

## Space Science

**The Ionosphere.** Proceedings of the International Conference held at London, July 1962. A. C. Strickland, Ed. Institute of Physics and the Physical Society, London, 1963 (order from Chapman and Hall, London). x + 528 pp. Illus. £5 5s.

Strickland and his collaborators are to be congratulated for the excellent format of this volume and for the speed with which it was published.

The book is divided into four sections: Ionospheric Constitution and Ionizing Radiations, Geomagnetism and the Ionosphere, Irregularities and Drifts in the Ionosphere, and the Mathematics of Wave Propagation through the Ionosphere. Three papers that give preliminary results from the first Anglo-American satellite, Ariel, are also included. Each section is preceded by a generally well-written introductory chapter in which the chairman of that section reviews the topics covered, and each is closed by a summary of the papers presented.

Broad features of the structure of the ionosphere are discussed in a paper that opens the section on the constitution of the ionosphere and ionizing radiations. Another paper in this section proposes a new model atmosphere, characterized by a high O to N<sub>2</sub> ratio, which is then used to obtain a model for the E and F1 layers. Electron density measurements are used by one author to determine the neutral scale height at the F2 peak, and by another to deduce ion temperatures above the F2 peak. Diurnal variations in electron density at the magnetic equator are reported. One of two papers on solar x-ray emission reports results from a series of rocket measurements; the other compares theoretical predictions with recent measurements. A single paper deals with the D region; this imbalance is characteristic of all sections. Rounding out the first section are papers on the effects of solar eclipses and flares on the ionosphere and on the geomagnetic anomaly of the F layer.

Interactions between the geomagnetic field and the ionosphere are treated in some 20 papers in the section on geomagnetism and the ionosphere. The papers deal generally with geomagnetic deformation of the ionosphere layers, under both quiet and disturbed conditions. Various processes of deformation are analyzed, but no clear statement of

the relative significance of the processes is made. Three interesting papers deal with the correlation of ionosphere behavior at geomagnetic conjugate points; another paper presents data on the effects of nuclear detonations on the ionosphere.

In the section on irregularities and movements of the ionosphere a large number of observations of those phenomena in the F region are reported. A substantial body of data from backscatter measurements and from scintillation of radio star and satellite radiations is presented. That only a limited number of conclusions can be drawn from these many observations is recognized in the summary paper; some of the theories employed to explain the experimental data are also discussed.

The section on the mathematics of wave propagation contains articles on such topics as the reflection of waves from various model ionospheres, one of which uses an energy-dependent electron-ion collision frequency; very low frequency propagation; impedance of an antenna immersed in the ionosphere; treatment of the wave equation in dipolar coordinates; and the usual earth-ionosphere waveguide problems. Unfortunately only one paper treats the ionosphere as a plasma. The comparative neglect of the latter approach is unjustified in view of the increasing importance of plasma methods in treating problems on the interaction between electromagnetic waves and the ionosphere.

The three papers in which preliminary results from the Ariel satellite are presented close the book. The first of these papers presents solar x-ray spectra observed during solar flares. Others report the results of plasma probe experiments that show a surprising diurnal electron temperature variation; direct measurements of ion spectra, including the identification of He<sup>+</sup>; and an electron density measurement that shows a significant new ledge of ionization near 800 kilometers. All of these data are very preliminary, and it seems likely that further analysis will alter some of the initial interpretations of the results.

The more than 70 papers in the volume contain a great deal of valuable material that will be useful to ionosphere scientists.

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## Aerophotogeodetic Surveying

**A Course in Higher Geodesy.** Spheroidal geodesy and fundamentals of gravimetry and practical astronomy. P. S. Zakatov. Translated from the Russian. Published for the National Science Foundation by the Israel Program for Scientific Translations, Jerusalem, ed. 2, 1962 (order from the Office of Technical Services, Washington, D.C.). x + 390 pp. Illus. Paper, \$4.

"This textbook is intended for fourth- and fifth-year university students specializing in aerophotogeodetic surveying," says the author in the preface to this excellent book. In one sense the prefix, "aerophoto," is somewhat misleading, for aerial photography and photogrammetry are never mentioned. Nevertheless, since the shape and dimensions of the Earth are basic to all maps and since, in modern practice, all maps, save those at the largest scale, rest ultimately on aerial photographs, geodetic surveying and aerial photography are both foundations of precise cartography and must be considered together; thus, the phrase "aerophotogeodetic surveying" is a logical marriage.

The volume is a comprehensive treatment of the fundamentals necessary for the geodetic portion of such work. The author begins with definitions of the parameters of the Earth's ellipsoid; he then proceeds logically to the relations between them and develops, with all necessary rigor, the familiar formulas for the solution of spherical and spheroidal triangles and the calculation of geodetic latitudes, longitudes, and azimuths. A chapter is devoted to the derivation of basic formulas that pertain to the transverse mercator projection, called the Gaussian; the author then discusses astrogravimetric leveling.

More than half the book is devoted to a lucid discussion of deflection of the vertical, the principles behind gravimetric methods of determining it, and astronomical methods of observation. This is no manual of instrumentation or field operations; instead, it is a clear and uncluttered development of basic theory, a derivation of formulas used, a discussion of accuracies attained by making certain reasonable approximations, and an outline of the steps required in data reduction, with a few illustrative examples of calculations. It should be required reading for anyone engaged in these aspects of physical geodesy.

The translation, obviously a work of care and intelligence, is excellent. This would be a truly international volume that could and should be used anywhere, if it were not for the few historical accounts in which all work in geodesy, past and present, is described as entirely Russian.

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## Body Composition

**The Body Cell Mass and Its Supporting Environment.** Body composition in health and disease. Francis D. Moore, Knud H. Olesen, James D. McMurrey, H. Victor Parker, Margaret R. Ball, and Caryl Magnus Boyden. Saunders, Philadelphia, 1963. xxvi + 535 pp. Illus. \$23.

This monograph presents data related to body composition which have been collected from normal subjects and patients. It is, furthermore, an exposition of the utilization of biophysical techniques in which isotopes are employed to systematically investigate the volumes and the compositions of the fluids found in the several compartments of the body. The authors and their colleagues have been among the pioneers in the development and use of these techniques, and it is fitting and useful that they should now bring together their material. The book is divided into two major sections. The first includes a discussion of materials, methods, and values; the second part presents the data obtained from a group of patients that included some of the common clinical, surgical, and medical problems seen in hospital practice.

In the first portion of the monograph there is a detailed account of the methods, interpretations, and calculations; an exposition of the statistical techniques employed; and a presentation of the values for normal adults. In their calculations and presentations the authors employ a variety of ratios aimed toward formulating the image of the average man in health. This has certain statistical qualities that recommend the approach in that it permits a basis for comparison. However, when the mean average datum for some parameter found among normal subjects is, in the clinical section, compared

with that observed in a patient, one sometimes wonders whether this might not be misleading in the context of the specific problem of the particular patient.

A more thorough and critical analysis of this problem, explicitly stated, would be helpful. Nevertheless, the data are exceedingly valuable and will be useful to many. A section at the end of the book presents some of the methodology in greater detail and thereby enriches the first part of the monograph.

The second portion deals with analyses of the distortion in body composition among patients with chronic wasting disease, acute injury and infection, hemorrhage, anemia, hypo- and hypernatremia, heart disease, renal and hepatic failure, and obesity. A "summary without conclusions" is then presented, which, in fact, summarizes the monograph in a systematic and sequential fashion. It is here, perhaps, that a searching critique of the potential pitfalls in the applications of this particular approach would have been appropriate.

The bibliography is concerned primarily with literature specifically related to the examination of body composition, and to this extent it obviously will be quite useful. However, since the authors attempt to correlate the distortions in body composition in disease with pathophysiologic mechanisms, it would be helpful if the bibliography included considerably more of the accumulated literature of this field. This is made all the more pertinent since the discussion of the pathophysiology is not always precise or complete.

This monograph will be helpful to all those who are interested in the volumes and the composition of the body fluids in health and the distortions thereof that may be observed among patients with a variety of disorders. The data, in both the normal and the diseased group, are obviously useful, and it is a great aid to have these collected in one volume. The book would have been strengthened if the authors had been more explicit with respect to some of the limitations of the techniques employed, and if a more complete and more elegant discussion of the pathophysiology of the disordered states had accompanied the account of alterations in body composition.

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## On Science Communication

**How to Know a Fly.** Vincent G. Dethier. Holden-Day, San Francisco, Calif., 1962. 127 pp. Illus. \$3.75.

This little book at once takes its place as a minor classic, somewhere between George Gamow's *Mr. Thompson in Wonderland* and Jean Henri Fabre's immortal accounts of the lives of insects. However, the strong breeze of wit and rationality that blows through these pages makes dear old Fabre appear verbose and sentimental. The difference is more than the difference between two men, though it is that. It represents a measure of the intellectual distance between the science of the late 19th century and that of the mid-20th century. The reader will find here not only a robust humor lacking in the more ponderous writing of the past but also a far greater critical acumen and a more penetrating imagination. Perhaps the increased sweep and surness of modern knowledge permits a lighter touch.

The author, an outstanding experimentalist at the University of Pennsylvania, writes largely but by no means exclusively from his own work. In many places the account becomes anecdotal but never trivial. Every story—the tale of the fly who reported on the tardy charwoman or the story of the carousel for flies—carries a point. The topics range from the biological clock within each fly to the changing food cravings of pregnant lady flies (if an egg-laden dipteran may be termed pregnant). The approach is generally neurophysiological, with emphasis on sensory responses. At the same time we are never permitted to forget the role of these processes in the life of the whole fly. Thus, it is entirely appropriate that a leading ethologist, Tinbergen, has provided an introduction.

The book is embellished with comic illustrations. The chapter headings are excerpts from Don Marquis, Lewis Carroll, and Edward Lear. These are amusing but often not very informative about the contents of the chapter. In conclusion, one is glad to admit that Dethier has made great strides in overcoming the language barrier which, for so many centuries, was almost the only effective barrier separating man and fly.

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