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Breaking bonds over many timescales: in celebration of Robin Perutz's 70th birthday

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It is a real pleasure and honour to act as guest editors for this special collection of papers in *Dalton Transactions* to celebrate the 70th birthday of Professor Robin Perutz. Robin is Professor of Inorganic Chemistry at the University of York and, over the course of his career, has been recognised with numerous awards, including both Tilden and Nyholm medals from the Royal Society of Chemistry. He was elected a Fellow of the Royal Society in 2010 and to a Fellowship of the American Association for the Advancement of Science in 2015.

Robin is a giant of mechanistic organometallic chemistry and, as commented by one of his former collaborators, 'perennially imaginative'. After graduating with a BA from the University of Cambridge in 1971, he worked for his PhD alongside Professor Jim Turner FRS, initially in Cambridge and then at the University of Newcastle upon Tyne. Utilising photochemical metal carbonyl dissociation in low temperature matrices, he produced seminal work on the interaction of $Cr(CO)_5$ with 'inert' matrix hosts, including CH_4 and Xe. His results provided the first examples of transition metal σ-complexes, a topic now covered in all modern day inorganic textbooks. His interactions with Turner, Martyn Poliakoff and Jeremy Burdett set the scene for a feature common to all of Robin's work and an approach he has instilled in many: that only through rigour and the application of a barrage of techniques can a chemical problem or a reaction mechanism be probed and fully understood. His ability to identify a problem and establish truly world-leading collaborations in order to address it continues to this day.

After post-doctoral work in Germany, and demonstrator positions in Edinburgh and Oxford, Robin moved to his home of 36 years, the University of York, in 1983. There he first developed a multi-technique approach of matrix isolation, laser flash photolysis and NMR spectroscopy to tackle the burgeoning field of C–H activation. Studies of $(\eta^5\text{-}C_5H_5)RhL$ (L = C_2H_4, PMe_3) complemented the international efforts of Bergman, Jones and Graham in North America. The search for an inert solvent in which to perform spectroscopic studies of C–H activation led to hexafluorobenzene (C_6F_6) and a demonstration that, far from being inert, this solvent was susceptible to carbon–fluorine bond activation. The connected fields of C–H and C–F activation have been a recurring theme in Robin's research since the late 1980s, alongside the coordination and activation of H–H, H–B and H–Si bonds. His photochemical studies on H–H addition followed by UV spectroscopy revealed just how fast the oxidative addition step can be. Together with Simon Duckett, he adapted an NMR probe for *in-situ* photochemistry within an NMR spectrometer to enable the low temperature characterisation of unstable species, such as σ-alkane complexes, in solution.

A sabbatical by Bill Jones in Robin's laboratory in 1989 underpinned an array of exciting developments that contributed to establishing the importance of η^2-arene interactions in C–H and C–F activation. In fact, his work on the evaluation of the energetics of activation provided a complete kinetic and thermodynamic picture of the oxidative addition of arenes. This concept of examining the role transient reaction intermediates play in defining chemical behaviour reflected an on-going theme in many studies since then. His work on the reactions of fluoropyridines and other heteroaromatics has provided routes to new fluoro-organic compounds formed from metal aryl fluoride complexes, while the discovery of transition metal-bifluoride (FHF) complexes formed by the release of HF added a further dimension.

Robin has always been a key advocate of the need to link experiment to theory. This may have started out by using simple force-field calculations to aid in the assignment of infrared bands of matrix isolated metal carbonyl species, but he soon recognised that as computing power grew, more advanced problems could be addressed. It is not surprising therefore that through collaboration with Odile Eisenstein (and others), he has produced insightful studies into bond activation that mean we can predict reactivity in metal systems that

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have not yet been prepared. Furthermore, his insight into catalysis was reflected in the development of the σ-complex assisted metathesis mechanism, or σ-CAM (developed with Sylviane Sabo-Etienne in Toulouse), which showed us how the existence of complexes with σ-bonds coordinated to a transition metal can facilitate metathesis.

Not satisfied with simple dissociative photochemistry, Robin has also contributed to the development of solar fuel cells by means of photo-induced electron transfer in supramolecular metal complexes. These studies have used light absorption to see photo-induced charge separation on picosecond and nanosecond timescales, to study ligand substitution at sites remote from the position of light absorption, and to investigate photocatalytic properties related to sustainable fuels.

When we set out as guest editors for this collection we wanted to acknowledge the very generous support that Robin has provided each of us over many years. We know that we are not unique in this regard, and that in addition to his array of impressive scholarly contributions, Robin has acted to nurture many researchers over his career. This has reflected a significant commitment that is further embodied in his work to support the Department of Chemistry at York (for example, as Head of Department from 2000 to 2004) and the wider University, the Royal Society of Chemistry and the Royal Society. Unsurprisingly, Robin has also played a major role in promoting women in science and served as a member of York's Athena SWAN group for many years. His contributions to obtaining their Athena SWAN Gold award cannot be underestimated. His active membership of the Royal Society's Diversity Committee and his support for disabled students in STEM subjects also need stating.

This *Dalton Transactions* collection includes a variety of contributions from friends and colleagues, whom we warmly thank for their willingness to participate in this enterprise. We are also very grateful for the support of the Editorial Board of *Dalton Transactions* in preparing this collection.

We share the opinion that Robin's passion for the subject is catching. He has always stood out as being a great role model for all of us and we wish him our heartfelt best wishes on his birthday.