Julgoldite-(Fe^{2+}) **$Ca_2Fe^{2+}(Fe^{3+},Al)_2(SiO_4)(Si_2O_7)(OH)_2 \cdot H_2O$**

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals flat prismatic to bladed, to 2 mm, elongated along [010] and flattened ∥ {100}. In fan-shaped, plumose crystal groups; granular. *Twinning:* Twin plane {001}, typically repeated, common.

Physical Properties: *Cleavage:* Perfect on {100} and {001}. *Tenacity:* Brittle. Hardness = 4.5 D(meas.) = 3.58–3.60 D(calc.) = 3.56

Optical Properties: Transparent. *Color:* Deep black, greenish black to green in small fragments; in thin section, brilliant interference colors in greens or blues. *Streak:* Greenish olive with a bluish tinge. *Luster:* Nearly submetallic.
Optical Class: Biaxial (–). *Pleochroism:* Strong; X = pale brown; Y = pale brownish green; Z = deep emerald-green. *Orientation:* $Y = b$. *Absorption:* $Z \gg Y > X$. $\alpha = 1.776(4)$ $\beta = 1.814(4)$ $\gamma = 1.836(4)$ 2V(meas.) = 50°–70° 2V(calc.) = 73°

Cell Data: *Space Group:* $A2/m$. $a = 8.922(4)$ $b = 6.081(3)$ $c = 19.432(9)$ $\beta = 97.60(6)°$ Z = 4

X-ray Powder Pattern: Scotland.
2.958 (100), 2.780 (80), 2.574 (80), 1.519 (80), 4.817 (70), 3.859 (70), 2.501 (60)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	34.0	32.04	MnO	0.2	
TiO_2	0.1		MgO	0.2	0.23
Al_2O_3	1.3	0.68	CaO	22.0	19.93
Fe_2O_3	29.6	30.28	BaO	0.01	
FeO	8.7	9.5	H_2O	4.69	[7.34]
			Total	100.8	[100.00]

(1) Långban, Sweden; by emission spectroscopy, corresponds to $(Ca_{8.8}Mn_{0.1})_{\Sigma=8.9}(Fe^{2+}_{2.7}Fe^{3+}_{1.2}Mg_{0.1})_{\Sigma=4.0}(Fe^{3+}_{7.2}Al_{0.6})_{\Sigma=7.8}Si_{12.7}O_{44.7}(OH)_{11.7}$. (2) Auchinstarry quarry, Scotland; by electron microprobe, Fe^{2+}:Fe^{3+} by Mössbauer spectroscopy, H_2O by difference; corresponds to $Ca_{8.01}Fe^{3+}_{8.55}Al_{0.30}Fe^{2+}_{3.00}Mg_{0.13}Si_{12.03}O_{48.47} \cdot (H_2O)_{9.18}$.

Polymorphism & Series: Forms two series, with pumpellyite-(Fe^{2+}), and with pumpellyite-(Mg).

Mineral Group: Pumpellyite group.

Occurrence: In hematite-magnetite ore (Långban, Sweden); in quartz-diabase (Scotland).

Association: Apophyllite, barite, hematite, magnetite, ilvaite, calcite, quartz, chlorite, prehnite, epistilbite, stilbite, pectolite, laumontite, babingtonite, titanite.

Distribution: At Långban, Värmland, Sweden. Between Tafjord and Fjøra, Sunnmøre district, Norway. In the Ratho quarry, near Edinburgh, and the Auchinstarry quarry, Kilsyth, Scotland. In Germany, from the Wolfmühl quarry, Waldgrehweiler, Rhineland-Palatinate. From Hale Creek, Trinity Co., California, and in the Clark mine, Copper Harbor, Keweenaw Co., Michigan, USA. At Sawda, near Jalgoan, and Bombay, Maharashtra, India. In the Marlin Norite quarry, Bushveld complex, South Africa.

Name: For Professor Julian Royce Goldsmith (1918–), mineralogist and geochemist, University of Chicago, Chicago, Illinois, USA, and its *ferrous iron* content.

Type Material: Swedish Museum of Natural History, Stockholm, Sweden; Harvard University, Cambridge, Massachusetts, 109641, 109642; National Museum of Natural History, Washington, D.C., USA, 137014.

References: (1) Moore, P.B. (1971) Julgoldite, the Fe^{+2}–Fe^{+3} dominant pumpellyite; a new mineral from Långban, Sweden. Lithos, 4, 93–99. (2) (1971) Amer. Mineral., 56, 2157–2158 (abs. ref. 1). (3) Allmann, R. and G. Donnay (1973) The crystal structure of julgoldite. Mineral. Mag., 39, 271–281. (4) Passaglia, E. and G. Gottardi (1973) Crystal chemistry and nomenclature of pumpellyites and julgoldites. Can. Mineral., 12, 219–223. (5) Livingstone, A. (1976) Julgoldite, new data and occurrences; a second recording. Mineral. Mag., 40, 761–763.