Review of The Periodic Table: A Very Short Introduction

ARTICLE *in* JOURNAL OF CHEMICAL EDUCATION · FEBRUARY 2014

Impact Factor: 1.11 · DOI: 10.1021/ed5001119

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Book and Media Review

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Review of *The Periodic Table: A Very Short Introduction*

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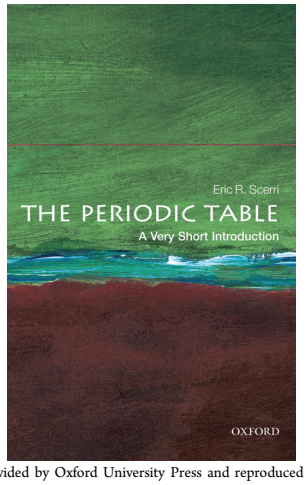
The Periodic Table: A Very Short Introduction, by Eric R.Scerri. Oxford University Press, Inc.: New York, 2011. 147 pp. ISBN: 978-0199582495 (paperback). $11.95.

The periodic table is chemistry's most iconic image. Its structure and shape draws our attention to rows, columns, and blocks as a means of organizing elements along two or three (or more) dimensions. It is not surprising that artists and visual designers find the periodic table a useful and attractive device when creating infographics.[1]

Given its iconic status, it is tempting, as students and teachers of chemistry, to treat as obvious the information conveyed within the periodic table. However, as Eric Scerri outlines in this short introduction to the periodic table, what at first glance seems simple hides within subtle, yet important questions about elements and periodicity. Partly historical and partly philosophical in its approach, *The Periodic Table: A Very Short Introduction* provides a thoughtful exploration of the maturation of the periodic table from Dalton's initial development of atomic theory in the early 1800s and Mendeleev's introduction of his periodic system of the elements in 1869, and the subsequent interplay between the chemist's atom of the 19th century and the 20th century atom of physicists, which emerged with the introduction of quantum mechanics.



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Divided into 10 short chapters, the text begins with two introductory chapters on elements and the modern periodic table. Scerri's treatment of elements emphasizes the importance to both the ancient Greek philosophers and the first modern chemists, such as Lavoisier, of relating a substance's macroscopic properties to the microscopic properties of its fundamental components. Scerri's brief overview of the modern periodic table introduces readers to the nomenclature used to describe the table, including groups, the periodic law, atomic weights, and atomic numbers. Although much of this material is familiar to students of chemistry, these chapters are essential to general readers unfamiliar with basic chemistry.

Beginning with Lavoisier's quantitative measurements of chemical reactions, Richter's determination of the equivalent weights of compounds, and Dalton's (re)introduction of atoms and his estimation of atomic weights, Scerri uses Chapters 3−5 to guide readers through the historical development of the periodic table. Among the many important steps in this process is Döbereiner's discovery in 1817 of triads of elements in which the chemical properties and atomic weight of one element are approximately the average of those for the triad's other two elements. This early recognition of a periodic relationship between elements, later extended by Lenssen, led to early two-dimensional visual representations of elements by Gmelin and Kremers, although neither representation evinces both the horizontal and vertical periodic organization of elements found in Mendeleev's periodic table.

Scerri's telling of the final steps leading to Mendeleev's periodic table captures for readers the thrill of scientific discovery. From de Chancourtois's and Hinrichs's spiral and radial arrangements of elements, which vertically aligned elements with similar chemical properties, to the patterns in atomic weights reported by Newlands and Odling, we see scientists on the verge of recognizing periodicity as a fundamental property of elements and come to understand that progress in science does not come easily. We learn, as well, of the all-too-human rivalry between Lothar Meyer and Mendeleev in establishing priority for first reporting a truly *periodic* table of the elements.

Mendeleev's periodic table and the modern periodic table are, of course, quite different in their construction, in part because Mendeleev used atomic weights to order the elements and because his table predates the discovery of the inert gases. In Chapters 6−9 Scerri explores how advances in physics gave final form to the periodic table by identifying an element's atomic number as the fundamental organizing property and by extending the elements beyond uranium, and how the periodic table helped guide the discoveries of quantum mechanics and the electronic structure of atoms.

A particular strength of Scerri's treatment of the periodic table is the final chapter in which he explores alternative forms of the periodic table and the search for the periodic table's optimal form. Here Scerri turns philosophical as he considers whether periodicity reflects an objective fact of nature or whether it is simply a pattern imposed upon nature by chemists and physicists. Among the issues Scerri considers are the location of hydrogen (Does it belong in group 1 with the alkali metals or in group 17 with the halogens?), the location of helium (Does it belong in group 18 with the inert gases or in

Published: February 14, 2014

dx.doi.org/10.1021/ed5001119 | *J. Chem. Educ.* 2014, 91, 307−308

group 2 with the alkaline earths, as in Janet's left-step periodic table?), and what elements properly constitute group 3 (Is it Sc, Y, La, and Ac? Or is it Sc, Y, Lu, and Lr?). In considering these questions, Scerri leaves his readers with a deeper appreciation for the open-ended nature of scientific inquiry.

Scerri's writing is lively, engaging, and accessible. Although written for a general audience—the text is one title in Oxford University Press' extensive Very Short Introduction series of monographs—*The Periodic Table: A Very Short Introduction* is recommended as a supplementary text for high school chemistry courses, introductory chemistry courses for undergraduates, and courses in the history and philosophy of science.

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Notes

The authors declare no competing financial interest.

REFERENCES

(1) For examples of infographics inspired by the periodic table, see http://www.meta-synthesis.com/webbook/35_pt/pt_database.php?Button=Non-Chemistry+PTs (accessed Feb 2014).