

## BOOK REVIEWS

### COMPREHENSIVE GLACIOLOGY

#### Traité de Glaciologie

Par Louis Lliboutry. Tome 2 : Glaciers—Variations du Climat—Sols Gelés. Pp. 429–1040 + 40 planches. (Paris : Masson et Cie., 1965.) 190 francs.

THIS is the second volume of a wide ranging treatise on glaciology which completes Lliboutry's survey of the subject. The first volume dealt with the detailed physics of the material concerned, both as ice and snow, and with the heat balance of glaciers. The second and larger volume discusses the characteristics of glaciers and ice in nature.

Lliboutry has considerable first hand experience of glaciers in Chile and in the French Alps. He directs the work of the Laboratoire de Glaciologie Alpine on the Aiguille du Midi in addition to his post as professor in the department of physics at the University of Grenoble. His approach to the subject combines that of an intelligent field observer with that of a physicist, and this has led him to produce fresh ideas which have stimulated interest, further work, and, sometimes, differences of opinion. Such contributions include work on the sliding of glaciers and on the possible formation of a zone of isothermal ice at pressure melting point beneath parts of the Antarctic ice sheet, while his outline of the relation of longitudinal stresses in glaciers to basal shear stress touches a field of research which has barely begun. In general, Lliboutry sets out a detailed mathematical background to physical problems.

As an author with strong views whose treatise covers such a wide range, Lliboutry frequently uses his own approach to a problem although it may not always be widely accepted. This seems a fair reward for the admirable effort that has been put into compiling the treatise; and in fairness it must be said that other views and reasons for his disagreement are set out. Lliboutry has covered a great amount of literature and presents information on the more important contributions to the subject. As a source book the treatise is, thus, invaluable and up to date as a reference source. It also serves to draw attention to many problems which need further investigation.

The first part of the second volume deals with the physical glaciology of existing glaciers and covers morphology and mass balance, geographical distribution, geophysical techniques, theory of flow, basal sliding, catastrophic advances, erosion and deposition, fluctuations of temperate glaciers and the flow and evolution of large ice sheets. The last topic leads on to a discussion of secular changes of climate and a useful survey of some theories of ice ages. The book finishes with two useful chapters on frozen ground phenomena.

The book is well illustrated throughout, both by line drawings and by a selection of excellent photographs. No book in the English language has provided such a broad and comprehensive cover of the subject of glaciology, even though such a treatise or even a series of related books on various aspects of the subject are needed. The author deserves full congratulations on his work. Unfortunately, the high price of the volume will tend to limit its acquisition mainly to libraries.

G. DE Q. ROBIN

### AROUND THE SUN

#### A Guide to the Solar Corona

By Donald E. Billings. Pp. x + 323. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London). Ltd., 1966.) 112s.

THIS attractively written and illustrated book offers a valuable guide to the history and present state of coronal knowledge and ideas. Its author has long been one of the leaders in the observational study and interpretation of coronal spectra and structure. He was introduced to this field of science by Roberts, who twenty years ago, in Colorado, set up a solar coronagraph on the lines pioneered by Lyot—the young French astronomer who in 1930 achieved what had come to seem impossible, the photography of the corona without a total eclipse. After that various lines of evidence engendered the idea that this outer atmosphere of the Sun, the corona, is much hotter than the apparent "surface" layer, the photosphere. The spectrum came to be interpreted as demonstrating the existence in the corona of very highly ionized atoms of calcium, iron and other minor constituents of the coronal gas, which is mainly hydrogen and helium. Estimates of the temperature rose to astonishing values. Fifteen to twenty years ago it was disputed whether the temperature was half a million degrees Kelvin, or a million. Different methods of estimation led to discrepant conclusions. Roberts, Billings, Waldmeier and their colleagues went farther, and proposed the presence, at times, of hot coronal regions where the temperature rose to several million degrees.

Such coronal discoveries and disputes opened up a fascinating and exciting new branch of solar physics, which has progressed very rapidly in recent years. The author of this book is well fitted to explain its development and ramifications, which he does with authority and skill.

A stalemate between considerably different observational inferences of the coronal temperature was broken when Burgess showed that an important recombination process in the coronal gas had been overlooked; the higher estimates gained in credibility. Radio studies added important knowledge of the structure extending out to several solar radii. Theoretical anticipations of still greater extension of the corona among the planets led on to the realization that the outer coronal gas must be streaming outward in all directions, though more over some solar regions than others: so that the Earth is always enveloped in the "solar wind". Interplanetary space probes have confirmed this inference and added a wealth of information as to the density, velocity and transported magnetic field in this radiating coronal emission. But as the author indicates, there are many outstanding problems of the corona. His book will materially help present and future workers who seek to find the solutions.

SYDNEY CHAPMAN

### MEASURING INTERFERENCE

#### Optical Interferometry

By M. Françon. Pp. xi + 307. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London). Ltd., 1966.) 108s.

ALTHOUGH this book is recommended by the publishers for graduate students having first contact with the subject, both its contents and its clear exposition make it eminently suitable for undergraduate work. The author has wisely employed the notation of Wolf and Mandel in the chapters dealing with coherence and laser interference effects so that the reader can then progress to the standard work of Born and Wolf and the research literature. The diagrammatic representation of the complex amplitude in the first chapter is particularly good and in general the diagrams