
Books

A Handbook of Lattice Spacings and Structures of Metals and Alloys. By W. B. Pearson. NRC No. 4303. 1044 pp. Pergamon Press, London & New York, 1958. \$38.00. *Reviewed by George H. Vineyard, Brookhaven National Laboratory.*

Metallurgists and solid-state physicists should take delight in this book, which is a monumental compilation of x-ray structural data. It treats all the pure metals and metalloids, all the binary and ternary alloys that have been examined, a large number of quaternary and higher alloys, and the metal hydrides, borides, carbides, oxides, and nitrides. The lattice spacings, structures, and atomic coordinates are given in a coverage of the literature that is essentially exhaustive. The principal part of the book, in which this data is assembled, contains no less than 790 pages, and includes information on approximately 2000 alloy systems (as determined by the reviewer's sampling techniques). This is a staggering number, although it is humbling to realize that out of some 78 elements that are metallic or semi-metallic, 3003 binary and 76 076 ternary alloy systems can be formed, and thus the great majority of possible alloys have not yet been the subjects of structural investigations at all.

Five introductory chapters set the stage for the great mass of data to follow. A discussion of precision x-ray methods for determining lattice spacings and for examining equilibrium diagrams in alloys is presented first. There is some good practical advice here and a distillation of much wisdom, although the reader who desires to know just how the experiments are performed will have to look elsewhere. A very concise discussion of the theory of alloys, largely along lines associated with the name of Hume-Rothery, is then given with emphasis on lattice spacings and atomic diameters. The relations between lattice spacings and magnetic properties, insofar as these can be discerned, and the influence of temperature, quenching, order, particle size, and other miscellaneous factors on lattice spacing are cursorily discussed. These sections are provocative and of broad scope, but because of their brevity, they are essentially guides to the literature rather than thorough treatments.

A large part of the information in this handbook is also to be found in the multivolume series *Strukturbericht* and *Structure Reports*, but has not previously been available in concise form. The book is designed to be used in conjunction with the *International Tables for X-Ray Crystallography* and describes crystal structures

in terms of *Strukturbericht* types. The conventions employed are carefully systematized and logically chosen, but the reader with only a limited knowledge of space groups may have difficulty extracting all of the crystallographic information contained herein, and will find it necessary to refer to the *International Tables* for full explanations. No diagrams of crystal structures are given. Pictures of at least the common types would have been a boon for most readers.

The leitmotiv of the entire book is, precisely as the title indicates, lattice spacing, and the author is interested in correlating this as widely as possible with all properties of metals and alloys. From a fundamental point of view this is a task which cannot be done with complete success at present, for two reasons: Theories of alloys are still in a rudimentary state and the lattice parameter is only one of a rather large number of properties having about equal basic importance. In drawing the threads together as far as possible, however, Dr. Pearson has created a most admirable and useful compendium of data.

Physics and Philosophy: The Revolution in Modern Science. Vol. 19 of World Perspectives. By Werner Heisenberg. 206 pp. Harper & Brothers Publishers, New York, 1958. \$4.00. *Reviewed by James MacLachlan, Earl Haig Collegiate Institute.*

In answer to critics of the quantum theory, Heisenberg here states that "It cannot be our task to formulate wishes as to how the atomic phenomena should be; our task can only be to understand them." And this book is dedicated to expanding the understanding of intelligent men for this strange, new physics.

It is probably true that we cannot make physicists of our lay friends, but if any one of them wishes to gain a deeper grasp of the implications of modern physics, no better book than this could be found. It will plunge him into the center of the controversies now current and will demonstrate the extent of achievements of the past fifty years. However, Heisenberg never hesitates to specify problems as yet unresolved, making it clear that there is still a lot of physics left to do.

The book's main thesis is the validity and range of applicability of the Copenhagen interpretation of quantum theory. This interpretation is founded on Bohr's principle of complementarity, and on the paradox that while the conditions and results of an atomic experiment are described in classical terms, no description is possible of the "events" between observations. The statistical nature of quantum theory is necessary for the prediction of succeeding observations. It is interesting to see the extension of complementarity beyond quantum theory: for example in daily life, deliberation about a proposed course of action is complementary to the decision to act.

Heisenberg discusses, in turn, the development and present situation of the quantum theory, the relation of quantum concepts to traditional philosophic points of