Table manners

There are many different versions of the periodic table, but one among them reigns supreme. Michelle Franch ponders on why chemists put elements in boxes.

The postcard to me began ‘53 90.8.92.g.1.t’. Stillling the urge to throttle my computer scientist sibling the next time we met, I flipped it over on the slim chance that some clue could be found on the other side. No, and worse yet, it was clearly a more complex cipher than simple substitution.

I dug into the decryption: 18 = ar; 53 = i; 6 = c; 90 = th. With that, I had it cracked. 90 is Th all right, element 90 on the periodic table, thorium. Pat had used the periodic table as the basis for his substitution cipher. (Management consultants take note; sometimes thinking inside the box is the key.)

Even so, it was a tough haul. Away on a rustic holiday, the only available periodic table was the slightly incomplete one in my head that I quickly sketched onto paper. The experience prompted me to muse about just why chemists have settled on the iconic, artistic potential.

Chemists have created hundreds of variations in search of the perfect periodic table. The periodic table has been mapped onto spirals, circles, triangles and even elephants. The first such ‘alternative’ periodic table, based on a spiral, was proposed by Gustavus Hinrichs in 1867 (ref. 2), two years before Mendeleev unveiled the forerunner to the current blocked tabular form. Still, open 50 random introductory chemistry texts and it is a fair bet that all 50 of them have IUPAC’s standard periodic table, or a close facsimile of it, inside the cover. Chemists are stuck in the box.

Periodic tables are a classic example of ‘cognitive art’. Information is communicated, but there can be an enduring aesthetic appeal to the depiction that extends beyond the need for the data set. The map of the London Underground system is an iconic piece of cognitive art; you can use it to find your way from Piccadilly Circus to King’s Cross, or you can hang a copy on your living room wall. Periodic tables have a similar iconic and artistic potential.

Is it resistance to change that keeps chemists bound to the square confines of the standard periodic table, even when other tables offer a better representation of the underlying chemical principles? Perhaps it is simply pragmatism. One cynical critic suggested that the compressed version is favoured because it fits well on a standard sheet of paper. Is there a way to distinguish between periodic tables that are masterpieces of cognitive art and those that are the equivalent of Elvis Presleys on velvet? The periodic table collapses a rich, multivariate chemical universe to a two-dimensional or three-dimensional map. Well-designed tables can quickly be searched for a particular entry, but they should also reveal relationships and patterns in the elements. They are portable. Aesthetics matter, but it always takes a back seat to clarity: any features should be meaningful.

How do the alternative periodic tables measure up against these standards? The Alexander three-dimensional periodic table brings out the helical relationship of the main group elements and offers a rich array of viewing angles. In recent years Hiro Sheridan has created a three-dimensional table on Drexel Island in Second Life that highlights periodic trends in properties such as atomic radii. Alas, neither of these elaborately constructed tables will tuck conveniently into your pocket or slip into your notebook.

Philip Stewart’s spiral version of the periodic table is often superimposed on a starry background, having the advantage that sequential atoms are never separated. Despite the arresting beauty of the galactic background and wide distribution by the Royal Society of Chemistry, it has not displaced the IUPAC standard. From a cognitive art perspective, the starry background has no function. It conveys no additional information about the atoms or their relationships. Like the dragons on medieval maps that signalled the edges, it is only a decorative underscoring of features already displayed.

Tables that are relatively wide or tall complicate matters when trying to abstract patterns and relationships. Making data visible in a single ‘eyeful’ is ideal; more than that and a reader must refocus both physically and mentally. Perhaps this — and not the constraints of paper...
less white space to pull the eye away, as hydrogen and helium move to the first row. It is symmetrical on a rectangular grid, easy to hold in the mind. Reactive elements, the halogens and the chalcogens occupy the privileged positions on the edges, instead of the noble gases. It is, I believe, a keeper.

What will the periodic tables of the future look like? Thin haptic ‘smart sheets’, perhaps, flat and flexible enough to slot into pocket or notebook, that switch with a touch between various tables. Spirals, the left-hand stack, the extended version and even rotatable three-dimensional tables literally at your fingertips.

And the default version on the front of that high-tech periodic table? I’m betting it will be a near cousin to Scerri’s proposed table, in black and white with red annotations and a serifed font for the elements — all in all, not so different from the antique Sargent–Welch wall chart that hangs over my desk.

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References

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**Figure 2** Scerri’s periodic table. Eric Scerri proposes a symmetrical version of the periodic table in which hydrogen is grouped with the halogens, and there are no longer any exceptional periods. Figure adapted with permission from Eric Scerri.