

REVIEWS.

Goldschmidt (V.). *Krystallographische Winkeltabellen*. Berlin, 1897.

Since the early editions of Phillips' *Mineralogy*, various text-books and works of reference have appeared, each containing more and more complete lists of crystal angles. But the number of angles that can be calculated between all the pairs of faces of such complicated crystals as occur in the mineral kingdom seems almost boundless, and it might be thought hopeless to make these lists even approximately complete.

This is, however, what is done by Dr. Victor Goldschmidt in the present volume, and it is only possible by means of the theodolite, or two-circle goniometer, of which he is an ardent champion. Every practical crystallographer will realise how much easier it is to identify the faces of a crystal by comparing their measurements with a table of angles than by calculating out the indices of each face from the measurements; but it may be that the angles actually measured are not those given in the available tables. With the two-circle goniometer, however, if the crystal be adjusted in the orthodox position, each face is fully defined by two angles which are directly read upon the goniometer circles. Dr. Goldschmidt has not hesitated to face the vast labour of calculating all the angles (about 22,000 in number) which belong to the known faces of minerals, a work which with the help of computers occupied him for nearly two years. The result is the present volume, with the help of which any student using the theodolite goniometer can identify any known face by a direct reading, and can determine new faces without much trouble. These tables will do much to popularise the new method of crystal measurement, which is now beginning to find many adherents. The writer can speak from personal experience of its utility in certain cases where measurement would be impossible without its aid.

H. A. M.

Fuchs (C. W. C.). *Anleitung zum Bestimmen der Mineralien*. 4th edition, revised by Dr. Reinhard Brauns. 234 pp. and 27 figs. Giessen: J. Ricker'sche Verlags-Buchhandlung. 1898.

The preparation of this fourth edition of Fuchs' *Introduction to the determination of Minerals* has been undertaken with excellent results by Dr. Reinhard Brauns, in succession to the late Prof. Streng.

Only comparatively slight alterations and additions have been made in the first parts of the book, dealing with the "Examination of Minerals with the help of the blowpipe and simple chemical reaction," and in the second part on microchemical reactions which was added by Streng in the preceding edition. The third part, however, consisting of the "Tables for the determination of Minerals by crystal form, physical characters and simple chemical reactions," has suffered a radical change. As indicated in the above heading, the first broad grouping of the minerals was according to the crystalline form. The objections to such a plan are too obvious to mention, and Prof. Brauns has wisely rejected it for an arrangement in which the chief weight is given to characters easily determinable on massive material. As the basis of his classification he has selected hardness in preference to fusibility, which is used for the same purpose in von Kobell's Tables as reproduced in Brush's *Manual of Determinative Mineralogy*. Hardness is not a very precise character of a mineral, but in the hands of students it is probably a more easily determinable and more reliable character than fusibility.

Minerals of approximately the same hardness are then divided into two groups, according as they do or do not possess metallic lustre. Colour and streak are the next marks of distinction, after which come cleavage, form, mode of occurrence, specific gravity and chemical characters.

Tables such as these no doubt fulfil a useful purpose, more especially, perhaps, as a means of instruction to the beginner, although they may not appeal so much to the more advanced student. The gradual tracking down of a mineral, for example, by rigorously following in all its detail such a systematic course of blowpipe and simple chemical tests as that given in the first part of the book, should form an excellent training for the student, until with increase of knowledge he learns to attain the same end by a less circuitous route.

The value of the book to the student has certainly been increased by the changes which Prof. Brauns has made in the present edition.