section). This is immediately followed by the statement that the maximum extinction angle in albite twins varies from 12° to 19°. This is only true for sections cut perpendicular to (010), exactly the kind of mistake that students make when first using the Michel-Lévy method to determine feldspars. Another very misleading statement is that 'among the members of the tourmaline group schorlite shows the strongest absorption normal to the plane of the polarizer'. There is no explanation of anomalous interference colours.

The standard of production of the book is generally good, with the exception of the photomicrographs, most of which are out of focus and unrecognizable. There are various errors of spelling and indexing, and two figures (4-12 and 4-13a) have had their captions transposed. The interference colour chart is of very poor quality. The most useful part of the book is the short section of determinative tables in which minerals are classified according to their various optical properties.

A. HALL

Anthony (J. W.), Williams (S. A.), and Bideaux (R. A.). *Mineralogy of Arizona.* Tucson, Arizona (Univ. of Arizona Press), 1977. viii + 225 pp., 50 figs., 69 colour photos. Price $22·50 (cloth), $9·75 (paper).

After an introduction, this book opens with a series of all-too-brief verbal sketches on Arizona specialities, pride of place in this copper-mining state being given to minerals of the porphyry copper and related deposits, followed by the Colorado Plateau-type uranium and vanadium deposits. Descriptions of the mineralogy of the Mammoth-St. Anthony mine at Tiger and of the mines at Bisbee are intended to fill a gap in the mineralogical literature. Special reference is also made to the hydrated sulphate minerals formed by a mine fire in 1894 at the United Verde mine and there is a note on Arizona meteorites. But after that clearing of the throat, as it were, the remainder of the book is devoted to an alphabetically arranged catalogue of Arizona minerals—totalling over 600 species, 224 of them recognized since the 1959 edition of *Minerals of Arizona* by Galbraith and Brennan, and including 48 mineral species first described from Arizona. This listing is followed by an extensive bibliography and detailed maps of Arizona mining districts.

In the catalogue, the chemical composition of each mineral is given, together with notes on its paragenesis and a list of localities, but few other details (even colour) are added. Some of the entries are accompanied by morphological drawings and there is a good leavening of generally excellent colour photographs of localized material; unfortunately no scales are given and only by intuition or experience is the reader able to judge that the crystal of wickenburgite reproduced 1 cm across is probably much smaller and that the prismatic crystals of dioptase or of brochantite are really incredibly tiny. Nevertheless this is an attractive and useful work and in the paperback version is surely good value.

R. A. HOWIE

Hill (C. A). *Cave Minerals.* Huntsville (Nat. Speleological Soc.), 1976. 136 pp., 108 figs., 9 colour pls. Available from National Speleological Society, Cave Avenue, Huntsville, Alabama 35810, U.S.A. Price $15·00 (postpaid).

This attractive and liberally illustrated book is one of very few to survey the field of minerals found in caves. Some seventy minerals are listed and described according to the usual groupings of carbonates, sulphates, etc. The author admits to having had some difficulty in defining a 'cave', and thus a cave mineral, and a number of those listed have been found only in large vugs in hydrothermal veins or in weathered zones above ore bodies. Precedence is naturally given to the many varieties of cave calcite and aragonite, and the author draws attention to problems in explaining how some of the bizarre forms grow. Reference is also made to the conflicting evidence as to what causes calcite to precipitate in one cave while aragonite forms in the one next door under apparently the same environmental conditions.

There are some oddities in the book: baryte is separated from the rest of the sulphates and noted among 'ore-associated' minerals. Cristobalite is consistently mis-spelt. Another is the inclusion of 'petromorphs', defined as 'secondary mineral deposits in the bedrock accidentally exposed within a cave': an example is the boxwork of small quartz veins in Wind Cave, South Dakota. Many of the other cave minerals listed could come within this category but they are not so noted.

Formulae are given for most minerals listed, but little is said on crystallography, in contrast to the comparable recent work by W. B. White, which this reviewer edited not so long ago (Chapter 8 in T. D. Ford and C. H. D. Cullingford, 1976. *The Science of Speleology.* Academic Press).

Locality information is deliberately sparse, as the author emphasizes, being largely restricted to tourist and other controlled caves in the United States so as to minimize commercial collecting and other forms of vandalism.

A short chapter at the end reviews matters such as speleothem dating, the role of micro-organisms,