

A Tale of 7 Elements, Eric Scerri, Oxford University Press, Oxford, 2013, xxxiii + 270 pp, ISBN 978-0-19-539131-2, \$19.95.

This book concerns the seven of the 92 naturally-occurring elements which had not been discovered by 1913, when Moseley showed that atomic numbers are an integral part of elemental properties and lie at the heart of the periodic table. These seven elements are treated in Scerri's book in separate chapters arranged by the chronology of their discovery: protactinium (91), hafnium (72), rhenium (75), technetium (43), francium (87), astatine (85) and promethium (61). There are two introductory chapters on Periodicity, and the last, chapter 10, briefly discusses elements 93 to 118.

In a long introduction Scerri discusses the criteria which constitute the discovery of an element, and the often complex matter of priority of discovery; each of these seven elements was claimed by a number of people. Scerri's first chapter, "From Dalton to the Discovery of the Periodic System," recounts the history of periodicity from Dalton to Mendeleev. (A curious conceit here is that it is all in the present tense except for the few pages on Mendeleev, which are in the more conventional past tense.) The second, "The Invasion of the Periodic Table by Physics," takes the story from Thomson's discovery of the electron to the Bohr atom and the four quantum numbers. Werner's astonishingly prescient suggestion of 1905, that thorium and uranium might occupy a lanthanide-like series rather than being transition elements is unfortunately not mentioned, though it is relevant to this book because elements 91 and 93-103 are what we now call the actinides. For each of the next seven chapters in which the tale is woven there is usually an introduction, a modern Periodic table showing the position of the element, a history of its discovery, the names of the generally accepted discoverers, and a short account of its chemistry and applications.

Protactinium (element 91, Mendeleev's *eka-tantalum*) is the first to be considered. Many names are associated with its recognition, for example, Göring, Crookes, Fajans, Soddy and Cranston, but it is generally agreed that Lise Meitner and Otto Hahn discovered it. The deplorable omission of Meitner from the Nobel prize for chemistry awarded to Hahn in 1944 for his work on fission is discussed: rightly, Scerri emphasizes the considerable role that women have played in the story of his seven elements. Hafnium (element 72) is one of the only two non-radioactive elements in this series, and the story of its discovery is complex. In 1911 Urbain (who had discovered ytterbium and lutetium, numbers 70 and

71) thought he had isolated another rare-earth, element 72, and called it celtium; Bohr, however, cast doubt on this, and the Dutch chemist Dirk Coster and the Hungarian George de Hevesy are the accepted discoverers of hafnium in 1923: they named it after the city of Copenhagen (Latin *Hafnia*). Rhenium (number 75, Mendeleev's *tri-manganese*) is likewise not radioactive. It was finally discovered by Walter Noddack and Ida Tacke (who later married Noddack) in 1925, and was named after *Rhenus*, the Latin name for the Rhine. Scerri recounts in some detail an earlier Japanese claim to have discovered the element as Nipponium in 1908 but there is little evidence that this was rhenium. Technetium (number 43, Mendeleev's *eka-manganese*) is the first man-made element (though there is some evidence now of traces of it in nature). The Noddacks, who had discovered rhenium, believed they had discovered element 43 in 1925 and called it masurium; many other "discoveries" were made by others (for example, ilmenium, neptunium, davyum, uradium, canadium, neo-molybdenum, moseleyum and others), but it was Emilio Segrè and Carlo Perrier who obtained it from molybdenum plates bombarded with deuterons in the Berkeley cyclotron in 1937. Francium (number 87, Mendeleev's *dvi-caesium*), was finally discovered by Marguerite Perey, who had been a laboratory assistant of Marie Curie, in 1939. Although Scerri does not mention this, it was Perey who in 1962 was the first woman to be elected to the Académie des Sciences in Paris, which had shamefully refused to elect Marie Curie, and her daughter Irène, many years earlier. Element 85 (astatine) has a very complex history. Unsuccessful claims were made from 1931 for it as alabamium, dakin, helvetium and anglohelvetium, but it was finally discovered in 1940 by Corson, MacKenzie and Segrè, by α -bombardment of bismuth. Scerri points out that it is one of the very few elements never to have been isolated in sufficient quantities to be visible to the naked eye: only about an ounce is thought to be present at any one time in the entire outer crust of the Earth (a similar abundance, or lack of it, is suggested for francium). Finally, element 61 (promethium), claimed in 1926 as illinium, was obtained in 1947 by Marinsky, Glendenin and Coryell at MIT from ion-exchange separations on material from the Manhattan project. It is well-named after Prometheus in view of its birth from a fiery source. A final short chapter, "From Missing Elements to Synthetic Elements," gives a very brief resumé of the discovery of elements 94 to 118.

The classic work in this area is of course *Discovery of the Elements* by M. E. Weeks and H. M. Leicester (7th ed., Journal of Chemical Education, 1968); there are also many books on the periodic table, including Scerri's own

earlier book on the subject. This new book breaks no substantial new ground, but I liked it on its own terms. It is compact and well-presented, researched and referenced; and it has an excellent index. At its relatively modest price it makes for rewarding reading.

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Sites of Chemistry in the 17th Century

The fourth conference in the Sites of Chemistry, 1600-2000 project, will be held in the Maison Française, Oxford, 17-19 July 2014.

<http://www.sitesofchemistry.org/>

History & Philosophy and the Teaching of Chemistry

Symposium at the 2014 Biennial Conference on Chemical Education at Grand Valley University, Michigan. August 3-7, 2014

<http://www.bcce2014.org/index.html>

Transformation of Chemistry from the 1920s to the 1960s

The International Workshop on the History of Chemistry (IWHC 2015) will be held March 2-4, 2015, at the Tokyo Institute of Technology.

Abstract deadline: May 30, 2014

<http://kagakushi.org/iwhc2015/>

Working Party for the History of Chemistry (EuCheMS)

The next International Conference (10ICHC) will take place in Aveiro (Portugal) September 9-12, 2015. The conference will be hosted by Isabel Malaquias as Chair of the Local Organising Committee, while Peter Morris has agreed to act as the Chair of the Programme Committee.

<http://www.euchems.eu/divisions/history-of-chemistry.html>