might suggest that the publication of morphological data on new crystalline materials practically ceased after 1919. To be sure, it is no longer as common as it once was. However, a check of volumes 55 to 60 of the *Zeitschrift für Kristallographie*, covering the first 5 years after the completion of Groth's compilation, reveals 19 reports of axial elements for newly described anorthic crystals and hundreds of reports for other crystals, several contributed by such distinguished crystallographers as Jaeger, Zambonini, and Machatschki. A test of the coverage of *The Barker Index* was made by selecting a dozen synthetic crystalline materials with published descriptions, half organic and half inorganic, distributed among all of the systems other than the isometric. Of these only three are included in *The Barker Index*. They are described on the basis of data from 1838, 1862, and 1900, as quoted by Groth, although the data for one of these substances were shown to be faulty in 1934.

The preface includes this surprising statement: "It has not been possible to include some 20 anorthic minerals. It is hoped that there may be a mineral supplement to include these as well as new anorthic minerals and new minerals belonging to other crystal systems." Mineralogists are the only group that includes any substantial number of morphological crystallographers.

In the course of preparing previously published volumes of *The Barker Index*, many errors in axial elements or calculated interfacial angles in Groth were detected, in some cases determining the exclusion of material from the index. In preparing material for the present volume, computers were used extensively; this was essential for completion of the very tedious calculations for anorthic crystals. However, because original sources were not used and some of the data are very old, it is to be feared that much effort may have been spent on reworking inferior data. The purely routine procedures used to detect errors in computed angles or axial elements will not detect errors in experimental data.

C. W. Wolfe [*Am. Mineralogist* **37**, 875 (1952)] and J. D. H. Donnay [*Nature* **169**, 851 (1952)] in their thoughtful reviews of volume 1 of *The Barker Index* praised it highly. Wolfe wrote that "This work must go a long way toward convincing the chemical profession and others that crystallography is a tool without which they cannot afford to continue," and Donnay wrote that "As an authoritative source of crystal data it will soon become indispensable." It is with great regret that I must dissent from these opinions. Barker's system was intended to be an improvement of the scheme for identifying crystals from morphological measurements published in Russia by the great Fedorov in *Das Krystallreich* (1920), almost simultaneously with the completion of Groth's compilation. It has taken 45 years to carry out this improvement. Only a minute part of the data accumulated in the meantime have been included in *The Barker Index*. Improved techniques in microscopy and entirely new techniques in x-ray diffraction together with modern compilations of optical and x-ray data have become the bases of widely used methods for the identification of crystalline materials. *The Barker Index* might have become the important tool that Wolfe and Donnay hoped it would be, if it had appeared at least 50 years ago. Even at the time that it was being planned, the beginnings of the methods that were bound to supercede it should have been evident to discerning crystallographers. It is a crowning irony that only the use of modern computers has permitted the completion of this anachronistic and monumental work.

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Astrophysics: Summary and Discussion

Sunspots. R. J. Bray and R. E. Loughhead. Wiley, New York, 1965. xvi + 303 pp. Illus. $13.75.

Although the science of astrophysics may be said to have begun in 1611 with the first telescopic observations of sunspots by Galileo and others, our understanding of sunspots today is certainly not one of the proudest achievements of this discipline. Indeed, so poorly are they understood that, although they receive descriptive treatment in almost all texts on astrophysics, this new book by Bray and Loughhead is the first modern text devoted entirely to sunspots. It is a formidable task to bring some sense of order to a topic that, despite a wealth of observational data, lacks an established coherent theory. However, in my opinion, these authors have succeeded admirably in setting out the current state of the subject in a logical and ordered fashion.

After a historical introduction, they give an account of high resolution methods of observation. A detailed discussion of the morphology of individual sunspots precedes an assessment of the physical conditions in sunspots derived from optical observations. Observations of magnetic fields in sunspots are discussed in detail, and magnetohydrodynamic theories of sunspots and the solar cycle are treated in the concluding chapter. Although they recognize the prime importance of the magnetic field, the authors give little weight to some of the elaborate magnetic models of sunspots put forward by various authors on the basis of slight observational evidence and weighty physical assumptions. Indeed, the great merit of this treatment is the disciplined relation of the degree of detail in a mathematical theory to the accuracy of the observations on which they are based. Various highly speculative theories of the solar magnetic fields are given adequate discussion, without being invested with a spurious mathematical respectability.

The book is well set out and generously illustrated with a selection of some of the best observational material available, much of which has been obtained by the authors themselves. Although it will undoubtedly "date" more rapidly than texts on well-understood topics, the dating process will be hastened by the book's own achievement in stating the current situation clearly and concisely and by pointing the way to future development. Active workers in the field will find it invaluable, while the more general reader, who will undoubtedly skip the technical discussions, will find a very readable account of this fascinating subject.

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