TABLE I. *Analyses of akrochordite*

Sample	FeO	MgO	CaO	ZnO	MnO	As_2O_5	H_2O	Total	Locality
Theory*		6.08			42.87	34.73	16.32	100.00	
Flink (1922)	0.46	6.94	0.99		38.98	33.51	16.78	100.31†	Långban
NMNH R5396	1.5	7.6	0.5	0.5	39.8	32.5	17.6‡	100.0	Långban
NMNH 94849	1.5	7.9	0.4	0.4	42.1	32.2	15.5‡	100.0	Långban
S-7-4-4A	0.2	0.8	0.8	1.5	49.5	31.6	15.6‡	100.0	Sterling Hill
146502	0.2	1.3	0.5	3.8	48.6	28.6	17.0‡	100.0	Sterling Hill
K-48	0.2	0.9	0.3	2.6	49.3	32.6	14.1‡	100.0	Sterling Hill
Theory§					51.22	33.19	15.59	100.00	

* Theoretical composition for $Mn_4Mg_1(AsO_4)_2(OH)_4 \cdot 4H_2O$.
† Includes 0.42 P_2O_5, 0.50 Mn_2O_3, 0.55 K_2O, and 1.18% Na_2O.
‡ Water by difference. Fluorine and chlorine both less than 0.3%.
§ Theoretical composition for $Mn_4Mn_1(AsO_4)_2(OH)_4 \cdot 4H_2O$.
Accuracy of data: ±3% of the amount present for major elements.

occurrence of an essentially Mg-free akrochordite and let the nomenclature decisions await a full crystal structure analysis.

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Triplite from the Megiliggar Rocks, Cornwall

THIS paper describes a new locality for the mineral triplite $(Fe,Mn,Ca)_2PO_4(F,OH)$, and its first reported occurrence in the British Isles. It was discovered during the summer of 1978 as a dark-brown irregularly shaped piece measuring about 5 × 2 cm across, partially rimmed by a blue mineral and closely associated with löllingite in pegmatite and leucogranite at the top of the main granite sheet at the Megiliggar Rocks (Grid ref. SW 610266). Since then several other samples of triplite have been found here.

The granitic sheets at the Megiliggar Rocks originate from the layered roof zone of the Tregonning granite and form part of the over-all roof complex. They are composed of leucogranite with thin pegmatitic stringers close to the Tregonning granite but pass away laterally from this body into dominantly layered pegmatite–aplite bodies with some leucogranite and tourmaline granite. The sheets are emplaced in the mainly pelitic rocks of the Mylor Series. Field relations have been described by Hall (1930) and Stone (1969, 1975). The

granitic rocks contain lithium micas, albite, and topaz and are enriched in elements such as F, Li, Rb, and Cs, together with Sn, P, and B (Stone, 1981; Exley and Stone, 1981). The granitic rocks, in particular the leucogranites, appear to have many similarities to the Meldon microgranite, particularly as both contain Li- and F-bearing minerals and several rare mineral species. Recently, Stone and George (1978) have described amblygonite ($LiAlPO_4(F,OH)$) from the Megiliggar Rocks, a mineral earlier recorded from Meldon by Kingsbury (1966).

Initial investigation by X-ray diffraction identified the brown mineral as triplite. The blue material rimming the triplite in the first specimen appears to be a mixture of vivianite, $Fe(PO_4)_2 \cdot 8H_2O$, and other iron phosphates.

Powder photographs of the triplite, taken with a Philips Debye-Scherrer camera (114.6 mm diameter) using Fe K-α radiation, were indexed by comparison with the standard JCPDS pattern. Unit cell dimensions determined with the help of a computer regression program, are a 12.077 ± 0.013, b 6.531 ± 0.007, c 9.962 ± 0.010 Å, β $105° 52' \pm 4'$ and they are fairly close to those of the triplite specimens quoted in Dana's System of Mineralogy (Palache et al., 1951, vol. II, p. 849), and, except for β, with a sample quoted by Waldrop (1969).

The identification of triplite from Cornwall was confirmed and the sample chemically analysed in the Mineralogy Department of the British Museum (Natural History). Hand-picked fragments of the material were prepared as polished grain mounts and analysed by both energy dispersive (EDS) and wavelength dispersive (WDS) electron-microprobe methods. The analysis shown in Table I is the average of measurements made on two grains, on each of which at least ten points were analysed. Samples were found to be homogeneous for the major elements on the micrometre scale. A trace of MgO (<0.15%) and TiO_2 (<0.20%) were found at some of the points analysed; Na and K were sought but not found. F was determined on a separate portion of the hand-picked sample using an ion-selective electrode after pyrohydrolysis. Total H_2O (0.21%) and CO_2 (0.13%) were determined on the hand-picked sample using a PE240 elemental analyser.

Colorimetric and atomic absorption spectrophotometric analysis on a bulk sample showed slightly lower MnO and slightly higher P_2O_5 concentrations compared with the range of values shown for the probe analyses: these small though significant differences are probably due to abundant inclusions which even by careful handpicking are difficult to separate. As a result, the probe data are considered to be more accurate.

Few analyses appear to be available in the literature for comparison. Of those listed in Palache *et al.* (1951) only two compare with the Cornish triplite in their FeO, MnO, and P_2O_5 contents and, of these, only one has a similar CaO content. Broadly similar chemical compositions in triplites are given by Haapala and Ojanperä (1969) and Fontan (1976). The formulae of these, together with a sample from Colorado (Waldrop, 1969), are compared with the Cornish sample below

$(Fe^{3+}_{0.12}Fe^{2+}_{0.68}Mn_{1.06}Mg_{0.01}Ca_{0.08})_{\Sigma 1.95}P_{0.98}$
$(O_{3.92}F_{0.81}OH_{0.27})_{\Sigma 5.00}$ (Fontan, 1976)

$(Fe_{0.25}Mn_{0.9}Mg_{0.7}Ca_{0.1})_{\Sigma 1.95}PO_4F$
(Waldrop, 1969)

$(Fe^{3+}_{0.09}Fe^{2+}_{0.73}Mn_{1.02}Mg_{0.07}Ca_{0.12})_{\Sigma 2.03}P_{0.93}$
$(O_{3.91}F_{0.96}OH_{0.13})_{\Sigma 5.00}$
(Haapala and Ojanperä, 1969)

$(Fe^{2+}_{0.77}Mn_{1.18}Ca_{0.10})_{\Sigma 2.05}P_{0.99}$
$(O_{4.09}F_{0.88}OH_{0.03})_{\Sigma 5.00}$ (This paper)

The sample of Waldrop (1969) has more Mg and F and less Fe than the Cornish material. On the other hand, the latter is only marginally richer in Mn and has an F content between the Fontan (1976) and Haapala and Ojanperä (1969) samples. Paucity of data for triplite precludes any attempt to relate cell dimensions to chemistry at present.

An apparently consistent relationship at the Megiliggar Rocks is the association of triplite with löllingite. Both minerals commonly occur in complex pegmatites elsewhere, although the relationship is not understood at present. However, the

TABLE I. *Averaged EMPA analysis of triplite from Megiliggar Rocks, using Geoscan-EDS system*

	Wt%	Range
*FeO	24.51	24,13–25.17
MnO	36.92	36.58–37.70
CaO	2.51	2.34– 3.01
P_2O_5	31.00	30.41–31.26
F	7.40†	7.39– 7.40
CO_2	0.13	
H_2O	0.21	
	102.68	
Less O = F	3.12	
Total	99.56	

Analyst R. F. Symes.
* Total iron shown as FeO.
† F determined on different grains to those used for probe analysis (Analyst V. K. Din).

occurrence of triplite here is consistent with the occurrence of other phosphates, namely, fluorapatite and amblygonite, with the high P content of the rocks (P_2O_5 ranges from 0.33 to 0.73 wt% in the lithium mica granitic rocks) and with the high F contents of both amblygonite and topaz (Stone and George, 1978) and of the associated granites, leucogranites, and aplites (F ranges from 0.99 to 1.74 wt% in these Li mica granitic rocks: Stone, 1975, 1981).

The occurrence of coarse-grained triplite within the pegmatitic facies of the granite sheets of the Megiliggar Rocks suggests that, along with apatite, quartz, and alkali feldspar, it was deposited from, or its growth was nourished by, an aqueous phase (F-rich) that had exsolved from an Li-F-enriched silicate magma that was precipitating or had already precipitated the coexisting aplite (Exley and Stone, 1981; Stone, 1981).

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