Veblenite $K_2\square_2Na(Fe^{2+}_5Fe^{3+}_4Mn^{2+}_7\square)Nb_3Ti(Si_2O_7)_2(Si_8O_{22})_2O_6(OH)_{10}(H_2O)_3$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As laths and fibers, to hundreds of μm, included in feldspar.

Physical Properties: *Cleavage*: Perfect on {001}. *Fracture*: Splintery. *Tenacity*: n.d. Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.046

Optical Properties: Translucent. *Color*: Red-brown. *Streak*: Very pale brown. *Luster*: Vitreous. *Optical Class*: Biaxial (–). α = 1.676(2) β = 1.688(2) γ = 1.692(2)° 2V(meas.) = 65(1)° 2V(calc.) = 59.6° *Orientation*: $X \wedge a = 87.8°$, $X \wedge b = 92.3°$, $X \wedge c = 126.7°$, $Y \wedge a = 96.0°$, $Y \wedge b = 168.2°$, $Y \wedge c = 36.9°$, $Z \wedge a = 173.6°$, $Z \wedge b = 78.5°$, $Z \wedge c = 93.0°$. *Pleochroism*: $X = Y$ = black, Z = orange-brown. *Absorption*: $X = Y > Z$.

Cell Data: *Space Group*: $P\bar{1}$. a = 5.3761(3) b = 27.5062(11) c = 18.6972(9) α = 140.301(3)° β = 93.033(3)° γ = 95.664(3)° Z = 1

X-ray Powder Pattern: Ten Mile Lake, Seal Lake area, Newfoundland and Labrador, Canada. 16.89 (100), 18.20 (23), 4.271 (9), 11.66 (8), 4.404 (3), 4.056 (3), 2.721 (3)

Chemistry:

	(1)		(1)
Nb_2O_5	11.69	BaO	1.31
TiO_2	2.26	SrO	0.09
SiO_2	35.71	CaO	1.49
Al_2O_3	0.60	Cs_2O	0.30
FeO	[11.58]	K_2O	1.78
Fe_2O_3	[10.40]	Na_2O	0.68
MnO	12.84	H_2O	[4.39]
ZnO	0.36	F	0.22
MgO	0.08	$-O = F_2$	0.09
		Total	95.69

(1) Ten Mile Lake, Seal Lake area, Newfoundland, and Labrador, Canada; electron microprobe analysis supplemented by IR spectroscopy, FeO/Fe_2O_3 and H_2O from structure analysis; corresponding to $(K_{0.53}Ba_{0.28}Sr_{0.03}\square_{0.16})_{\Sigma=1}(K_{0.72}Cs_{0.07}\square_{1.21})_{\Sigma=2}(Na_{0.72}Ca_{0.17}\square_{1.11})_{\Sigma=2}(Fe^{2+}_{5.32}Fe^{3+}_{4.13}Mn^{2+}_{5.97}Ca_{0.70}Zn_{0.15}Mg_{0.07}\square_{0.66})_{\Sigma=17}(Nb_{2.90}Ti_{0.93}Fe^{3+}_{0.17})_{\Sigma=4}(Si_{19.61}Al_{0.39})_{\Sigma=20}O_{77.01}H_{16.08}F_{0.38}$.

Occurrence: Included in feldspar in gneiss.

Association: Niobophyllite, aegirine-augite, barylite, eudidymite, neptunite, Mn-rich pectolite, pyrochlore, sphalerite, galena.

Distribution: At Ten Mile Lake, Seal Lake area, Newfoundland and Labrador, Canada.

Name: Honors of David R. Veblen (b. 1947), Minneapolis, Minnesota, USA, in recognition of his outstanding contributions to the fields of mineralogy and crystallography.

Type Material: Royal Ontario Museum, Toronto, Ontario, Canada (M26148).

References: (1) Cámara, F., E. Sokolova, F.C. Hawthorne, R. Rowe, J.D. Grice, and K.T. Tait (2013) Veblenite, $K_2\square_2Na(Fe^{2+}_5Fe^{3+}_4Mn^{2+}_7\square)Nb_3Ti(Si_2O_7)_2(Si_8O_{22})_2O_6(OH)_{10}(H_2O)_3$, a new mineral from Seal Lake, Newfoundland and Labrador: mineral description, crystal structure, and a new veblenite Si_8O_{22} ribbon. Mineral. Mag., 77(7), 2955-2974. (2) (2016) Amer. Mineral., 101, 492 (abs. ref. 1).