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graphs illustrate the text and lucid drawings of the arrangement of instrumentation inside these rockets aid greatly in the appreciation of the field. References are given throughout the text to the pertinent technical and scientific papers. A final chapter on satellites and interplanetary rockets discusses the mechanics and power economy of such flights.

Small-Angle Scattering of X-Rays. By André Guinier and Gérard Fournet. Translated by C. B. Walker. 268 pp. John Wiley & Sons, Inc., New York, 1955. \$7.50. Reviewed by George H. Vineyard, Brookhaven National Laboratory.

Colloids, macromolecules, micelles, viruses, precipitation nuclei in alloys, and tiny voids in cold worked metals are all examples of structures which have been studied by small angle x-ray scattering. The theory and techniques of the field have been developing since Professor Guinier's pioneering work appeared in 1938, but no reviews more complete than an isolated chapter or two in larger works has come out until now.

This book is both an introduction and a moderately comprehensive summary of the field, starting with the basic theory of small angle scattering, discussing experimental equipment and methods, and showing how to interpret results. There is also an interesting chapter describing miscellaneous applications which have been made of small angle scattering techniques, and a very extensive annotated bibliography compiled by K. L. Yudowitch. The bibliography is a revision of an earlier one published by the American Crystallographic Association.

The theoretical discussion has extraordinary depth, all under the assumption of single scattering without attenuation or extinction. Within this approximation virtually every possibility is considered—spherical particles and irregular particles, homogeneous and heterogeneous dispersions, dilute solutions and dense solutions, etc. The limitations on the structural information which can be gained from small angle scattering are rightly emphasized, and a number of common fallacies in interpreting the experiments are exposed. The treatment is lacking in breadth, however, in that it ignores all effects of multiple scattering (including refraction and extinction) and sometimes these are important.

There is a lengthy and useful discussion of that troublesome perturbation, interparticle interference. The treatment proceeds from Fournet's statistical mechanical theory of radial distribution functions for particles, which parallels the Born-Green-Rodriguez development for molecules in fluids. This is an elegant approach and nicely demonstrates most of the qualitative results of closer packing, but the reader is not sufficiently warned that this theory employs several approximations and is not accurate at high densities. The theory also applies only to systems in which the particles interact with pairwise central forces and are in a state of thermodynamic equilibrium. It would seem that in very many of the systems studied with small angle scattering the

interparticle forces would be more complicated than this and that nothing like thermodynamic equilibrium would prevail.

The chapters on experimental techniques and interpretation of results are especially valuable, and should be much consulted by the nonspecialists in diffraction for whom small angle scattering has become important. One only wishes that the authors had gone a little beyond the bounds of their title to include something about small angle diffraction of neutrons, for this involves an essentially identical theory, supplements x-ray scattering nicely, and has given some of the most beautiful confirmations of the theoretical ideas.

Science and the Human Imagination. By Mary B. Hesse. 171 pp. Philosophical Library, New York, 1955. \$3.75. Reviewed by T. A. Welton, Oak Ridge National Laboratory.

The author attempts to ease the conflict between religious belief and scientific thought which has arisen since the time of Galileo. She is not completely preoccupied with this formidable task, however, and has managed to give a very readable account of the scientific and philosophical developments which have engendered the conflict. The reviewer has some reservations as to her success in her avowed aim (she makes no extravagant claims), but he was much interested by the description of the process by which the medieval church was committed to Aristotelianism with all the implications that the work of Aquinas held for the future relation of religious and scientific thought.

The author describes the evolution of our world picture from the billiard-ball universe to quantum mechanics. Her treatment of the operational concept and scientific models are concise and at least, for the non-philosophic reader, well-packed with interesting ideas. The reviewer (a theoretical physicist) gained the somewhat unfortunate, and perhaps false, impression that the author was perhaps suggesting that our universe models, in their increasing mathematical subtlety, are becoming somehow more vague and simpler to reconcile with the intuitive and anthropomorphic world ideas of classical religious thought.

Thermodynamics and Statistical Mechanics. Vol. V, Lectures on Theoretical Physics. By Arnold Sommerfeld. Translated by J. Kestin. 401 pp. Academic Press Inc., New York, 1956. \$7.00. Reviewed by Norman H. Nachtrieb, The University of Chicago.

If one may judge from the clarity and elegance of this little book, Arnold Sommerfeld's lectures on theoretical physics must have been a joy to attend. Completed after his death by Professors Bopp and Meixner, it comprises the substance of Sommerfeld's Munich lectures on thermodynamics and statistical mechanics. This skillful translation into English by Professor Kestin adds another to five previously translated volumes of Sommerfeld's treatise: *Mechanics, Mechanics*

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