RESEARCH SEMINAR ABSTRACTS
A LITTLE BIT OF STRAIN CAN BE GOOD FOR YOU:
GEM-DIHALOGENOCYCLOPROPANES AS BUILDING BLOCKS FOR
CHEMICAL SYNTHESIS

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ABSTRACT
The biologically natural and non-natural products shown below have been or are currently the
subject of synthetic studies in our laboratories. A common thread in all of these studies has
been the use of ring-fused cyclopropanes as precursors to the target molecules. This lecture
will attempt to highlight the benefits of using such precursors.

References
Chemistry, 2005, 9, 1589.
TOWARDS THE TOTAL SYNTHESIS OF COMPLEX NATURAL PRODUCTS

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ABSTRACT

Natural products are a continuing source of new pharmaceuticals, academic learning and student training and as such offer the synthetic organic chemist considerable adventure. For the past 6 years the Williams group have focused on studies towards the total synthesis of biologically active natural products so as to confirm structure and explore biological activity. The lecture will detail some of our work in the complex diterpene area (see figure below).

Figure 1

Acknowledgment: The author thanks the University of Queensland, The Australia Research Council and Queensland’s local biotechnology sector for continued financial support.
TOWARDS SELECTIVE CHEMOTHERAPEUTIC DRUGS: SMALL MOLECULE INHIBITORS OF THE PROTEIN Bcl-X_L

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ABSTRACT

The quest for new chemotherapeutics for the treatment of diseases is a continuing challenge to both synthetic and biological chemists. The event of high throughput screening has facilitated the process of identifying lead compounds from large compound libraries, both synthetic and natural in origin. This, in turn, has led to the identification of small molecule inhibitors which interact with validated targets and this constitutes the first step towards the development of selective chemotherapeutic drugs. One such validated biological target is the Bcl family of proteins. These proteins are anti-apoptotic proteins, i.e. proteins that prevent cells from undergoing apoptosis, a programme cell death. In damaged cells, including damaged cells resulting from cancer, apoptosis provides a mechanism in which these undesired cells can be removed. However many cancer cells can prevent apoptosis from occurring by overproducing the anti-apoptotic proteins such as Bcl2 and Bcl-X_L. One strategy for cancer chemotherapy is to target inhibitors of the anti-apoptotic proteins. This should enable the inactivation of these anti-apoptotic proteins and thus allow for the ‘normal’ removal of damaged cells through apoptosis. Recently, Yu et. al identified the natural product chelerythrine as an inhibitor of Bcl-X_L through high-throughput screening of natural products.¹ Preliminary investigations using NMR spectroscopy show that despite their structural similarity, chelerythrine and its homologue sanguinarine bind at different sites on the Bcl-X_L protein. In order to understand this further as well as to carry out a structure activity relationship study, a number of phenanthridines that are structurally related to chelerythrine and sanguinarine were synthesised. This presentation will outline some preliminary results of our study.

References

THE DEVELOPMENT OF NEW AGENTS FOR BORON NEUTRON CAPTURE THERAPY

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ABSTRACT

Boron Neutron Capture Therapy (BNCT) is an experimental cancer treatment that is currently undergoing Phase I/II clinical trials in several countries. The key aspect of the therapy is the interaction of slow (thermal) neutrons with $^{10}$B-containing agents that are localised within malignant cells. The resulting nuclear reactions involving the $^{10}$B nucleus ultimately lead to cell destruction owing to the production of high linear energy transfer (LET) particles that are accompanied by approximately 2.4 MeV of kinetic energy. The search for new classes of boronated agents with relevance to BNCT remains a major research objective.

A number of results have been obtained in our laboratory regarding the preparation and anticancer properties of novel platinum(II)-amine complexes (1), DNA metallointercalators (2), and cyclic RGD peptides (3), all of which have been tethered to a boron-rich dicarba-closo-dodecaborane(12) (carborane) moiety. We also have recently commenced studies of functionalised BN nanotubes. The key results of our work will be presented.
BINDING AND PATTERNING OF ORGANIC MOLECULES ON SILICON SURFACES

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ABSTRACT
Attaching functional organic layers to silicon surfaces is emerging as one of the promising approaches in the development of new semiconductor-based microelectronic devices and biosensors. It provides opportunities for incorporating molecular recognition, chirality, chemical/biological sensing, light emission/detection and lubrication for various technological needs. Recent systematic investigations on chemical reactions of organic molecules on silicon surfaces clearly demonstrated that both Si(100) and Si(111)-7×7 can act as reagent-like substrates with a high reactivity for covalent binding of different classes of organic functionalities. Reaction mechanisms including [2+2]-cycloaddition, [4+2]-cycloaddition, and dative-bonding addition have been revealed and will be discussed, providing a molecule-level understanding on reaction mechanisms, chemical and surface-site selectivities at organic/silicon hybrid interfaces. In addition, new approaches for fabricating organic nanopatterns using self-assembled templates on silicon surfaces will be introduced, which can be useful in growing organic nanomaterials for developing nano- or molecular-scale devices.
NOVEL $\pi^*-\pi^*$ INTERACTIONS IN SULFUR AND OXYGEN CHEMISTRY

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ABSTRACT

A novel type of chemical force, $\pi^*-\pi^*$ interaction, is essential to understand the molecular geometries of many sulfur- and oxygen-containing compounds, including the prism structure of S$_6$ [1], spiral cluster and cuboid structures of S$_8$ [2], and singlet open-chain isomers of S$_7$ [3], branched rings of binary sulfur oxides S$_n$O$_2$ [4-6]. The unusual molecular geometries can be understood in terms of the $\pi^*-\pi^*$ interaction between the $\pi^*$ orbitals of the two S=S (or S=O) moieties. The nature of chemical bonding in these sulfur and oxygen-containing compounds is probed by charge density analysis based on quantum theory of atoms in molecules. Remarkably, well-defined rhomboid O$_8$ ($D_{2h}$) molecules have been observed very recently in dark-red $\varepsilon$-O$_2$ phase of solid oxygen [7]. Theoretical calculations [8] have assisted in the further characterization and understanding of this surprising molecule. Again, the concept of $\pi^*-\pi^*$ bonding between open-shell species can explain the formation of O$_8$.

References

NANOSTRUCTURED MATERIALS USING SELF-ASSEMBLY AND MOLECULAR ENGINEERING APPROACHES

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ABSTRACT

Design and synthesis of novel supramolecular architectures is an interesting area of research in the last two decades. Intermolecular interactions assisted self-assembly of small building blocks play an important role in obtaining the desired shape and function of the supramolecular architectures. A combination of the classical covalent synthesis with the self-assembly assisted formation of well-defined architectures (noncovalent synthesis) allows us to develop novel multifunctional materials. Our approach in this area is focused on the design of novel molecular building blocks and the optimization of structure-property relationship of the materials using self-assembly approach. Moreover, we are interested in developing the self-assembly as a powerful tool towards the design and development of nanostructured materials. This presentation will focus on our recent efforts on design and synthesis of molecular building blocks for investigation of the self-assembly, formation of nanostructures, synthesis and fine-tuning the optical properties of novel conducting polymers.

Selected recent references from our group:


ABSTRACT
The study of function-specific materials is increasingly leading to novel compounds that have potential industrial and technological applications. For example, the drive for ever-more performant electronic devices over the last 10-15 years, resulted in the rapid transfer of technologies such as magneto-resistive and ferro-electric materials into consumer products of today. Meanwhile, chemists have continued to develop new processing techniques that permit truly novel materials to be synthesized, often with application-targeted functionality. The concurrent design and characterisation of these new materials, whether they be highly porous, have novel electronic or magnetic properties or be photo-active, for example, is a highly iterative process, relying upon the accurate determination of the physical properties of the resulting samples. At UNSW we aim to make use of neutron scattering techniques at the newly completed OPAL reactor to further elucidate the properties of many of the materials that we are developing, by providing a more complete characterisation. Making use of neutrons to probe technologically relevant materials has distinct advantages over other techniques, due to the inherent sensitivity to any magnetic moments or hydrogen within the sample and as a nondestructive, bulk technique. It is hoped that this approach may lead to new insights into the materials that will respond to many of the technological challenges that we continue to face, such as future energy needs, data storage and sustainability.
SONOCHEMICAL FORMATION OF NANOPARTICLES

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ABSTRACT

Sonochemistry owes its origins to the radicals produced from the collapse of microbubbles in a fluid exposed to ultrasound. In water the primary radicals produced are H and OH from the thermal homolysis of water vapour trapped within collapsing bubbles. Over the past ten years we have studied the details involved in sonochemistry with respect to using ultrasound mediated radical generation processes to produce nanoparticles in an aqueous solution. Metal particles, e.g., Au, Pt, etc, can be made by the reduction of their respective salts, by secondary radicals produced by adding specific solutes that scavenge the primary radicals. The secondary radicals are usually aliphatic alcohols but a number of other organic solutes have been investigated. We have also been able to produce metal sulfide nanoparticles and through an emulsion process, latex nanoparticles. The talk will illustrate some of the systems we have studied and present some of the mechanisms believed to be responsible for the production of nanoparticles via the sonochemical route.

References
1. F. Grieser et al., Ultrasonics 34, 547 (1996)
2. R. Caruso et al., Colloids & Surfaces 169, 219 (2000)
TOTAL ELECTRONIC ENERGY OF LARGE MOLECULES VIA FRAGMENTATION: TREATING NON-BONDDED INTERACTIONS

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ABSTRACT

Recently several methods have been developed to compute the total electronic energies of large molecules much faster and cheaper that ever before. These methods essentially achieve linear scaling in CPU time with the size of the molecule. These methods involve fragmentation of a target molecule into many smaller fragment molecules that are much more amenable to high-level quantum chemical methods. The fragmentation method has been shown to work very well for a wide variety of systems, but for those molecules with substantial non-bonding interactions the present fragmentation methods fail in accurately reproducing the electronic energy. In this talk I will introduce a method that overcomes this difficulty.
SINGLE NANOCRYSTAL SPECTROSCOPY

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ABSTRACT

This talk will provide an overview of our recent research into the spectroscopy and surface chemistry of single semiconductor and metal nanocrystals.

In the first part of the talk, we focus on the possibility to study the optical properties of single metal particles using dark-field microscopy. It is now possible to routinely collect the scattered light from single metal nanocrystals and use this to study the effects of particle size and shape on the surface plasmon (SP) resonances. We show that the linewidth and energy of the SP resonance is acutely sensitive to the particle end cap geometry, to the aspect ratio and to atomic roughness on the particle surface. We demonstrate that electron injection causes colour changes in single particles.

In the second part of the talk we discuss the phenomena of blinking and spectral diffusion in the luminescence collected from single semiconductor nanocrystals and its origins. We demonstrate that the Auger mechanism often postulated to account for blinking and spectral diffusion is inconsistent with observations. Instead we propose that surface recombination can account for many of the unusual effects observed. By passivating the crystals with thin shells of a second semiconductor, we find that we can completely passivate the crystal and produce an ideal two level system.

References

SCALABLE CONTROL OF SIZE, SHAPE, MORPHOLOGY, AND STRUCTURE OF NANOPARTICLES

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ABSTRACT

Spinning disc processing (SDP), is an instantaneously scalable, continuous flow and high throughput flash nano-fabrication technology. SDP can be applied to the fabrication of nanoparticles of organic molecules (including drugs), inorganic material (including metals), and composites. Previous use of SDP has focused on particles > 100 nm. We have developed SDP for generating truly nano-particles, ie particles < 100 nm, for a range of materials including \( \beta \)-carotene, fullerences, superparamagnetic magnetite, and metals. The work on silver nano-particles alone highlights the power and versatility of SDP. Nano-particles of silver can be prepared with remarkable control in size (5 – 200 nm), shape (spheroidal, acicular or agglomerate rosettes), surface characteristics, and phase (cubic versus hexagonal), along with imparting defects for particles > 10 nm diameters. The control is associated with changing the nature of the stabilising surfactant (starch, polyethylene glycol and poly(4-vinylpyridine)), the concentration of the reactants, and flow rates. Variation in surface features of the disc and temperature on the nature of the particles will also be presented.

The use of SDP in generating nano-particles is also of interest in incorporating green chemistry metrics into nano-technology at the inception rather than using the 20\textsuperscript{th} century approach of dealing with unforeseen negative impact issues at a later date. The use of SDP in fabricating nano-particles is a paradigm shift in developing nano-technologies which can address nano-toxicology issues, scalability, effluent treatment and hazardous work environment. SDP comes under the umbrella of process intensification whereby all molecules are exposed to the same conditions.

References

LOCAL CRYSTAL CHEMISTRY, INHERENT STRUCTURAL FLEXIBILITY AND THE CONSEQUENCES FOR MATERIALS CHEMISTRY

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ABSTRACT
There exist a wide range of inherently flexible crystalline materials exhibiting an equally wide range of useful physico-chemical properties (microporous molecular sieve materials, environmentally acceptable rare earth based pigments, low temperature melting, disordered Bi-based dielectric materials for use as microwave dielectric ceramics … etc.) whose crystal structures and functions are not describable in conventional 3-d crystallographic terms? Such inherent, local crystal chemical flexibility is not a nuisance that can be ignored but a fundamental structural characteristic. Until such inherent ‘disorder’/flexible ‘order’ is properly taken into consideration, the local crystal chemistry and physico-chemical properties of such materials can never be properly understood.

The above will be illustrated by application to a range of useful crystalline solid state materials including zeotypic, microporous aluminophosphates (transition metal doped AlPO₄-11’s, for example, are active, selective and stable catalysts for the skeletal isomerization of n–butene), ‘defect’ NaCl type rare earth sulfides which are excellent prospects for use as pigments in the paints and plastics industry (growing environmental restrictions as a result of the toxicity of ‘traditional’ transition and heavy metal inorganic pigments such as Cd(S,Se) mean that there is an ever-increasing need for new environmentally acceptable pigments) and Bi-based $A_2B_2O_7$ pyrochlore systems such as $(Bi_{1.5}Zn_{0.5})(Zn_{0.5}Nb_{1.5})O_7$, BZN, or $(Bi_{1.5}Zn_{0.5})(Nb_{0.5}Ti_{1.5})O_7$, BZNT. The latter have high dielectric constants, low dielectric losses and can be sintered at relatively low temperatures (~900°C). In addition, their dielectric constants can be tuned under the action of an applied electric field.
NEW DEVELOPMENTS IN GREEN CHEMISTRY

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ABSTRACT

The Centre for Green Chemistry at Monash University is a Special Research Centre funded by the Australian Research Council, utilizing custom-built research laboratories and state-of-the-art facilities. The Centre’s mission is to become a world leader for research, industrial collaboration and graduate training in several focused areas of green chemistry, and to harness this expertise to enhance the international competitiveness of Australian industry. Research is being undertaken in cleaner synthesis technology, green biotechnology and instrumentation development, including new approaches associated with the development of sustainable manufacturing processes. The outputs of the Centre include new molecules and materials, novel processes and advanced monitoring tools for use by the chemical, pharmaceutical and allied industries. The current research program of the Centre addresses inter alia the synthesis and use of novel macrocyclic and supramolecular compounds for use in industrial processes, the bioconversion of biomass/humic material, the development of new CO$_2$ sequestration and clean fuel/energy technologies, advanced electro- and photo-chemistry, the synthesis of pharmacological active “lead” compounds, and the development of other classes of chemical and biological products and processes that are required by the chemical, biotechnology, pharmaceutical, food, mining and other industry sectors.

In this presentation, vignettes will be provided on several projects currently underway in the Centre, documenting the pathway that has been followed from fundamental discovery to industrial application. Central to this work has been the overarching consideration of risk reduction ---- be it at the level of design, synthesis or application. Our objective is thus to achieve elegant solutions that lead to process and product development or refinement, which are energy efficient, and which fulfil their desired functional roles without generating hazards or waste. This nexus between practical elegance in design, synthesis and application represents a holistic whole-of-cycle approach that is used to guide these initiatives within the Monash Centre for Green Chemistry.

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CHALLENGES AND OPPORTUNITIES IN AQUATIC CHEMISTRY – AN OVERVIEW OF RESEARCH IN THE WATER STUDIES CENTRE AT MONASH UNIVERSITY

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ABSTRACT

This presentation will provide an overview of the current research activities and future opportunities in the Water Studies Centre.

The WSC was established in 1976 and its mission is to generate and exchange scientific knowledge to underpin the effective management of waterways. Although focused on Australia, considerable collaborative work has been, and is being done in Asia (mainly PNG, Thailand, Laos, Cambodia, Vietnam and Indonesia) and southern Africa. The WSC achieves this mission through its strategic and contract research program, its postgraduate training program and a program of knowledge exchange.

There are four major research themes within the WSC:

- **Biogeochemistry**
  This theme, under the direction of Dr Mike Grace, investigates the environmental chemistry associated with the speciation and movement of nutrients, metals and contaminants in the aquatic environment and links transformation processes, which are often microbially mediated, to the ecological functioning of the aquatic ecosystem.

- **Real-time instrumentation**
  Associate Professor Ian McKelvie’s research is focused on developing new analytical methodologies, based on Flow Injection Analysis, for real-time monitoring of chemicals of environmental concern including nitrate, ammonia, phosphorus (phosphate and organic P species), pesticides and alkalinity.

- **Urban research**
  Despite the fact that much environmental degradation of waterways is caused by urbanization, there is very little study of urban aquatic systems. Dr Chris Walsh is a world leader in urban aquatic ecology. Although primarily biological in outlook, this research complements the other activities in the WSC.

- **Ecological risk assessment (ERA)**
  A key component of better management of waterways is a transparent, objective decision-making framework. The ERA program under the leadership of Professor Barry Hart and Dr Mike Grace examines a wide range of aquatic management problems e.g. contaminants in waterways, optimizing denitrification for Nitrogen removal in urban systems, environmental flow allocations, water resource issues in developing countries (e.g. the Solomon Islands) and combines environmental chemistry, biology, modeling & simulation with stakeholder interactions and social science.
NEW BENZOPHENONE DIMERS WITH ACTIVITY AGAINST MRSA
FROM THE FUNGUS CHAETOPHOMA SP.

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ABSTRACT

A series of new benzophenone dimers were isolated from the fungus Chaetophoma sp., which was collected from lake sediment in Singapore, using bioassay-guided isolation against methicillin-resistant Staphylococcus aureus (MRSA). The most potent member of this new antibacterial series had an MIC of 1 µM against MRSA, showed broad spectrum activity against other Gram-positive bacteria, weak activity against Gram-negative bacteria and had IC$_{50}$ values of 10-20 µM against mammalian cell lines. The structure elucidation and biological activities of these compounds, along with an introduction to MerLion Pharmaceuticals, will be discussed.
REACTION MECHANISM OF METALLOENZYME-CATALYZED HYDROLYSIS

GERHARD SCHENK, Eleanor Leung, Sarah Smith, Fernanda Ely, Kieran Hadler, Paul Herrald, Andrew Dick, Tristan Elliott, Rebecca Buchholz, Robyn Aston, Chris Noble, Mark Riley, Nataša Mitić, Lawrence Gahan, Luke Guddat

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ABSTRACT

Binuclear metallohydrolases are a ubiquitous group of enzymes, distributed across the animal, plant and fungal kingdoms. Many of these enzymes are implicated in the course of diseases, and have been the focus of study in bio(inorganic) and medicinal chemistry, molecular and structural biology, with significant recent emphasis being placed on the development of new pathogen resistant drugs. Reaction mechanisms proposed for metallohydrolases are yet to comprehensively describe the molecular details of catalysis. The fundamental aspects of catalysis are subject of this study and are of profound interest, with outcomes applicable to the broad interdisciplinary chemical and biological sciences.

Selected references from our group

SYNTHESIS AND BIOLOGICAL EVALUATION OF MALEIMIDE AND MALEIC ANHYDRIDE NATURAL PRODUCTS OF *ANTRODIA CAMPHORATA*

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**ABSTRACT**

A traditional Taiwanese tribal medicine extracted from the fruiting body of the mushroom *Antrodia camphorata* used for the treatment of liver cancer and inflammation has recently been brought to the attention of the research community.\(^1\)\(^2\) The *Antrodia camphorata* extract has revealed many compounds however, those bearing a maleimide and maleic anhydride carbocyclic backbone, 1 and 2, are of particular interest because of their activity against Lewis lung carcinoma cell lines.

This presentation will focus on the synthesis of both these new compounds through Suzuki and Negishi palladium mediated C-C cross coupling reactions.

**References**

THE “CATALOMICS” OF MATRIX METALLOPROTEASES

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ABSTRACT
Enzymes are arguably the most important class of proteins, practically involved in every biological process in the cellular machinery. Many classes of enzymes, e.g. proteases, kinases and phosphatases, are linked to a variety of diseases. We are interested in what is called “Catalomics” - the large-scale study of enzymes (and, in future, other catalytic molecules at the organism scale) by using a variety of chemical approaches developed both in our own laboratories and by others. Research in all aspects of enzymes are currently being pursued, ranging from the development if novel techniques for potential high-throughput identifications of enzymes, the detailed studies of enzyme reactions and kinetics, as well the way by which enzymes work inside a living organism, to the design, synthesis and screening of biologically interesting molecules which may module (e.g. activate or inhibit) enzyme activities. The ultimate aim of our research is to develop potential enzyme-targeting, drug candidates that help in the cure of major human diseases.

In this presentation, I will discuss our recent efforts in the study of one key class of enzymes – Matrix Metalloproteases (MMPs), with a specific focus in the following areas: (1) diversity-oriented synthesis of hydroxamate-containing warheads for potential generation of small-molecule MMP inhibitors; (2) high-throughput inhibitor fingerprinting of MMPs using small molecule microarray; (3) “click chemistry” for rapid generation of small molecule MMP inhibitors; and (4) activity-based fingerprinting of MMPs.
NEW IDEAS IN TREATING MAJOR TROPICAL DISEASES

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ABSTRACT

Schistosomiasis is one of the most burdensome of the neglected tropical diseases, infecting over 200 million people, mainly in sub-Saharan Africa. 1 Praziquantel (PZQ) remains the drug of choice for the treatment of this disease. PZQ’s high efficacy and low cost make it highly successful, but with the massive recent increase in use (as a result of Gates Foundation funding) comes the inevitability of increased resistance or tolerance. There are still no realistic back-ups or alternative drugs for the widespread treatment of schistosomiasis. We have demonstrated a novel chemical synthesis of praziquantel, 2 as well as its synthesis on a solid support, a powerful strategy in the synthesis of chemical libraries. 3 For rational drug design knowledge of the in vivo target of the drug is required, and we describe our first experiments in this direction. PZQ presents an interesting synthetic challenge on the large scale, in that only one enantiomer is effective. Preliminary results on the enantioselective synthesis of PZQ are discussed. Finally, very recent developments to facilitate biomedical research of this kind with an online Open Source model are outlined. 4

References

TARGETING CHEMICAL COMMUNICATION IN BACTERIA

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ABSTRACT

The emergence of multi-drug resistance in common human pathogens has highlighted the need to identify new anti-microbials and moreover, the need to develop novel classes of antimicrobials for the treatment of human disease. It is now increasingly apparent that many bacteria control the expression of virulence factors in a density-dependent fashion and coordinate this behaviour through the use of chemical cues or signals in processes known as microbial cell-cell signalling. We have recently demonstrated that fimbrolides, 3-butyl-4-halo-5-halomethylene-2(5H)-furanones, a class of marine natural products isolated from the red marine algae \textit{Delisea pulchra} can be used in an animal model of \textit{P. aeruginosa} lung infection and lead to a 3 log reduction in the number of bacteria in the lungs of infected mice [1]. Our efforts to develop novel antagonists of bacterial signalling pathways based on 3-butyl-4-halo-5-halomethylene-2(5H)-furanones will be highlighted. A new class of peptide mimetics derived from N-acylisatins will also be discussed.

References

SCHOOL
OVERVIEW
SUMMARIES
OVERVIEW OF THE UNIVERSITY OF MELBOURNE SCHOOL OF CHEMISTRY

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ABSTRACT

The School of Chemistry at the University of Melbourne is one of the largest and oldest in Australia – the first lectures in Chemistry were given in 1856 soon after the University was founded. The School currently has over 3000 individual undergraduate subject enrolments, with teaching staff of approximately 30 and a similar number of research-only and administrative and technical support personnel. In 2006 there are 120 students involved directly in research projects through PhD, MSc and BSc (Honours) programs.

The School has received recognition for its innovative teaching programs, including its interactive on-line ChemCAL™ resources, and has a strong record of success in securing external research grant funding support with staff involvement in several national research Centres of Excellence. Recent activities of the School include its role as a core participant in the new Bio21 Institute of Molecular Science and Biotechnology. A number of chemistry research groups are located in new laboratories in this A$100 million multidisciplinary research building that opened in 2005. The School is also a founding member of the Victorian Institute for Chemical Sciences (along with Chemistry departments at Monash University and RMIT) established with the assistance of the Victorian State Government to undertake collaborative chemistry research and teaching programs.

Further information about the research and teaching activities of the School of Chemistry at the University of Melbourne can be found at http://www.chemistry.unimelb.edu.au/
CHEMISTRY AT THE UNIVERSITY OF NEW SOUTH WALES

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ABSTRACT

The School of Chemistry moves into a new era with the completion of its new laboratories and a totally refurbished teaching and office building. This is the culmination of over 2 years of design and construction work.

At a cost of around $A 50 million the state of the art experimental building contains 114 fumehoods and large flexible research and teaching laboratories spread over 3 floors. A dedicated basement and ground floor houses an extensive suite of instrumentation including NMR, Electron Microscopy and Surface Analysis.

The new Chemical Sciences precinct will incorporate Chemistry activities from both the School of Chemistry, Chemical Engineering and Industrial Chemistry groups in Engineering.
CHEMISTRY AT THE UNIVERSITY OF QUEENSLAND

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ABSTRACT

School of Molecular and Microbial Sciences
Chemistry research strengths and highlights:
Synthetic, Biological, Pharmaceutical, Marine, Materials, Polymer, Surface, Computational,
Reactive Intermediates, Spectroscopy

Centres within Chemistry:
Brisbane Surface Analysis Centre,
Centre for Metals in Biology,
Centre for Computational Molecular Science

The other programs in the School:
Biochemistry and molecular biology
Microbiology and parasitology (incl. virology and immunology)

University Institutes:
Institute for Molecular Biology
Australian Institute for Bio-engineering and Nanomaterials
Queensland Brain Institute
Centre for Immunology and Cancer research
Queensland Institute of Medical research