

“The Periodic Table: Its Story and Its Significance”

BY ERIC R. SCERRI (University of California, Los Angeles, U.S.A.), Oxford University Press, Inc, New York, U.S.A., 2007, 368 pages, ISBN 978-0-19-530573-9, £19.99, U.S.\$35.00

Reviewed by Michael Laing

Professor Emeritus, University of KwaZulu-Natal;

61 Baines Road, Durban 4001, South Africa; E-mail: laingm@eastcoast.co.za

The author, Eric Scerri, teaches chemistry and the history and philosophy of science at the University of California, Los Angeles, U.S.A. He has published widely about the development and structure of the Periodic Table, and is the Editor-in-Chief of the journal *Foundations of Chemistry* (1). He was an invited speaker at the 2003 conference, “The Periodic Table: Into the 21st Century” (see also (2)). This book is timely – it is over thirty years since books about the periodic system by Mazurs (3) and van Spronsen (4) were published.

It is not simply a plodding, step by step history nor a collection of all known tabular arrangements of the elements. The author describes developments, explains what led to them, comments on them and discusses their implications. He carefully describes the philosophical thinking of Dimitri Mendeleev and how he differentiated between “the element” and “simple substance”, a difference that was critical in helping Mendeleev deduce the periodic law and system.

One must ask: for whom is this book written? It is for *all* chemists. What is there for the chemist involved with the platinum group metals (pgms)? Mendeleev in 1869 (5, 6) specifically quotes the similar atomic weights of platinum, iridium and osmium as being an important foundation of his periodic system. Now jump forward fifty years to quantum mechanics and the deduction of electron configurations of the elements. The commonly held doctrine says that the chemical properties of an element are determined by the configuration of the valence electrons. This implies that elements in the same group, having

similar chemical properties, will have the same electron configurations. Unfortunately, this is not true. An example is the group: nickel, palladium, platinum: Ni $4s^2 3d^8$; Pd $5s^0 4d^{10}$; Pt $6s^1 4f^{14} 5d^9$. It is evident to any pgm chemist that these electron configurations do not fit the chemistry of refining. Conversely, we have the group copper, silver, gold: Cu $4s^1 3d^{10}$; Ag $5s^1 4d^{10}$; Au $6s^1 4f^{14} 5d^{10}$, whose common oxidation states are Cu²⁺, Ag¹⁺, Au³⁺. The author discusses these problems.

The brightly coloured cover is attractive and calls out: “Read me”. There are many black-and-white portraits of chemists. Unfortunately, those of de Chancourtois, Newlands and Odling are missing although their contributions are discussed at length. There is one surprising omission. There is no current form Periodic Table. Similarly it would have been valuable to have had the 1950 short form “W. M. Welch Scientific Company” table for comparison, known as the Periodic Chart of the Atoms.

There is a very complete set of references and notes at the back of the book which are keyed to the relevant pages in the text. These are a mine of information for those who want to further pursue this interesting subject.

There is one surprising and disappointing shortcoming. There seem to be a larger-than-normal number of printing errors. Some examples are: p. 129, it is stated that “Based on its formation of tetravalent compounds, Mendeleev realized that uranium had a predominant valence of 4, as do such elements as chromium.” (*sic*); p. 217, iutetium (for lutetium); p. 239, $4s^2 3d$ should be $4s^2 3d^9$ for copper. There are others,

which will (I hope) be corrected in the next printing. This book deserves better editing and proofreading.

This is a book for the thinking chemist. It reflects the personal interests of the author. Scerri advocates a different layout: the left-step table of Janet, in which the long periods follow the Madelung rule and begin with Group 3 elements: boron, aluminium; scandium, yttrium; lanthanum, actinium; and helium is above beryllium. His discussion of this topic is valuable. There is no requirement that we agree with all of his conclusions, but Eric Scerri makes us think, and that, after all, is what good science is all about. This is a book that is well worth reading.

References

- 1 *Foundations of Chemistry*, Philosophical, Historical, Educational and Interdisciplinary Studies of Chemistry, Editor-in-Chief Eric R. Scerri, Springer, The Netherlands:
<http://www.springer.com/philosophy/philosophy+of+sciences/journal/10698>
- 2 "The Periodic Table: Into the 21st Century", eds. D. H. Rouvray and R. B. King, Research Studies Press, Baldock, Hertfordshire, U.K., 2004
- 3 E. G. Mazurs, "Graphic Representations of the Periodic System During One Hundred Years", 2nd Edn., University of Alabama Press, Alabama, U.S.A., 1974
- 4 J. W. van Spronsen, "The Periodic System of Chemical Elements: A History of the First Hundred Years", Elsevier, Amsterdam, The Netherlands, 1969
- 5 D. Mendeleev, *Zhur. Russ. Khim. Obsch.*, 1869, 1, 60
- 6 D. Mendelejeff, *Z. Chem.*, 1869, 12, 405

The Reviewer



Michael Laing was born in Durban, South Africa, and obtained his B.Sc. (Hons) and M.Sc. degrees from the University of Natal in 1960. He earned his doctorate from the University of California, Los Angeles, U.S.A., in 1964, and taught Inorganic Chemistry at the University of Natal, Durban, from 1965 until he retired in 1997. He was twice Visiting Professor at California State University, Northridge. His main field of interest was the determination of molecular structure and bonding by single crystal X-ray diffraction. He has also applied the X-ray powder diffraction method to the analysis of materials such as urinary calculi, fossil-bearing breccia, failed construction materials and intractables from a pgm refinery. He also generated specialist academic courses, including metal extraction for chemical engineers, material failures for architects and explosives for graduate chemists. He has over 200 publications in such diverse fields as crystallography, bonding, coordination compounds, the Periodic Table, chemical education and military history.