of color (dispersion) on the quality of the image and methods for correcting such effects for thin lenses and a thick lens. He then proceeds to develop the general laws of geometrical optics from the Hamiltonian method in a very clear and comprehensive way. The various characteristic functions, the Bruns eikonal, and the direct method developed by the author are treated side by side, first for general optical systems and then for specific systems such as concentric systems. The rotationally symmetric systems which are of such great importance in optical instrumentation are analyzed in great detail by using the characteristic functions and the direct method. The analysis of image errors, or aberrations, of third and fifth order, which play a paramount role in the design of quality optical instruments, is carried out to the last detail by means of Hamiltonian methods and the author's direct method, hardly equalled or even approached in the existing treatises on the subject. One important contribution which should be pointed out concerns the representation of the image functions by means of any of the four characteristic functions and their use in different types of optical instruments. The transformation formulas which permit the use of one characteristic function from the knowledge of another one in expressing the image function are carried out in an explicit form. Important chapters on the limitation of image formation and on caustic surfaces in normal systems are also included for both symmetric and asymmetric systems. Another significant contribution is the analysis of various classifications of the types of aberrations of the third and fifth order for infinite and finite apertures (diaphragms) and the dependence of the aberrations on the position of the object, diaphragm, and image planes and for nonplanar objects. Another topic important from the point of view of the designer is the analysis of aberration or characteristic curves on an image plane, which describes theoretically the geometrical light distribution. Another subject left out in modern books is the method of vignetting of rays and of constructing spot diagrams which determine geometrically the quality of the image and its distribution in the image plane, including numerical computations for an actual lens of the coordinates of intersection of rays with the exit-pupil, the diapoints and the aberration coefficients for various field angles. The last chapter contains a treatment of inhomogeneous media which is regrettably short in view of its many applications to other fields such as microwave optics.

The numerous illustrations which accompany the text should be of great help to the readers not familiar with the subject, as well as the extensive bibliography for those who desire to pursue futher the study of this branch of optics. We warmly recommend this book to persons interested in applied geometrical optics, or in the geometrical theory of optical instruments, to the applied mathematician interested in the beauty of Hamiltonian methods, and to the teachers and students desirous of teaching and learning a fascinating branch of physics and mathematics.

Theories of Figures of Celestial Bodies. By Wenceslas S. Jardetzky. 186 pp. Interscience Publishers, Inc., New York, 1958. $6.50. *Reviewed by Robert E. Street, University of Washington.*

THE name of Liapounov is associated in the minds of many with a well-known theorem on the stability of the solutions of nonlinear differential equations. That Liapounov made significant contributions to the classical problem of the figures of equilibrium of rotating celestial bodies is less well known. Professor Jardetzky, one of the last pupils of Liapounov before the latter committed suicide in 1918, has continued to contribute to this field, in particular to the problem of the evolution of the earth and its crust, and is thus well qualified to be the author of this monograph which fills an obvious gap in the literature. Except for several books on the earth, there has been nothing on the general subject of fluid bodies from the mathematical point of view in English.

The excellency of this little book lies in the clear expression of the mathematical development, the historical development, the difficulties of deriving solutions, and problems yet to be solved. The investigations of the classical mathematicians such a Jacobi, Riemann, Poincaré, and others leading up to that of Liapounov and the work of Lichtenstein, Wavre, Jardetzky among more recent mathematicians is presented carefully and systematically. A knowledge of potential theory such as presented in Kellogg is essentially required to get the most out of this book; its shortness precludes too much mathematical detail which the reader must contribute himself. Most of the book is devoted to shapes of bodies composed of an incompressible fluid, although the effects of viscosity are included, and only in the last chapter is the effect of compressibility included. However, the cases of zonal rotation, oscillations of shapes, rigid plus liquid parts are included. Anyone interested in the connection between the mathematical problem presented here and the applications to geophysics and astronomy will find Jardetzky's book an authoritative survey.

Mechanics, Wave Motion, and Heat. By Francis Weston Sears. 664 pp. Addison-Wesley Publishing Co., Reading, Mass., 1958. $9.50. *Reviewed by C. M. Ablow, Stanford Research Institute.*

THIS very fine text presents an abundance of material in a lucid, well-illustrated, unhurried exposition. Over half the book, thirteen chapters out of twenty-three, is devoted to the elements of mechanics. The basic principles of statics, the laws of conservation of linear and angular momentum, and the planar motion of a rigid body receive full and careful attention. A typical chapter begins by defining terms and deriving a general theorem such as a conservation law. Then examples of increasing complexity apply the theorem in concrete situations. The chapter ends with a score of nontrivial problems some of which are not numerical.