

catalogues, including the massive *Geschichte des Fixsternhimmels* and the *Index der Sternörter*. The last two chapters describe individual published catalogues in some detail.

Since the number of catalogues that has been published is probably well over a thousand, Eichhorn has done well to restrict himself to thorough discussions of about sixty catalogues and to preparing an annotated list of about 150 of the more important independent catalogues. At times the discussions are a bit uneven (he does not mention that the Smithsonian Astrophysical Observatory Catalogue contains 258 997 stars or that the scale adopted for the Astrographic Catalogue was for ease of identification), and the data given in the annotated list are not always complete (for example, the rms error of a catalogue position is given about 75% of the time, and the average number of observations utilized occurs only once). It would have added much to the content of the text if important associated star charts were mentioned. Eichhorn has devoted the last tenth of his book to a description and hearty advocacy of the re-reduction (if not reobservation) of the Astrographic Catalogue. This catalogue begun almost a century ago, is, as

Eichhorn claims, a buried treasure of astrometric positions; if fully usable it could probably yield positions of up to 14 million stars and conceivably be complete to the 12th magnitude.

The typographical errors and sometimes unpleasing page layout could have been avoided by a more conscientious editor, but the publisher is to be congratulated for having the wisdom to bring out a book on this fascinating yet esoteric subject. Improvements can await a future edition. The student who understands the fundamentals of astrometry and needs further detailed information will find his needs fulfilled by Eichhorn's text; those who are looking for a "cookbook" text and who need direction and guidance will need to do more digging on their own. The book belongs in every astronomy library.

* * *

Katherine Haramundanis is co-author of an undergraduate textbook in astronomy and author of numerous astronomy articles in encyclopedias and professional journals. She is a long-time student of astrometry and is principally responsible for the construction and analysis of the Smithsonian Astrophysical Observatory Star Catalogue and its companion Star Atlas.

Physics of Drop Formation in the Atmosphere

Yu. S. Sedunov

334 pp. Halsted, New York, 1974. \$21.00

The Earth's atmosphere is a complex mixture of gaseous and condensed matter. As a first approximation to a definition, we denote the nongaseous component that remains suspended for an appreciable time (from hours up to a year or more) due to small settling velocities or turbulence as the atmospheric aerosol. However, the aerosol itself has several domains and subdomains wherein the formation, interaction, growth, motion and, therefore, measurement techniques differ markedly. The size domain treated in this book is the intermediate one whose lower limit is on the order of 0.1 micron, below which lie the so-called condensation nuclei, and whose upper limit is around 30.0 microns, above which lie particles whose principal growth mechanism is coagulation. From the standpoint of formation and growth processes, what distinguishes this domain of cloud droplets from the condensation nucleus domain is the sensitivity of the larger particles to atmospheric humidity and the general validity of macroscopic diffusion expressions for heat and mass fluxes. It is the application of these

methods that *Physics of Drop Formation in the Atmosphere* treats.

This book is appropriate for both the advanced graduate student and the researcher in the field of cloud physics. Yu. S. Sedunov introduces the reader to the subject by treating in some detail the thermodynamics and transport processes of droplet growth. Using this, he derives the conditions for the conversion of condensation nuclei into small cloud droplets and then treats the kinetics of the initial condensational growth stage in detail. The final three of the book's seven chapters are concerned with the growth behavior of cloud-droplet populations in the steady state, with turbulence and fluctuations in the atmospheric variables, and lastly with the inclusion of the as-yet largely unexplored role of the stochastic nature of most variables affecting cloud droplets. The treatment in this book is unabashedly mathematical while being self contained. Sedunov pays scrupulous attention to physical interpretation and justification of the mathematics. Because the author generally takes a critical approach to the work presented, this book comes across to the reader as a status report on an evolving field placing the substantial research it encompasses in proper perspective.

Atmospheric droplet growth is a subject to which the author has made numerous contributions in the Russian research literature. The appearance of

this translation from the original 1972 Russian edition is a welcome addition, not only to the literature of cloud physics, but also to that of aerosol physics which is presently undergoing a great rebirth of interest, largely in connection with air pollution questions.

WILLIAM H. MARLOW

Brookhaven National Laboratory
Upton, New York

Structured Polymer Properties

R. J. Samuels

251 pp. Wiley, New York, 1974. \$19.95

Even though the birth of polymer physics may be traced back to the pioneering efforts of Hermann Staudinger in the 1920's, its development to date may still be considered to be at the late stages of infancy. As recently as a decade ago, and to some extent even today, polymer physicists were arguing over what model best represents a single polymer crystal and to what extent may its mechanical properties be related to the model parameters. Through the years much data has been gathered and many innovative techniques developed to elucidate the structure of polymer systems. Many hundreds of articles have appeared in diverse technical journals and yet one would be very hard pressed to recommend even a very few texts that deal adequately with the subject. In this light, R. J. Samuels's text, *Structured Polymer Properties*, is a useful addition to an area of polymer science that could stand a great deal more of attention as far as text publications are concerned.

In this book Samuels has gathered much of his published work as a researcher for Hercules Inc and combined these articles in such a manner that it is difficult for the reader to conceive of the work as a coherent text rather than a number of journal articles bound together. Nevertheless, the author has been quite thorough, and often innovative in his experimental techniques in polymer morphology.

The first section of the book deals with such diverse techniques as wide-angle x-ray diffraction for the determination of a crystalline orientation function, sonic modulus for the determination of an amorphous orientation function and birefringence for the determination of the total molecular orientation. Infrared dichroism, a technique involving the interpretation of optical anisotropy, is presented not only as a quantitative technique for determining orientation functions, but also for the determination of an important molecu-

lar-structure parameter—the transition-moment angle. Thus, the exploration of a polycrystalline material can be seen to proceed from the arrangement of the atoms within the polymeric chain, through the folding of the chains, followed by the arrangements of neighboring chains and finally to the formation of the very interesting supermolecular structures—spherulites. It is in this area where Samuels breaks out on his own and demonstrates his expertise in the area of small-angle light scattering. He discusses qualitative as well as quantitative interpretation of SALS patterns in detail. From these techniques he develops a comprehensive approach to the characterization of polycrystalline materials. The study is essentially limited to investigations of films and fibers of isotactic polypropylene and poly (ethylene terephthalate). Samuels takes these findings and suggests that the results may be generalized to all polycrystalline polymer systems, and perhaps to mixed metal systems as well.

The text is suitable for use by graduate-level students and researchers who possess a firm foundation in polymer science and should definitely not be used, as the author suggests, as an introductory text. For this purpose, F. W. Billmeyer's *Textbook of Polymer Science* or D. J. Williams' *Polymer Science and Engineering* are better suited for the job.

MARTIN I. PULVER

Bronx Community College of CUNY
Bronx, New York

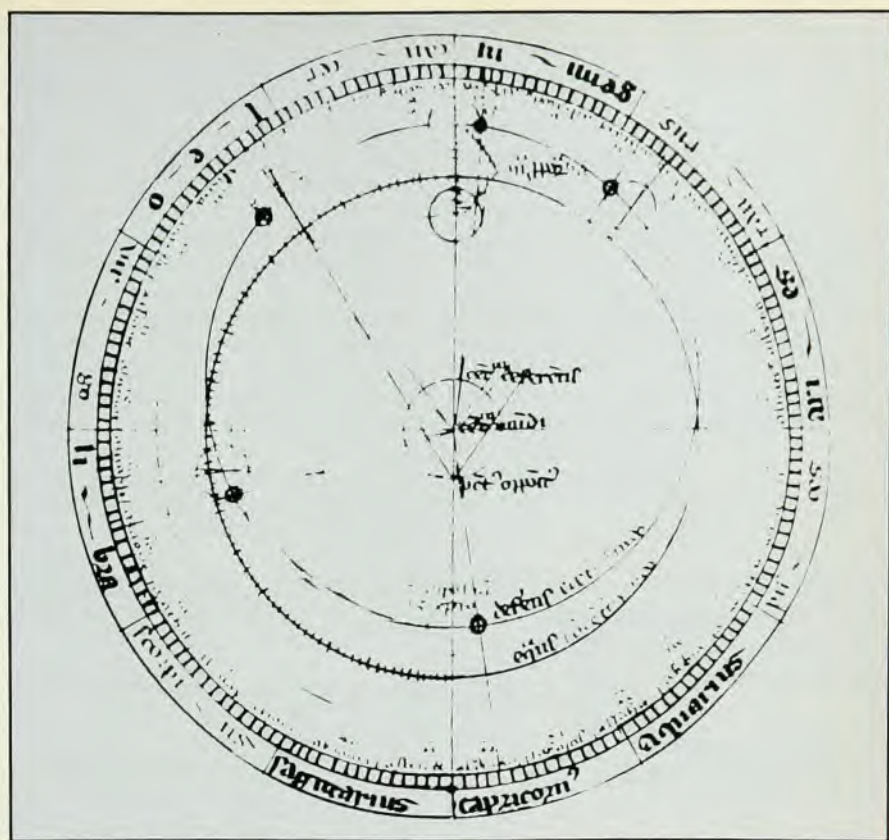
A Source Book in Medieval Science

E. Grant, ed.

864 pp. Harvard U. P., Cambridge, Mass.,
1974. \$32.50

It is now perhaps a truism that medieval science has come of age. Due to the scholarly efforts of Pierre Duhem, Lynn Thorndike, Anneliese Maier, Marshall Clagett, Ernest Moody, Pearl Kibre (to mention only some of the most important names in the serious study of medieval science) and to the many students of Clagett and their students, what seemed at best a contradiction in terms—Medieval Science—is now one of the more exciting, potent, and appealing branches of the historiography of science.

Edward Grant's numerous articles and three books [*Nicole Oresme, De proportionibus proportionum and Ad pauca respicientes* (1966), *Nicole Oresme and the Kinematics of Circular Motion* (1971) and *Physical Science in the Middle Ages* (1971)] have been in-



The motions of the moon are illustrated in a figure that accompanies the popular *Theorica Planetarum*, a manual for "liberal arts" courses. Ptolemy's *Almagest* was also widely available but was too advanced and theoretical for such classes. The author and the exact date of *Theorica Planetarum* are not known, but there is reason to believe that it appeared during 1260–80 in Paris. The treatise in translation and the figure are in *A Source Book in Medieval Science*.

strumental in the further definition of the field and in the process of adding new and important elements to our understanding of medieval science. A *Source Book in Medieval Science*, appearing in the prestigious series "Source Books in the History of the Sciences" and dealing almost exclusively with the Latin West, represents the fulfilment of a long-standing desideratum for students of the history of medieval science. Finally, there is available under one cover an authoritative anthology containing reliable English translations of medieval scientific writings, accompanied by competent critical annotations and introductions by specialists in the various disciplines comprising the broad area of medieval science.

One of the great merits of the book is indeed the fact that it includes the contributions of a great many scholars working in the field. No single historian can master the whole range of medieval science. Consequently, aiming for manageable comprehensiveness, Grant has wisely decided to appeal to the scholarly acumen of the various specialists working in the area. And the book is the better for his decision. It contains selections from the wide spectrum of medieval scholarly endeavours, which can rightly be construed as instances of "medieval science." Thus, in addition

to materials gleaned from the more traditional mathematical, physical, and life sciences, it also comprises selections from logical, astrological, and alchemical treatises. (Grant refers to the life sciences as "biological," which is clearly an anachronism; the use of the term "oceanography" to categorize Grosse-teste's discussion on the causes of the tides (page 640) is another instance of anachronistic appellation. Even "geology" (page 615) may rightly seem offensive to some. There are a few other instances of infelicitous nomenclature of medieval disciplines.) There are also selections from the Latin encyclopedists, a couple of texts having to do with the translations into Latin from Greek and Arabic, texts on the classification of the sciences, and seven selections on the reaction to the introduction of Aristotle (one of the editor's pet issues).

Among the 188 distinct selections included (from about 85 authors), there are numerous translations appearing for the first time in any vernacular translation. (For example, to mention only two contributors, John Murdoch's translation from *The Tractatus de successivis* attributed to William Ockham and David Lindberg's translations from Neckam, Grosseteste, Roger Bacon, Alhazen and Witelo.) The book will almost certainly do for the teaching of