hydroxy derivatives (documented with an extensive table) and a classic treatment, by S. F. Mason, of the ultraviolet and infrared spectra of pyrimidines.

The production of this volume equals that of the others in the series, the Chemistry of Heterocyclic Compounds, which is edited by Arnold Weissberger. This volume fills a need not met by the older, or by the more recent, less comprehensive, reviews, and I recommend it for all chemistry libraries that maintain a basic collection in organic chemistry and for all individuals and groups working in this specific research area.

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Cloud Physics for Amateurs

Clouds, Rain and Rainmaking. B. J. Mason. Cambridge University Press, New York, 1962. 145 pp. Illus. Paper, $1.95; cloth, $4.50.

This book is popular science in the best meaning of the term. The author, perhaps more than any other individual, has been responsible for making cloud physics a coherent branch of science, with identifiable problems and reliable techniques of investigation. He has also the talent for making his subject clear and for transmitting his own excitement to his audience. In this book Mason summarizes much of the content of his technical monograph, *Physics of Clouds*, but the summary is somewhat superior to the full account in organization and clarity. The summary also incorporates recent discoveries that add understanding to the problems of rainmaking and of cloud electrification.

Clouds, Rain and Rainmaking is an edited account of lectures given at the University of London to physics students who have little background in atmospheric physics. The treatment is largely qualitative, and one might even say that it is written in narrative style. However, the author pulls few punches, many unsolved problems are presented, and mathematics is used where appropriate. The subjects discussed include cloud forms, condensation nuclei, droplet growth, crystal growth, precipitation, rainmaking, and electrical charging of clouds. Simple experiments are suggested, which illustrate some of the phenomena discussed, and there are 46 excellent photographs (selected from many sources) of clouds, ice crystals, the results of rainmaking experiments, lightning, and the like.

A few of the book's less successful aspects are: figure 10, which gives the incorrect impression that droplets grow from very small size to a radius of 20 to 30 microns by condensation or by coalescence in equal times (this carries over an ambiguity from *Physics of Clouds*); the review of inadequate theories of charge generation before the presentation of the only satisfactory theory is somewhat tedious and does not make for clarity; and there is little valid reason for isolating in the appendix the material on droplet growth by condensation and on collision efficiency.

After reading *Clouds, Rain and Rainmaking* there remains a haunting question: what is the audience for this book and who should be encouraged to read it? The answer may lie in the fact that the book is in the English tradition of the tough-minded amateur; it is neither a textbook, nor a specialized technical monograph, nor a painless interpretation of science—types of science books which are familiar in the United States. The tradition of the amateur in science is one we well might emulate; it rewards diligence with enjoyment, the satisfying enjoyment of following a stimulating mind in exploring an exciting area.

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Russian Translation

Beryllium. Evaluation of deposits during prospecting and exploratory work. A. A. Beus. Translated by F. Lachman. Lincoln R. Page and R. K. Harrison, Eds. Freeman, San Francisco, Calif., 1962. x + 161 pp. Illus. $5.

In this book one of Russia's most distinguished students of beryllium deposits, A. A. Beus, accomplishes his objectives—to provide a generalization of Soviet and foreign experience gained in studies of beryllium desposits and to establish the most efficient methods of prospecting and evaluation—by the use of examples drawn from his own extensive experience in Russia and from foreign literature. In part 1, Beus discusses beryllium outside Russia, beryllium minerals, the geochemistry of beryllium, and types of deposits. Although the chapter on geochemistry has been up-dated to 1956, other chapters include only the information available to 1953; thus later noteworthy publications, such as *Professional Paper No. 318* (U.S. Geological Survey), as well as several recent major discoveries, are not discussed.

In the chapter on geochemistry, Beus gives excellent information on diadochic substitution of beryllium in minerals. The chapter on types of deposits is heavily weighted toward pegmatites; unfortunately, locations are not given for the Russian deposits discussed, and as one of the editors (L.R.P.) notes, Beus ignores conflicting ideas, which are held by American geologists, concerning the genesis of the pegmatite deposits in America. Nonpegmatic deposits are grouped as hydrothermal-pneumatolytic, including greisens and various veins, and as beryllium-bearing skarns. Because their discovery postdates the writing of the original Russian volume, the following are not mentioned: beryllium-bearing tuffs (such as those at Spor Mountain, Utah) and the recent major discoveries at Seal Lake, Labrador (barylite in paragneiss) and at Coahuila, Mexico (bertrandite in fluorite pipes).

In part 2, on prospecting for and evaluation of deposits, Beus relies chiefly on geologic mapping to locate deposits in areas previously selected as favorable by referring to geologic and geochemical factors. No reference is made either to geochemical reconnaissance methods or to the use of the neutron detector, although both have proved invaluable in recent American exploration and evaluation and are, in conjunction with geologic mapping, probably the best exploration tools available. Techniques of mapping, drilling, and sampling are outlined in the chapters on physical exploration and the evaluation of deposits; these techniques are also standard practice in the United States.

Specialists will note some discrepancies. For example, the variation in refractive indices of beryl is shown (in Fig. 1) as a function of Na_2O and K_2O (oxides which seldom constitute significant percentages of some beryls) rather than as total alkalies (thus including the oxides of cesium and rubidium which are more common constituents). Grouping the vein-type deposits of fluorite,

mica, and chrysoberyl, which occur in limestones at some distance from tin-bearing intrusive rocks, with the skarn deposits rather than with the vein deposits is, in my opinion, unfortunate; clearly, they are vein deposits.

Notwithstanding the omissions noted above, the book will be of great interest and usefulness, especially to exploration geologists and engineers who wish a working background in the geology, geochemistry, and mineralogy of beryllium deposits.

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Astronomy for Laymen

A History of Astronomy. Antonie Pannekoek. Interscience, New York, 1961. 521 pp. Illus. $9.25.

Astronomy. Fred Hoyle. Doubleday, New York, 1962. 320 pp. Illus. $12.95.

The ABC's of Astronomy. An illustrated dictionary. Roy A. Gallant. Doubleday, New York, 1962. 125 pp. Illus. $3.95.

These three books are intended primarily for the interested and literate layman. The first two are by professional astronomers of distinction, and both present our present-day conception of the universe and its constituents as a historical development, through many stages in the attempts of civilized men to understand those features of their celestial environment that were significantly related to terrestrial life as they lived it. The third book is also by a professional—a professional interpreter of science to nonscientists, a "science writer," and a good one. This book is for would-be amateur astronomers, and it combines a dictionary of the astronomical language and a handbook for those who desire firsthand acquaintance, by naked-eye observation or the use of a small telescope, with the heavens always spread out above us. All three books are typographically attractive. Hoyle's book is sumptuously illustrated with color plates, reproductions of manuscripts and pages from famous works, very clear explanatory diagrams, and fine black-and-white pictures of celestial objects and of astronomers. Gallant's book is really a collaborative work with John Polgreen, whose drawings, diagrams, and selections of astronomical photographs are an essential part of the presentation.

Pannekoek's *History of Astronomy* was originally published in Dutch in 1951. The translator is not named (was it Pannekoek himself?). It is not an original investigation but a comprehensive survey which invites comparison with two classic surveys written in English a half century ago—Berry's *Short History of Astronomy* (1898) and Dreyer's *History of the Planetary Systems* (1905). Pannekoek gives a much more extensive treatment of pre-Greek astronomy than either Berry or Dreyer—nearly a quarter of the book passes before Hipparchus appears. Dreyer stops with Kepler, and Berry carries his history to the late 19th century (when modern astrophysics was just getting started). But Pannekoek reaches World War II and portrays well 40 years of intensive advance in many directions; he records the major changes in the views generally held at the turn of the century and leaves us with the expectation of more changes in the future. There are three sections to the book: Astronomy in the Ancient World (to the close of the Arabian period); Astronomy in Revolution (to Laplace); Astronomy Surveying the Universe (the 19th and 20th centuries, considered topically rather than chronologically). His style is clear and direct, the treatment essentially nontechnical but not superficial, and much attention is paid to the instruments of the astronomers and to the way in which observations were made. The influence of the intellectual, technological, and social background of each period upon the endeavors of the astronomers is rightly stressed. A valuable feature is the provision of more than 200 references to authoritative historical treatises and original papers.

On the jacket of Hoyle's book the publisher calls it a history of man's investigation of the universe. But the book also incorporates, in three expository chapters and in sections of all the other chapters, a very fine account of descriptive astronomy, of the telescopes, spectroscopes, and other instruments used in observation, and of the physical principles upon which astronomy is founded. The history is well and vividly narrated, but this is done more briefly and selectively than in Pannekoek's longer work. The record is brought almost to the present moment, and the most recent developments are described with a particular effectiveness, appropriate to one whose contribution to them has been considerable. Hoyle's well-known felicity of expression and skill in exposition are evident throughout the book, and these, together with the superb illustrations, make me feel that the book is well worth its price. Looking far back to high school days when I neglected lessons to devour books on astronomy, I can imagine the delight with which I would have greeted this one.

Gallant and Polgreen's dictionary and observer's handbook I find a bit disappointing. The writing is direct, simple, and clear, the illustrations excellent, and the format attractive. As dictionary definitions go, these are pretty good, with a few exceptions ("centrifugal force" is one); the art of definition is a very difficult one, and it is much easier to find fault than to contrive a better definition in as few words. Some of the diagrams and charts are very good. But to the amateur learning how (and how *not*) to get the most out of a small telescope, this book tells little of value, nor does it provide enough sky lore to make naked-eye star study very inviting. Perhaps, as a professional teacher, I have some bias against the scrappy assembly of unsystematized facts presented in a dictionary. But I have seen many such books that were not as good as this one.

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A Compelling Amalgam

About Biology. Karl von Frisch. Translated from the German by Elsa B. Lowenstein. Oliver and Boyd, Edinburgh, 1962. 287 pp. Illus. 25s.

The title page of this translation of *Du und das Leben,* a popular introduction to animal biology, lists the publication date of the original as 1959, but the copyright date is given as 1949. The earlier date more accurately reflects the contents, for the achievements of the last decade with its flowering of molecular biology and biophysics are not represented here. Hence it would be proper to point out that the book does not serve to introduce to the reader the major bandwagons of modern biology, but to suggest this as a criticism would be very short-sighted. The book is a most gracious and compelling amalgam of comparative anatomy, com-