

Chemistry recrystallized

Why are we launching this journal, and what can you expect from it?

“ We aim for reviews that are authoritative and accessible, critical and pedagogical ”

Chemistry is vast and is only getting bigger. Divisions between its traditional subdisciplines are increasingly blurred, with new fields emerging at their peripheries. Some of the most exciting advances in our science — be they experimental or theoretical, fundamental or applied — have appeared in our sister research journal *Nature Chemistry*. However, chemistry is constantly evolving, and keeping up to date is a constant challenge to its practitioners. It is with this in mind that we introduce you to *Nature Reviews Chemistry* — just the second physical sciences title in the *Nature Reviews* portfolio.

Reviews have long been an important part of the chemistry literature, so it is pertinent to begin by asking one seemingly simple question: what makes a great review? In answering this, it is instructive to go a little off-piste. In 2002, then United States Secretary of Defense, Donald Rumsfeld, said of intelligence gathering:

“...there are known knowns; there are things we know we know. We also know there are known unknowns. That is to say, we know there are some things that we know we do not know. But there are also unknown unknowns. The ones we don't know we don't know.”

Although widely criticized at the time, these words (often interpreted in terms of four ‘quadrants’) do serve as a useful mnemonic to describe a good review article. A review must provide more than just a summary of the literature. The rise of the internet has made information readily available, and merely interrogating a database and collecting the results on a particular topic barely contributes to understanding. Although a comprehensive list of examples and publications is certainly a good start, it is essential to whittle these down

to only the most significant developments. The process of producing a good review is a purification, a recrystallization if you will, of the research literature. This then covers the known knowns. Arguably more important is recognizing things that we would like to know but do not — the known unknowns. A deep comprehension of the pertinent literature, combined with ‘educated speculation’ on future directions, can elevate a decent review article to an excellent one. Maybe, the very process of writing a review might help one to uncover examples in the remaining two quadrants: unknown unknowns and possibly even unknown knowns. There exists a certain satisfaction when one snaps out of tunnel vision, steps back and takes in a wider chemical landscape. Only then might a particularly intuitive trend or broader realization become apparent.

By extracting the diverse knowledge and experience of our authors, we will publish reviews with a collective scope that spans the entire chemistry spectrum. Writing for us are not only leading academic researchers — from emerging to emeritus — but also those more involved in chemistry policy, industry and education. The voices of our authors come through in succinct articles that will not only allow a connoisseur to keep their finger on the pulse of a pet subject, but also guide a reader venturing into unfamiliar territory. Indeed, we aim for reviews that are authoritative and accessible, critical and pedagogical.

So what can you expect from the monthly online offerings of *Nature Reviews Chemistry*? In addition to our two main article types — Reviews and shorter, more opinionated, Perspectives — each issue will also include Editor-penned Research Highlights on a selection of recent reports from the research literature. Like any true forum, we will also provide a stage for eminent scientists to weigh in on topical themes. In the first such Comment article, Helmut Schwarz argues that the significant and long-term benefits of fundamental research must be commensurately recognized with considerable and long-term funding. Only then will outstanding individuals, in particular younger scientists, do away with incremental research and instead take risks, push boundaries and diversify their research.

Most review journals — indeed, most chemistry journals — devote the vast majority of their pages to academic research. But this is just one part of the chemistry enterprise. Our reach will extend beyond this to



Stephen Davey



David Schilter



Gabriella Graziano

discuss chemistry education and the translation of chemistry research into business opportunities. Two regular columns have been added to the line-up to help us achieve our goal. In our first In the classroom piece, Simon Lancaster explains why developments in chemistry education deserve our attention; and in our first Down to business column, John Spevacek discusses the opportunities and challenges in the commercial production of bioderived polymers.

The topics for the Review articles themselves are chosen from across chemistry. For example, our addiction to digging up decomposed organisms might be cured by instead using renewable monomers and fuels. The latter need not be carbon-based, and processes such as water splitting become attractive if energy is efficiently utilized and precious metal catalysts are eschewed. A Review by Isolda Roger, Michael Shipman and Mark Symes describes heterogeneous earth-abundant metal electrocatalysts for the hydrogen and oxygen evolution half-reactions. These catalysts often take the form of pure metals (or alloys), with oxides or chalcogenides, pnictides and carbides also showing promise. Harnessing solar and electrical energies in reactions mediated by base metal catalysts will ultimately lower the cost — both environmentally and economically — of renewables relative to fossil fuels.

Although the electrolysis of water has been known for two centuries, many other experiments conducted today would have been unimaginable even half a century ago. Among the most striking analytical technologies, scanning probe microscopy captures molecular landscapes at atomic resolution, enabling single atom manipulation with exceptional control. Tantalizingly, as detailed by Niko Pavliček and Leo Gross, microscopy allows the generation and characterization of so far unknown molecules, including elusive radicals and tautomers. Such species are not only involved in tip-induced

intramolecular reactions, but also in intermolecular processes that are undeniably more challenging to control.

Understanding intra- and intermolecular interactions is central to the study of chemistry. One phenomenon attracting interest of late is the considerable collective influence that weak interactions have on chemical systems. It is well known that London dispersion forces have key roles in macromolecular structure and function, but, as David Liptrot and Philip Power address in their Review, such forces also serve to stabilize smaller, otherwise fragile organic and organometallic assemblies. The same ligands used to protect and isolate reactive sites can contribute to these sites coming together, with the effects of London dispersion forces often being more significant than those of covalent interactions.

A discussion of dispersion interactions is particularly timely given the utility and pervasiveness of bulky ligands in modern catalysis. For example, bulky polydentate ligands feature prominently in the chemistry of actinides, with these large *f*-block ions having a propensity to undergo one-electron redox processes. Such behaviour contrasts that of the heavier *d*-block elements, and, as expounded upon by Polly Arnold and Zoë Turner in their Review, enables actinides to mediate the incorporation of carbon oxygenates both into fuels and fine chemicals. In addition to carbon monoxide and dioxide substrates, actinides also process lactones — renewable feedstocks whose ring opening affords biodegradable polymers.

This journal is, for us, a labour of love, a passion that we hope spreads to the wider chemistry community, whom we work both for and with. We welcome your feedback on our content and your suggestions for future topics. On behalf of our dedicated editorial, art and production staff we wish you — our valued authors, reviewers and readers — a very warm welcome to *Nature Reviews Chemistry*.