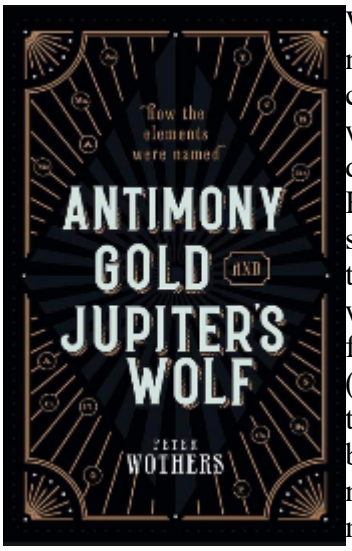
This page is really a book review but it is very relevant to the Nature of Science with particular reference to chemistry. The book, Antimony, Gold, and Jupiter's Wolf written by Peter Wothers provides concrete evidence as to how many NOS problems have arisen and been addressed in the past and also gives good background information on how theories develop and are later discarded as the prevailing paradigms change. If you get the chance to get hold of a copy it is well worth reading.

Antimony, Gold, and Jupiter's Wolf

All good chemists should be concerned not only with the facts, skills and concepts underpinning our subject but also its underlying culture. Antimony, Gold, and Jupiter's Wolf: How The Elements Were Named is written by Peter Wothers and is well worth reading.



Wothers is a teaching fellow at the University of Cambridge in the UK. His book not only describes how the names of the elements have been arrived at but also contains a considerable amount of Nature of Science/Theory of Knowledge in the way it is narrated. During the seventeenth and eighteenth centuries chemistry developed from alchemy and the book describes how science itself developed - How can disputes be resolved? Should discoveries be shared freely? How can scientists communicate, collaborate, and form a consensus with each other, despite the geographical borders and language barriers that separate them? The book is well researched and documented. It contains many anecdotes and much material for chemistry (or pub!) quizzes. For example, France, Germany, Poland, America (and now Japan with nihonium) all have elements named after them but which is the only country to be named after an element? Argentina is the obvious answer but Cyprus is in the chicken and egg situation as no-one is sure whether copper is named after Cyprus or whether Cyprus, which in Roman times had many copper mines, is named after copper.

The book is aimed at the general reader rather than the specialised chemist but a good knowledge of chemistry will make you appreciate it all the more. Lavoisier's careful weighings of reactants and products, which led to the overthrow of Phlogiston theory, are probably already well known. Perhaps less well known is that because of Lavoisier's insistence that all acids contained oxygen rather than hydrogen, at least as we now define acids according to Arrhenius and Brønsted-Lowry – but not Lewis or Usanovich, the names of oxygen (acid producer) and hydrogen (water producer) should really be the other way round.

If I have one criticism it is that the book is rather western in nature. After comparing the seven known metals of ancient times with the seven planets in the geocentric view of the universe it tends to focus more on Europe in the seventeenth, eighteenth and nineteenth centuries when the modern concept of an element was defined and where many elements were first discovered. The book mentions that in 2016 the names of the last four unnamed elements were agreed by IUPAC – nihonium, moscovium, tennessine and organesson. – but there is no mention of the trans-fermium wars (see my earlier blog on $_{104}$Ku-an anachronism in a gulag).

During this period from the late 1960s until the 1990s some elements were known not only by different names but also by different symbols depending upon whether you were based in the former USSR or in the West.

Classroom (or pub) quiz questions

Here are a five more "pub" quiz questions on the elements. (If you come to my pub in South Wales then to put you in the TOK frame of mind you can have a pint of 'Paradigm shift' brewed by The Vale of Glamorgan brewery while you work out the answers.)

Two beers, ‘Paradigm Shift’ and ‘Dark Matter’, served in my local pub – the Old Swan in Llantwit Major. Ideal for discussing NOS/TOK.

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1. Which village in Sweden gives its name to four different elements?

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2. Mendeleyev left spaces in his first periodic table to account for elements yet to be discovered. However he did include one element in the table that still had not been isolated and whose physical and chemical properties had not been determined – which element was it?

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3. Which country has two elements named after it?

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4. Who discovered a new element on French soil when his country was actually at war with France?

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5. What is Jupiter’s Wolf?
