and for someone who wishes to make practical application of celestial mechanics. The attraction of irregular bodies is much compressed and presented in a very concise form compared to Moulton's classic text. Again, of great usefulness to a physicist who is not trained as a "spherical astronomer" is the discussion of coordinates and time systems. It is practical throughout, with a good many examples given. The discussion of precession and nutation will be of particular interest to the physicist who wishes to acquire the pertinent information rapidly, but it is presented in too short a manner.

The last three chapters are more advanced and of less general interest. They deal with general perturbations, with the particular perturbations involved in artificial earth satellites including the effect of atmospheric resistance and nonspherical shape of the earth, and finally a chapter on numerical integration of orbits and special perturbations.

There are a number of topics missing which one would very much like to see discussed even in an introduction to celestial mechanics; for example, the valuable geometrical discussion of perturbations (à la Moulton) which is based on impulsive perturbations of the orbit, if possible with sketches to illustrate the points involved, and fix them in the mind of the reader. Then again, a discussion of tidal forces and spheres of influence (à la Tisserand and Fessenkov) might have been very valuable. The restricted three-body problem is not discussed but, of course, there are many adequate references for it and it does not have too much importance in celestial mechanics as such. However, the problem of Jacobi capture of a small third body into a rotating two-body system would have been worth including. Another topic which could perhaps have been brought out in detail would be a discussion of the lunar motion.

But one should not expect to find all important problems in this slim volume. What is included is extremely well described and is of great topical importance in the application of celestial mechanics to modern problems. The book can be recommended most warmly and adds considerably to the luster of the Interscience Tracts on Physics and Astronomy, which is already fairly high.

The Moon. Our Nearest Celestial Neighbor. By Zdeněk Kopal. 131 pp. Academic Press Inc., New York, 1960. $4.50. *Reviewed by D. Keefe, Lawrence Radiation Laboratory.*

PROFESSOR Kopal, who is head of the department of astronomy at Manchester University, has recently embarked on the elaborate program of a precise contour mapping of the surface of the moon. This painstaking task will take many years and involves a study of multiple exposures of sunrise and sunset over the lunar landscape. His preoccupation with what the moon really looks like at close quarters emerges clearly in his book; the author's own excitement in trying to

predict from afar exactly what a moon-traveller may find, some day soon perhaps, cannot but transmit itself to the reader. Throughout there runs the vein of wonderment voiced by Captain Boyle: "*What* is the moon? And *what* is the stars?" [sic]

This book is meant mainly for the layman. We have had for a long time a great deal of information about the moon from visual observations—from the point of astronomical distances it is incomparably closer than any other celestial object. Yet its inertness and impassivity present a peculiar and fascinating challenge in that it is extremely difficult to obtain very much more information than can be gotten by visual observation. The author describes how optical, infrared, and radio spectroscopy allow certain properties of the lunar atmosphere and surface to be determined. These techniques are all explained quite simply and clearly. He discusses in detail the extraordinary activity in the crater Alphonsus observed two years ago by Kozyrev; the "cold" moon school whose disciples hold that the lunar craters were the result of impacts and the "hot" moon adherents who favour volcanic activity as the explanation both used this new evidence with equal persuasion in renewed polemics.

When it comes to describing space probes, and circumnavigating and photographing the rear face of the moon, Professor Kopal becomes really enthusiastic. There are none of the usual conservative words of restraint here. Clearly the sooner a human being can get up there and take a look at things the better he will like it. This is more, however, than just refreshing optimism, for he has taken considerable pains to think through the problems (and also the simplifications) of life for the man on the moon.

This is an attractively produced book, and has an excellent selection of photographic plates.

Manual of Mathematical Physics. By Paul I. Richards. 486 pp. Pergamon Press, London & New York, 1959. $17.50. *Reviewed by R. Bruce Lindsay, Brown University.*

THE extent of theoretical physics is now so vast that the urge to provide manuals, handbooks, collections of basic formulas, brief encyclopedias, dictionaries, etc., for ready reference is not surprising. In fact, many such works have appeared during the past few years. The volume under review is unique among these compendia in that it is the work of a single author and as such constitutes a veritable tour de force. In less than 500 pages the author has managed to present in highly condensed form the contents of a whole library. Unlike some recent reference manuals the book is divided into two parts of about equal length, the first devoted primarily to physics and the second to mathematics. It is not simply a collection of formulas, but attempts to introduce a connected account of each topic through the deduction of the most important results from basic assumptions and princi-