# Book Reviews

***Studies in hydrodynamics and structure of stars and planets.*** Jeremi Wasiutynski. (*Astrophysica Norvegica,* Vol. IV.) Oslo, Norway: A. W. Brøggers Boktrykkeri, 1946. Pp. vxi + 497. (Illustrated.) Norw. Kr. 50,00.

The author's purpose in writing this book was to show the usefulness, in astrophysics, of physical hydrodynamics, applied nowadays mainly in dynamical and theoretical meteorology. The almost 500 pages of his book give an excellent proof of the great importance of hydrodynamical research for problems of the structure of stars and planets.

In the first chapter the author presents as an introduction a quite general theory of turbulence, extending the classical method of O. Reynolds. Using the concept of Prandtl's theory of mixing length and modifying Taylor's vorticity transport theory, he develops general expressions for all important quantities defining the turbulent motion (as turbulent friction force, turbulent flux of heat, Reynolds' stresses for spherical coordinates, etc.) as well as the condition for full development of turbulence, corresponding to the known Reynolds criterion.

In the second chapter large-scale currents in stars, especially the hydrodynamics of solar activity, are discussed. In order to simplify the problems from the mathematical point of view, the author introduces many assumptions, transforming the general theory of turbulence to the well-known theories of Taylor, Solberg, Høiland and others. These simplifications are far from being plausible or realistic, and it is most surprising that his theoretical results agree well with observed facts, even though he assumes the central core of the sun rotating as a rigid body and the outer layers rotating quite independently. This assumption could hardly be fulfilled with respect to all frictional and mixing effects at the inner boundary between these layers. This fact with some others—for example, that in large-scale motions the horizontal mixing has definitely greater importance than vertical mixing, which forms the basis of all Wasiutynski's consideration owing merely to the very small vertical width of layers in question compared with the horizontal dimensions—will probably lead to a very important discussion and revision of all theories explaining large-scale motion in the interiors or surfaces of stars.

The next chapters (4 and 5) contain the theory of convection currents of Bénard-Rayleigh types with very interesting applications to the theory of solar granulation and the formation of the lunar craters, as well as in the study of the evolution of the surface features of the Earth and Mars. The various features of planetary crusts may be explained as resulting from hydrodynamical processes in the interior of the planet before and after solidification.

In Chapter 6 the mathematical theory of Bénard-Rayleigh convection currents is extended for spherical rotating layers of gas heated from below and attracted toward the center, and the problems of planetary atmospheres in general are discussed.

The last two chapters, which form the culmination of the whole book, are devoted to the problem of stability of radiative equilibrium in stars and, finally, to stellar structure and evolution. Assuming that all stars have similar outer layers (composed mainly of hydrogen), the author discusses in detail four possible stellar models according to the kind of equilibrium (radiative or convective and adiabatic) in the hydrogen-helium layer and in the layer next below. These chapters, as well as all preceding ones, present so many new suggestions, conclusions, and even theories, that all those interested in such astrophysical problems as stellar structure and evolution should find much of interest in this book. The first chapters might also be of interest to those concerned with problems of turbulence and general circulation in the Earth's atmosphere. The only handicap to the latter group is a different terminology from that used in books and papers in dynamical and theoretical meteorology. Finally, Chapter 5, containing a very complete discussion of mountain formation (important in the theory of formation of the Earth's crust) should not escape the attention of geologists.

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# Scientific Book Register

ANDREWS, W. B. *The response of crops and soils to fertilizers and manures.* State College, Miss.: Author, 1947. Pp. xv + 459. (Illustrated.) $4.50.

COOK, DONALD. *Ulcer: the primary cause of gastric and duodenal ulcer: diagnosis, medical and surgical treatment, prevention.* Chicago: Medical Center Foundation and Fund, 1947. Pp. xiii + 187. (Illustrated.) $5.00.

CURETON, THOMAS KIRK, JR. *Physical fitness appraisal and guidance.* St. Louis: C. V. Mosby, 1947. Pp. 566. (Illustrated.) $6.00.

MAXTED, E. B. *Modern advances in inorganic chemistry.* Oxford, Engl.: at the Clarendon Press, 1947. Pp. xi + 296.

POTTER, GEORGE EDWIN. *Textbook of zoology.* (2nd ed.) St. Louis: C. V. Mosby, 1947. Pp. 948. (Illustrated.) $5.00.

SELLING, LOWELL S. *Synopsis of neuropsychiatry.* (2nd ed.) St. Louis: C. V. Mosby, 1947. Pp. 561. (Illustrated.) $6.50.

TOP, FRANKLIN H. *Communicable diseases.* (2nd ed.) St. Louis: C. V. Mosby, 1947. Pp. 992. (Illustrated.) $9.50.