shift from the method to the applications. The principal application is to the elucidation of structure on the colloidal level.

Although small angle X-ray scattering is now a fairly well established research tool, a first book should nonetheless attempt a wide coverage. The authors have succeeded in this, not only in the subject matter but also in the level of the treatment. The first two chapters (more than a third of the book) present a careful and expert discussion of the theoretical background. Especially valuable is the material on the scattering from dense systems, that is, systems in which interparticle interferences are important. Even at low concentrations of macromolecules in solution interparticle interference effects may distort the single particle scattering function and complicate the measurement of the radius of gyration. At high concentrations structure is introduced into the scattering curve which characterizes the relative spatial distribution of the molecules but which has been interpreted in too simplified a manner by many workers. Much of the material on dense systems will be interesting to physical chemists using light scattering techniques. They are accustomed to a thermodynamic rather than a geometric interpretation of concentration effects, but the problem is essentially the same. In fact a very promising but still undeveloped application of small angle X-ray scattering is the use of interparticle interference effects to determine molecular interactions.

The third chapter treats of experimental equipment. There is a good general discussion of the conflicting requirements of high intensity and high collimation of the X-ray beam and details of nearly all the collimators, scattering chambers and detecting devices which have been used successfully. This chapter includes also some very useful material on the correction of scattering curves for the finite size, particularly the height, of the apertures defining the beam.

The remaining chapters on the interpretation of experimental results and on applications again constitute somewhat more than a third of the book. The exposition is less mathematical than in the first two chapters but covers much of the same ground emphasizing, of course, the material most useful to the experimentalist. Here again the authors perform a notable service in warning against the dangers of over-interpretation of X-ray data.

It may be of interest to mention in greater detail the last chapter on applications. Up to this point the monograph is written for those who have a serious interest in learning of, and presumably using, small angle X-ray techniques. The last chapter is for the more casual reader. It will furnish a quick survey of the fields in which small angle X-ray scattering has been found useful, and spare him a great deal of wandering through a well scattered literature. These applications include the determination of size, shape and interaction of macromolecules in dilute solution, the measurement of long periods and partially ordered arrangements of micelles in natural and synthetic fibers, the measurement of size and surface area of commercial catalysts (this is now a routine procedure in some laboratories) and a large number of uses in physical metallurgy. In the latter field the method is particularly well suited to the investigation of the very early stages of the precipitation of a new phase, before changes are obvious under the microscope.

The authors have brought up to date and reprinted the 1952 bibliography on small angle X-ray scattering of the American Crystallographic Association. It contains almost six hundred titles, frequently followed by a descriptive sentence or two. The typography and the translation are excellent.

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Lithium Aluminum Hydride in Organic Chemistry. Monographs. Volume CCXXXVII. Section for Natural Sciences and Mathematics. No. 9. Edited by KOSTA V. PETKOVIC, Member of Academy, Secretary of the Section for Natural Sciences and Mathematics. By VUKIC M. MICOVIC, Ph.D., Professor of Chemistry in the University of Belgrade (Faculty of Sciences) and MIHAILO LJ. MIHAILOVIC, Ph.D., Lecturer in Chemistry in the University of Belgrade (Faculty of Sciences). Servian Academy of Sciences, Knez Mihailova 35, Boegrad, Yugoslavia. 1955. xi + 193 pp. 17.5 × 24 cm. Price $3.00.

Here, at a price within reach, is a review (in English) of the synthetic applications of lithium aluminum hydride. It is a concise, factual representation of the literature (1732 literature references) up to mid-1954. The flood of literature on this subject has probably reached its crest (*cf.* Fig. 1,

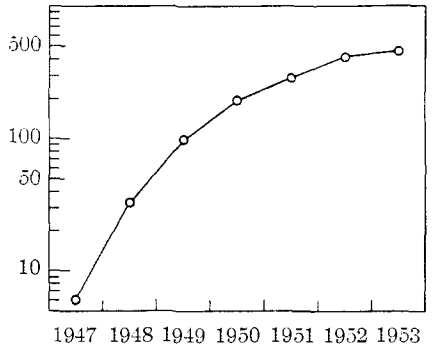

Fig. 1.—References cited 1947–1953.

showing distribution of references by year) and it is fair to say that the main outlines in the synthetic applications have been adequately delineated. The deviations from the normal pattern of reaction are already sufficiently numerous that one has no doubt the mechanistic problems will occupy the attention of physico-organic chemists for some time to come.

In a brief foreward Professor Schlesinger gives the work his blessing.

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Molecular Beams. By K. F. SMITH. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1955. x + 133 pp. 11 × 17 cm. Price, $2.00.

This little book by Dr. Smith gives an admirable account of many of the advances in the molecular beam art which have taken place since the publication by Methuen and Co. of a similar book authored by Ronald Fraser in 1937. One certainly welcomes this present edition; on the other hand, the 18-year intervening period has been long and the expansion from 66 to 127 pages of text does not appear to the reviewer to have been adequate. Thus there results a book covering the newer resonance techniques in insufficient detail to satisfy the needs of a man who wishes to enter the field; yet it is not sufficiently comprehensive in covering, in a reference fashion, the work of the intervening years so that the book can serve unfailingly as a guide to detailed accounts in the scientific literature. One hoped for a comprehensive and reasonably exhaustive treatise on the subject of molecular beams. Such a treatise should include in considerable detail the various aspects which deal with the processes of production of beams. Fraser's 1937 Cambridge University Press book entitled "Molecular Rays" has much more in it on these phases than the present book or its predecessor. Yet many of the things regarding mean free path-slit width criteria, more or less taken as gospel until recently, are now being re-examined and some discussion is in order, if for no other reason than to show how little we actually do know regarding the elementary process of effusion.

In spite of these limitations the present book definitely fills a well-felt need and the author is to be commended on his ability to cram so much into such a few pages and yet do it in a clear and understandable fashion. The first chapter covers the production and measurements of molecular beams, particularly the latter where the newer methods of beam detection are discussed. The second chapter includes a discussion of the velocity distribution in a beam and the deviations from the $v^3e^{-v^2/\alpha^2}$ law which can and do occur. A very interesting review of the use of atomic beams in optical spectroscopy is also included. Chapter III covers experiments on the wave nature of particles, crystal cleavage plane diffraction effects and beam scattering phenomena.