Book Reviews

Concise Inorganic Chemistry. **Fourth Edition**. By John D. Lee (Loughborough University of Technology). Chapman & Hall: New York. 1991. xxxv + 1032 pp. $39.95. ISBN 0-412-40290-4.

This book is the fourth edition of a 25 year old text. It was written for British college students to use prior to the final year honors chemistry texts "...to provide a modern textbook of inorganic chemistry that is long enough to cover the essentials, yet short enough to be interesting."

Although "concise" is part of the book's title, a textbook with more than 1000 pages can in no way be considered concise. One reason for the size of the book is that outdated concepts are retained along with explanations of more recent origin. The text frequently takes a historical approach to chemical theories. For example, in the section on acids and bases within a chapter on hydrogen and hydrides, Arrhenius, Bronsted–Lowry, Lewis, solvent system (Cady and Elsey), Lux–Flood, Usanovich, and hard–soft theories of acids and bases are all presented.

A section on atomic structure begins the text. Atomic structure of elements is illustrated with diagrams of nuclei and electrons in concentric orbits. The spectrum of hydrogen is discussed with respect to the Bohr orbits of an electron around the nucleus. This is followed by the Bohr–Sommerfield theory of elliptical electronic orbits. The author then presents the Schrödinger equation and a discussion of the radial distribution functions for electron orbitals. The historical presentation of bonding models is overly long, and the author seems unwilling to make any value judgement on the relevance of these various theories.

The introductory chapter on bonding defines ionic, covalent, and metallic bonds as bonds between an electropositive element and an electronegative element, between two electronegative elements, and between two electropositive elements, respectively. This is simplistic at best. Three chapters on bonding follow. A chapter on the ionic bond contains interesting sections on solids and defects of solid materials, semiconductors, and transistors. The chapter on the covalent bond has a somewhat historical approach, going from Lewis theory, to Sidgwick–Powell theory, and then to VSEPR, hybridization, valence bond theory, and molecular orbital theory. The chapter on the metallic bond includes sections on alloys and conductivity as well as the bonding theories of metals. It also includes a superconductivity section, which I found to be poor. For example: "...This is called the Meissner effect, and gives rise to 'levitation'. Levitation occurs when objects float on air." Some statements are incorrect. "An extremely high current can be passed through a very fine wire made of a superconductor." No explanation for the phenomenon of superconductivity is presented.

The bulk of the book consists of a description of the elements in the periodic table and their properties and compounds. The strength of the book lies in these chapters. They are well-written and easy to follow. Sections of topical interest are added to most chapters. The book contains a great deal of "practical chemistry, including significant amounts of metallurgy and a chapter on the chlor-alkali industry that are probably not relevant to undergraduate chemistry students. There are some very short sections on organometallic chemistry and bioinorganic chemistry in certain chapters. It would be more useful to have complete chapters devoted to these important topics.

A problem section follows most chapters. Some problems require students to explain concepts or rationalize an observation, while others only require the student to extract some fact from the text.

Overall, I would not recommend this book for use in either freshman level or advanced undergraduate inorganic chemistry classes in the United States. It contains more detail than is appropriate for either group. The sections on bonding are not sophisticated enough for a student in an advanced course and information on reaction mechanisms is entirely lacking.

Patricia A. Shapley, *University of Illinois*

Annual Review of Physical Chemistry. **Volume 42**. Edited by H. L. Strauss (University of California, Berkeley); Associate editors G. T. Babcock (Michigan State University) and S. R. Leone (University of Colorado). Annual Reviews Inc.: Palo Alto, California. 1991. x + 819 pp. $44.00. ISBN 0-8243-1042-X.

This volume covers recent topics in three major areas of modern physical chemistry (molecular spectroscopy, physical chemistry of condensed matters, and physical chemistry of chemical reactions) which are fairly uniformly dealt with by the authors chosen in these fields.

The article on photochemistry and spectroscopy of organic ions and radicals is a well-organized account of photoinitiated transformations including rearrangements of radicals and radical ions. These photochemical transformations are often very different than their parents which derive their reactivity from either excited singlet or/and triplet states. Particular emphasis is given to the interesting biphotonic processes and reactions in noble gas matrices which promises exciting future applications. It is hoped that future reviews in this field would include also a survey on the photoreactions of short-lived transient radicals initiated in laser flash photolysis of fluid systems.

Although there is no lack of reviews on the application of NMR to structural determination of small proteins, the article Protein Structure via NMR is an excellent overview of the fascinating progress achieved in the last decade by the application of sophisticated 2D and 3D NMR (closely related to the well-known NOESY) to the elucidation of the dynamics and folding of polypeptide chains in solutions. The crux of these structural studies is a simultaneous analysis of NMR data and molecular dynamics of the simulated structure. Continuing rapid growth in the computational facilities/capacities combined with increasingly detailed spectroscopic resolution would soon lead to the next challenge: the determination of tertiary and quaternary structures of membrane-soluble and large proteins.

It was only 8 years ago that the very existence of solids with long-range positional order but not crystallographic order would have been considered as a heresy. Today, we are reading a review on the structural varieties and properties of such exotic objects (Quasicrystal Structure). Despite the lack of a consensus in 1992 on the topology and structure of the quasicrystals, the experimental data have prompted the proposals of two different theoretical models: the "icosahedrical glass" and the thermodynamically stable phases organized as Penrose tiling. Both models can adequately predict the diffraction patterns, but the latter enjoys a greater success. However, none of the models gives a clear picture of how the structures obeying such a complex and strict geometrical rules can ever grow. The answer to this and other problems of quasicrystal physics is likely to be found as more data on their properties become available. At the moment, only some preliminary results on the electronic, vibrational, and magnetic properties of the materials have been obtained. There is no doubt that this exciting development will significantly broaden our horizon and the understanding of order and disorder in the solids.

J. K. S. Wan, *Queen's University*