
Books

Theoretical and Experimental Aspects of Controlled Nuclear Fusion, Vol. 31 (390 pp.) & **Controlled Fusion Devices**, Vol. 32 (463 pp.) of Proc. of 2nd UN Internat'l Conf. on the Peaceful Uses of Atomic Energy (Geneva, Sept. 1958). United Nations, Geneva & New York, 1958. \$15.00 each. **Controlled Thermonuclear Conference** (Washington, D. C., Feb. 1958). 536 pp. (AEC) Office of Technical Services, Dept. of Commerce, Washington, D. C., 1958. Paperbound \$4.75. *Reviewed by D. J. Rose, Massachusetts Institute of Technology.*

SOME time ago, I observed the appearance of *An Annotated Collection of Mongolian Riddles*.¹ Presumably answers were supplied, an advantage not shared by some contributions to the volumes under review. What does a reviewer say about such books? He cannot make occasion to needle the author, nor even propagate his own views, which by inference are superior to those in the book. These volumes, being collections of papers dumped into the laps of program committees, are for experts in the field almost exclusively. But the expert already has a fair idea of what is in them, and has purchased them if his need is great enough. If anyone be still undecided, I address my remarks to him.

The Washington Conference Report (for short) is paperbacked, but pretty well bound nonetheless. It lists 87 titles of papers. From this one subtracts 11 papers for which no text was available, about 20 which are abstracts only or impossibly brief, and a dozen more that have no apparent useful content. Incidentally, about thirty of the listed titles refer to work also discussed in the Geneva Conference volumes. A few are identical; one can sometimes get considerable mileage per paper on a clear day. All in all, considering that the substance of a further number of papers can now also be found in the standard literature, there remain only about 30 not conveniently found elsewhere. The nature of these is such that the book should be available in the library, but generally not on anyone's desk.

The Geneva Conference volumes are a somewhat different matter. The two volumes contain 110 papers on fusion topics, and both should be considered together. To be sure, most of the theory is in Volume 31, and most of the diagnostics is in Volume 32; the remainder of the papers, despite the titles listed for the volumes and the sessions recorded therein, are not

sharply divided. This reflects the fact that a "controlled fusion device" is really an "experiment". While a number of these papers are also finding their way into the standard literature, one would search a long time to compile an equivalent set. Everyone put his best foot forward for the conference, so the worldwide state of the art is well sampled. A few papers are patently ridiculous, and some are mysterious (if not inscrutable), but most are very acceptable. Personal experience shows that samples from this collection, augmented with some basic theory and ancillary facts, will make a satisfactory graduate course in thermonuclear processes. The volumes are highly recommended to all who teach the subject.

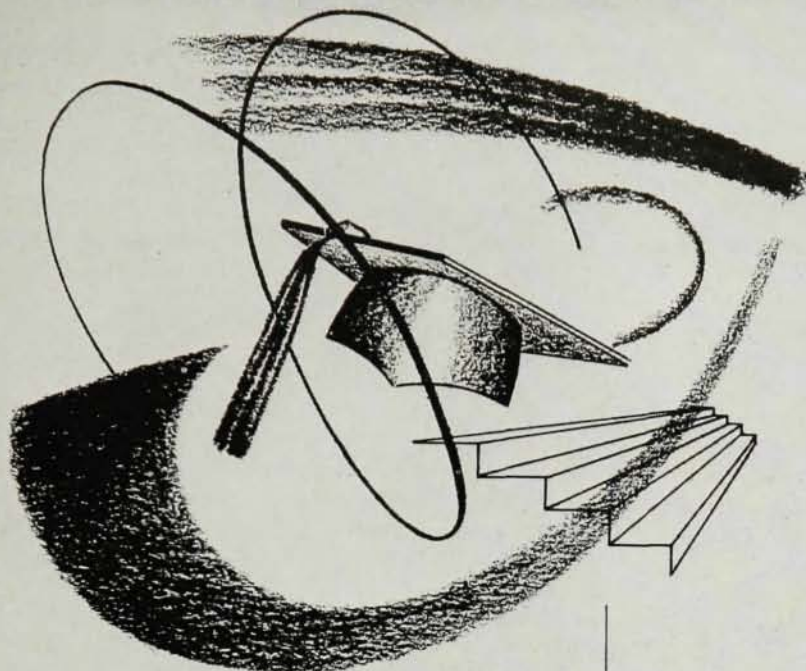
They serve as an excellent record of thoughts on controlled fusion up to 1958, and it will be interesting to look back in later years upon our current naïveté. Even now, it is both amusing and salutary to consider the optimism of five years ago, before some of the difficulties became apparent.

One can make some general observations from the Geneva volumes: there are several excellent reviews (Artsimovich, for example); the USSR has better papers on some phases of plasma theory; the USA has generally better large devices; a disturbing fraction of the large devices are turning out to have their theoretical foundation built upon the sand; there is probably a lot more theoretical sand, which hasn't been found yet; there is a need (attempts are being made) to unify the various approaches to the theory, so that more common meeting ground can be discovered; some of the most significant advances come from projects of modest size, well thought out; the various groups working on separate ideas (even in the same country) don't talk to each other often enough; security has held back the program.

Liquid Helium. K. R. Atkins. 312 pp. Cambridge U. Press, New York, 1959. \$11.00. *Reviewed by A. Maradudin, Institute for Fluid Dynamics and Applied Mathematics, University of Maryland.*

THE appearance of a new book on liquid helium, only the second to have been written about the subject in the fifty-one years since Kammerlingh Onnes succeeded in liquefying helium, and the first new one since Keesom's *Helium* was published seventeen years ago, must be considered an event. It also prompts one to make the inevitable comparison with Keesom's compendium of the nature and properties of helium in all its forms. Both books are exhaustive surveys of the theoretical and experimental knowledge of their subject at the time they were written. The resemblance pretty well stops here. While Keesom discussed the properties of helium gas, solid helium, the helium atom, and the helium nucleus, in addition to the properties of liquid helium, Atkins confines himself to the latter topic exclusively. Furthermore, considerable progress has been made in the field since 1942. At that time the two-fluid theory was only two years old. Landau's

¹ Amer. Phil. Soc. Trans. 44, Part 3 (1954).



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theory of liquid helium in its earliest form had just been proposed, second sound, although predicted, had not yet been discovered experimentally, and although x-ray determinations of the structure factor of liquid helium had already been made, the use of neutron spectroscopy for the same purpose and for the determination of the spectrum of elementary excitations was still many years away. All of these topics are thoroughly covered by Atkins, together with discussions of the more recent theories of liquid helium of Bogoliubov, Feynman, Onsager, and Yang and Lee. The book is rounded out with a presentation of experimental and theoretical information regarding properties of helium films, He^3 , and He^3 - He^4 mixtures. In discussing various theories of liquid helium Atkins is careful to give the experimental data which prompt the theory, and experimental results are discussed in the light of the existing theory. Notwithstanding the wealth of material contained in this comparatively short book and its rather detailed presentation, it is still a very readable book.

Almost any book on recent developments in the study of liquid helium could have won a place in the literature for itself by default; Atkins' monograph accomplishes this on its merits.

Progress in Elementary Particle and Cosmic Ray Physics, Vol. 4. Edited by J. G. Wilson and S. A. Wouthuysen. 470 pp. (North-Holland) Interscience Publishers, Inc., New York, 1958. \$12.50. *Reviewed by R. D. Sard, Washington University.*

LIKE its predecessors, this fourth volume of an approximately biennial series consists of critical, self-contained surveys by active workers in the field. The editors have maintained the international character of the series, the authors of the present volume being from Geneva, Madison, Bristol, Durham, Maryland, and Moscow.

The broadening of the title and the editorship, to straddle accelerators and cosmic rays, as well as theory and experiment, is to be welcomed. Compartmentalization should be resisted as long as possible.

The first article, "Some Theoretical Aspects of the Strong Interactions of the New Particles", by D'Espagnat and Prentki, is a critical exposition of the theoretical speculations up to early 1957 on the physical significance of the "strangeness" quantum number. The main experimental results to be correlated were already known at the time of writing, and it appears that this explicit account should still be of value to a reader versed in the transformation properties of abstract spaces.

"The Properties and Production of K-Mesons", by W. D. Walker, is a brief survey of the experimental results again as of early 1957. It includes a presentation of the strangeness scheme, and a presentation of the data on energy and angle distributions in tau decay and the theoretical arguments based on them about spin and parity of the parent. The Revolution of Janu-

ary 1957 has demolished the parity arguments, but the considerations about spin are still cogent.

"The Interaction of Mu-Mesons with Matter", by G. N. Fowler and A. W. Wolfendale, is mainly of interest as a survey of experiments bearing on apparent anomalies in the behavior of fast mu mesons, in many of which the authors have been involved. To the reviewer, who has also worked in this field, the evidence for anomalies seems on the whole rather ghost-like, enveloped in the clouds of uncertain particle identification, naïve sampling, and noise analysis, and uncertain theoretical prediction. A major step toward clarification has recently been made by Fukui et al. (*Phys. Rev.* 113, 315, 1959). The survey under review is required reading for anyone venturing into this difficult field, if only for the warnings it contains.

"The Primary Cosmic Radiation and its Time Variations", by S. F. Singer, is a well-written and well-organized presentation, some 125 pages long. It contains a wealth of reference material on geomagnetic theory and high-altitude observations, as well as some stimulating comments on current research problems.

V. L. Ginzburg's "The Origin of Cosmic Radiation" is a presentation of his theory that most of the cosmic radiation comes from supernovae, and perhaps novae, in our galaxy. The nonthermal radio and optical emission from them is regarded as evidence for very high-energy electrons, up to some 10^{12} ev, and whatever mechanism it is that accelerates the electrons is assumed also to accelerate protons and complex nuclei. The article surveys present knowledge of the primary cosmic radiation near the earth and of cosmic radio-emission, presenting many useful theoretical results on magnetic bremsstrahlung. The reviewer is not competent to compare Ginzburg's theory with its rivals, but he is impressed by the physical insight and breadth of view shown in this article.

The book is attractively printed and bound, but there are more typographical and editorial slips than one is accustomed to in this series.

Applied Mathematics for Engineers and Scientists. By C. G. Lambe. 518 pp. The Macmillan Co., New York, 1959. \$8.50. *Reviewed by J. Gillis, Weizmann Institute of Science.*

THIS is a welcome addition to the series of excellent textbooks which have been appearing under the general editorship of Sir Graham Sutton. Let us hope that the dichotomy "engineers and scientists" will not cause offense to members of the first group.

The material is all completely standard and includes dynamics of particles and of rigid bodies; Lagrange's equations with applications; statics of a rigid body and of ropes and chains; structural statics, hydrostatics, hydraulics, and elementary hydrodynamics; the wave, heat-flow, and Laplace equations, leading to the study of Legendre and Bessel functions. The examples, both those worked out in the text and also those set as exercises for the student, are abundant and well chosen.