial, $2V(+) = 64°$, α 1.714, γ 1.769, pleochroism very strong with X and Y colorless, Z strong golden yellow, the optic axial plane is parallel to the cleavage. The measured specific gravity is 3.34.

Analysis of 0.65g (M. B. Costello, analyst) gave: SiO_2 43.25, Al_2O_3 0.07, TiO_2 21.15, $(Nb+Ta)_2O_5$ less than 1000ppm. Fe_2O_3 1.70, FeO 0.61, ZrO_2 0.85, MgO nil, BaO 14.47, CaO 1.77, MnO n.d., Na_2O 4.50, K_2O 10.83, H_2O^+ 0.94, Cl n.d., total 100.14. This gives a chemical formula of: $(Na_{0.84}K_{1.16})_{2.00}(Ba_{0.55}K_{0.20}Ca_{0.18})_{0.93}(Ti_{1.55}Fe_{0.18}Zr_{0.04}Al_{0.01}Si_{0.21})_{1.99}Si_{4.00}(O_{13.39}(OH)_{0.61})_{14.00}$.

No crystallographic data are given. Forty unindexed lines of the x-ray powder pattern (Ni filtered Cu radiation) are tabulated. The strongest lines (in Å) are: 2.911 vs, 3.201 s, 3.399 s, 2.634 s, 2.191 ms, 2.102 ms, 1.680 ms, and 1.568 ms. The author states, "The four strongest lines correspond with those of batisite (Kravchenko *et al.*, 1960) but thereafter there is no correspondence."

The mineral is considered to be related to shcherbakovite and batisite. The name is for the locality.

DISCUSSION.—In the absence of single crystal data, the exact relationship of this mineral to batisite and shcherbakovite is obscure. Although some of the stronger x-ray lines match the strong lines of batisite, others match some of shcherbakovite. It is quite possible that "noonkanbahite" is shcherbakovite.

J. A. MANDARINO

Brownmillerite

Gerhard Hentschel, Mayenit, $12CaO \cdot 7Al_2O_3$, und Brownmillerit, $2CaO \cdot (Al, Fe)_2O_3$, zwei neue Minerale in den Kalksteineinschlüssen der Lava des Ettringer Bellerberges. *Neues Jahrb. Mineral., Monatsh.*, 1, 22–29 (1964).

The locality, manner of occurrence, and mineral associations of brownmillerite are identical with those of mayenite. Like mayenite, brownmillerite has long been known as a constituent of Portland cement clinker; it was named by E. Spohn in 1932 to honor Dr. Lorrin Thomas Brownmiller, Chief Chemist of the Alpha Portland Cement Company, Easton, Pennsylvania, who was among the first to prepare and describe the artificial compound. Brownmillerite occurs as reddish brown platelets, generally 60 μ or less along an edge and 15 μ thick, that are tetragonal in outline. Brownmillerite is optically biaxial, (−); indices of refraction determined by immersion in sulfur, are α(yellowish brown) <2.02, β and γ (reddish brown) >2.02; Y and Z lie in the plane of the platelets, extinction in that plane is diagonal; the pleochroism is distinct. The optical data agree well with those for artificial material of similar composition. The average specific gravity is 3.76. Sufficient material for a normal chemical analysis could not be isolated, therefore only the expected constituents were determined spectrophotometrically, The composition so determined was Al_2O_3 17.2, Fe_2O_3 30.5, CaO 46.2, loss on ignition 0.5%; approximately the values for for $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$. Indexed *x*-ray diffraction powder lines agree well with those for artificial material of this composition; the strongest lines for natural material are 2.65 (*v st*), 7.19 (*st*), 2.78 (*st*), 1.93 (*st*), 2.05 (*m st*), 3.65 (*m*), 1.82 Å (*m*). Artificial material is orthorhombic, the space group is probably *Imma*. Bertaut *et al.* (*Acta Cryst.* **12**, 149–159, 1959) determined the structure of brownmillerite; in their setting (*Ibmm*) they determined *a* 5.58, *b* 14.50, *c* 5.34 Å; V 432.1 Å^3, Z=2, D_x 3.73 g/cm^3.

Hentschel suggests that, because natural and artificial material with the composition $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$ belongs to a solid-solution series ranging from $2CaO \cdot Fe_2O_3$ to $6CaO \cdot 2Al_2O_3 \cdot Fe_2O_3$ (the members of the series with >33% Al crystallize in space group *Pnma*), the name brownmillerite be used for the isomorphous series in *Imma* with the range $2CaO \cdot (Al, Fe)_2O_3$ in which Al/(Al+Fe) is 0.33−0.69.

Another occurrence of brownmillerite, or a mineral closely related to it, is mentioned by Bentor *et al.* (*Nature* 199, 478–479) from the "Mottled Zone" in sedimentary rocks of Maestrichtian to Paleocene age in Israel and Jordan.

The name was approved in advance of publication by the Commission on New Minerals and Mineral Names, IMA.

Kurt Servos

Mayenite

Gerhard Hentschel, Mayenit, $12CaO \cdot 7Al_2O_3$, und Brownmillerit, $2CaO \cdot (Al, Fe)_2O_3$, zwei neue Minerale in den Kalksteineinschlüssen der Lava des Ettringer Bellerberges. *Neues Jahrb. Mineral., Monatsh.*, 1, 22–29 (1964).

A calcium aluminate, identical with "stable $12CaO \cdot 7Al_2O_3$," occurs in several thermally metamorphosed marly limestone inclusions of Tertiary (?) age in effusive volcanic rocks of the Ettringer Bellerberg (leucite-tephrite), related to the Quaternary extrusives of the Laacher See area, near Mayen, Eifel district, (Rhineland-Palatinate), West Germany. Such inclusions long ago yielded the initial occurrence of ettringite. Besides ettringite, the new mineral is associated with calcite, wollastonite, gehlenite, larnite, diopside, brownmillerite, grossular, pyrrhotite, spinel, afwillite, hydrocalumite and portlandite. The new mineral, named after the locality, occurs as clear colorless rounded grains having no recognizable crystal faces, with a maximum diameter of 60 microns. The average specific gravity is 2.85. The mineral is isotropic, with average n_D 1.643. Values for the specific gravity and refractive index of synthetic material and of glasses with similar composition are cited from the literature; in some instances these values agree closely with those determined for natural material, in others they differ widely. Properties of the material are well-known because it is an important constituent of Portland cement clinker. Sufficient material for a normal chemical analysis could not be isolated, hence only the expected constituents were determined colorimetrically with a spectrophotometer. The composition so determined was Al_2O_3 45.2, Fe_2O_3 2.0, CaO 45.7, loss on ignition 2.2%; but the scarcity of material prevented the determination of the iron content as impurity or as essential constituent. Indexed *x*-ray diffraction powder lines agree well with those for artificial material; the strongest lines are 2.69 (*v st*), 4.91 (*st*), 2.45 (*m st*), 3.00 (*m*), 2.19 (*m*), 1.95 (*m*), 1.66 (*m*), 1.60 (*m*), 1.73 Å (*m wk*); average *a* (calc.) is 12.02 Å for natural material. Artificial material has a garnet-like structure and probably belongs to space group $I\bar{4}3d$.

The name was approved in advance of publication by the Commission on New Minerals and Mineral Names, IMA.

KURT SERVOS

Unnamed tin sulfides (2)

GÜNTER H. MOH AND FRITZ BERNDT, Two new natural tin sulfides, Sn_2S_3 and SnS_2. *Neues Jahrb. Mineral., Monatsh.*, 3, 94–95 (1964).

Tin sulfide ore from a zone of secondary enrichment or oxidation at Cerro de Potosi, Bolivia, contains two new minerals, observed in polished sections, Sn_2S_3 and SnS_2, which are unnamed in this preliminary description pending the completion of further studies. Sn_2S_3, orthorhombic, occurs as small laths, commonly twinned, replacing stannite and replaced by cassiterite. It polishes moderately well; appears gray in polished section (darker than herzenbergite), weakly pleochroic and strongly anisotropic. The polishing hardness is slightly lower than that for herzenbergite. Internal reflections are orange brown. Mosburg *et al.* (*U. S. Geol. Survey Prof. Paper* **424-C**, 347–348, 1961) synthesized Sn_2S_3 by heating the elements at 700° C. "for several days." Synthetic Sn_2S_3 has an acicular habit. Synthetic Sn_2S_3 is orthorhombic, space group *Pnam*, with a 8.79±0.03, b 14.02±0.05, c 3.74±0.01 Å; strongest lines of the indexed powder pattern are 4.131 (100), 5.495 (75), 2.670 (45), 7.003 (40), 3.740 (35), 2.747 Å (35). Moh has reported elsewhere (*Carnegie Inst. Wash. Year Book* **62,** 197–198, 1963) that DTA on synthetic Sn_2S_3 gives a thermal effect at 732° C., on heating and on cooling, which suggests the possible existence of a high-temperature polymorph.

SnS_2, hexagonal, has a tabular habit and golden yellow streak; it is very soft, translucent to transparent with very intense brownish to orange yellow internal reflections. It appears gray in reflected light; the determination of its anisotropy is difficult. It is a secondary mineral and occurs as very fine inclusions in pyrite which has replaced stannite. Moh (*loc. cit.*) elsewhere states that SnS_2 exists in two modifications: hexagonal β-SnS_2 on heating inverts to isometric α-SnS_2 at 692° C., but the inversion is too sluggish to be observed by DTA.

KURT SERVOS

Unnamed (Co_9S_8)

E. F. STUMPFL AND A. M. CLARK, A natural occurrence of Co_9S_8, identified by X-ray microanalysis. *Neues Jahrb. Mineral., Monatsh.*, 8, 240–245 (1964).

A cubic mineral occurs as fine intergrowths in partly euhedral grains of linnaeite; associated with chalcopyrite, sphalerite and pyrrhotite; at the Vauze mine, 15 mi north of Noranda, Quebec, Canada. The mineral apparently represents an unmixed phase of linnaeite, for its occurrence is restricted to grains of linnaeite: lamellae of the mineral are parallel to (100) of linnaeite. Because the mineral is very fine-grained, quantitative measurements of the reflectivity and microhardness cannot be determined precisely. The reflectivity is slightly higher than that of pentlandite; it is estimated at ~55%. The hardness is higher than that of chalcopyrite, but lower than that of linnaeite; the microhardness of pure Co_9S_8 is estimated at 330–350 kg/mm². Corrected quantitative *x*-ray microanalysis gives Co 66.6, Ni 0.1, Fe 1.3, Cu 0.3, S 31.7%; in close agreement with the theoretical composition of Co_9S_8 (Co 67.40, S 32.60%). The mineral is therefore a purer cobalt-pentlandite than those described by Kuovo *et al.* (*Am. Mineral.*, **44,** 897–900, 1959) who adopted the name *cobalt pentlandite* for natural pentlandite rich in Co, but all the specimens they described from Finland contain more than 9% Ni and 10% Fe. Geller (*Acta Cryst.* **15,** 1195–1198, 1962) determined the crystal structure of Co_9S_8 with the following data for the unit cell: *a* 9.928 ±0.001Å, V 978.56 Å³, Z=4, space group *Fm3m*; and D_x 5.34 g/cm³.

DISCUSSION.—The mineral seems to be a nearly pure end-member of the isomorphous series along the join "nickel pentlandite"—"cobalt pentlandite." Further work is necessary to characterize the mineral adequately; when this has been done the cobalt analogue of pentlandite should have a specific name.

KURT SERVOS

Xanthiosite

R. J. DAVIS, M. H. HEY AND A. W. G. KINGSBURY, Xanthiosite and aerugite. *Mineral. Mag.* **35,** 72–83 (1965).

A golden yellow material found at the South Terras mine, St. Stephen-in-Brannel, Cornwall, gives an *x*-ray powder pattern identical to that of xanthiosite which was described by Bergemann (1858) and named by Adam (1869). Analyses (M. H. Hey, analyst) of the new material, of material from the type locality (Johanngeorgenstadt, Saxony), and of synthetic material prepared by Taylor and Heyding (1958) yield almost identical results. The indicated chemical formula is $4[Ni_3(AsO_4)_2]$. The density of pure synthetic xanthiosite was measured with the Berman balance using a 12-mg sample. The measured values are 5.37 and 5.47. The calculated density if 5.388±0.003. Unit cell data are: Space group $P2_1/_a$, *a* 10.174±0.005, *b* 9.548±0.002, *c* 5.766±0.001 Å, β 92° 58½±1′. *X*-ray powder data are given for the material from the type locality. Thirty-nine indexed and thirty unindexed spacings are listed for CuKα radiation. The strongest lines (in Å) are: 2.529 vvs B($32\bar{1}$), 3.46 vs B($12\bar{1}$, 220, 211) 2.757 and 2.739 vs D (320, 012, 311), 2.690 and 2.666 vs D ($13\bar{1}$, 230, 112, 131), 4.32 s B(111, 120), 2.621 s (112), 1.544 s, 1.527 s, 1.492 S, and 1.436 s. In the powder data, B=broad, D=double, not resolved in poor photographs.

The mineral occurs with aerugite in comby quartz vein-material. Presumably this material came from the deeper workings of the mine. Associates are various Ni–Co–As minerals, traces of decomposing pitchblende and various alteration products.

J. A. MANDARINO

Aerugite

R. J. DAVIS, M. H. HEY AND A. W. G. KINGSBURY, Xanthiosite and aerugite. *Mineral. Mag.* **35,** 72–83 (1965).

A green mineral associated with xanthiosite (see preceding abstract) at the South Terras mine, St. Stephen-in-Brannell, Cornwall, has been identified as aerugite. Aerugite, like xanthiosite, was described by Bergemann (1858) and named by Adam (1869). Chemical analyses (M. H. Hey, analyst) of the South Terras mineral, of the mineral from the type locality and of synthetic material agree well with the original analysis by Bergemann. The ideal chemical formula is considered to be $2[Ni_9As_3O_{16}]$ with one-sixth of the arsenic trivalent. The ratio of Ni to As in the natural material is about 2.6. The space group is $C2/m$, $C2$, or Cm and the unit cell parameters are a 10.29±0.024, b 5.95±0.01, c 9.79±0.02 Å, and β 110° 19′±5′. The mean of five specific gravity determinations on synthetic material is 5.85±0.07 which compares favorably with calculated values of 5.76 (type), 5.73 (South Terras), 5.80 (synthetic), and 5.83 (synthetic). The calculated value for the ideal compound is 5.95. Fifty-eight x-ray powder spacings are tabulated for CuKα radiation; of these 19 are indexed. The strongest spacings (in Å) are: 2.060 vvs (222, $40\bar{4}$), 3.76 vs (201, $11\bar{2}$), 2.329 s ($11\bar{4}$, 221, $40\bar{3}$), 5.05 s (110, $20\bar{1}$), 2.862 s ($11\bar{3}$, 202), 2.492 s (022, 311, $31\bar{3}$), and 1.485 s.

J. S. Mandarino

Evenkite, Flagstaffite, Idrialite and Refikite

H. Strunz and B. Contag, Evenkit, Flagstaffit, Idrialin und Reficit. *Neues Jahrb. Mineral., Monatsh.* 1, 19–25 (1965).

Evenkite ($C_{24}H_{50}$). Evenkite was described by Skropychev (*Doklady Akad. Nauk S.S.S.R.* **88,** 717–719, 1953) as wax-like pseudohexagonal tabular crystals in geodes associated with a vein cutting vesicular tuff in the Evenk district, Lower Tunguska River, Siberia (*Am. Mineral.* **40,** 368, 1955). Examination of material from the type locality gives G 0.920; a 7.52, b 4.98, c 32.50 Å, $\beta\sim 90°$, monoclinic-pseudohexagonal symmetry; probable space group $P2_1/a$; crystals flattened $\perp c(001)$. Comparison of these new data with those of other hydrocarbons in the literature shows good agreement with the properties of a monoclinic modification of n-tetracosane, $C_{24}H_{50}$ (which has a 7.50, b 4.99, c 32.7 Å, β94°, Z=2, m.p. 50.7–50.8° C.).

Flagstaffite ($C_{10}H_{22}O_3$). Guild (*Am. Mineral.* **5,** 169–172, 1920) named and described flagstaffite, originally found as well-formed colorless transparent crystals in radial cracks of fossil logs near the San Francisco Peaks, north of Flagstaff, Arizona. Guild later recognized the identity between flagstaffite and *cis*-terpin monohydrate (which has the cell dimensions a 18.51, b 22.87, c 10.96 Å, determined on artificial material). Reexamination of crystals of flagstaffite from the type locality shows that they are orthorhombic, strongly pyroelectric, with a 18.60, b 23.00, c 10.86 Å; $a:b:c::0.808:1:0.472$, in good agreement with the morphological axial ratio; Z=16; space group $Fdd2$. The density (pycnometer) is 1.09 g/cm³. The most common forms are $\{110\}$ and $\{111\}$, less common $\{010\}$ and $\{011\}$. Cleavage, imperfect (110). $(110):(1\bar{1}0)=77°45'$; $(110):(111)=52°54'$. The strongest powder diffraction lines (indexed data given) are 4.93 (10), 8.76 (5), 7.19 (5), 4.35 (5), 3.55 (5). Crystals are biaxial, (+)., with ns (Na)α1.505, β1.512, γ1.524; 2V=77°, 2E=143°; optic axial plane (010); $r>v$. M. p. 116° C. Reaction with conc. H_2SO_4 produces a strong orange-yellow solution that is further diagnostic.

Idrialite ($\sim C_{22}H_{14}$). Even though Tuček and Kouřimský (*Rozpravy Českoslov. Akad. Věd,* **63,** 1–18, 1953) showed the identity of "curtisite" (Wright and Allen, *Am. Mineral.* **11,** 67, 1926) with idrialite (Dumas, *Ann. Chem. Phys.* **50,** 360, 1832), and idrialite has priority. Frank-Kamenetskii and Maleeva (*Doklady Akad. Nauk S.S.S.R.* **88,** 135, 1953), described "curtisite" from the Transcarpathians as orthorhombic, $C_{24}H_{18}$, with a 8.06, b 6.33, c 30.97 Å, Z=4. The type locality for curtisite is Skaggs Springs, Sonoma County, California.

S. and C. examined idrialite from the type locality, Idria, Yugoslavia. They report that the type material is a miture of picene ($C_{22}H_{14}$), or a homologous compound, and related hydrocarbons. The organic material, which fluoresces bluish-white in ultraviolet light, was extracted from the mercury ore with chloroform. Idrialite separates from this solution as light brown tabular crystals. Determination of unit cell constants showed orthorhombic symmetry, *a* 8.07, *b* 6.42, *c* 27.75 Å. M.p. of purified material is 319° C. Like picene, the material is soluble in conc. H_2SO_4, producing an intense blue-green color. Infrared spectra show picene bands with some additional ones, indicating that idrialite is not a single substance, but a mixture of predominant picene and closely related similar substances. Indexed powder diffraction patterns of idrialite are compared with those of picene and of "curtisite"; the strongest lines of type idrialite are 4.94 (10), 3.39 (8), 4.04 (6), 2.47_5 (3).

Discussion.—The name idrialite should be retained.

Refikite ($C_{20}H_{32}O_2$?). Acicular crystals in fossil roots of spruce in a swamp in southern Bavaria, Germany, are crystalline resin acid, identical with refikite (Lacava, 1852). Crystals are orthorhombic, with *a* 10.43, *b* 22.35, *c* 7.98 Å; Z=4; space group $P2_12_12$. The m.p. is 182° C. Identification of the crystals as a resin acid is indicated by infrared spectra. The crystals produce an orange to yellow brown solution in a mixture of acetic anhydride and conc. H_2SO_4. The strongest lines of an indexed powder diffraction pattern are 5.50 (10), 6.09 (9), 5.20 (7). The crystals are identical with refikite and a resin acid, specifically Δ13-dihydro-d-pimaric acid.

Kurt Servos

DISCREDITED MINERALS

Hoeferite (=Chapmanite)

J. Sobotka, Die Identität des Hoeferits mit dem Chapmanit und der Chapmanit aus Boněnov. *Acta Univ. Carolinae, Geol.* 1965, 2, 129–140.

Spectrographical, chemical and *x*-ray powder studies of hoeferite (höferite) from the type locality at Chříč (Křitz), Central Bohemia, Czechoslovakia, show its identity with chapmanite. Hoeferite was described by Katzer (*Tscherm. Min. Petr. Mitt.* **14,** 519–525, 1894) as a new mineral of the nontronite-series.

Discussion.—The name hoeferite had been proposed for a new mineral (borate) from Lardarello, Italy, but was withdrawn and replaced by the name biringuccite (*Am. Mineral.* **48,** 709–711, 1963).

František Čech

Trigonomagneborite (=Macallisterite)

I-Hua Ch'u, Yu-T'ien Han, Tzu-Chiang Ch'ien, Lai-Pao Liu, and Ling-Sheng Min, Preliminary report of the discovery in China of a new mineral, trigonomagneborite. *Scientia Sinica* **14** (8), 1246–1248 (1965) (in Russian).

The mineral was found as a white efflorescence in contemporary salts of a lake of continental origin. Analysis gave B_2O_3 53.12, MgO 10.43, CaO 0.83, H_2O 35.53, sum 99.91%, corresponding closely to $MgO \cdot 3B_2O_3 \cdot 7.5H_2O$. It is optically uniaxial, (−), with ω 1.507, ε 1.4638 (natural and synthetic), G 1.851 (natural), 1.856 (synthetic). *X*-ray study of synthetic crystals showed it to be trigonal, space group $R3c$ or $R\bar{3}c$, *a* 11.64, *c* 35.30 Å. Indexed *x*-ray powder data are given (50 lines); the strongest are 8.80 (10), 4.08 (10), 3.36 (10), 3.27 (10), 2.818 (9), 6.71 (8), 5.78 (8), 4.38 (8), 2.471 (8), 2.119 (8), 1.933 (8), 1.707 (7). DTA study showed endothermic effects at 229–238° and 1156–1130°, and an exothermic effect at 820–834°.

Discussion.—This is clearly identical with macallisterite (*Am. Mineral.* **50,** 629–640, 1965). The Chinese paper was received for publication January 12, 1965; the paper on macallisterite September 25, 1964. An abstract on macallisterite was published for the Geol. Soc. Am. meeting November 1964. In addition, the name macallisterite was submitted to the Commission on New Minerals, IMA, in July, 1963, approved August 8, 1963, and therefore has clear priority.

Uzbekite (=Volborthite)

E. A. ANKINOVICH, G. L. VILESHINA AND I. I. GEKHT, Volborthite from the vanadiferous shales of the Middle Cambrian of Kazakhstan: *Vestnik Akad. Nauk Kazakh SSSR* 1963, 5, 54–67 (in Russian).

New analyses, optical data and *x*-ray study confirm the identity of uzbekite with volborthite, $Cu_3(VO_4)_2 \cdot 3H_2O$.

Cerolite (kerolite) = mixture of Serpentine + Stevensite

YU. S. D'YAKONOV, *X*-ray study of cerolite. *Mineralog. Sbornik Vses. Nauchn.-Issled. Geol. Inst. No. 3, Trudy Vses. Nauchn.-Issled. Geol. Inst.* **96,** 203–212 (1963).

X-ray study, including data on heated samples and samples treated with glycerol, was made of 5 samples previously determined to be alpha-cerolite or beta-cerolite, some of them high in nickel. All but one of these samples proved to be mixtures of a serpentine-group mineral (not specifically identified) with a stevensite-like mineral, the two being present in variable proportions. The fifth sample (containing NiO 18.06%) gave the stevensite-like pattern only.

The author suggests that the name cerolite be retained for the mineral containing talc-like layers with hardly any hydrated interlayers.

DISCUSSION.—The name cerolite has already been the source of considerable confusion and ought to be dropped completely.

Didymolite (=Plagioclase)
Angaralite (=a chlorite)
Tatarkaite (=a chlorite)

E. I. SEMENOV, On the so-called didymolite, angaralite, and tatarkaite. *Mineralog. Genet. Osobernnost. Shchelochnykh Massivov, Akad. Nauk S.S.S.R., Inst. Mineralog. Geokhim. i Kristallokhim.* 1964, 33–35 (in Russian).

These three minerals, described by Meister (1908) were re-examined by *x*-ray and optical methods on type material preserved in the Mineralogical Museum, Academy of Sciences, U.S.S.R. Didymolite is a plagioclase (labradorite-anorthite); the others are chlorites similar to ripidolite; the original analyses were evidently faulty.