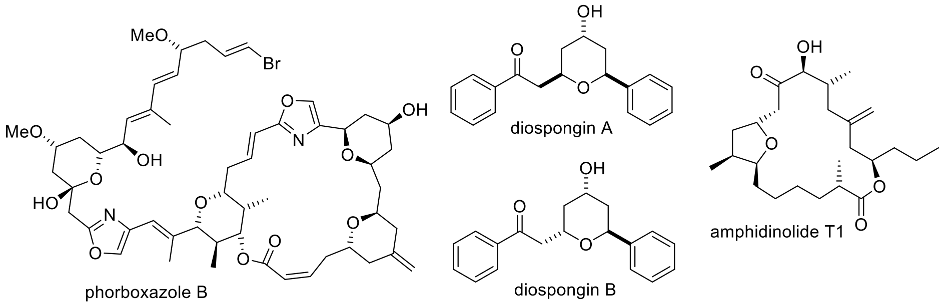
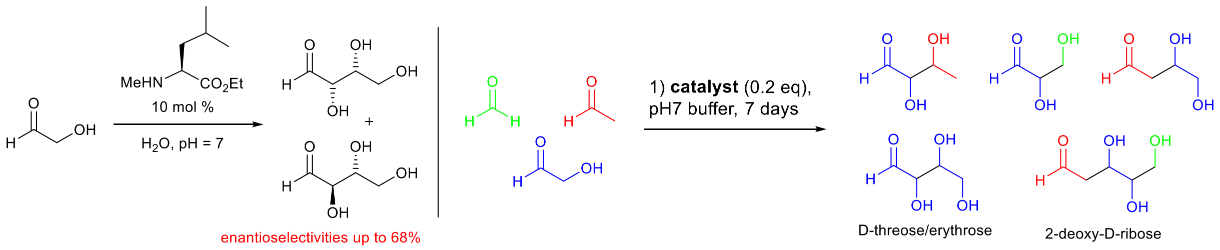
Dr. Paul A. Clarke

PhD and MSc Research Projects

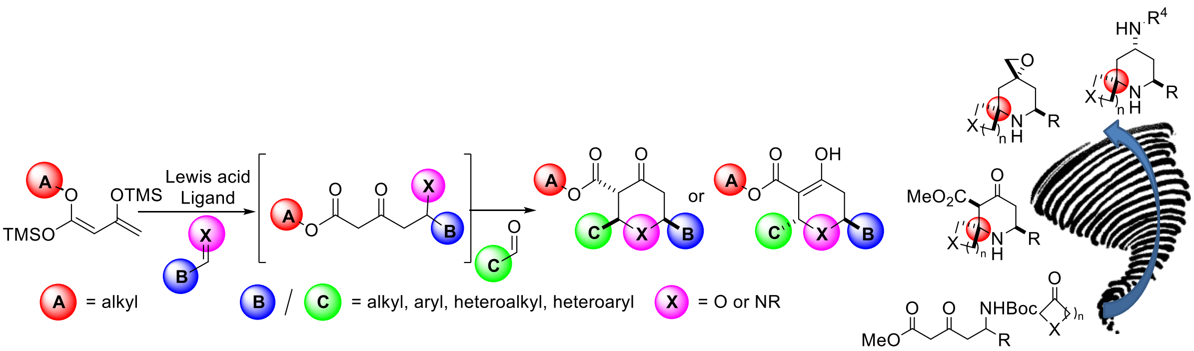
Cyclic Ether Natural Products: The group has been instrumental in the development of new methods of tetrahydropyran synthesis and their application to the total synthesis of natural products, like phorboxazole B and diospongin A and B. Current work in the group is focused on new Brønsted acid-catalysed asymmetric methods for the construction of 5- and 6-membered cyclic ethers, which are present in a large number of biologically active natural products. *Org. Lett.* **2011**, *13*, 624; *Org. Lett.* **2012**, *14*, 5550; *Org. Biomol. Chem.* **2015**, *13*, 4743; *Org. Biomol. Chem.* **2016**, *14*, 6840 and *Chem. Sci.* **2017**, *8*, 482.



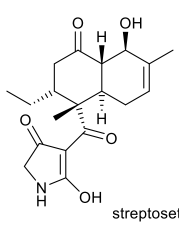
Prebiotic Genesis of Carbohydrates: We are attempting to answer one of the fundamental questions in science: how did the building blocks of life arise on the prebiotic Earth in enantiomerically enriched forms. Specifically, we are investigating the prebiotic genesis of carbohydrates. This exciting research has shown that it is possible to form threose and erythrose in the highest % e.e. to date, and 2-deoxy-D-ribose from interstellar building blocks. Studies are now focusing on the development of a "living protocell" capable of generating 2-deoxy-D-ribose, inorganic phosphate and glycolipids in a coupled process. *Chem. Comm.* **2010**, *46*, 4776; *Org. Biomol. Chem*. **2012**, 10, 1565; *Chem. Comm*. **2017**, *53*, 10362.



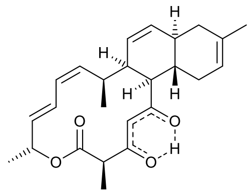
Synthesis of 3D-Heterocyclic Scaffolds: Over the last few years there has been a desire by the pharmaceutical industry for an increase in the availability of small molecules that occupy a more 3-dimensional area of chemical space. The Clarke group has been developing new variations of the aza-Maitland-Japp reaction for the synthesis of highly functionalised heterocyclic systems, especially 2-spiropiperidines and bridged-piperidines. *Org. Lett.* **2008**, *10*, 2877; *Curr. Org. Chem*. **2013**, *17*, 2025; *Chem. Eur. J.* **2017**, 23, 9262.



Carbocyclic Natural Products: The group is also interested in the synthesis of polycyclic (decalin-containing) natural products such as streptosetin A and anthracimycin. These molecules have biological activity against cancer and MRSA resistant bacteria respectively. Key stereochemical relationships are constructed by use of Diels-Alder and Sakurai reactions.



streptosetin A



anthracimycin

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