Delaunay's theory, which is presented here in a clear manner and applied to the solution of an artificial satellite including the drag effect on its motion and also the motion of a minor planet perturbed by Jupiter.

Among the references given in the text, the excellent treatise by Andoyer, the successor of Poincaré at the Sorbonne, is not mentioned in either this or in other recent books published in the English language. We mention this omission because there are many things in common between the present book and Andoyer's treatise, which was written in the same spirit.

Stability by Liapunov's Direct Method With Applications. By Joseph La Salle and Solomon Lefschetz. Vol. 4 of Mathematics in Science and Engineering, edited by Richard Bellman. 134 pp. Academic Press Inc., New York, 1961. $5.50. *Reviewed by R. C. Alverson, Stanford Research Institute.*

TWO eminent authorities in the field of differential equations have collaborated to produce this monograph on stability theory of differential equations. It should prove to be of great value to the engineer or physicist who is concerned with problems of stability of physical systems. The authors state in their preface that it is not possible to run away from mathematics entirely; however, they have done remarkably well in presenting the subject in such a manner that it is well within the grasp of the technically trained person with only a modest mathematical background.

The book is primarily an exposition of the second method of Liapunov but does contain some of the work of other Russian mathematicians. The presentation is complete, the necessary mathematical background is developed, the theory is presented, and some important and informative applications are discussed.

The second method of Liapunov is a direct approach to the study of stability, and since it does not depend on any knowledge of the solution of the differential equation, it is more powerful and more generally applicable than other methods. It does, however, depend on the ability of the investigator to construct the "Liapunov functions" appropriate to his special problem, and probably for this reason it has not received as much attention as the indirect methods. However, as control systems become more complex and the demands on their performance become more rigid, those who are concerned with the analysis of the stability of such systems must have recourse to more powerful methods, possibly such as presented in this book.

The reader will find that the exposition is clear and accurate, the main arguments are geometrical and easy to follow, and the text is amply illustrated. In short, the appearance of this book is a welcome and timely addition to the literature.

Qualitative Methods in the Many Body Problem. By G. F. Khilmi. Transl. from Russian by B. D. Seckler. 117 pp. Gordon and Breach Science Publishers, Inc., New York, 1961. $6.50. *Reviewed by A. A. Maradudin, Westinghouse Research Laboratories.*

THE many-body problem discussed in this book is not the many-body problem of statistical mechanics, but is rather the many-body problem of the astronomer, i.e., the problem of several bodies interacting through gravitational forces. The central dynamical problem for a collection of such bodies is the determination of their trajectories as functions of time. In the past, this problem was attacked by perturbation theory, which in many cases yielded quite accurate answers. The author's thesis in this book is that, in view of the difficulties which attend a quantitative solution of the many-body problem, the main hope for success in the study of this problem lies in the use of qualitative methods of analysis. This approach consists of studying the general dynamical properties of a set of parameters which, although it does not characterize the system completely, still characterizes certain aspects of the system. The kind of result this approach can yield is, for example, the restrictions on the initial data which ensure the occurrence of a particular type of final motion, such as hyperbolic, for the gravitating bodies. After the derivation of some general results for the n-body problem, the author describes three tools of qualitative analysis which are useful in the study of this problem: the methods of dimensional analysis, continuous induction, and invariant measure. He concludes with a discussion of some aspects of the problem of planetary evolution. The level of the analysis presented in this book is such as to make it accessible to a graduate student in physics. The translation from the original Russian reads well. The only criticism I can make about the book is that many of the equations are very poorly reproduced.

Studies in Statistical Mechanics, Volume 1. J. De Boer and G. E. Uhlenbeck, eds. 350 pp. (North-Holland, Amsterdam) Interscience Publishers Inc., New York, 1962. $13.75. *Reviewed by Stuart A. Rice, University of Chicago.*

THIS book is the first of a series of studies in statistical mechanics. Each contribution to the first volume is a lengthy and detailed article worthy of extended study.

The first article is a translation of the famous monograph by Bogoliubov, entitled *Problems of a Dynamical Theory in Statistical Physics.* This work has had an enormous influence on developments in statistical mechanics both in Russia and in the United States and is a very welcome addition to the literature. The second article by Uhlenbeck and Ford is a beautiful exposition of the theory of graphs as applied to the theory of gases. Much of this material was previously available only in scattered form throughout the literature or in hard-to-locate dissertations. The last two articles both deal largely with nonequilibrium problems. The article by Mori, Oppenheim, and Ross is concerned with the distribution-function formulation of the theory of strongly interacting fluids. The article by Dresden, on the other hand, deals extensively with very simple model calculations designed to elucidate the mathematics of irreversibility (but not necessarily the physics).

In my opinion, this volume represents an extremely valuable contribution to the growing literature of statistical mechanics and sets a standard which other collections should attempt to achieve. The only demurrer I wish to enter concerns the time lag in publication. The translation of the book by Bogoliubov was available in preprint form three years ago and Mori, Oppenheim, and Ross comment in a footnote that their article was completed in 1959. There is little excuse for such a long delay in publication. Fortunately, the particular articles in this volume have a timeless quality which makes them valuable, but the publisher has no guarantee that this will be the case in the future. Greater efforts should be made in the future to publish succeeding volumes more promptly.

Handbook of Astronautical Engineering. Heinz Hermann Koelle, ed. 1814 pp. McGraw-Hill Book Co., Inc., New York, 1961. $27.50. *Reviewed by R. E. Street, University of Washington.*

HERE is the first real handbook in the field of astronautical engineering. The distinguished editorial board, and the fact that the list of contributors includes enough of the best engineers and scientists actively engaged in pushing back the frontiers of space, is sufficient to this reviewer to enable him to categorically state that this volume will be, for some time at least, an authoritative reference. He does not claim to have read all of the book; 1800 pages are just too many. However, sampling sections of greatest interest, it appears that in most of the chapters the basic equations are clearly derived and, if not in full detail, references are made to the original publications. The figures are good and sufficient, and the applications are indicated without too much emphasis upon the hardware. The result is a well-balanced compendium of fundamental data and theory which will be useful to students and designers of spacecraft. The scientist concerned with the development of experiments in space will also find much useful information here as well.

Broken down into six parts and twenty-eight chapters, all of the scientific, engineering, and human aspects of space flight are included. This means that there is considerable information on orbits, trajectories, all forms of propulsion, navigation, vehicle design, and operations. Most chapters, like the ones on aerodynamics, propulsion, and design, give a large number of formulae for the simpler cases without derivation,