

## NEW MINERAL NAMES\*

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### Brianyoungite\*

A. Livingstone, P.F. Champness (1993) Brianyoungite, a new mineral related to hydrozincite, from the north of England orefield. *Mineral. Mag.*, 57, 665–670.

Occurs as white rosettes (<100  $\mu\text{m}$ ) of thin, vitreous, transparent blades ( $\sim 1\text{--}2\ \mu\text{m}$ ) that are elongate [010] and taper to a sharp point. Chemical analysis gave ZnO 71.47, CO<sub>2</sub> 9.90, SO<sub>3</sub> 6.62, H<sub>2</sub>O 10.70, sum 98.69 wt%, corresponding to Zn<sub>11.73</sub>(CO<sub>3</sub>)<sub>3</sub>(SO<sub>4</sub>)<sub>1.10</sub>(OH)<sub>15.88</sub>, ideally Zn<sub>12</sub>(CO<sub>3</sub>)<sub>3</sub>(SO<sub>4</sub>)<sub>3</sub>(OH)<sub>16</sub>, simplified as Zn<sub>3</sub>(CO<sub>3</sub>,SO<sub>4</sub>)(OH)<sub>4</sub> as there are structural indications that CO<sub>3</sub> and SO<sub>4</sub> occupy the same equivalent position. Hardness not determinable, perfect {100} cleavage and possibly also {001},  $D_{\text{meas}} = >3.93$  and  $<4.09$ ,  $D_{\text{calc}} = 4.11\ \text{g/cm}^3$  for  $Z = 4$ , non-fluorescent, readily soluble with effervescence in dilute acids. Optically biaxial,  $\alpha = 1.635$ ,  $\beta = 1.650$ , straight extinction. TGA showed losses of 3.7 wt% to 240 °C (absorbed H<sub>2</sub>O), a major loss between 320 and 450 °C (simultaneous evolution of H<sub>2</sub>O and some CO<sub>2</sub>), and three losses between 450 and 900 °C (CO<sub>2</sub> and SO<sub>2</sub>); total loss was 36.8 wt%. The infrared spectrum has major absorption bands for OH, CO<sub>3</sub>, and SO<sub>4</sub>. Electron diffraction patterns indicate orthorhombic symmetry (or monoclinic with  $\beta = \sim 90^\circ$ ),  $a = 15.724(3)$ ,  $b = 6.256(5)$ ,  $c = 5.427(5)$  Å as refined from the X-ray powder pattern; strongest lines are 15.44(100,100), 7.88(100,200), 5.25(20,300), 2.714(40,002,021), 2.577(20,202,221), 2.397(20,321,212), and 1.565(30,023,040,631).

The mineral occurs with gypsum on rubbly limestone within the oxidized zone of the Brownley Hill mine at Nenthead, Cumbria, England. Also found on specimens from the Smallcleugh mine, Nenthead, the Bastenberg mine at Ramsbeck, Germany, and at Vieille, Montagne, Hollogne, Belgium. The new name is for Brian Young (b. 1947), who collected the type specimen, now stored in the Royal Museum of Scotland. J.L.J.

### Deanesmithite\*

A.C. Roberts, J.T. Szymański, R.C. Erd, A.J. Criddle, M. Bonardi (1993) Deanesmithite, Hg<sub>2</sub><sup>1+</sup>Hg<sub>3</sub><sup>2+</sup>Cr<sup>6+</sup>O<sub>5</sub>S<sub>2</sub>, a

\* Before publication, minerals marked with an asterisk were approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association.

new mineral species from the Clear Creek claim, San Benito County, California. *Can. Mineral.*, 37, 787–793.

Electron microprobe analysis gave Hg<sub>2</sub>O 34.9, HgO 54.4, CrO<sub>3</sub> 8.6, S 5.3, less O  $\equiv$  S 2.6, sum 100.6 wt%, corresponding to Hg<sub>1.98</sub><sup>1+</sup>Hg<sub>2.97</sub><sup>2+</sup>Cr<sub>1.02</sub><sup>6+</sup>O<sub>5.05</sub>S<sub>1.95</sub> for O + S = 7, with HgO and Hg<sub>2</sub>O partitioned on the basis of the single-crystal X-ray structure determination ( $R = 0.0292$ ). Occurs as orange-red, transparent, fan-shaped, prismatic aggregates to 0.5  $\times$  0.5 mm; also as isolated bladed to acicular radiating clusters, and rarely tabular. Crystals are flattened on {100}, which is the major form, with minor {320}, {001}, {510}, {011}, and numerous smaller forms. Striated [001], good  $\bar{1}10$  and fair {001} cleavages, sub-conchoidal fracture, adamantine luster, orange-red streak, brittle to friable,  $H = <5$ , nonluminescent,  $D_{\text{calc}} = 8.14\ \text{g/cm}^3$  for  $Z = 2$  and the ideal formula. Optically biaxial,  $n = >2$ , pleochroic; dark bluish gray to light gray in reflected light, yellow-orange to orange-red internal reflections, weakly birefractant, and weakly pleochroic. Triclinic symmetry, space group  $P\bar{1}$ ,  $a = 8.116(6)$ ,  $b = 9.501(8)$ ,  $c = 6.819(9)$  Å,  $\alpha = 100.43(8)$ ,  $\beta = 110.24(8)$ ,  $\gamma = 82.80(8)^\circ$ , as refined from the powder pattern (114-mm Debye-Scherrer, Cu radiation), with strongest lines of 5.72(90,110), 3.373(60,112,102,121), 3.008(100,122,212,131,112,202,031), 2.864(50B,012,201,220,022), 2.774(50,221), 2.536(50,132), 2.486(50,310), and 2.425(60,221,032,302).

The mineral occurs with cinnabar and various other Hg minerals in a quartz + magnesite rock from a prospect pit near the former Clear Creek Hg mine, New Idria district, San Benito County, California. The new name is for Deane K. Smith of Pennsylvania State University. Type material is in the National Mineral Collection at the Geological Survey of Canada, Ottawa. J.L.J.

### Edoylerite\*

R.C. Erd, A.C. Roberts, M. Bonardi, A.J. Criddle, Y. LePage, E.J. Gabe (1993) Edoylerite, Hg<sub>3</sub><sup>2+</sup>Cr<sup>6+</sup>O<sub>4</sub>S<sub>2</sub>, a new mineral from the Clear Creek claim, San Benito County, California. *Mineral. Record*, 24, 471–475.

Electron microprobe analysis gave Hg 51.6, HgO 27.9, CrO<sub>3</sub> 11.5, S 8.2, sum 99.2 wt%, corresponding to Hg<sub>3.26</sub><sup>2+</sup>Cr<sub>0.97</sub><sup>6+</sup>O<sub>4</sub>S<sub>2.16</sub>, ideally Hg<sub>3</sub>CrO<sub>4</sub>S<sub>2</sub> as determined from a sin-

gle-crystal X-ray structure determination (not reported). Occurs as canary to orange-yellow, stellate to acicular groups, in which crystals are up to 0.5 mm long, elongate [101], showing {010}, {111}, {001}, and {101}. Adamantine luster, yellow streak, transparent to translucent (opaque in masses), brittle, subconchoidal fracture, good {010} and fair {101} cleavages, nonfluorescent; photosensitive, turning olive green after a few months,  $H$  not determinable,  $D_{\text{calc}} = 7.13 \text{ g/cm}^3$  for the ideal formula, and  $Z = 4$ . Optically biaxial, positive elongation,  $n > 1.78$ , slightly pleochroic in lemon yellow, with  $Z > X = Y$ . Monoclinic symmetry, space group  $P2_1/a$ ,  $a = 7.524(7)$ ,  $b = 14.819(8)$ ,  $c = 7.443(5) \text{ \AA}$ ,  $\beta = 118.72(5)^\circ$ , as refined from a Debye-Scherrer pattern (114 mm, Cu radiation), with strongest lines of 5.94(40,011,111), 4.88(50,120,021,  $\bar{1}21$ ), 3.212(100,210, $\bar{2}02$ , $\bar{1}41$ ,012), 3.012(60,131), 2.307-(40, $\bar{1}61$ ), 2.208(35, $\bar{3}31$ ), and 2.185(40, $\bar{1}33$ , $\bar{2}52$ ).

The mineral formed as a primary alteration product of corroded cinnabar associated with quartz, chalcedony, magnesite, and several other Hg minerals in a small prospect near the former Clear Creek Hg mine, New Idria, San Benito County, California. The new name is for mineral collector Ed Oyler (b. 1915), who made the initial discovery. Type material is in the Systematic Reference Series of the National Mineral Collection at the Geological Survey of Canada, Ottawa. **J.L.J.**

#### Ershovite\*

A.P. Khomyakov, Yu.P. Men'shikov, R.K. Rastsvetaeva, G.N. Nechelyustov (1993) Ershovite  $\text{Na}_4\text{K}_3(\text{Fe}, \text{Mn}, \text{Ti})_2\text{Si}_8\text{O}_{20}(\text{OH})_4 \cdot 4\text{H}_2\text{O}$ : A new mineral. *Zapiski Vseross. Mineral. Obshch.*, 122 (1), 116–120 (in Russian).

Electron microprobe analysis (average of three; oxidation state of Fe assumed) gave  $\text{Na}_2\text{O}$  12.4,  $\text{K}_2\text{O}$  13.6,  $\text{CaO}$  0.1,  $\text{MgO}$  0.5,  $\text{MnO}$  4.7,  $\text{FeO}$  6.1,  $\text{TiO}_2$  3.0,  $\text{SiO}_2$  47.1,  $\text{H}_2\text{O}$  (by difference) 12.5, sum 100 wt%, corresponding to  $\text{Na}_{4.08}\text{K}_{2.95}(\text{Fe}_{2.57}^{2+}\text{Mn}_{0.68}\text{Ti}_{0.38}\text{Mg}_{0.13}\text{Ca}_{0.02})_{22.08}\text{Si}_8\text{O}_{19.98}(\text{OH})_{4.04} \cdot 5.06\text{H}_2\text{O}$ , ideally  $\text{Na}_4\text{K}_3(\text{Fe}^{2+}, \text{Mn}, \text{Ti})_2\text{Si}_8\text{O}_{20}(\text{OH})_4 \cdot 5\text{H}_2\text{O}$ . The mineral is olive green with brown and yellow tinges, vitreous luster, translucent in macroscopic pieces, and transparent in thin section. Fracture is fibrous, perfect {100} and {101} cleavages,  $H = 2\text{--}3$ .  $D_{\text{meas}} = 2.75(2)$ ,  $D_{\text{calc}} = 2.73 \text{ gm/cm}^3$  for  $Z = 1$ . Nonfluorescent, slightly soluble in weak solutions of  $\text{HCl}$ ,  $\text{HNO}_3$ , and  $\text{H}_2\text{SO}_4$ . Unchanged after heating to  $300^\circ\text{C}$ , it becomes isotropic and X-ray amorphous when heated to  $500^\circ\text{C}$ . Optically biaxial positive,  $\alpha = 1.569(2)$ ,  $\beta = 1.574(2)$ ,  $\gamma = 1.590(2)$ ,  $2V_{\text{meas}} = 58(2)$ ,  $2V_{\text{calc}} = 59^\circ$ , average dispersion  $r > v$ . Fibers have positive elongation, and angles between the fiber and  $X$ ,  $Y$ , and  $Z$ , are 86, 73, and  $17^\circ$ , respectively. Strongly pleochroic, with  $Z =$  dark olive green,  $X$  and  $Y =$  light green or yellow,  $Z > Y \geq X$ . The IR spectrum has maxima at 455, 505, 630, 670, 885, 960, 1015, 1660, and  $3380 \text{ cm}^{-1}$ . Single-crystal X-ray study gave triclinic symmetry, space group  $P\bar{1}$ ,  $a = 10.244(2)$ ,  $b = 11.924(3)$ ,  $c = 5.276(3) \text{ \AA}$ ,  $\alpha = 103.491(2)$ ,  $\beta = 96.960(3)$ ,  $\gamma = 91.945(3)^\circ$ ,  $V = 620.8 \text{ \AA}^3$ . The strongest

powder lines (67 given) are 11.58(100,010), 2.990(100, 230, $\bar{3}20$ , $\bar{3}01$ ), 2.709(80,141), 2.608(70,131), and 1.652-(80,070,271).

The mineral occurs in unweathered (subsurface) pegmatites of the Khibinsk alkali massif, and at Mount Rasvumchorr and Mount Koashva, Kola Peninsula, Russia. It forms disseminated elongate grains with a maximum dimension of 10 mm and parallel fibrous aggregates up to 3 cm long, associated with orthoclase, nepheline, sodalite, aegirine, alkali amphibole, villiaumite, natrite, rasvumite, vuonnemite, astrophyllite, scherbakovite, kazakovite, koashvite, thermonatrite, and nacaphite. The name is for Vadim Victorovich Ershov (1939–1989). Type material is at the Fersman Mineral Museum, Moscow, and the Geological Museum of the Kola Science Center, Apatity.

**Discussion.** This is the unnamed Na-K-Fe silicate for which preliminary data were abstracted in *Am. Mineral.*, 77, p. 673 (1992). **D.A.V.**

#### Gaidonnayite, Ca analogue

G.P. Belyayevskaya, B.Ye. Borutskiy, I.M. Marsiy, Ye.V. Vlasova, A.V. Sivtsov, T.I. Golovanova, A.I. Vishnev (1991) Potassium-calcium gaidonnayite  $(\text{Ca}, \text{Na}, \text{K})_{2-3}\text{ZrSi}_3\text{O}_9 \cdot n\text{H}_2\text{O}$ , a new mineral variety from the Khibiny block. *Doklady Akad. Nauk SSSR*, 320 (5), 1220–1225 (English translation, *Doklady U.S.S.R. Acad. Sci., Earth Sci. Sections*, 321A (9), 111–116).

The mineral occurs as rims and complete pseudomorphs of eudialyte in a pegmatitic vein, about 50 cm thick, at Mannepakhk Mountain in the northwestern part of the Khibiny alkalic complex. Fine-grained; color patchy and variable from light to dark reddish brown, not transparent,  $H = \sim 2$ , nonluminescent,  $n = 1.68\text{--}1.71$ . Electron microprobe analysis (one of three listed) gave  $\text{SiO}_2$  44.71,  $\text{TiO}_2$  2.15,  $\text{ZrO}_2$  24.75,  $\text{Fe}_2\text{O}_3$  0.82,  $\text{La}_2\text{O}_3$  0.07,  $\text{MnO}$  2.44,  $\text{CaO}$  6.73,  $\text{SrO}$  1.37,  $\text{MgO}$  0.40,  $\text{Na}_2\text{O}$  2.26,  $\text{K}_2\text{O}$  3.15,  $\text{H}_2\text{O}$  (by difference) 11.15, sum 100 wt%, corresponding to  $(\text{Ca}_{0.50}\text{Na}_{0.29}\text{K}_{0.27}\text{Sr}_{0.05}\text{Mn}_{0.14}\text{Mg}_{0.04})_{21.29}(\text{Zr}_{0.81}\text{Ti}_{0.11}\text{Fe}_{0.04})_{20.96}\text{Si}_3\text{O}_9 \cdot n\text{H}_2\text{O}$ . The X-ray powder pattern (114-mm camera, Fe radiation) is similar to that of gaidonnayite, and, by analogy,  $a = 11.768$ ,  $b = 12.805$ ,  $c = 6.67 \text{ \AA}$ ; strongest lines are 5.899(60,011), 3.617(50,221), 3.106(100,112), 2.942(50–60,400), 2.822(50,212), 2.208(50,013), 1.897(50,512), and 1.869(50,360). The infrared spectrum has an overall similarity to that of gaidonnayite, but with some differences that include the appearance of a multiplicity of absorption bands between 400 and  $770 \text{ cm}^{-1}$ .

**Discussion.** This may be the Ca analogue of gaidonnayite, but the fine-grained, turbid nature of the material hinders proof of homogeneity. **J.L.J.**

#### Harrisonite\*

A.C. Roberts, J.A.R. Stirling, J.D. Grice, T. Frisch, R.K. Herd, J.L. Jambor (1993) Harrisonite, a new calcium

iron silicate-phosphate from Arcdeckne Island, District of Franklin, Arctic Canada. *Can. Mineral.*, 31, 775–780.

J.D. Grice, A.C. Roberts (1993) Harrisonite, a well-ordered silico-phosphate with a layered crystal structure. *Can. Mineral.*, 31, 781–785.

Electron microprobe analysis gave CaO 7.65, FeO 52.27, MgO 3.89, MnO 0.11, SiO<sub>2</sub> 15.99, P<sub>2</sub>O<sub>5</sub> 19.18, sum 99.09 wt%, corresponding to Ca<sub>1.01</sub>(Fe<sub>2.36</sub>Mg<sub>0.71</sub>Mn<sub>0.01</sub>)<sub>Σ6.08</sub>(Si<sub>0.98</sub>O<sub>4</sub>)<sub>2</sub>(P<sub>0.99</sub>O<sub>4</sub>)<sub>2</sub>, simplified as Ca(Fe, Mg)<sub>6</sub>(SiO<sub>4</sub>)<sub>2</sub>(PO<sub>4</sub>)<sub>2</sub>. Occurs as equidimensional, anhedral, yellow-brown to orange-brown grains averaging 0.2–0.5 mm; pale yellow streak, vitreous luster, translucent to transparent, brittle, conchoidal fracture, a very poor cleavage,  $H = < 5$ ,  $D_{\text{meas}} = 4.02$ ,  $D_{\text{calc}} = 4.01$  g/cm<sup>3</sup> for the simplified analytical formula, and  $Z = 3$ . Optically uniaxial negative, commonly biaxial with  $2V = \sim 5^\circ$  from strain,  $\omega = 1.770(5)$ ,  $\epsilon = 1.759(3)$ , slightly pleochroic in pale yellow. Single-crystal X-ray structure study ( $R = 0.025$ ) indicated trigonal symmetry, space group  $R\bar{3}m$ ;  $a = 6.240(2)$ ,  $c = 26.784(5)$  Å, as refined from a 114-mm Gandolfi pattern (Co radiation), with strongest lines of 5.00(60,012), 3.119(100,107), 2.689(80,021), 2.558(100,116), 2.505(80,024), 1.903(60,125,0.2.10), and 1.560(80,1.2.11,220).

The new name is for J. M. Harrison (1915–1990), former director of the Geological Survey of Canada. The mineral occurs in an iron silicate + quartz + apatite-layered body thought to be a shaly, phosphatic iron formation that has been metamorphosed to the granulite facies. Type material is in the National Mineral Collection at the Geological Survey of Canada and at the Canadian Museum of Nature, Ottawa. **J.L.J.**

#### Megacyclite\*

A.P. Khomyakov, G.N. Nechelyustov, N.A. Yamnova, D.Yu. Pushcharovskii (1993) Megacyclite Na<sub>8</sub>KSi<sub>9</sub>O<sub>18</sub>(OH)<sub>9</sub>·19H<sub>2</sub>O: A new mineral. *Zapiski Vseross. Mineral. Obshch.*, 122 (1), 125–128 (in Russian).

Electron microprobe analysis (average of four) gave Na<sub>2</sub>O 19.75, K<sub>2</sub>O 3.62, SiO<sub>2</sub> 43.42, H<sub>2</sub>O by difference 33.21, sum 100 wt%, corresponding to Na<sub>7.96</sub>K<sub>0.96</sub>Si<sub>9.02</sub>O<sub>18</sub>(OH)<sub>9</sub>·18.51H<sub>2</sub>O, ideally Na<sub>8</sub>KSi<sub>9</sub>O<sub>18</sub>(OH)<sub>9</sub>·19H<sub>2</sub>O. The mineral is colorless, transparent, dull vitreous luster, steplike fracture, perfect {100} and less perfect {001} cleavages,  $H = 2$ ,  $D_{\text{meas}} = 1.82(5)$ ,  $D_{\text{calc}} = 1.87$  g/cm<sup>3</sup> for  $Z = 4$ . Dissolves easily in H<sub>2</sub>O and whitens with prolonged atmospheric exposure. Optically biaxial negative,  $\alpha = 1.460(2)$ ,  $\beta = 1.478(2)$ ,  $\gamma = 1.481(2)$ ,  $2V_{\text{meas}} = 43(1)$ ,  $2V_{\text{calc}} = 44^\circ$ . Strong dispersion,  $r > v$ ,  $\mathbf{b} = Y$ ,  $\mathbf{c} \wedge X = 30^\circ$ . Nonluminescent in ultraviolet light. The IR spectrum has absorption maxima at 3570, 3410, 1660, 1225, 1125, 1090, 1040, 995, 900, 865, 505, 470, and 450 cm<sup>-1</sup>. Single-crystal X-ray study gave monoclinic symmetry, space group  $P2_1/c$ ,  $a = 24.91(5)$ ,  $b = 11.94(1)$ ,  $c = 14.92(2)$  Å,  $\beta = 94.47(9)^\circ$ . The structural formula with  $Z = 2$  is Na<sub>16</sub>K<sub>2</sub>[Si<sub>18</sub>O<sub>36</sub>(OH)<sub>18</sub>]·38H<sub>2</sub>O. The strongest

powder diffraction lines (25 given) are 4.26(60,511), 3.08-(100,124,531), 2.938(70B,040,802,523), 2.649(60B,902), 2.400(35,116,216), and 2.289(35,543,144,824,615).

The mineral occurs in the subsurface, unweathered, veined pegmatites of Mount Rasvumchorr, in the Khibinsk alkali massif, Kola Peninsula, Russia, as irregular grains from 1 to 3 mm in diameter, associated with fenaksite, revdite, orthoclase, and delhayelite. Other minor minerals include pectolite, eudialyte, shcherbakovite, lomonosovite, lamprophyllite, aenigmatite, aegirine, alkali amphibole, rasvumite, nacaphite, villiaumite, and natrite. The name, derived from the Greek for “large and cyclical,” alludes to the structure, in which there are unusual, large, ringlike groups consisting of 18SiO<sub>4</sub> tetrahedra. Samples are deposited at the Fersman Mineralogical Museum, Moscow.

**Discussion.** Preliminary data for the then-unnamed mineral were abstracted in *Am. Mineral.*, 78, p. 676 (1993). **D.A.V.**

#### Parkinsonite\*

R.F. Symes, G. Cressey, A.J. Criddle, C.J. Stanley, J.G. Francis, G.C. Jones (1994) Parkinsonite, (Pb,Mo,□)<sub>8</sub>O<sub>8</sub>Cl<sub>2</sub>, a new mineral from Merehead quarry, Somerset. *Mineral. Mag.*, 58, 59–68.

Occurs as compact clusters or patches, to 3 mm, of bladed, red to purplish red crystals up to 100 × 300 μm. Electron microprobe analysis gave PbO 88.4, MoO<sub>3</sub> 8.0, Cl 4.4, O ≡ Cl 1.0, sum 100.8 wt%, corresponding to Pb<sub>6.34</sub>Mo<sub>0.89</sub>□<sub>0.77</sub>O<sub>8.02</sub>Cl<sub>1.98</sub>, similar to that obtained from synthetic material. Translucent, scarlet to grenadine red streak, sectile, adamantine luster,  $H = 2$ –2.5; perfect {001} cleavage, also a fair cleavage on possibly {100} and indistinct on possibly {350};  $D_{\text{meas}} = 7.32$  (synthetic material),  $D_{\text{calc}} = 7.39$  g/cm<sup>3</sup> for  $Z = 1$ . Optically uniaxial negative, with  $\omega = 2.58$ ,  $\epsilon' = 2.42$  calculated from reflectance spectra. Single-crystal X-ray study indicated tetragonal symmetry, possible space groups  $I4/mmm$ ,  $I42m$ ,  $I4m2$ ,  $I4/m$ , or  $I422$ ,  $a = 3.988(1)$ ,  $c = 22.34(1)$  Å as refined from a Debye-Scherrer pattern (Cu radiation) with strongest lines of 3.507(32,103), 2.983(100,105), 2.816-(78,110), 1.989(75,118), 1.658(51,215), and 1.586(33,1.0.13).

The mineral occurs both at the Merehead quarry, Cranmore, Somerset, England, and at the Wesley mine, Didsbury, near Bristol, as a constituent of a lead oxychloride assemblage associated with manganese oxide veins in Carboniferous limestone. The new name is for R.F.D. Parkinson (b. 1928), who first found the mineral. Type material is in the Natural History Museum, London. **J.L.J.**

#### Pringleite,\* ruitenbergite\*

A.C. Roberts, J.A.R. Stirling, J.D. Grice, P.C. Burns, B.V. Roulston, J.D. Curtis, J.L. Jambor (1993) Pringleite and ruitenbergite, polymorphs of Ca<sub>5</sub>B<sub>26</sub>O<sub>34</sub>(OH)<sub>24</sub>Cl<sub>4</sub>.

13H<sub>2</sub>O, two new mineral species from Sussex, New Brunswick. *Can. Mineral.*, 31, 795–800.

The minerals occur in a single hand specimen consisting mainly of halite, hilgardite-1A, and sylvite from the Mississippian Windsor Group evaporites at the Potash Company of America mine at Penobsquis, near Sussex, New Brunswick.

### Pringleite

Occurs as colorless to pale yellow, platy to prismatic, subhedral to anhedral grains up to 2 mm (aggregates to 4 mm); vitreous luster, white streak,  $H = 3-4$ , brittle, good {110} cleavage, even to slightly conchoidal fracture, nonluminescent, rare simple twinning,  $D_{\text{meas}} = 2.21(1)$ ,  $D_{\text{calc}} = 2.11 \text{ g/cm}^3$  for  $Z = 1$ . Electron microprobe analysis gave CaO 26.29, B<sub>2</sub>O<sub>3</sub> 46.75, Cl 6.48, O = Cl 1.46, H<sub>2</sub>O by difference 21.94, sum 100 wt%, corresponding to Ca<sub>9.27</sub>B<sub>26.56</sub>O<sub>34.98</sub>(OH)<sub>24.64</sub>Cl<sub>3.64</sub> · 11.76H<sub>2</sub>O, ideally Ca<sub>9</sub>B<sub>26</sub>O<sub>34</sub>(OH)<sub>24</sub>Cl<sub>4</sub> · 13H<sub>2</sub>O. Optically biaxial positive,  $\alpha = 1.537(1)$ ,  $\beta = 1.548(1)$ ,  $\gamma = 1.570(1)$ ,  $2V_{\text{meas}} = 77(1)$ ,  $2V_{\text{calc}} = 71.4^\circ$ , nonpleochroic, strong dispersion  $r \ll v$ ;  $X = c$ ,  $Y:a = 40^\circ$  in  $\gamma$  acute,  $Z:b = 46^\circ$  in  $\gamma$  obtuse. Single-crystal X-ray study indicated triclinic symmetry, space group  $P1$  (structure to be reported),  $a = 12.759(6)$ ,  $b = 13.060(5)$ ,  $c = 9.733(4) \text{ \AA}$ ,  $\alpha = 102.14(4)$ ,  $\beta = 102.03(3)$ ,  $\gamma = 85.68(4)^\circ$ , as refined from a 114-mm Gandolfi pattern (Co radiation). Strongest lines are 9.21(70,110), 7.69(100,111), 5.74(60,111,201), 4.63(40,221), 3.845(35,222), 2.199(30B,350,242,513,440), and 2.058(30,152,602). The new name is for Gordon J. Pringle of the Geological Survey of Canada, Ottawa.

### Ruitenbergitte

Known only as a single, anhedral grain, 4 × 7 mm, which is associated with pringleite and is physically identical to it except that cleavage is {100}. Optically biaxial positive,  $\alpha = 1.542(1)$ ,  $\beta = 1.545(1)$ ,  $\gamma = 1.565(1)$ ,  $2V_{\text{meas}} = 47(1)$ ,  $2V_{\text{calc}} = 42.5^\circ$ , nonpleochroic, dispersion not determinable;  $X = b$ ,  $Y:a = 25^\circ$  in  $\beta$  obtuse,  $Z = c$ . X-ray single-crystal study indicated monoclinic symmetry, space group  $P2_1$  (structure to be reported),  $a = 19.88(1)$ ,  $b = 9.715(4)$ ,  $c = 17.551(9) \text{ \AA}$ ,  $\beta = 114.85(4)^\circ$ , as refined from a 114-mm Gandolfi pattern (Co radiation). Strongest lines are 9.03(60,200), 8.56(100,110), 6.62(70,210), 6.14(30B,012,212), 5.12(30,310), 4.09(30,410), 3.786(30,320), 3.493(30,222), 2.890(30), 2.134(30B), and 2.037(30). The new name is for A. A. Ruitenbergh of the Geological Surveys Branch, New Brunswick Department of Natural Resources. The mineral is the monoclinic polymorph of pringleite. Portions of type ruitenbergitte and pringleite are in the National Mineral Collection housed at the Geological Survey of Canada and at the Canadian Museum of Nature, Ottawa. **J.L.J.**

### Seelite\*

P. Bariand, B. Bachet, C. Brassy, O. Medenbach, M. Deliens, P. Piret (1993) Seelite, a new uranium mineral

from the Talmessi mine, Iran, and Rabjac, France. *Mineral. Record*, 24, 463–467.

The mineral occurs in the oxidation zones of the Talmessi mine in central Iran and the Rabejac U deposit near Lodève, Hérault, France. Electron microprobe and CHN analyses (Rabejac) gave MgO 4.28 (4.09), UO<sub>3</sub> 65.37 (62.43), As<sub>2</sub>O<sub>3</sub> 14.00 (13.41), As<sub>2</sub>O<sub>5</sub> 6.98 (6.67), H<sub>2</sub>O 13.40 wt%, where values in parentheses are after correction for dehydration under the electron beam, and As<sup>3+</sup>–As<sup>5+</sup> was partitioned according to the X-ray structure determination. The corrected results correspond to Mg<sub>0.97</sub>U<sub>2.08</sub>As<sub>1.30</sub>As<sub>0.56</sub><sup>3+</sup>O<sub>17.64</sub>(H<sub>2</sub>O)<sub>7.08</sub>, ideally Mg[UO<sub>2</sub>(AsO<sub>3</sub>)<sub>x</sub>(AsO<sub>4</sub>)<sub>1-x</sub>]<sub>2</sub> · 7H<sub>2</sub>O, with  $x$  about 0.7. Occurs as tufted spherules and rosettes of bright yellow tabular crystals elongate [010], flattened on (100), showing {100} and {001} prism faces terminated by {010} or by {011} and {011̄}. Vitreous luster, irregular fracture, white streak,  $H = 3$ , nonfluorescent,  $D_{\text{meas}} = 3.70$ ,  $D_{\text{calc}} = 3.60$  (Talmessi) and 3.71 g/cm<sup>3</sup> (Rabejac) for  $Z = 2$ . Optically biaxial negative with indices (Talmessi and Rabejac, respectively)  $\alpha = 1.602(1)$ , 1.610(2),  $\beta = 1.737(3)$ , 1.730(4),  $\gamma = 1.753(3)$ , 1.740(4),  $2V_{\text{meas}} = 41.0(5)$ , 30(3)°,  $2V_{\text{calc}} = 37.5$ , 34°, OAP (010),  $Z: c = 5(1)^\circ$ , extreme dispersion  $r > v$ , strongly pleochroic with  $X \parallel a$  (colorless),  $Y \parallel b$  (yellow),  $Z \parallel c$  (yellow). Single-crystal X-ray study indicated monoclinic symmetry, space group  $C2/m$ ,  $a = 18.207(5)$ ,  $b = 7.062(3)$ ,  $c = 6.661(3) \text{ \AA}$ ,  $\beta = 99.65(5)^\circ$  as refined from the powder pattern (Talmessi) which has strongest lines of 9.05-(100,200), 4.85(50,201,111), 4.44(80,400), 3.99(50,311), 3.52(60,020), and 1.92(80,603,911,132).

The new name is for mineral collectors Paul (1904–1982) and Hilde Seel (1901–1987). Type material is in the Royal Institute of Natural Sciences of Belgium in Brussels (Rabejac), and in the Mineralogical Collection, Pierre and Marie Curie University, Paris (Talmessi).

**Discussion.** The initial paper on the X-ray structure of the Talmessi mineral was abstracted as unnamed Mg[(UO<sub>2</sub>)(AsO<sub>4</sub>)<sub>2</sub> · 4H<sub>2</sub>O] in *Am. Mineral.*, 78, p. 453 (1993). Another paper on the structure is reported to be in preparation. **J.L.J.**

### Tiettaite\*

A.P. Khomyakov, V.P. Pavlov, D.L. Rogachev, O.A. Zalkind, A.V. Martynova (1993) Tiettaite (Na, K)<sub>17</sub>FeTiSi<sub>16</sub>O<sub>29</sub>(OH)<sub>30</sub> · 2H<sub>2</sub>O: A new mineral. *Zapiski Vseross. Mineral. Obshch.*, 122 (1), 121–125 (in Russian).

Analysis by electron microprobe, recalculated to 100 wt% after subtracting rasvumite inclusions, gave Na<sub>2</sub>O 19.21, K<sub>2</sub>O 9.93, CaO 0.30, Fe<sub>2</sub>O<sub>3</sub> 4.05, TiO<sub>2</sub> 3.91, SiO<sub>2</sub> 47.65, H<sub>2</sub>O 14.95, sum 100.00 wt%, corresponding to (Na<sub>12.51</sub>K<sub>4.25</sub>Ca<sub>0.11</sub>)<sub>Σ16.87</sub>Fe<sub>1.02</sub><sup>3+</sup>Ti<sub>0.95</sub>Si<sub>16</sub>O<sub>29.10</sub>(OH)<sub>29.80</sub> · 1.84H<sub>2</sub>O, ideally (Na,K)<sub>17</sub>FeTiSi<sub>16</sub>O<sub>29</sub>(OH)<sub>30</sub> · 2H<sub>2</sub>O. Grayish white, transparent, with vitreous or silky luster, tarnishes with prolonged exposure to air. Perfect {100} and {010} cleavages, steplike fracture,  $H = 3$ , nonluminescent, soluble in weak HCl and HNO<sub>3</sub>,  $D_{\text{meas}} = 2.42(2)$ ,

$D_{\text{calc}} = 2.39 \text{ gm/cm}^3$ . Thermal analysis showed endothermic effects at 120, 270, and 360 °C. Colorless in thin section, biaxial negative,  $\alpha = 1.532(2)$ ,  $\beta = 1.548(2)$ ,  $\gamma = 1.559(2)$ ,  $2V_{\text{meas}} = 79(1)$ ,  $2V_{\text{calc}} = 79^\circ$ , average dispersion  $r < v$ . Cleavage fragments have straight extinction with positive or negative elongation, orientation  $\mathbf{a} = X$ ,  $\mathbf{b} = Y$ ,  $\mathbf{c} = Z$ . The IR spectrum has absorption maxima at 475, 545, 638, 870, 925, 980, 1060, 1100, 1690, and 3600  $\text{cm}^{-1}$ . Single-crystal X-ray studies showed the mineral to the orthorhombic, space group  $Cmcm$ ,  $Cmc2_1$ , or  $C2mc$ ,  $a = 29.77(1)$ ,  $b = 11.03(2)$ ,  $c = 17.111(5)$  Å. The strongest lines (40 given) are 10.38(100,110), 4.516(75,313), 3.220(65,604), 3.097(80,315,623,820), 2.972(65,912), and 2.773(90,134,913).

The mineral occurs in unweathered (subsurface) ultragpaitic pegmatites at both Mount Rasvumchorr and Mount Koashva, Khibinsk alkali massif, Kola Peninsula, Russia. Associated minerals are orthoclase, nepheline, sodalite, aegirine, villiumite, natrite, rasvumite, phosinaite, vuonnemite, astrophyllite, shcherbakovite, kazakovite, koashvite, ershovite, olympite, sidorenkite, djerfisherite, and shafanovskite. The mineral forms rounded friable aggregates up to 1 cm, containing acicular hairs elongate [001] and flattened (100). The name is for the Saamsk word *tietta*, meaning science or knowledge (and also used as the name of the first scientific station of the USSR Academy of Sciences in Khibinsk). Samples are at the Fersman Museum, Moscow, and the Kola Science Center, Apatity. D.A.V.

#### Tsaregorodtsevitte\*

L.A. Pautov, V.Yu. Karpenko, E.V. Sokolova, K.I. Ignatenko (1993) Tsaregorodtsevitte  $\text{N}(\text{CH}_3)_4[\text{Si}_2(\text{Si}_{0.5}\text{Al}_{0.5})\text{O}_6]_2$ : A new mineral. *Zapiski Vseross. Mineral. Obshch.*, 122 (1), 128–135 (in Russian).

Electron microprobe analysis (average of three) gave Si 31.03, Al 6.45, N 3.2, O 45.6, sum 86.28 wt%. The presence of  $\text{CH}_3$  was demonstrated through gas chromatography, IR-spectroscopy, and laser Raman microanalysis. The ideal formula is  $\text{N}(\text{CH}_3)_4[\text{Si}_2(\text{Si}_{0.5}\text{Al}_{0.5})\text{O}_6]_2$ . The mineral is insoluble in boiling sulfuric, nitric, or hydrofluoric acid, and partly dissolves with prolonged boiling in phosphoric acid. Thermal analysis showed exothermic effects at 630, 700, 790, and 930 °C, and an endothermic effect at 660 °C. Weight loss commences at 660 °C, with ammonia generation. The IR spectrum resembles that of sodalite, with additional lines near 1420 and 1480  $\text{cm}^{-1}$  due to the  $\text{CH}_3$  group. The mineral is colorless to slightly yellow, vitreous luster, brittle, no cleavage, conchoidal fracture,  $H = 6$ ,  $VHN_{120} = 835$  (796–893),  $n = 9$ , nonluminescent,  $D_{\text{meas}} = 2.04(5)$ ,  $D_{\text{calc}} = 2.01 \text{ gm/cm}^3$  for  $Z = 2$ . Optically biaxial negative,  $2V_{\text{meas}} = 76(5)^\circ$ ,  $\alpha = 1.529(2)$ ,  $\gamma = 1.531(2)$ . Many sections exhibit sector twinning. Single-crystal X-ray studies showed the mineral to be orthorhombic, space group  $I222$ ,  $a = 8.984(3)$ ,  $b = 8.937(2)$ ,  $c = 8.927(2)$  Å. The powder pattern is very close to that of ammonian sodalite (PDF 14–17). The strongest

lines (36 given) are 6.33(60,110), 4.50(12B,200), 4.46(82,020), 3.66(100,211), 3.16(12,202), and 2.586(15,222).

The mineral forms exceptional isometric, pseudocubic crystals up to 10 mm in diameter. The {100}, {001}, and {010} faces are dull, whereas the remaining faces are lustrous. The mineral occurs in friable material that fills tectonic fractures within muscovite-chlorite schist from Man'-Khambo, Khanty Mansiysk region, Ural Mountains, associated with chlorite, quartz, anatase, brookite, monazite, albite, phillipsite, and rutile. The name is for the Ural expert and mineral collector Sergei Vasil'evich Tsaregorodtsev (1953–1986). Samples are at the Il'menskii Nature Reserve (Miass), the Saint Petersburg Mineral Museum, and the National Museum (Sophia).

**Discussion.** The preliminary description was abstracted in *Am. Mineral.*, 77, p. 1118, (1992). D.A.V.

#### Vistepite\*

L.A. Pautov, D.I. Belakovskii, R. Skala, E.V. Sokolova, K.I. Ignatenko, A.V. Mokhov (1992) Vistepite  $\text{Mn}_5\text{-SnB}_2\text{Si}_5\text{O}_{20}$ : A new borosilicate of manganese and tin. *Zapiski Vseross. Mineral. Obshch.*, 121 (4), 107–112 (in Russian).

Electron microprobe analysis (average of eight) gave  $\text{SiO}_2$  33.78,  $\text{Al}_2\text{O}_3$  0.66,  $\text{SnO}_2$  17.60,  $\text{CaO}$  0.66,  $\text{FeO}$  0.44,  $\text{MnO}$  39.40,  $\text{B}_2\text{O}_3$  7.98, sum 100.52 wt%, corresponding to  $(\text{Mn}_{4.84}\text{Ca}_{0.10}\text{Fe}_{0.05})_{24.99}\text{Sn}_{1.02}\text{B}_{2.00}(\text{Si}_{4.90}\text{Al}_{0.11})_{25.01}\text{O}_{20.00}$ , ideally  $\text{Mn}_5\text{SnB}_2\text{Si}_5\text{O}_{20}$ . The  $\text{B}_2\text{O}_3$  was confirmed independently by a colorimetric method. The mineral is orange-yellow, transparent, vitreous luster, brittle, perfect cleavage in three directions,  $H = 4.5$ , nonluminescent,  $D_{\text{meas}} = 3.67(5)$ ,  $D_{\text{calc}} = 3.70 \text{ gm/cm}^3$  for  $Z = 7$ . DTA revealed a small endothermic effect at 850 °C. IR spectroscopy showed absorption lines at 400, 422, 472, 508, 556, 570, 615, 700, 760, 920, 1110, and 1500  $\text{cm}^{-1}$ , suggesting that B has fourfold coordination. Optically biaxial negative,  $2V_{\text{meas}} = 57(3)$ ,  $2V_{\text{calc}} = 54.3^\circ$ ,  $\alpha = 1.696(3)$ ,  $\beta = 1.711(5)$ ,  $\gamma = 1.715(5)$ , no pleochroism, strong dispersion  $r > v$ , polysynthetically twinned parallel to the elongation. X-ray powder studies gave monoclinic symmetry, space group  $P2/m$ ,  $a = 28.77(1)$ ,  $b = 7.01(2)$ ,  $c = 13.72(2)$  Å,  $\beta = 96.6(2)^\circ$ . Single-crystal study was hindered by the twinning. The strongest powder lines (38 given) are 3.41(80,004), 3.22(80,204,703,321), 2.83(100,314), 2.81(100,422), 2.24(70), 1.750(60), and 1.703(50).

The mineral occurs within biotite-quartz hornfels at the margin of a Sn-bearing granite massif on the northern slope of the Inyl'chek mountains, southeastern Khirgiz, where it forms radial aggregates up to 15 mm associated with rhodonite, quartz, tephroite, galena, hübnerite, chalcopyrite, sphalerite, stannite, rhodochrosite, a Cl-bearing manganese silicate, cassiterite, celsian, fluorite, helvite, neotocite, schorl, pyrite, and pyrophanite. The name is for the mineralogist and collector Victor Ivanovich Stepanov (1924–1988). Samples are at the Vernadskii Geological Museum, Moscow, the museum of the Il'menskii Nature Reserve (Miass), and the Fersman Mineralogical Museum, Moscow. D.A.V.

**Watanabeite\***

M. Shimizu, A. Kato, S. Matsubara, A.J. Criddle, C.J. Stanley (1993) Watanabeite,  $\text{Cu}_4(\text{As,Sb})_2\text{S}_5$ , a new mineral from the Teine mine, Sapporo, Hokkaido, Japan. *Mineral. Mag.*, 57, 643–649.

Electron microprobe analysis gave Cu 41.1, Ag 0.1, Mn 0.3, As 15.4, Sb 14.3, Bi 2.4, S 26.2, sum 99.8 wt%, corresponding to  $(\text{Cu}_{0.93}\text{Mn}_{0.03}\text{Ag}_{0.01})_{\Sigma 3.98}(\text{As}_{1.25}\text{Sb}_{0.72}\text{Bi}_{0.07})_{\Sigma 2.04}\text{S}_{4.98}$  for 11 atoms, ideally  $\text{Cu}_4(\text{As,Sb})_2\text{S}_5$ . Silvery lead gray color, lead gray streak, no cleavage, uneven fracture, brittle,  $VHN_{100} = 253\text{--}306$ , megascopically indistinguishable from tetrahedrite-group minerals.  $D_{\text{meas}} = 4.666(2)$ ,  $D_{\text{calc}} = 4.66 \text{ g/cm}^3$  for  $Z = 16$ . Gray in reflected light, resembling tetrahedrite; weakly anisotropic and birefractant, revealing a mosaic of nearly rectangular grains and elongate grains to  $50 \mu\text{m}$ . Maximum and minimum reflectance percentages (SiC standard) in air and in oil are, respectively, 32.5, 31.5, 17.7, 17.0 (470 nm), 32.0, 31.1, 17.0, 16.3 (546 nm), 31.1, 30.3, 16.1, 15.5 (589 nm), and 30.0, 29.3, 15.0, 14.5 (650 nm). The unit cell calculated from the X-ray powder pattern is orthorhombic,  $a = 14.51(1)$ ,  $b = 13.30(1)$ ,  $c = 17.96(1) \text{ \AA}$ ; strongest lines (diffractometer, Co radiation, 76 lines given) are 3.36(7,115,402), 2.999(100,422,006), 1.594(20,424,151), 1.833(40,428), and 1.546(15B,4.2.10). The stronger lines are indexable on a tetrahedrite-like cubic cell with  $a' = 10.37$ .

The new name is for Takeo Watanabe (1907–1986). The mineral is associated with quartz from a hydrothermal vein and is monomineralic except for minute inclusions of emplectite, native bismuth, and tennantite. Type material is in the National Science Museum, Tokyo, the University Museum of the University of Tokyo, and the Natural History Museum, London. **J.L.J.**

**New Data****Fiedlerite-1A,\* fiedlerite-2M<sub>1</sub>\***

S. Merlino, M. Pasero, N. Perchiazzi (1994) Fiedlerite: Revised chemical formula  $[\text{Pb}_3\text{Cl}_4\text{F}(\text{OH})\cdot\text{H}_2\text{O}]$ , OD de-

scription and crystal structure refinement of the two MDO polytypes. *Mineral. Mag.*, 58, 69–78.

Fiedlerite, known previously only from Laurion (Laurium), Greece, also occurs in Etruscan iron slags at Baratti, southern Tuscany, Italy. Electron microprobe analyses of the mineral from both localities showed the presence of 2.01–2.59 wt% F, which approximates one atom in the formula unit and indicates that the original formula,  $\text{Pb}_3\text{Cl}_4(\text{OH})_2$ , should be revised to  $\text{Pb}_3\text{Cl}_4\text{F}(\text{OH})\cdot\text{H}_2\text{O}$ . Single-crystal X-ray structure study of the mineral from both localities showed the presence of order-disorder relationships; the two crystals with the maximum degree of order were found to be triclinic (1A, Baratti,  $R = 0.092$ ) and monoclinic (2M<sub>1</sub> Laurion,  $R = 0.061$ ) polytypes. The 1A polytype has the space group  $P\bar{1}$ ,  $a = 8.574(3)$ ,  $b = 8.045(4)$ ,  $c = 7.276(2) \text{ \AA}$ ,  $\alpha = 89.96(4)$ ,  $\beta = 102.05(4)$ ,  $\gamma = 103.45(4)^\circ$ ; the 2M<sub>1</sub> polytype has the space group  $P2_1/a$ ,  $a = 16.681(4)$ ,  $b = 8.043(3)$ ,  $c = 7.281(2) \text{ \AA}$ ,  $\beta = 102.56(4)^\circ$ . **J.L.J.**

**Iowaite**

R.S.W. Braithwaite, P.J. Dunn, R.G. Pritchard, W.H. Parr (1994) Iowaite, a reinvestigation. *Mineral. Mag.*, 58, 79–85.

Well-crystallized iowaite occurs in cavities in carbonatite at the Palabora open-pit mine, Transvaal, and platy crystals are up to 2 cm across. Perfect micaceous cleavage {0001},  $H = 2\frac{1}{2}$ ,  $D_{\text{meas}} = 2.09$ ,  $D_{\text{calc}} = 2.04 \text{ g/cm}^3$  for  $Z = \frac{3}{8}$ . Optically uniaxial negative,  $\omega = 1.561(2)$ ,  $\epsilon = 1.543(2)$ ; intense pleochroism  $O =$  pale yellow,  $E =$  deep blue-green. Single-crystal X-ray structure study ( $R = 0.017$ ) indicated trigonal symmetry, space group  $R\bar{3}m$ ,  $a = 3.1183(9)$ ,  $c = 24.113(8) \text{ \AA}$ . Electron microprobe and C analyses plus TGA gave MgO 35.3, Fe<sub>2</sub>O<sub>3</sub> 24.6, Cl 7.0, CO<sub>2</sub> 0.4, H<sub>2</sub>O (to 200 °C) 11, total volatiles 41 wt%, which gives a formula close to  $(\text{Mg}_{5.9}\text{Fe}_{0.1}^{2+})\text{Fe}_2^{3+}(\text{OH})_{16}[\text{Cl}_{1.4}(\text{OH})_{0.48}(\text{CO}_3)_{0.06}]\cdot 4\text{H}_2\text{O}$ , ideally  $\text{Mg}_6\text{Fe}_2(\text{OH})_{16}\text{Cl}_2\cdot 4\text{H}_2\text{O}$ . The new results indicate that iowaite is the chloride analogue of pyroaurite. **J.L.J.**