well in this respect that a second edition was prepared in a slightly revised fashion in 1963.

The whole book consists of three lectures. In the first, electrons as particles and waves are discussed, the wave function of the ground state of the hydrogen atom is derived and then, using as an analogue the energy of an oscillating string, it is shown that the energy of the "cathodic substance" per mass unit (that is per electron, if particles are considered) is of the order of magnitude of the energy of a hydrogen atom calculated by Bohr. The Pauli principle is introduced and also the electron spin. Finally it is shown qualitatively how, on the basis of the Pauli principle, the periodic system is understood. In the second lecture the bond between H and H^+, the formation of H_2, and the impossibility of H_3 are discussed. The author continues by describing the bonds between Li and H, O and H, N and H, C and H, and closes the lecture with the three types of bonding (the van der Waals bond is not mentioned).

In the last lecture the ionic bond is discussed, starting with the calculation of the lattice energy and the Madelung factor. Then, upon introduction of steric factors, the formation of complex ions and complex compounds is described. The book ends with the discussion of the covalent and the atomic bond, bonding in organic compounds, and finally bonding in metals.

The book may be useful for chemistry students, and even for students of physics if they wish to become acquainted with the problem of bonding. However, no literature is cited, and only at the end are the books of Heisenberg, Hund, and Hartmann himself recommended for further study.

Activation Processes in Solid Metals and Alloys. By K. A. Osipov. Transl. by Scripta Technica. 131 pp. American Elsevier, New York, 1964. $7.75.
Reviewed by Norman H. Nachtrieb, University of Chicago.

This small monograph adds little to the literature of metal physics, and its translation from Russian was a waste of time in this reviewer's opinion. To give it its due, it *does* summarize in useful tabular form a large number of experimental results on the energy of formation and migration of lattice vacancies in various metals. However, its approach to activated processes (diffusion, plastic deformation, recovery, creep, and recrystallization) is heavily biased with the author's views on heterophase fluctuations.

Many eminent physicists, including Maxwell, Planck, and Kammerlingh-Onnes, have entertained the idea that a continuous series of states connects the solid and liquid states. It was the Russian theoretical physicist, John Frenkel, however, who developed the theory of heterophase fluctuations most fully, arguing that thermal energy fluctuations lead to transient nuclei of the liquid phase in the thermodynamically stable crystalline state at all temperatures below the melting point. No direct experimental evidence has yet established the existence of such *proto* liquid nuclei, although a certain amount of indirect evidence has been adduced.

This review is critical, not of the concept of heterophase fluctuations, but rather of the author's oversimplified approach to the estimation of their energy. He endeavors to calculate the change in the thermodynamic potential from functions of the heat capacity, when a metal is heated from 0°K to its melting point. The resulting quantity, called q, is variously compared with experimental values of the formation energy and migration energy of lattice vacancies. The author seems to be uncertain as to just which of these two quantities his calculation relates. The reader might well suppose that q could be the sum of the formation and migration energies, but alas! it falls short of reliable values for the activation energy for self-diffusion in metals by factors that range from one to four.

A reader has a right to expect several things of an author. One of these is critical judgement of the validity of data in his field of knowledge. Yet Osipov reports without surprise the unbelievable work of Pryanishnikov, who found that the activation energy for self-diffusion in λ-iron falls from 75 kcal. g. $atom^{-1}$ to 26 kcal. g.

atom^{-1} over a hydrostatic pressure range of 1–150 atmospheres! Another obligation of an author is to call the attention of his readers to recent theoretical advances in his field. Of the work of N. B. Slater, Vineyard, Rice, LeClaire, and Manning to mention a few, however, there is not a word.

Dynamics of Charged Particles. By Bo Lehnert. 300 pp. (North-Holland, Amsterdam) Interscience, New York, 1964. $11.50.

Reviewed by Harold P. Furth, Lawrence Radiation Laboratory.

The subject matter of this book is somewhat less general than the title may suggest. There is a marked specialization in hydromagnetics and associated topics in single-particle motion. Those readers whose interest in the dynamics of charged particles relates to accelerators or microwave devices will find themselves in unfamiliar territory.

Within its range of coverage, the presentation is conscientious and well organized, and one can readily join in the author's own description: "With a few exceptions (the book) should give a complete line of deductions all the way to the final results. Much space has been devoted to clarify conceptual difficulties. . . . The results are illuminated by simple physical interpretations."

A brief discussion of the laws of classical electrodynamics and the Hamiltonian formulation leads into orbit theory and adiabatic invariants, and finally links up with hydromagnetics. The subsequent sections on waves and instabilities are somewhat sketchy, except in respect to the flute instability; and the vast area of non-hydromagnetic modes is left untouched. The section on particle confinement refers mainly to the single-particle picture. Partly because of the light treatment of the stability question, the motivation for the various plasma-confinement geometries is not brought out.

In the areas in which Lehnert's book specializes, it should prove a useful reference work for advanced students. The space-plasma physicist may be the ideal reader.