The principal ore constituents of the vein are goethite and an intergrowth of various manganese oxides, the nature and relationships of which are still being studied. Secondary lead and copper minerals, including mendipite, cerussite, hydrocerussite, and chloroxiphite, occurred in cavernous parts of the manganese oxides in the upper parts of the vein and closely resemble those from the near-by Higher Pitts mine (Spencer, 1923); preliminary descriptions have been made by Alabaster (1976) and by Symes and Embrey (in press). Lower in the vein, the goethite increased considerably in width and completely cut out the manganese oxides. Here, in an area of 2 × 1 m, cavities in the goethite were found to be encrusted by an assemblage of apophyllite, datolite, calcite, and baryte. Observation of the exact relationships was hampered by large fallen blocks, but the formation of the encrusting minerals and intimacy of their association suggests that they were roughly contemporaneous with the iron and manganese mineralization.

A thick layer of calcite, fibrous radiating masses of datolite, and occasional small apophyllite crystals lie in direct contact with botryoidal goethite, and contain white aggregates of platy baryte crystals up to 2 cm across. The botryoidal surface of this layer is coated with a thin crust, up to 3 mm thick, of milky white fibrous datolite, in crevices within which lie aggregates of larger ($< 10 \times 10$ mm) transparent tabular crystals of apophyllite.

This appears to be the third occurrence of either datolite or apophyllite in south-west England, and the first reported from Somerset. Datolite has been found at the Ramsley mine, Devon, apophyllite in the Levant mine, Cornwall, and both occur in the aplite quarry at Meldon, Devon. Both minerals commonly occur elsewhere in zeolitic associations in basaltic rocks, but apophyllite is well known as a constituent of vein-type mineral assemblages; its occurrence in a low-temperature hydrothermal vein with calcite and harmotome at the Korsnäs lead mine, Finland, has been described by Sahama (1965), but there the crystal habit was prismatic-pyramidal and not tabular.

Boron, an essential constituent of datolite, is also present at Merehead as a minor element in the lead oxychloride minerals in the upper part of this vein.

Department of Mineralogy,
British Museum (Natural History)

R. F. SYMES

REFERENCES

Alabaster (C. J.), 1976. *Proc. Bristol Nat. Soc.* (1976) **36**, 76–104.
Sahama (Th. G.), 1965. *Mineral. Mag.* **34**, 406–15.
Spencer (L. J.), 1923. Ibid. **20**, 67–92.

[*Manuscript received 22 November 1976*]

MINERALOGICAL MAGAZINE, SEPTEMBER 1977, VOL. 41, PP. 411–14

Stokesite crystals from two localities in Cornwall

THE rare mineral stokesite, $CaSnSi_3O_9.2H_2O$, is now represented in the collection in the British Museum (Natural History) by crystals recently found by the donor, Mr. R. W. Barstow, at two localities in Cornwall. Several crystals (BM 1975, 541–6) 3 to 7 mm long were obtained in June 1975 from two boulders in the Penryn Granite Company's quarry at

Halvosso (grid ref. SW738338). A month later, an incomplete single crystal (BM 1975, 547) 4 mm long was found on axinite crystals at Wheal Cock Zawn (grid ref. SW363340), a precipitous sea-inlet penetrating Roscommon Cliff, the reported type locality, near St. Just.

TABLES I AND II: TABLE I (left). *Electron probe analyses and optical properties of stokesite.*

TABLE II (right). *Observed forms on stokesite crystals from Halvosso quarry, Cornwall*

	1	*2*	*3*	*4*	*5*	*6*	*7*
SnO_2	35.79	32.08 %	33.33	35.35 %	35.54	35.77 %	35.62
FeO	0.00	1.74	0.43	0.09	0.04	0.04	–
MnO	0.00	0.26	0.99	0.17	0.52	0.63	–
CaO	12.86	13.24	13.00	12.69	12.46	12.45	13.25
SiO_2	42.89	43.72	43.31	43.13	42.54	43.34	42.61
H_2O*	8.46	8.96	8.94	8.57	8.90	7.77	8.52

Number of ions based on 11 oxygens

	1	*2*	*3*	*4*	*5*	*6*	*7*
Sn	1.00	0.89	0.92	0.99	0.99	1.01	1.00
Fe	–	0.10	0.03	0.01	0.003	0.003	–
Mn	–	0.02	0.06	0.01	0.03	0.04	–
Σ (Sn, Fe, Mn)	1.00	1.01	1.01	1.01	1.02	1.05	1.00
Ca	0.97	0.98	0.97	0.95	0.94	0.95	1.00
Si	3.01	3.03	3.01	3.02	2.98	3.07	3.00
OH	2.03	2.07	2.07	2.00	2.08	1.84	2.00

* Water calculated by difference

$2V_\gamma$ (calc.)	70°23′	66°40′	66°40′
$\alpha \parallel [001]$	1.618	1.616	1.618
$\beta \parallel [010]$	1.621	1.619	1.621
$\gamma \parallel [100]$	1.627	1.626	1.628

r<v perceptible

1,2 BM 1975,547 Roscommon Cliff, Cornwall

3,4 BM 1975,546 Halvosso Quarry, Cornwall

5,6 BM 1974,97 Corrégo do Urucum, Galiléia, Minas Gerais, Brazil

7 Ideal $CaSnSi_3O_9.2H_2O$

Forms that gave faint signals:

	ϕ_{obs}	ϕ_{calc}*	ρ_{obs}	ρ_{calc}*
a 100	90°00′	–	90°00′	–
m 110	51°01′	–	90°00′	–
d 011	00°00′		19°58′	20°01′
e 101	90°05′	90°00′	24°17′	24°14′
q 301	90°02′	90°00′	53°29′	53°28′
o 111	51°02′	51°01′	30°02′	30°04′

Forms that gave confused signals or reflections only (measured to ½°):

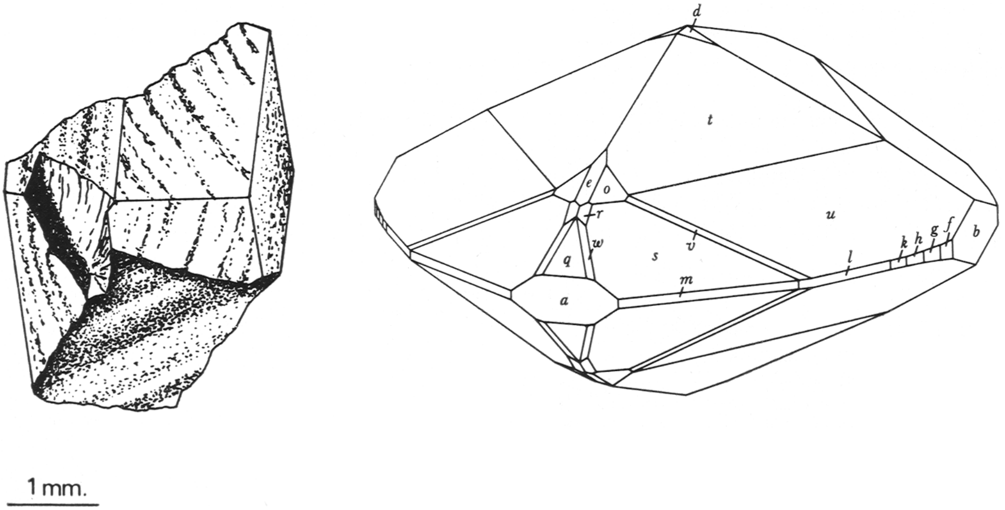
	ϕ_{obs}	ϕ_{calc}*	ρ_{obs}	ρ_{calc}*
b 010	00°	–	90°	–
f 130	22½°	22°23′	90°	–
g 5.13.0	25½°	25°25′	90°	–
h 5.12.0	27°	27°15′	90°	–
k 490	28½°	28°47′	90°	–
l 120	31½°	31°43′	90°	–
r 211	68°	67°58′	44°	44°09′
s 221	51°	51°01′	49°	49°11′
t 243	31½°	31°43′	30°	29°43′
u 485	31½°	31°43′	34°	34°25′
v 353	36½°	36°33′	37°	37°45′
w 823	79°	78°34′	51°	51°03′

* Calculated from the mean of the *x* and *y* co-ordinates of the best faces.

Hutchinson (1899) found the original stokesite crystal while examining the Joseph Carne (1782–1858) collection in the Cambridge University museum. The specimen was labelled as gypsum from Roscommon Cliff, St. Just, and was associated with axinite crystals. Despite determined efforts by Hutchinson, and by many other collectors since 1899, no stokesite has been found *in situ* at Roscommon Cliff until now. Although the new find is less than half the size of the original crystal, it is of similar habit and also associated with axinite crystals, leaving little doubt that Roscommon Cliff is the type locality.

Stokesite in very small amounts has been reported at two localities in Czechoslovakia by Čech (1961) and Černý (1966) while at Corrégo do Urucum, Brazil, it has been found (White, 1973) as spherical clusters of crystals up to 3 cm diameter. A description of the two latest finds is given by Couper and Barstow (1977). The purpose of this short communication is to give the results of electron probe analyses and full optical and morphological data.

Electron probe analyses have been made of stokesite from Wheal Cock Zawn and Halvosso quarry, Cornwall, and from Corrégo do Urucum, Galiléia, Minas Gerais, Brazil, using standards of pure cassiterite, analysed wollastonite, and pure Fe and Mn. The water figures were obtained by difference. The results given in Table I after computer correction of the measured intensities agree well with the accepted formula of the mineral, $CaSnSi_3O_9.2H_2O$, but some analyses show substantial substitution of Fe and Mn for Sn. In fact Hutchinson (1900) reported 1·9 and 0·7 % Fe_2O_3 in his original analyses of the Roscommon Cliff stokesite, but erroneously attributed it to laboratory contamination. Our work on the new Roscommon Cliff find shows Fe and Mn to be inhomogeneously distributed because analyses 1 and 2 were made on the same crystal at points 1 mm apart. Significant variation in these two minor elements also occurs across the crystal from Halvosso quarry (analyses 3 and 4) but two individual crystals from Brazil (analyses 5 and 6) show much less variation.



FIGS. 1 and 2: FIG. 1 (left). Stokesite crystal (BM 1975, 547) from Wheal Cock Zawn, Roscommon Cliff, Cornwall. Orientation $a < c < b$. FIG. 2 (right). Idealized crystal-drawing of stokesite from Halvosso quarry, Cornwall, using the conventional orientation for orthorhombic crystals, $c < a < b$.

Grains from the Halvosso quarry and Wheal Cock Zawn crystals and from a Brazilian crystal-group in the British Museum (Natural History) collection were examined optically and the results are given in Table I. The refractive indices (±0·002) are similar despite the zonal substitution of Fe and Mn for Sn shown by the electron probe analyses, but are 0·007–0·009 higher than those calculated by Hutchinson (1900) from the angle of minimum deviation and also higher by 0·006–0·008 than those obtained by Černý (1966) for the stokesite from Věžná, Czechoslovakia.

As with Hutchinson's crystal (Hutchinson, 1900) the faces of the Wheal Cock Zawn and Halvosso quarry crystals tend to be rough or curved or both and many of the interfacial angles could not be determined with accuracy. The measurement of the Wheal Cock Zawn crystal was further complicated by impressions left by axinite crystals but the dominant form is the bipyramid {121} rounding to {243}, in combination with {010} (fig. 1).

The Halvosso quarry crystals are more complex and consist of incomplete modified bipyramids {243} rounding to, or separate from, {485}, and usually in divergent groups. Table II lists the forms and angles observed on three Halvosso crystals (BM 1975, 543–5). The calculated angles were used for the idealized drawing (fig. 2) and were obtained from the mean of the x and y coordinates of the faces in the forms {110}, {101}, {301}, {011}, and {111}. The axial ratio of 0·8092 : 1 : 0·3642 derived from the calculated angles is close to that of 0·8056 : 1 : 0·3627 calculated by Gay and Rickson (1960) from the cell dimensions obtained by an X-ray examination of the type specimen in the Museum of the Department of Mineralogy and Petrology, Cambridge.

Acknowledgement. The authors are grateful to Mr. P. Hicks for the crystal drawings.

Department of Mineralogy,
British Museum (Natural History),
London SW7 5BD

A. G. COUPER
A. M. CLARK

REFERENCES

Čech (F.), 1961. *Mineral. Mag.* **32**, 673–5.
Černý (P.), 1966. Ibid. **35**, 835–7.
Couper (A. G.) and Barstow (R. W.), 1977. *Min. Record*, **8**, 294–7.
Gay (P.) and Rickson (K. O.), 1960. *Mineral. Mag.* **32**, 433–5.
Hutchinson (A.), 1899. *Phil. Mag.* ser. 5, **48**, 480–1.
—— 1900. *Mineral. Mag.* **12**, 274–81.
White (J. S.), 1973. 'What's New in Minerals?' *Min. Record*, **4**, 275–6

[*Manuscript received 15 October 1976*]

MINERALOGICAL MAGAZINE, SEPTEMBER 1977, VOL. 41, PP. 414–16

A new interactive computer program to process electron microprobe data

FOR many years now the MK2 version of the NPL–IC–BM electron microprobe data processing computer programs (Mason, Reed, and Frost, 1968; Beaman and Isasi, 1970) has been successfully used in many laboratories. This program is used for batch processing and is punched-card orientated. Nowadays, computer networks often offer terminals, interactive software, and flexible file-handling systems (sections of disc storage, allocated for private use). This note describes a program, named MK7, for processing data from electron microprobes, which takes advantage of these advances in computing. Only a brief summary of the main details are given here and full specifications, listings, and card decks may be obtained on request to the author. The program has been written in Fortran, specifically for a CDC