

BOOK REVIEWS

Tektites. John A. O'Keefe, ed. 228 pp. Univ. of Chicago Press, Chicago, 1963. \$10.95.

Reviewed by S. Fred Singer, University of Maryland.

The origin of tektites is controversial; the experts tell us that they come either from the earth, or from the moon, or from somewhere else; each source has its partisans, vociferous, vehement, and even a little violent. It is my hypothesis that the subject attracts people who have a natural abundance of these 3-V characteristics.

Be this as it may, there are at least some facts about tektites which are not in controversy. They are usually small and round; their weight may range from 0.1 g to 3000 g; their shape ranges (alphabetically) from buttons and boats, through dumbbells, gherkins and gumdrops, on to teardrops. They are glassy, with the chemical composition resembling acidigneous rocks. (There are minor differences, but there lies one of the "rubs").

They are found in strewn fields in certain areas of the world, from which they derive picturesque names. They show evidence of melting and ablation from high-speed travel through the atmosphere. The falls took place some millions of years ago (with a considerable spread); the lack of ^{26}Al implies a cosmic-ray exposure of less than 5×10^6 years; the K/A ages agree roughly with the fall dates.

It is at this point where the proponents square off, J. A. O'Keefe favoring a lunar origin, A. J. Cohen a terrestrial origin. Both parties agree that the immediate cause was a meteorite impact and that the tektites represent ejecta from either the lunar or terrestrial surface. But which hypothesis is correct? The reader is left with the evidence and may decide for himself.

The evidence is presented in the form of very nicely done survey papers. They provide an excellent foundation for additional theoretical speculations concerning the origin of tektites. But perhaps the most fascinating implications, many as yet unexplored, relate the tektite formation to the history of the earth-moon system. Of course, the first analysis of a lunar rock sample may settle the tektite problem, or at least delimit some of the speculations.

Modern Applications of Physical Optics. By M. Françon. No. 13 in Tracts on Physics and Astronomy, edited by R. E. Marshak. Translated from the French by Scripta Technica, Inc. 106 pp. Interscience, New York, 1963. \$4.50.

Reviewed by Stanley S. Ballard, University of Florida.

The field of optics has been undergoing a quiet revolution during the past two decades. The reading public has been made well aware of outstanding recent developments through the wide coverage given to lasers and their applications. This little book gives an excellent description of some of the less gaudy aspects of "the new optics". It is written by an acknowledged expert in the field, and he has selected the phenomena in which he is personally most interested and on which he can speak authoritatively. I refer especially to the current treatment of image formation by the use of the Fourier transform, and the associated practical applications of spatial frequency filtering in order to increase the contrast in images (Chapter 2). This seems to me to be the high point of the monograph.

I also like the straightforward introductory material on interference, with special reference to thin films and filters, and including applications to the infrared and ultraviolet spectral regions; this comprises Chapter 1 and

about half the book. This material can be found in the research literature but is seldom collected into as compact and readily available a form as is given here. The subject of interference microscopy is one in which a good deal of work has been done recently, and again an admirably succinct treatment is given.

The third and final chapter, on polarization, is short but is valuable for its description of the use of polarized light in the observation of transparent objects, i.e., those whose refractive indexes differ only slightly from that of the surroundings.

In brief, this is a timely, well-written little book that will be worthwhile reading for anyone who wants to be brought up to date in a hurry on some of the forward steps that have been made in physical optics and its applications during recent years.

Lattice Theories of the Liquid State. By J. A. Barker. Vol. 1 of Topic 10 of The International Encyclopedia of Physical Chemistry and Chemical Physics, edited by E. A. Guggenheim, J. E. Mayer, F. C. Tompkins. 133 pp. (Pergamon, Oxford) Macmillan, New York, 1963. \$8.50.
Reviewed by R. B. Lindsay, Brown University.

It is well known that the liquid state is characterized by high cohesion (leading to low compressibility), lack of rigidity, and relatively low resistance to flow. But the attempt to account for these properties theoretically on the general assumption of a molecular constitution has been so far much less successful than in the case of solids and gases. Nevertheless there exists a very large body of statistical mechanics of liquids, some of which the present volume summarizes in clear and succinct fashion. The author confines his attention to the so-called "lattice" theories, and hence does not discuss the theories based

essentially on molecular distribution functions, such as have been in general successful in describing the properties of gases.

Lattice theories of the liquid state start from the assumption that there exists in a liquid some kind of order or structure reminiscent of that which characterizes the crystalline solid, though it is recognized that the structure must necessarily be much looser, changeable at any place with time, and decisive in producing the observed properties of the liquid only through the average values calculated from it. The methods discussed by the author are the "cell" theories, in which a regular lattice structure is postulated with all sites occupied, the "hole" theories, in which some of the lattice sites are unoccupied, the "tunnel" type of theory, in which a tunnel, through which a whole line of molecules can move, replaces the single cell, and the "Monte Carlo" theory, which assumes that the volume available for molecular motion is divided up into large cells, each containing many molecules. The last-named method essentially involves averaging over ensembles of molecular configurations.

The author discusses these various methods in turn, devoting indeed most of his attention to the "cell" theories. It is assumed that the reader is acquainted with the basic principles of statistical mechanics. Armed with this equipment he will find the book a useful summary of present knowledge. The shortcomings of the available theories of liquids are candidly set forth, and the challenge which this difficult state of matter still presents to the theorist is clearly presented.

Radio Exploration of the Planetary System. By Alex G. Smith and T. D. Carr. 148 pp. Van Nostrand, Princeton, N. J., 1964. Paper \$1.50.

Reviewed by H. J. Hagger, Albiswerk Zürich, Switzerland.

It is astonishing that most radio astronomers are interested in radio emission from sources in deep space and from interstellar matter, but only a few scientists are eager to learn more about the members of the solar family by using radio telescopes.

A. G. Smith and T. D. Carr, two radio astronomers from Florida Radio Observatory, have undertaken the task of writing a booklet on the radio exploration of our solar system for students and other people having an understanding of physics and an interest in the subject. The first two chapters deal with a historical survey of radio astronomy and with the tools and techniques a planetary radio astronomer uses. In very simple but concise language the basic experimental and theoretical features of the subject are described. In chapter three the authors start with some general remarks on thermal radiation and its relationship to temperature, later on they discuss the temperature measurements taken from planets at different wavelengths. The discrepancies of Venusian temperature measurements are explained from the point of view of transparency of the planet's atmosphere to frequency. In chapter four the most interesting planet of our system, Jupiter, is investigated both with regard to its thermal radiation and to the nonthermal microwave emission which a radiation belt is considered responsible for. In chapter five the authors deal with the sources of planetary radio signals, discussing plasma dynamic explanations for nonthermal radiation, and again Jupiter as a radio source is of topmost interest. At the end of the chapter the question remains open whether or not Jupiter is actually the only planet showing radio emission of nonthermal origin. Radar astronomy, the subject of the next chapter, is mostly used for meteor investigations, but conclusions about the nature of the surface of planets may be drawn from radar echo measurements. The last chapter relates radio astronomy to man's exploration of space and gives an outlook into future projects which may try to answer the question of the existence of intelligent life in other planetary systems.

This booklet may be considered to a certain extent a supplement to Steinberg and Lequeux's book *Radio Astronomy* reviewed previously (*Physics Today*, June 1964, p. 58), but considered separately this booklet stimulates the wish to take part in

planetary exploration by radio. The authors have solved the problem of explaining the radio mysteries of our solar system in a nice and concise manner. The graphs shown are easy to read and to understand, the selected photographs of instruments and objects under investigation are welcome, and the references given and the index are very helpful. Thus I can highly recommend this book to everyone interested in radio astronomy and in our solar system in particular. Even a reader with a non-specialized physics background may easily understand and enjoy the book.

Functions of a Complex Variable and some of their Applications. By B. A. Fuchs and B. V. Shabat. 389 pp. Hindustan Publishing Corporation, Delhi, 1962. Rs 35.00.

Reviewed by J. Gillis, Weizmann Institute of Science, Israel.

It is clear from the material in this book that the Russian original must be excellent. After all it is not easy to say anything terribly new in the classical theory of functions of a complex variable at the level of the advanced undergraduate and early graduate student. Such textbooks can really differ very little from one another except as to titbits of useful explanation and the choice of examples, and in these respects the book under review definitely scores. There is a careful exposition of fundamentals and these are abundantly illustrated by interesting applications, including some to electrostatics and classical hydrodynamics. And one must praise the selection of real integrals evaluated by means of residues. For once we have a book with examples different from those which have appeared with dismal regularity in every previous textbook known to the reviewer.

Unfortunately the standard of the translation is low. The English style is worse than poor, and theorems are stated in such a slipshod manner that the book is more liable to harm students than help them. Thus Liouville's theorem is extended to the proposition, "If the function $w = (z)$ be regular in the whole open plane and does not take up values corresponding to a certain curve in