ADDENDUM

Since this note was accepted for publication, the author has read the discussion of similar material from the French Massif Central. Nédélec and Paquet (1981) describe an isotropic substance in high-grade gneisses, which they believe to be a glass resulting from incongruent melting of biotite. Clemens and McMillan (1982) and Marchand *et al.* (1982) express doubts about the laboratory work and interpret the substance as an alteration product of cordierite, but Nédélec and Paquet (1982) stand by their earlier results. The Massif Central and Champira Dome occurrences are similar in chemical composition, and also have in common a high-grade metamorphic setting, a vitreous appearance in thin section, and an apparent reaction relationship with biotite. The present author considered the possibility that the Champira Dome material was a glass, quenched from a melt formed from biotite and cordierite during metamorphism, but this hypothesis had to be rejected because the geological environment did not permit the rapid cooling needed to quench a liquid, the chemical composition was not consistent with a metamorphic melt, and the substance closely resembled cordierite alteration products described from other areas. For the same reasons, the interpretation of the Massif Central occurrence as a quenched melt cannot be sustained, but Nédélec and Paquet have none the less helped to characterize the isotropic substance. Their TEM observation (1982) of 'minute crystals of kaolinite, about 1000 Å in size, embedded in a glassy matrix' offers a model that would (with 'amorphous' substituted for 'glassy') satisfactorily account for the observed properties of the Champira Dome material. The alteration of cordierite to this amorphous substance may thus be distinct from its alteration to white mica and/or other phyllosilicates, the different forms of alteration presumably taking place under different conditions, and the isotropic material which Schreyer and Yoder (1961) found to consist of 'a 1 *M* muscovite and a 7 Å phase (aluminous serpentine or septechlorite)' may represent incipient crystallization from an amorphous substance.

REFERENCES

Clemens, J. D., and McMillan, P. F. (1982) *Contrib. Mineral. Petrol.* **79,** 436–8.

Marchand, J., Bossière, G., and Leyreloup, A. (1982) Ibid. **79,** 439–42.

Nédélec, A., and Paquet, J. (1981) Ibid. **77,** 1–10.

———(1982) Ibid. **79,** 443–5.

Schreyer, W., and Yoder, H. S., Jr. (1961) *Carnegie Inst. Washington Yearb.* **60,** 147–52.

Institute of Geological Sciences, 64/78 Gray's Inn Road, London WC1X 8NG H. W. HASLAM

MINERALOGICAL MAGAZINE, JUNE 1983, VOL. 47, PP. 240-241

Wroewolfeite in SW England

THE recently described copper sulphate hydroxide hydrate, wroewolfeite (Dunn and Rouse, 1975), has been found at two locations in SW England. These are Devon Friendship Mine, Marytavy, Devonshire, and Penberthy Croft Mine, St. Hilary, Cornwall. These mines were worked for copper together with a little tin and lead, and the lodes at both localities show certain similarities in their mineralization, containg fair amounts of calcium carbonates.

At Devon Friendship Mine wroewolfeite was found on old dumps on the western side of the stream that cuts through the mine workings situated southeast of the village of Marytavy. These dumps contain a large amount of decomposing chalcopyrite- and pyrite-bearing material, and also quantities of galena and calcite veinstuff from the north–south trending lead lode that was worked in the mine apart from the major east–west copper lodes. The wroewolfeite occurs as beautiful greenish-blue to sky-blue sharp transparent monoclinic crystals scattered on open joints in a dark slatey veinstone, with speckles of chalcopyrite and later veinlets of quartz and calcite. The crystals range in length from 1 to 2 mm. Another form found on one specimen consists of radiating aggregates of flattened tabular crystals of a pale sky-blue colour attaining 5 mm in length, implanted on a joint in quartz. Crystalline crusts of bright green brochantite occur on some specimens.

At Penberthy Croft Mine wroewolfeite occurs on dumps in the eastern section of the mine. It is found as small light blue scales and poorly formed crystals rarely larger than 2 mm in size, scattered on joints and in cavities in weathered brecciated slate and dolomite veinstuff with threads of chalcopyrite.

At both localities wroewolfeite has formed in the dumps as a result of weathering of chalcopyrite-bearing veinstuff, and it appears that calcium

carbonates (as calcite at Devon Friendship Mine and dolomite at Penberthy Croft Mine) play some part in the formation of the mineral. It is notable that wroewolfeite has been found under similar conditions at several localities in central Wales.*

Acknowledgement. I would like to thank the Department of Mineralogy, British Museum (Natural History) for confirmation of the identity of the wroewolfeite by X-ray powder diffraction.

* Dr R. S. W. Braithwaite, personal communication.

REFERENCE

Dunn, P. J., and Rouse, R. C. (1975) *Mineral. Mag.* **40**, 1–5.

[*Manuscript received 12 March 1982*]

Drakewalls House, Drakewalls, Gunnislake, Cornwall The late R. W. BARSTOW