

Elemental: How the Periodic Table Can Now Explain (Nearly) Everything, Tim James

In *Elemental*, Tim James describes some of the great discoveries, theories, and experiments that have defined and shaped our current understanding of chemistry. Chemistry today is a multifaceted subject, with wide-reaching implications that link also to much of biochemistry, biology, and physics. James focusses on some of chemistry's more important ideas (while not being afraid to mention the odd anecdote or two along the way), and crucially he aims to explain 'why' rather than just 'what'. The result is an informative, entertaining, and thought-provoking introduction to the richness that emerges from just 118 known elements of the periodic table.

Each chapter opens up avenues that the reader might explore further. In the Introduction, the chemical formula of a human is said to be $\text{H}_{375,000,000}\text{O}_{132,000,000}\text{C}_{85,7000,000}\text{N}_{6,430,000}\text{Ca}_{1,500,000}\text{P}_{1,020,000}\text{S}_{206,000}\text{Na}_{183,000}\text{K}_{177,000}\text{Cl}_{127,000}\text{Mg}_{40,000}\text{Si}_{38,600}\text{Fe}_{2,680}\text{Zn}_{2,110}\text{Cu}_{76,114}\text{Mn}_{13}\text{F}_{13}\text{Cr}_7\text{Se}_4\text{Mo}_3\text{Co}_1$.

The reader might ask themselves: why is there so much hydrogen, oxygen, carbon, and nitrogen? Or they might notice the tiny amount of cobalt, and then find out where it is located in the body and what it does. In Chapter 1, it is said that air was discovered to be a mixture of two gases by the Polish alchemist Michał Sędziwój. How could one design an experiment to show this oneself? In Chapter 12, James argues that dysprosium is the most boring element in the periodic table. A reader might want to think: which would I choose as the most boring element – or the most interesting – and why? And on reaching the end of the book, do I agree with the assertion of the book's subtitle, namely that the periodic table can now explain (nearly) everything?

There is an extensive set of references to further information at the end of the book. Here are some other suggested follow-up resources:

- The Nobel Prize-winning physicist, Richard Feynman, famously said 'I learned very early the difference between knowing the name of something and knowing something'. This is good advice for all budding scientists – however, the names of the elements do sometimes give clues about their behaviour. The RSC's interactive periodic table explains the origins of the element names, and much, much more.
<https://www.rsc.org/periodic-table>

- *What is Chemistry?*, by Professor Peter Atkins (an Oxford Chemist) is a beautifully-written perspective on the underlying principles of chemistry, its applications, and what its future may have in store.
- *50 Chemistry Ideas You Really Need to Know*, written by Hayley Birch, contains short, 4-page introductions to topics from chirality to solar cells, and spectra to artificial muscles. Highly recommended.
- *The Disappearing Spoon*, written by Sam Kean, takes another look at the periodic table from a historical perspective.
- Professor Sir Martyn Poliakoff, at The University of Nottingham, has made a brilliant Periodic Table of Videos with demonstrations of all aspects of chemistry. Here are his top ten.
<https://www.youtube.com/watch?v=HcgpUkcYXfc>

Dr Martin Galpin

*Supernumerary Fellow and College Lecturer in Mathematics for Chemistry;
 Deputy Director of Studies in Chemistry*