Probertite $NaCaB_5O_7(OH)_4 \cdot 3H_2O$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals are acicular to elongated along [001], flattened on {100} or {110}, with {100}, {110}, {010}, {011}, with several other forms noted, to 5 cm; in rosettes or flat radial groups, fibrous.

Physical Properties: *Cleavage:* On {110}, perfect. *Tenacity:* Brittle. Hardness = 3.5 D(meas.) = 2.135–2.141 D(calc.) = 2.132 Decomposes partially in hot H_2O.

Optical Properties: Transparent to translucent. *Color:* Colorless, white, gray, pale yellow. *Luster:* Vitreous, may be satiny.
Optical Class: Biaxial (+). *Orientation:* $Y = b$; $Z \wedge c = 12°$–$13°$. *Dispersion:* $r > v$.
$\alpha = 1.514$–1.517 $\beta = 1.524$–1.525 $\gamma = 1.543$–1.544 2V(meas.) = 73°

Cell Data: *Space Group:* $P2_1/a$. $a = 13.428(2)$ $b = 12.560(2)$ $c = 6.588(1)$
$\beta = 99.97(1)°$ Z = 4

X-ray Powder Pattern: Boron, California, USA.
9.12 (100), 2.807 (35), 6.62 (20), 3.52 (20), 2.935 (20), 2.884 (20), 2.172 (20)

Chemistry:

	(1)	(2)
B_2O_3	50.44	49.56
CaO	15.45	15.97
Na_2O	8.53	8.82
H_2O	25.58	25.65
Total	[100.00]	100.00

(1) Baker mine, California, USA; average of two analyses, recalculated to 100% after deduction of insoluble 3.73%. (2) $NaCaB_5O_7(OH)_4 \cdot 3H_2O$.

Occurrence: In lake-bed deposits, the boron supplied by hydrothermal spring activity; may be an ore of boron.

Association: Kernite, colemanite, ulexite, borax.

Distribution: In the USA, in California, from the Baker, Western Borax, and Suckow mines, Kramer borate deposit, Boron, Kern Co.; in several mines around Ryan, and at the Eagle Borax Spring, Furnace Creek district, Inyo Co.; in the Sterling borax mine, Lang, Los Angeles Co.; and from the Pacific Coast Borax Co. mine, Calico Hills, north of Daggett, San Bernardino Co.; at Southard, Blaine Co., Oklahoma. From the Tincalayu borax deposit, Salar del Hombre Muerto, Salta Province, Argentina. From one km south of Oficina Santa Luisa, Atacama, Chile. In the Günevi deposit, Bigadiç borate district, Balıkesir Province, Turkey. At the Gorleben salt dome, Lower Saxony, Germany. From the Piskanja deposit, Jarandol Basin, Serbia, Yugoslavia. In the Bakhmut depression and the Donets Basin, Ukraine.

Name: To honor Frank Holman Probert (1876–1940), Dean of the Mining College, University of California, Berkeley, California, USA, who provided the first specimens.

Type Material: National Museum of Natural History, Washington, D.C., USA, 95832–95833.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 343–345. (2) Clark, J.R. and C.L. Christ (1959) Studies of borate minerals (V): reinvestigation of the X-ray crystallography of ulexite and probertite. Amer. Mineral., 44, 712–719. (3) Menchetti, S., C. Sabelli, and R. Trosti-Ferroni (1982) Probertite, $CaNa[B_5O_7(OH)_4].3H_2O$: a refinement. Acta Cryst., 38, 3072–3075.