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New Practical Methods For Synthesis

Over the past year we have continued our research programme here at Cardiff aimed at the development of new practical methods for synthesis with three guiding principles:

- Reactions should proceed at room temperature.
- Reactions should proceed in the presence of moisture and air.
- Catalysts/reagents should be bench stable and accessible in three or fewer synthetic steps.

Realisation of these goals will provide new bond-construction methods of broad utility which, most importantly, will be accessible to synthetic chemists' worldwide without the need for highly specialised equipment or techniques.

Our main advances this year has been within the area of Organocatalysis and the development of new methods for the formation of C–C, C–O, C–N and C–S bonds, the daily challenge of the synthetic organic chemist. Organocatalysis describes the acceleration of a chemical reaction through the addition of a sub-stoichiometric quantity of an organic compound which does not contain a metal atom. The interest in this field of research has increased spectacularly in the last few years due to the accordant potential for environmental, social, political and economic benefit. The ultimate aim of the work is to greatly simplify catalytic asymmetric synthetic transformations such that they can be carried out at room temperature in the presence of both moisture and air, thus greatly increasing both the accessibility and cost effectiveness of the chemistry.

Collaboration with the Swansea MS centre is essential to the progress of our research. The knowledge, experience and high-quality support provided underpins our efforts and allows publication in internationally respected peer reviewed journals, maximising the impact of the science. The fast, reliable service is a testimony to this centre of excellence and is indispensible for our continued progress.

We have defined the kinetics of iminium ion catalysed reactions (Angewandte Chemie, International Edition **2008**, *47*, 2820) and gone on to investigation the reactive conformation of the MacMillan imidazolidinone (Organic Letters **2009**, 133). Additionally, we have also found copper (Organic Letters **2008**, 797) and palladium (Organic Letters **2009**, 233) catalysed methods for the coupling of aryl halides with hydroxylamines and exploited the products in the formal C–H functionalisation of aromatic rings (European Journal of Organic Chemistry **2008**, 5135).