BOOK REVIEW

THE PERIODIC TABLE—ITS STORY AND ITS SIGNIFICANCE by Eric R. Scerri. (2006) Oxford University Press, 349 pages, $35.00. ISBN: 978-0-19-530573-9.

The periodic table is one of the most familar forms of "wall art" found in schools, universities, and laboratories around the world. This book is a celebration of the periodic table. The book consists of ten chapters that cover the origins and development of the periodic table as well as its present role in science. The expertise of the author, Eric Scerri, is not only in chemistry, but also history and philosophy of science—this book embraces all these subjects. The research is comprehensive. The author does an excellent job of summarizing demonstrably interrelated events at various stages in the development of the periodic table, and he also offers his own qualified insight into some lesser-known events that might have influenced the development of the periodic table. The contributions of many scientists, both major and minor figures, are covered. Honestly, the content of these chapters is so rich and diverse it is impossible to acknowledge all historical and interesting factual nuggets in this review.

The 10 chapters of *The Periodic Table* track the origins of concepts and vocabulary related to the periodic table and its development to its present form.

● Chapter 1 reviews the origins of much of the terminology of the periodic table, and it gives an overview of the development of the periodic table into its present form.

● Chapter 2 looks at the first attempts to discover and analyze quantitative relationships among the weight proportions or volumes of elements known at the time. Some of these relationships were known as *triads*, an example of which would that the weight of SrO = (CaO+BaO)/2.

● Chapter 3 discusses the importance of the Karlsruhe Congress of September 1860, which focused on the rationalization of atomic weights partly through recognition that some elements are diatomic. As a direct result of the Karlsruhe Congress, at least six scientists began work that contributed to the evolving body of research that became the periodic table.

● Chapters 4 and 5 center on Mendeleev and his research. Mendeleev's work had the largest effect on the periodic table. Mendeleev had attended the Karlsruhe Congress and was also writing a textbook on inorganic chemistry. Some impetus for Mendeleev's periodic table came partly from choosing a rationale for determining the order of the coverage of elements in the book. Although other versions of a periodic table were being developed, Mendeleev's periodic table that was presented in 1869 gained acceptance largely because his periodic table succeeded in predicting undiscovered elements. As an example, from his periodic table Mendeleev predicted a hypothetical element that he called eka-aluminium; this element was discovered in 1875 and named gallium. The predictive ability of Mendeleev's periodic table was driving the search for unknown elements.

● Chapter 6 covers the role of the discovery of radioactivity. As radioactivity became understood, atomic number instead of weight was recognized as the most basic property of the elements. The atomic number allowed estimates of the total number of elements as well as the number of elements that were undiscovered. Recognition of isotopes provided a refinement of the atomic weights of elements.

● Chapter 7 is a short chapter that deals with the discovery of the electron by J.J. Thomson, chemical periodicity and the structure of the atom. Contributions of Niels Bohr, Edmund Stoner, and Wolfgang Pauli are discussed. Their work covers the origins of quantum theory, the maximum numbers of electrons present in subshells, and the relationship of electrons to the lengths of the periods of the periodic table.

● Chapter 8 is also a short chapter that deals with electronic explanations of the periodic system from chemists instead of physicists. Particularly the work of Gilbert Newton Lewis, Irving Langmuir, Charles Bury, and John David Main Smith is detailed. Of particular note is the realization by Bury that in the transition elements atoms do not fill their electron shells sequentially. This knowledge allowed Bury to predict that element 72 (Hf) would be a transition element with properties similar to Zr instead of a rare earth element.

● Chapter 9 examines the old quantum theory of Bohr and the breakthrough of quantum mechanics (Heisenberg and Schödinger), which eventually led to the first quantum mechanical calculation of the covalent bond by Heiter and London of a diatomic H molecule. This chapter continues to discuss contributions of quantum mechanics, but is focused on the extent to which quantum mechanics explain the details of the periodic table.

● The final Chapter 10 deals with a variety of topics. The origin and abundance of elements and isotopes via nucleosynthesis, and the best form for the presentation of the periodic table. The latter topic is a thought-provoking short reflection on the virtues of the aesthetic vs. utility in science.

This book is full of many more interesting historical accounts that relate to the development of the periodic table than can be mentioned above. Much of the history of the periodic table that is recounted in this book is not generally part of the taught curriculum in the geological sciences. The book is well written and very readable, and full of information that could be used to embellish the historical perspective of lectures in mineralogy or geochemistry. I highly recommend this book.

JOHN C. SCHUMACHER
Department of Earth Sciences, University of Bristol
Wills Memorial Building, Queen's Road
Bristol BS8 1RJ, U.K.

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