

1 for each voice at BTL) will undoubtedly be reduced by the rapid development of digital computers, and the composer will be given fast, flexible, direct control of a processor generating sounds in real time. Analog methods to generate music are much less expensive at present and much more widely available. Unfortunately, much more labor is required to exploit their flexibility, and they are being developed by very few people with most inadequate funds. Psychoacoustic information is badly needed by the composer, for he is no longer limited by motor performance but only by aural perception. Milton Babbitt has demonstrated that these limits are unknown. The composer must know what is perceptually significant and what is not so that he can create interesting tones of character. This subject can be illuminated by analyzing the tones of musical instruments to ascertain what physical invariants characterize these instruments and by synthesizing these tones to assess the aural importance of the invariants found. The present composers and scientists appreciate well the importance of low-frequency modulations—that is, subaudio spectra distributed about each of the audio spectra.

Except for such use of data processors, the development of artistically important musical instruments has nearly ceased during the present century, despite the much faster pace of technological developments. Is it possible that viable new instruments to be played by performers will not be developed because the evolutionary approach historically demanded of all successful instruments is lacking and that composers will, therefore, entirely bypass the performer and use devices developed for entirely different purposes and reasons? I hope not. How and when will men learn to spend an infinitesimal fraction of the effort they devote to developing devices for their own self-destruction on effort to make their lives more worthwhile?

The authors of this record have achieved considerable success in displaying the kinds of sounds and combinations of sounds that can be created by a computer; in my opinion they should be very strongly encouraged to expand their work. It will certainly be exciting to see where the work leads.

MELVILLE CLARK, JR.

8 Richard Road,  
Cochituate, Massachusetts

4 JANUARY 1963

## Experimental Techniques

**Neutron Physics.** Proceedings of the symposium held at Rensselaer Polytechnic Institute, May 1961. M. L. Yeater, Ed. Academic Press, New York, 1962. xiii + 303 pp. Illus. \$12.

This book is the transcript of a symposium on neutron interactions, which was held at Rensselaer Polytechnic Institute in May 1961. An evaluation of the book must be clearly distinguished from an evaluation of the symposium itself, since the two serve rather different purposes.

The principal value of the book, to most readers, lies in the numerous discussions of experimental methods for measuring cross sections and other nuclear constants of interest to reactor designers. Approximately three-fourths of the book is devoted to these topics, and the reader is able to make a good assessment of the relative merits and areas of applicability of various techniques, for example, fast choppers versus pulsed electron linacs as time of flight spectrometers. The discussions of experimental work are accompanied by current examples of the data obtained but the book, like the symposium, can serve as a source of this information only to the extent that it combines the work of several contributors into a convenient compilation.

The theoretical papers are devoted exclusively to topics related to neutron thermalization. The dynamics of the atomic motions and some of the problems of calculating thermal neutron spectra are discussed, without the detailed quantum mechanical treatment required for a complete presentation. For the theoretical physicist, this is a somewhat superficial treatment, but it provides a useful starting point for further study.

In addition to the useful information contained in the technical discussions, each paper is accompanied by references to the latest publications, which will be helpful in searching out many details that fall outside the scope of the papers.

At the request of the editor, the transcripts of each paper were reviewed by the authors for accuracy, but the papers were not rewritten. This retains the informal and sometimes extemporaneous nature of the original presentations. The inclusion of parts of the discussion periods has the same effect and also helps

to point out interrelationships between the separate topics.

The contents would be more consistent with the title if the coverage included recent work on resonance absorption, neutron age, and neutron reactions in fast reactors, but this limitation was forced by the nature of the symposium itself.

In summary, *Neutron Physics* provides a useful and easily read compilation of background information, especially with respect to experimental techniques, and the book can serve as a good starting point for assessing the current status of work on the problems covered.

C. A. PRESKITT

Oak Ridge National Laboratory,  
Oak Ridge, Tennessee

## Comprehensive Review

**The Pyrimidines.** D. J. Brown. Interscience (Wiley), New York, 1962. xxv + 774 pp. Illus. \$40.

Research in the field of pyrimidine chemistry has been increasing at such a rate that it seems hardly possible for a critical, comprehensive, but reasonably current review to be written by one person. Nevertheless, this book, which represents a tremendous organized search and review of the literature, has some 56 tables listing all simple pyrimidine derivatives (approximately 4000 entries along with melting points and literature references) through 1957, and the text draws examples from the literature through mid-1960.

Brown intended the book to be a practical treatment dealing with synthesis, properties, and structures of the major classes of pyrimidines. Only a brief treatment of the extensive areas of nucleic acids and barbituric acid derivatives is accorded, and it is not intended to cover more complex natural products and fused pyrimidine derivatives.

The 29-page introductory chapter reviews nomenclature and gives the best *brief* review of pyrimidine chemistry available. Although theoretical aspects and mechanistic interpretations are not emphasized, the final chapter, "The ionization and absorption spectra of pyrimidines," includes a valuable and lucid treatment of the  $pK_a$  values of pyrimidine and its amino and

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.

HARRY S. MOSHER

Department of Chemistry,  
Stanford University

## 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.

ROBERT G. FLEAGLE

Department of Atmospheric Sciences,  
University of Washington

## 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 deposits 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<sub>2</sub>O and K<sub>2</sub>O (oxides which seldom constitute significant percentages of some beryls) rather than as total alkalis (thus including the oxides of cesium and rubidium which are more common constituents). Grouping the vein-type deposits of fluorite,