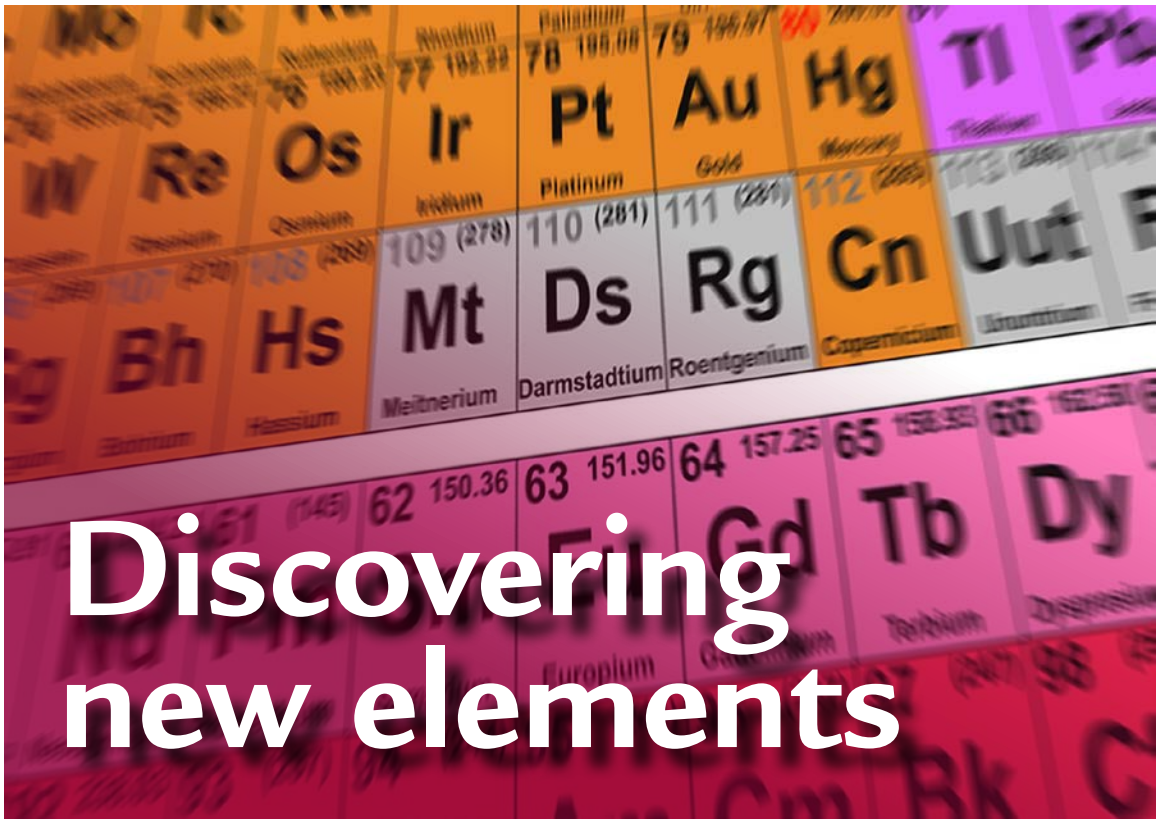
Vicky Wong



Discovering new elements

I cannot imagine many things more exciting than discovering a new element. Perhaps that is because I am a chemist, but the idea that you are seeing an element that no-one has ever seen before is thrilling.

At the very end of 2015, the International Union of Pure and Applied Chemistry (IUPAC), which oversees chemistry around the world, announced that four new elements had been discovered. One of these was by a team from Japan and is the first element to be discovered in Asia. The other three were by a joint team of Russian and American scientists.

These elements have numbers 113, 115, 117 and 118. As they complete the 7th row of the periodic table, if any further elements are discovered then a new period or row will be required.

The elements have yet to be named, but the groups which have been credited with their discovery have the right to suggest the name and symbol. There are rules to naming elements – they have to be inspired by people, places, nature or mythology – but the final decision rests with the International Union of Pure and Applied Chemistry.

Heavier and heavier

The last time new elements were announced was in 2011 – elements 114 and 116. These were subsequently named Flerovium (symbol Fl) for 114 and Livermorium (symbol Lv) for 116.

These super-heavy elements are not naturally occurring so the discovery involves not just finding them but also making them by smashing together atoms of other elements. The Japanese team made element 113 by firing a beam of zinc-70 atoms (zinc atoms with 30 protons and 40 neutrons) at a target made of bismuth-209 (bismuth atoms with 83 protons and 126 neutrons) – both of which are naturally occurring. After thousands of hours of this bombardment they had made enough atoms of element 113 to make a claim about the identity of this new element.

The RIKEN Nishina Centre in Japan is home to this high-energy accelerator which was used to fuse two lighter elements together to create the new element 113.

Elements 114 and 116 are named after two Nuclear Physics laboratories, the Flerov lab in Russia and the Lawrence Livermore lab in the USA.

Like most super heavy elements, element 113 is very unstable and decays to a different element after only the fraction of a second. This means that to prove it has been made requires more than collecting some and putting it into a jar. These new elements are usually identified by looking at the radiation they emit as they decay – the energy and type of that radiation and the nuclides (new nuclei) that are produced.

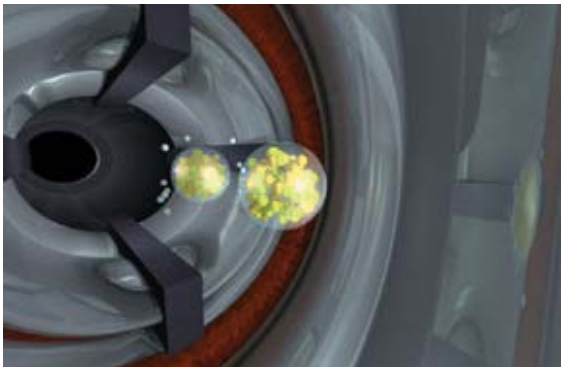
The Japanese team first claimed to have made this element in 2004 but they had to provide further evidence to prove its existence. Part of the difficulty for the team was that element 113 produced element 111 as it decayed – and element 111 was only verified at the end of 2004. Only known nuclei are permitted as part of the evidence for the existence of a new element. The team went back to the lab and over the past 10 years have gathered sufficient evidence to convince IUPAC that they have indeed made element 113.

The teams credited with the discovery of the other elements have similar stories – the discovery of new elements is not an easy task.

TEMPORARY NAMES

The new elements are given names and symbols based on their atomic numbers.

113 ununtrium Uut
115 ununpentium Uup
117 ununseptium Uus
118 ununoctium Uuo



A computer simulation of a collision between an ion of calcium-43 and an americium-243 target; the particles fused to form an atom of element 115.

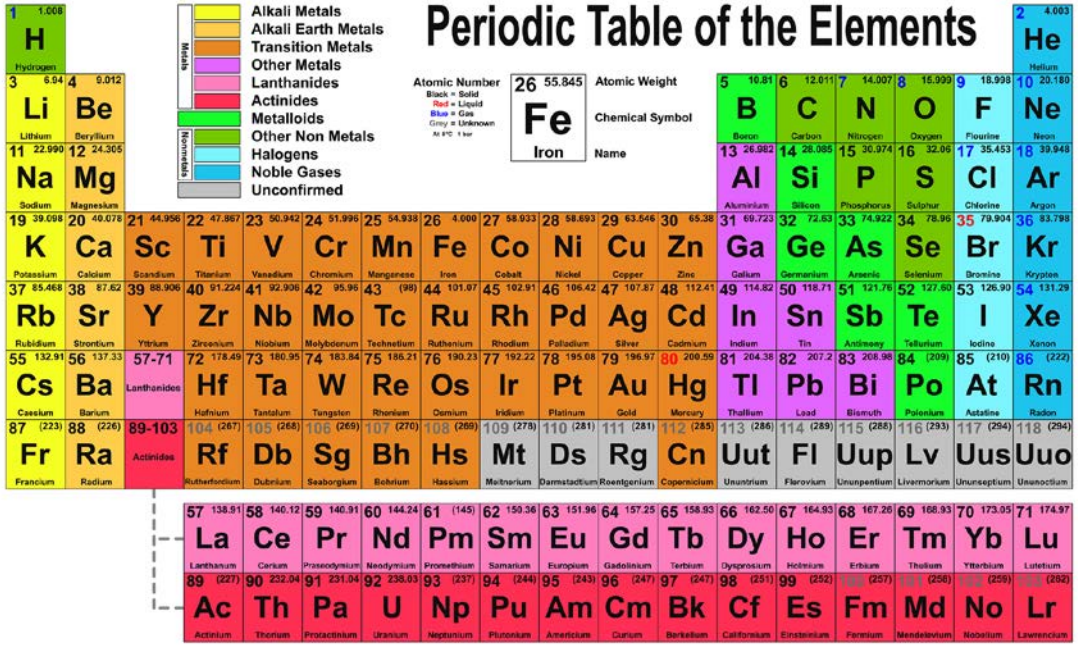
An eighth row?

Researchers are now likely to begin to look for elements beyond the 7th row of the periodic table. To make these elements will be even more challenging as the targets for the bombardment experiments would probably have to be made of super-heavy, short-lived elements themselves. No one has yet claimed to have made an element heavier than 118 and it is not even known if it can be done.

The periodic table may, therefore, be complete – but there is always the possibility that a heavier element may one day be discovered.

Look here!
For a song including all the elements of the periodic table: *http://tinyurl.com/ogqq9jh*

Vicky Wong is chemistry editor of CATALYST.



The periodic table showing the most recently discovered elements in grey. The latest elements have temporary names until the new ones are confirmed.