

BOOKS

Molecular Theory of Gases and Liquids.
Joseph O. Hirschfelder, Charles F. Curtiss, and R. Byron Bird. John Wiley & Sons, Inc., New York (1954). 1219 pages. \$20.

This volume, the result of studies undertaken in the Bumblebee Program of the Bureau of Ordnance, is divided into three roughly equal parts covering equilibrium properties (equation of state, vapor-liquid equilibria, surface tension), nonequilibrium or transport phenomena (viscosity, diffusion, thermal conductivity), and intermolecular forces.

The first section contains a review of equilibrium statistical mechanics and develops the equation of state in terms of the potential energy of interaction between molecules of the fluid. In principle the dependence of the potential energy of interaction on the distance between two interacting molecules and their orientation can be calculated from *a priori* quantum mechanical considerations. In practice empirical potential-energy functions containing adjustable parameters are used.

The second section is a presentation of nonequilibrium statistical mechanics and of the theory of transport phenomena. Included are hydrodynamic applications such as propagation of sound waves, detonations, and flames.

The third section is devoted to the electromagnetic and quantum mechanical theory of the forces between molecules, ions, free radicals, and atoms. The results of calculations of intermolecular forces are compared with the information obtained from bulk properties in sections one and two.

A particularly useful feature of the book is the inclusion of numerous illustrative examples giving in detail numerical examples of the calculation methods employed. Problems are given at the end of each chapter. The book concludes with about eighty pages of tables of functions required in the calculation of properties by means of potential-energy functions.

This volume will be useful and informative for the engineer who has good basic training in mathematics, physics and statistical mechanics. It will be particularly valuable in indicating logical methods for predicting properties and extrapolating, on a sound theoretical basis, into regions where no experimental data exist.

The authors are to be complimented on this work. It is a compendium of the present status of knowledge of a fundamental portion of our science.

A useful excerpt* of the work has also been published.

ERNEST SOLOMON

THE M. W. KELLOGG COMPANY

*Hirschfelder, J. O., C. F. Curtiss, and R. B. Bird, *Am. Soc. Mech. Engrs.*, 76, 1011 (1954).

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