Johnbaumite $Ca_5(AsO_4)_3(OH,F)$

Crystal Data: Hexagonal. *Point Group:* 6/*m.* Prismatic crystals striated along [0001], granular, to 8 mm, or massive.

Physical Properties: *Cleavage:* Distinct on {1010}. *Tenacity:* Brittle. Hardness = ~ 4.5 D(meas.) = 3.68(3) D(calc.) = 3.73 Fluoresces medium pinkish orange under SW UV; exhibits pale pink cathodoluminescence.

Optical Properties: Translucent. *Color:* Grayish white; colorless in thin section. *Streak:* White. *Luster:* Adamantine to greasy on fracture surfaces, vitreous on cleavage surfaces.
Optical Class: Uniaxial (–). ω = 1.687-1.716 ε = 1.684-1.698

Cell Data: *Space Group: P*$6_3/m$. a = 9.7242(2) c = 6.9657(9) Z = 2

X-ray Powder Pattern: Franklin, New Jersey, USA.
2.895 (100), 2.820 (70), 2.798 (70), 3.98 (50), 3.47 (50), 2.683 (45), 1.879 (45)

Chemistry:

	(1)	(2)	(3)
P_2O_5	1.7	0.46	
As_2O_5	52.2	51.71	54.28
SiO_2		0.18	
FeO	0.2		
MgO	0.1		
CaO	43.5	43.49	44.14
PbO		1.13	
F	0.2		1.50
Cl	0.1	0.18	
H_2O	1.3	[1.35]	0.71
$-O = (F,Cl)_2$	0.1	0.04	0.63
Total	99.2	98.46	100.00

(1) Franklin, New Jersey, USA; by electron microprobe, H_2O by DTA-TGA; corresponding to $(Ca_{4.86}Fe_{0.02}Mg_{0.02})_{\Sigma=4.90}[(As_{0.95}P_{0.05})_{\Sigma=1.00}O_{3.99}]_3[(OH)_{0.90}F_{0.06}Cl_{0.02}]_{\Sigma=0.98}$. (2) Harstigen mine, Långban, Sweden; average of 5 electron microprobe analyses, H_2O calculated as 1 (OH+Cl) pfu; corresponds to $(Ca_{5.02}Pb_{0.03})_{\Sigma=5.05}(As_{2.91}P_{0.04}Si_{0.02})_{\Sigma=2.97}O_{12}(OH_{0.97}Cl_{0.03})$.
(3) $Ca_5(AsO_4)_3(OH,F)$ with OH:F = 1:1.

Mineral Group: Apatite group.

Occurrence: A very rare mineral, part of a metamorphic skarn assemblage in a metamorphosed stratiform zinc orebody (Franklin, New Jersey, USA).

Association: Yeatmanite, diopside, andradite, franklinite, copper, roméite (Franklin, New Jersey, USA); tilasite, andradite, calcite, caryopilite (Långban, Sweden).

Distribution: From Franklin and Sterling Hill, Ogdensburg, Sussex Co., New Jersey, USA.
In Russia, at the Novofrolovskoye copper deposit, Turinsk district, near Krasnoturinsk, Northern Ural Mountains and Yuliya Svintsovaya Pb-Zn deposit, 20 km east-northeast of Son railway station, western Siberia. At the Harstigen mine, Långban, Värmland, Sweden. At the Fuka mine, Okayama Prefecture, Japan.

Name: Honors John L. Baum (1916-2011), Hamburg, New Jersey, USA, former Curator of the Franklin Mineral Museum and collector of the first specimen containing the mineral.

Type Material: Royal Ontario Museum, Toronto, Canada; the Natural History Museum, London, England; Harvard University, Cambridge, Massachusetts (116461) and the National Museum of Natural History, Washington, D.C., USA (144444).

References: (1) Dunn, P.J., D.R. Peacor, and N. Newberry (1980) Johnbaumite, a new member of the apatite group from Franklin, New Jersey. Amer. Mineral., 65, 1143-1145. (2) Malinko, S.V.,

G.S. Rumyantsev, and G.A. Sidorenko (1966) Svabite [= johnbaumite] from contact-metamorphic deposits of Siberia and the Urals. Doklady Acad. Nauk SSSR, 166, 1195-1198 (in Russian).
(3) Biagioni, C. and M. Pasero (2013) The crystal structure of johnbaumite, $Ca_5(AsO_4)_3OH$, the arsenate analogue of hydroxylapatite. Amer. Mineral., 98, 1580-1584. (4) Kusachi, I., C. Henmi, and S. Kobayashi (1996) Johnbaumite from Fuka, Okayama Prefecture, Japan. Mineral. J., 18(2), 60-66.