Landesite $(Mn^{2+},Mg)_9Fe_3^{3+}(PO_4)_8(OH)_3 \cdot 9H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Massive, replacing reddingite.

Physical Properties: *Cleavage:* Good on {100}; poor ⊥ {100}. Hardness = 3–3.5
D(meas.) = 3.026 D(calc.) = 3.210

Optical Properties: Translucent. *Color:* Yellowish brown; yellowish brown in transmitted light.
Optical Class: Biaxial (–). *Pleochroism:* X = dark brown; Y = light brown; Z = yellow.
Orientation: $Z \perp \{100\}$. $\alpha = 1.720$ $\beta = 1.728$ $\gamma = 1.735$ 2V(meas.) = Large.

Cell Data: *Space Group: Pbna.* $a = 9.458(3)$ $b = 10.185(2)$ $c = 8.543(2)$ Z = 4

X-ray Powder Pattern: Berry quarry, Maine, USA.
3.207 (100), 5.096 (54), 3.163 (35), 2.758 (29), 4.284 (27), 2.630 (24), 3.090 (23)

Chemistry:

	(1)
P_2O_5	31.94
$Fe_2O_3 + FeO$	13.91
Mn_2O_3	2.69
MnO	33.65
MgO	3.07
CaO	1.39
H_2O	13.60
insol.	0.13
Total	100.38

(1) Berry quarry, Maine, USA; corresponds to $(Mn^{2+}_{7.2}Mg_{1.2}Ca_{0.5})_{\Sigma=8.9}(Fe^{3+}_{2.7}Mn^{3+}_{0.5})_{\Sigma=3.2}(PO_4)_8(OH)_{3.2} \cdot 8.8H_2O$.

Occurrence: Replacing reddingite in a complex granite pegmatite (Berry quarry, Maine, USA).

Association: Reddingite, lithiophilite, rhodochrosite, eosphorite, fairfieldite, apatite (Berry quarry, Maine, USA).

Distribution: In the USA, in the Berry quarry, Poland, Androscoggin Co., and the Emmons quarry, Greenwood, Oxford Co., Maine; from Branchville, Fairfield Co., Connecticut. At Hagendorf, Bavaria, Germany.

Name: Honors Dr. Kenneth Knight Landes (1899–1984), Professor of Geology, University of Michigan, Ann Arbor, Michigan, USA, for his study of Maine pegmatites.

Type Material: Harvard University, Cambridge, Massachusetts, USA, 91214.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 729–730. (2) Moore, P.B. (1964) Investigations of landesite. Amer. Mineral., 49, 1122–1125. (3) Moore, P.B., T. Araki, and A.R. Kampf (1980) Nomenclature of the phosphoferrite structure type: refinements of landesite and kryzhanovskite. Mineral. Mag., 43, 789–795.