

Research Summary

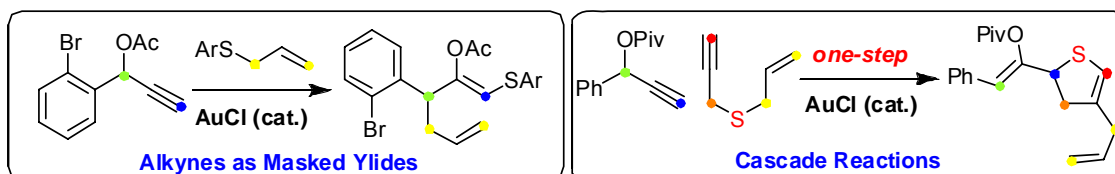
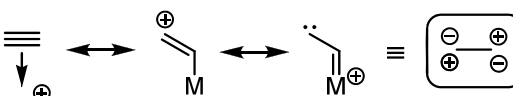
Dr Paul Davies

Our research activities are centered on transition-metal catalysis within synthetic organic chemistry. Much of our current focus is on gold and platinum catalysis, although there are also current projects in silver and palladium reactions.

The main objective of our research is to develop more effective synthetic routes that reduce the time, effort, cost and waste associated with the preparation of complex molecules. We aim to achieve this by developing novel transformations and new processes from simple, readily introduced functionality. During these studies we look to increase our understanding of both the limits of these processes and the key control factors.

Alkyne activation

The use of alkynes as reactive precursors for a wide range of different transformations is of particular interest to us. Alkynes are rendered electrophilic and can also display alkyldiene carbenoid reactivity when co-ordinated by a π -acidic metal template (such as gold or platinum salts).¹ This allows the simple unit to be employed as a densely reactive synthon for synthetic purposes without any need for leaving groups or prior pre-activation of the molecule.



All the reactions we have developed proceed under mild, functional group tolerant conditions and require only substrate, solvent and catalyst without additional reagents or sacrificial functionality.²

Available Projects

A variety of different projects are available to work under the general themes of catalysis in organic synthesis. For further information about any of these projects please contact Paul directly.

- Alkynes as masked ylides³
 - This project explores the rich chemistry of ylides using a novel activation of an alkyne thus avoiding the lengthy and often dangerous syntheses of the reaction precursors previously used in synthetic chemistry.
- Gold driven synthesis of biologically important natural products
 - This project will explore the synthesis of useful natural products using newly developed and novel gold reactions thus increasing synthetic efficiency and acting as a reaction development tool.
- Cascade reactions as a tool for advanced synthesis
 - Building on some of our preliminary results, novel cascade reactions triggered by gold catalysts will be employed to build up complex structures from simple starting materials in one step. Several new bonds are formed in a single reaction.
- Design and preparation of new gold catalysts
 - With the recent advance in gold catalysis, there is significant need for more active and recoverable catalysts species. This project will look at the preparation of such complexes and test their relative reactivity, longevity and applicability in a range of transformations.

¹ For a review see A. Fürstner,* P. W. Davies,* *Angew. Chem. Int. Ed.* **2007**, *46*, 3410-3449.

² For examples see A. Fürstner, P. W. Davies, *J. Am. Chem. Soc.* **2005**, *127*, 15024-15025; A. Fürstner, E. K. Heilmann, P. W. Davies, *Angew. Chem. Int. Ed.* **2007**, *46*, 4760-4763; A. Fürstner, P. W. Davies, T. Gress, *J. Am. Chem. Soc.* **2005**, *127*, 8245-8246.

³ For our preliminary publication on this subject P. W. Davies,* S. J.-C. Albrecht, *Chem. Commun.* **2008**, 238-240.