Schoonerite $Fe_2^{2+}ZnMn^{2+}Fe^{3+}(PO_4)_3(OH)_2 \cdot 9H_2O$

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Lathlike and strawlike crystals, elongated along [100], flattened on {010}, showing {001}, {010}, {100}, to 2 mm, typically curved and crinkled, as rosettes, scales, in sprays and mats.

Physical Properties: *Cleavage:* {010}, perfect; {001}, good. Hardness = ∼4
D(meas.) = 2.87–2.92 D(calc.) = 2.79

Optical Properties: Transparent to translucent. *Color:* Pale tan to brown, greenish brown, yellowish brown; copper-red to bronzy on exposure. *Streak:* Pale brown. *Luster:* Subvitreous to waxy.
Optical Class: Biaxial (–). *Pleochroism:* Weak; X = pale yellow; Y = pale brown; Z = brown. *Orientation:* $X = b$; $Y = c$; $Z = a$. *Absorption:* $Z > Y > X$. $\alpha = 1.618(5)$ $\beta = 1.652(3)$ $\gamma = 1.682(3)$ 2V(meas.) = 70°–80°

Cell Data: *Space Group: Pmab.* $a = 11.119(4)$ $b = 25.546(11)$ $c = 6.437(3)$ Z = 4

X-ray Powder Pattern: Palermo #1 mine, New Hampshire, USA.
12.77 (10), 2.768 (9), 8.356 (7), 6.43 (4), 3.761 (4), 3.182 (4), 1.600 (4)

Chemistry:

	(1)	(2)
P_2O_5	29.45	27.69
Al_2O_3	0.73	
Fe_2O_3		10.38
FeO	29.84	18.69
MnO	7.32	9.23
ZnO	7.95	10.58
MgO	1.74	
CaO	1.38	
K_2O	0.47	
H_2O	[23.43]	23.43
Total	[102.31]	100.00

(1) Palermo #1 mine, New Hampshire, USA; by electron microprobe, total Fe as FeO, H_2O from theory. (2) $Fe_2^{2+}ZnMn^{2+}Fe^{3+}(PO_4)_3(OH)_2 \cdot 9H_2O$.

Occurrence: A rare late-stage low-temperature hydrothermal alteration and weathering product formed from earlier more reduced phases.

Association: Mitridatite, laueite, strunzite, whitmoreite, siderite, ludlamite, messelite, vivianite, whitlockite, hydroxylapatite, childrenite, jahnsite, arrojadite, Fe–Mn oxyhydroxides (Palermo #1 mine, New Hampshire, USA).

Distribution: From the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire, and at Newry, Oxford Co., Maine, USA. At Hagendorf, Bavaria, Germany.

Name: To honor Richard Schooner (1925–), Woodstock, Connecticut, USA, student and collector of New England minerals.

Type Material: National Museum of Natural History, Washington, D.C., USA, 135934, 137019.

References: (1) Moore, P.B. and A.R. Kampf (1977) Schoonerite, a new zinc-manganese-iron phosphate mineral. Amer. Mineral., 62, 246–249. (2) Kampf, A.R. (1977) Schoonerite: its atomic arrangement. Amer. Mineral., 62, 250–255.