

coverage is given to a group of analytical methods devised for predicting the gamma-ray absorption distributions in the complicated geometry of a reactor at a time when high-speed computing machinery techniques were not applied commonly. These methods should still be valuable for preliminary design studies in their direct approach, as well as at sites not having ready access to the machine calculations. The last part reviews briefly some measurements pertinent to the kinetic behavior of the reactor. The treatment is not in sufficient detail for ready assimilation, however.

Missing from the volume is a detailed discussion of criticality calculations on the various experimental assemblies constructed in simple geometry as well as the multigroup cross sections employed. While references to some such calculations are supplied, their lack, coupled with the complete absence of more recent work on intermediate systems, makes this volume more a project summary of historical interest than a clear exposition of the physics of intermediate reactors.

Introduction to Neutron Physics. By L. F. Curtiss. 380 pp. D. Van Nostrand, Co., Inc., Princeton, N. J., 1959. \$9.75. *Reviewed by J. E. Lynn, A.E.R.E., Harwell.*

IT was the aim of the author in writing this book to present a survey of the experimental facts concerning the neutron and of the experimental methods used in observing its behavior. The author appears to have aimed the book at the graduate-student level.

An account of a branch of physical science, which is heavily biased towards the experimental side, inevitably has its difficulties. The author realizes this and includes brief descriptions of the theoretical framework where necessary. This is particularly the case in the sections on neutron interactions with nuclei and with matter. The theoretical parts of the book, however, are rather superficial. One feels that the student who reads them will learn some of the jargon but will obtain little feeling for the physical principles of the subject. There are also a number of definite mistakes. For instance, modern theories do not allow the neutron to be considered as a combination of a proton and an electron as is stated in the book (although diluted by the words "as a first approximation"). A neutron resonance is not associated with levels of the *target nucleus*; the statement on p. 40, to the effect that it is, is corrected in later parts of the book but the result of this careless writing can only be that the newcomer to the subject becomes confused. In a later part of the book the meaningless phrase "channel spin of the compound nucleus" occurs.

The most satisfactory parts of the book are those on technique. There are useful surveys on neutron sources, detectors, monochromators, calibrations, and standards. There are occasional rather significant omissions in these sections, however, such as spontaneous fission sources and, in the section on pulsed neutron sources, the use of high-current linear electron accelerators. This last omission is particularly curious in

that a fairly detailed description is given in the book of a neutron detector whose main application has been in conjunction with linear accelerators.

The safety aspects of the experimental techniques are everywhere emphasized and there is a special chapter on health physics. This is as it should be, for with the increasing use and spread of radiation sources safety cannot be too strongly stressed.

On the whole this is a satisfactory book for the graduate student, but it cannot be said that it is excellent.

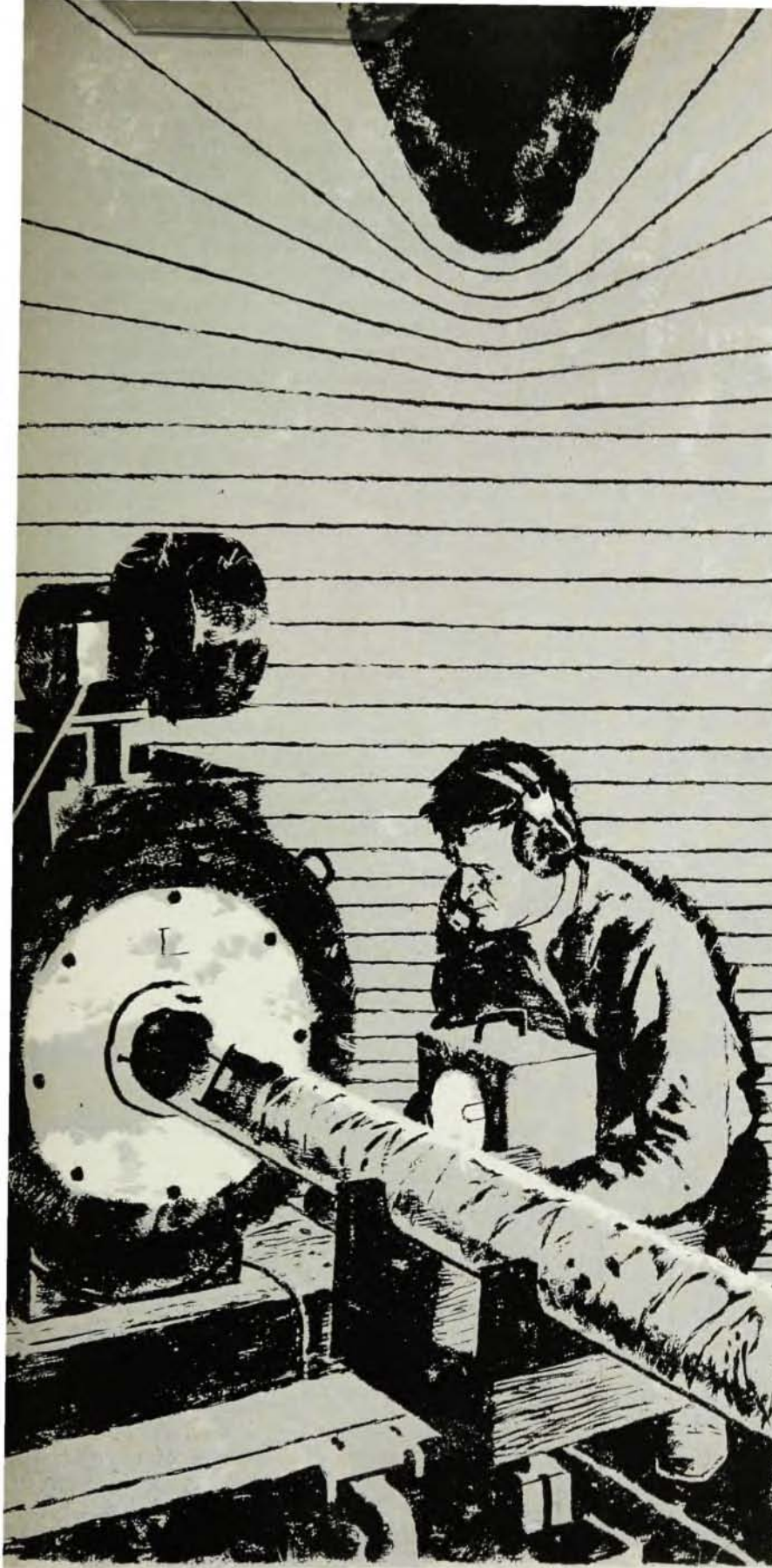
Basic Physics of Atoms & Molecules. By U. Fano and L. Fano. 414 pp. John Wiley & Sons, Inc., New York, 1959. \$10.00. *Reviewed by T. H. Edwards, Michigan State University.*

U. AND L. FANO'S *Basic Physics of Atoms and Molecules* is the first edition of a book which goes a long way towards filling the need for a good text on elementary quantum mechanics. The authors have made a successful effort to tie together classical and quantum phenomena and have included many valuable facts, not usually brought out, in their discussions of the various phenomena covered. There are a few problems at the end of each chapter (sufficient to please me) and the answers are given in a very fine form, complete with a brief explanation. Some of the more difficult and more specialized parts of the work are in the ten appendices. Appendix X on resonance is particularly worthwhile.

My principal criticism of this work concerns the authors' English and use of words. In addition, such difficult concepts as complementarity, correlation, correspondence, and incompatibility are not all clearly defined when first met and the index, while helpful in this regard, is less complete than desirable. A careful teacher can easily overcome these difficulties and they can be repaired in future editions. Unaccountably, a figure belonging to chapter 18 was bound into chapter 12 in the review copy. Despite these things, *Basic Physics of Atoms and Molecules* is a very good text for a course in elementary quantum mechanics and students who use this text should have much less difficulty than usual understanding how quantum mechanics applies to real physical situations.

High Altitude and Satellite Rockets: Symp. Proc. (Cranfield, England, July 1957). Sponsored by Royal Aeronautical Soc., British Interplanetary Soc., and Col. of Aeronautics. 136 pp. Philosophical Library, Inc., New York, 1959. \$15.00. *Reviewed by Robert E. Street, University of Washington.*

PUBLICATION almost two years later of papers read at a symposium in 1957, before Sputnik and the IGY, produces a volume which is essentially of historical interest. Almost all of the ideas, conjectures, and proposals have appeared elsewhere and the plans for the IGY have been carried out by now or have



SPACE AGE ENVIRONMENTS

A new challenge at Avco

Hundreds of miles above the earth, totally new environments arise to challenge man's progress in space flight.

Today, at Avco, standard and very special machines are being used to seek out the parameters of space flight environments. These machines test components and systems for the Air Force Titan and Minuteman intercontinental ballistic missiles at, and beyond, the expected environmental limits.

Among the more severe environments that Avco nose cones must conquer are the re-entry problems of mechanical and acoustic noise vibration, extremely high temperature and deceleration shocks. These environmental problems will be common to all space vehicles.

Typical example of testing machines is the Avco-developed acoustic noise generator which creates the extremely high noise level that occurs during atmospheric re-entry.

Finding, predicting, and solving new environmental problems is an interesting, challenging job for Avco engineers and scientists, but it is only one of the many fields of work at Avco. Basic research and advanced development are carried on over an extremely wide area, mixing many scientific disciplines and creating an interchange of information and a stimulating work atmosphere.

Avco
Research & Advanced Development
division

For information on unusual career opportunities for exceptionally qualified scientists and engineers write to: R. Rubino, Scientific and Technical Relations, Avco Research and Advanced Development Division, Avco Corporation, 201 Lowell Street, Wilmington, Mass.



**SOLID STATE PHYSICISTS
PHYSICAL CHEMISTS
APPLIED MATHEMATICIANS**

Which challenge is yours?
Can you qualify to join our new
and growing research staff and
work in the following fields?

Semi-conductor thin films

Magnetic thin films

Semi-conductor circuits

Molecular electronics

Optical electronics

Information theory

Growth of high purity crystals

**Thermo-electric and
photoelectric phenomena**

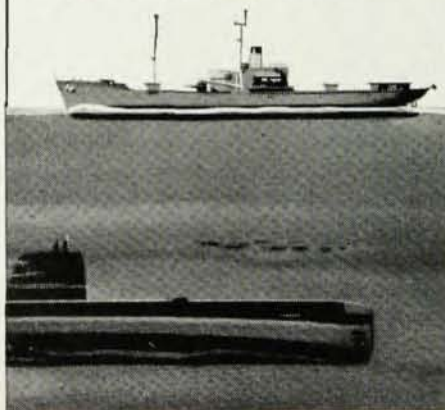
Electro-mechanical effects

Autonetics is expanding its CENTRAL RESEARCH STAFF at work in fields of the future.

The men we want have a MS or PhD., and have demonstrated creativity, judgment, and technical soundness through several years' industrial experience.

Send your resume to:
Mr. B. D. Benning
Manager, Employment Services
Dept. J-104
9150 East Imperial Highway
Downey, California

Autonetics 
A Division of North American Aviation, Inc.



been modified. Most of these papers would have had more interest if they had been published immediately in a less attractive but cheaper and more rapidly produced format. One paper, that on the dynamics of a dissociating gas by Freeman, has been available for over a year as AGARD Report No. 133. Massey's paper on scientific applications is the only one on a purely physical topic, the use of rockets and satellites to obtain upper-atmosphere data, although Lines' discussion of instrumentation and guidance with its emphasis on electronics is closely related. The other papers cover the topics of rocket engine design, the Vanguard and Skylark rockets, use of aerodynamic lift upon re-entry for recovery of satellites, high-temperature materials, and space medical problems. Because of the various specialized fields covered and the different backgrounds of the participants, the papers all have a high expository level, consequently are well written and are a pleasure to read.

Symposium on Information Theory in Biology (Gatlinburg, Tenn., Oct. 1956). Edited by Hubert P. Yockey, Robert L. Platzman, Henry Quastler. 418 pp. Pergamon Press, London & New York, 1958. \$12.00. Reviewed by J. R. Pierce, Bell Telephone Laboratories.

INFORMATION theory as Shannon devised it is concerned with the statistics of message sources and the statistics of communication channels. It shows that with an ergodic source there can be associated an entropy or rate of production of information, measured in bits per second, and that with a noisy channel there can be associated a channel capacity, also measured in bits per second. If the capacity of a channel is less than the entropy of the source by however small an amount, the messages produced by the source can be sent over the channel with a vanishingly small error, providing encoding is done properly in very long blocks.

Information theory has called to the attention of the world a number of internally useful ideas concerning conditional probabilities and entropies and complex encoding. Some physicists, psychologists, and biologists have been anxious to use these in their own fields. It is hard to judge their success, for what they seek to do is rather apart from the original aim of information theory.

Happily, Quastler in "A Primer on Information Theory", the first paper in this book, shows a familiarity with and understanding of the subject which is all too uncommon among those who wish to extend its applications. Many of the other papers in the book are closely related to the ideas of information theory in that they are concerned with the idea of coding in chromosomes, proteins, and protein synthesis, with fluctuations in neural thresholds, with statistical considerations in connection with membrane phenomena, with statistical aspects of radiation damage phenomena, and with other statistical matters.

The book as a whole is baffling, at least to me. I don't have enough knowledge of biology to judge the