Organic Synthesis Research Group at VUW

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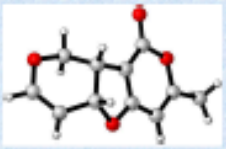
Current Team: Dr Hemi Cumming, Kalpani Somarathne, Jingjing Wang, Thomas Bevan, Sophie Geyrhofer, Amira Brackovic, Loic Lassueur, Sarah Brown

We design and construct molecules for health!

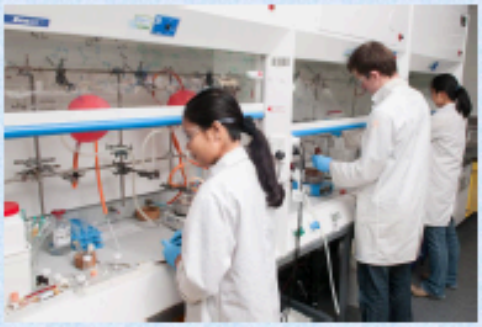


Key areas of interest:

Natural products synthesis – total synthesis provides access to bioactive compounds that are often available in only minute quantities from the natural sources; this may be useful for elucidation or confirmation of structure, stereochemistry and biological activity.

Analogue synthesis – preparation of compounds that are structurally related to natural products leads to novel materials that ideally have similar or better properties to the natural compounds.

Development of synthetic chemistry methodology – challenges in synthesis of target compounds lead to discovery and development of new methods or new applications of existing methods.



Research Competencies:

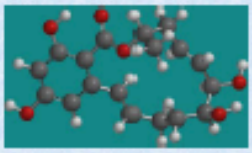
- Organic synthesis, organometallic chemistry, use of strained rings, macrocycle synthesis
- Design and synthesis of bioactive compounds for therapeutic applications
- Molecular modelling and study of docking to inform analogue design
- Retrosynthetic analysis
- Medicinal chemistry competency

Available Technologies/Equipment:

- PureSolv apparatus for high quality, dry solvents
- Microwave reactor for use in synthesis
- Inert atmosphere conditions using double manifold and balloon set-ups
- High-field NMR spectrometers, high-resolution ESI mass spectrometry, and other instrumentation for characterisation of new materials

Linkages:

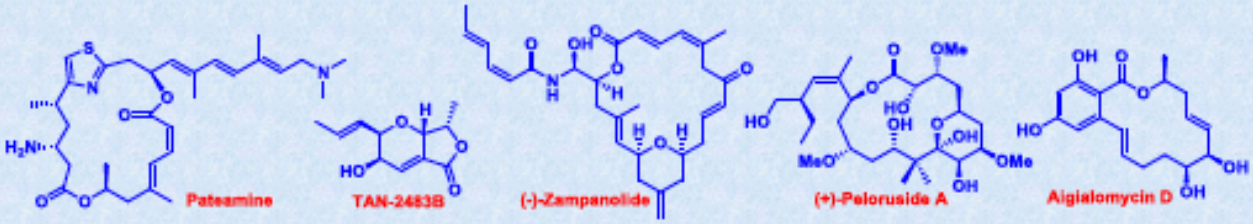
- We are part of the Maurice Wilkins CoRE, providing links to other NZ scientists working in molecular biodiscovery
- We are part of the Centre for Biodiscovery, a VUW Research Centre spanning the School of Biological Sciences, the School of Chemical and Physical Sciences, the Ferrier Institute and the Malaghan Institute, with strengths in chemical biology research
- We have active collaborations with scientists at international institutes

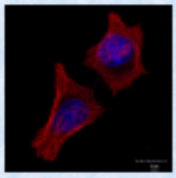


Current projects

Design and synthesis of bioactive natural product analogues

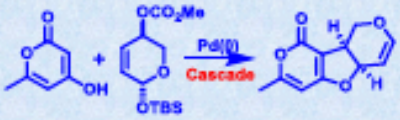
Secondary metabolites (natural products) have important biological activities, therapeutic potential and complex chemical structures. Structurally related analogues can be easier to prepare, can have greater activity or perform health functions more effectively. Synthesis of these large-ring compounds is challenging and requires considerable skill. We are currently working on the synthesis of the following natural products, and designed analogues based on them, as therapeutic drug leads:

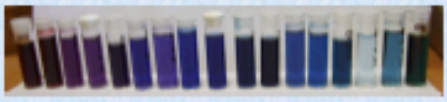


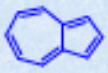


Development of new chemical methodology – the synthesis of challenging targets often requires new methods to be developed. In the process, we explore the new reaction methodology for scope and the bioactivity for potential applications

- Organometallic cascade reactions
- Azulene derivatives as colour-indicating tools for organic synthesis







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