technical language of the geologist which this reviewer found considerably difficult to follow. Such an article is almost unique in space literature and points out a field which obviously is going to be important not only in lunar exploration but in planetary exploration as well.

Moore and Greenwood in their article "Venus as an Astronautical Objective" argue that even though less is known about this planet than some others, it may yet be the first space-flight objective after the moon. All of the factual as well as speculative knowledge of Venus is carefully and interestingly reviewed. Similarly the following article by Hess on Mars as an astronautical objective covers the known facts about Mars as a planet, especially its atmosphere. Both articles indicate how sketchy our knowledge of these two nearest planetary neighbors of ours really is, and how necessary exploration of both by means of fully instrumented probes will be before manned flights can be undertaken. Newburn's article on Mercury, asteroids, major planets, and Pluto reviews the information on the remaining planets of the solar system. Manring considers the effects of interplanetary matter as well as means of detecting it in the next article.

"Structures of Carrier and Space Vehicles" by Alberi and Rosenkranz is an excellent and comprehensive survey of all aspects of this important technological problem. A very short survey of advanced nuclear and solar propulsion systems by Cooley serves to present the latest advances in this field. Similarly the last article on aspects of weightlessness by Campbell covers our present knowledge of this important factor in space flight.

As in the earlier two volumes, this latest one contains an excellent selection of topics, well written and emphasizing present knowledge and state of progress, attesting to the good judgment of the editor and his board of advisors.

The Third Law of Thermodynamics. By J. Wilks. 142 pp. Oxford U. Press, London & New York, 1961. 15s. *Reviewed by R. H. Asendorf, Hughes Research Laboratories.*

THIS book, the eighth in a series of monographs called the Oxford Library of the Physical Sciences, is generally descriptive and is designated as an introductory undergraduate text. It is intended primarily to give a comprehensive survey of the celebrated so-called Third Law of Thermodynamics and achieves its purpose well. Quoting from the introduction, the author says ". . . the Second Law merely postulates the *existence* of an entropy function, while the Third Law discusses its *behaviour*."

The author writes well and with assurance. The more mathematical parts of the book are the sections which deal with elementary statistical mechanics, and are very well presented. In broad outline, the book covers (not necessarily in this order) entropy and probability, statistics of a perfect gas, internal degrees of freedom, the third law and its statistical basis, nuclei and entropy, chemical equilibria, and the unattainability of absolute zero. The author covers a wide range of topics in physics and chemistry, particularly the study of phenomena near absolute zero; topics discussed include the behavior of orthopara hydrogen, liquid helium, magnetic cooling, the graphite-diamond transition, and others. The book contains 41 figures and is well documented with 112 references to the literature.

Physics of the Solar Chromosphere. By Richard N. Thomas and R. Grant Athay. Vol. 6 of Monographs and Texts in Physics and Astronomy, edited by R. E. Marshak. 422 pp. Interscience Publishers, Inc., New York, 1961. $15.50. *Reviewed by E. J. Öpik, University of Maryland.*

THE authors have published a great number of papers on the interpretation of chromospheric phenomena, especially those observed at the solar eclipse of 1952. The monograph summarizes and further develops these researches, making use also of work by others.

They are concerned only with the chromosphere, defined broadly as that part of the solar envelope comprised between photosphere and corona. The traditional concept of "reversing layer" is discarded, perhaps unfortunately; with the peculiar temperature distribution as described in the monograph, the concept could have been retained for the region "-500 km $\lesssim h \lesssim +500$ km" where the temperature is below that of the photosphere; in that case the chromosphere proper, from $+500$ to some 7000 km up, would be characterized by a temperature rising outwards from 6100 °K to values of the order of 5×10^4 deg K. The still undeciphered clue to the structure of the chromosphere and even the corona is seen in the spicules, jets of denser gas (magnetically contained?) intruding into the chromosphere from below with velocities of the order of 30 km/sec; they cover less than one percent of the solar surface, and are probably the source of chromospheric heating.

No attempt is made to trace the mechanism of the spicules nor of the source of heating. The treatment is restricted to the problems of radiative transfer and local equilibrium state of matter which is shown to depart considerably from local thermodynamic equilibrium, (L.T.E.) apparently as the result of mechanical heating. Of course, departures from L.T.E. in stellar atmospheres were known long ago and were termed "superexcitation" by H. N. Russell (whose name, however, is missing from the bibliography). The amount of detail in the treatment is contrasted by the large margin of uncertainty in the conclusions and proposed models; this, however, is the consequence of insufficiency of the observational data, and of an additional degree of freedom due to the spicules causing a deviation from spherically symmetric hydrostatic and radiative equilibrium which cannot yet be quantitatively assessed.