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This booklet is intended to provide an overview of the research activities within the School of Chemistry and to give you an indication of the Honours projects that will be offered in 2015. You are encouraged to study these and to speak with the research supervisors. This research project makes up 75% of the final mark for the Honours year, with the other 25% from the coursework component which runs in first semester.

Current third year students are eligible to do Chemistry Honours (Clayton) in 2015 provided that they fulfil the entry requirements and that a supervisor is available. Students will be allocated to supervisors and projects on the basis of their third year results and their preferred projects. Great care is taken to ensure that all students are treated equitably and where possible that they are be allocated to the area and supervisor of their choice.

All Honours candidates must discuss prospective projects with at least four supervisors before choosing their preferred project. They should then select at least three potential supervisors and projects in order of preference. The application forms – one for Honours entry which is from the Faculty of Science, the other is the project nomination form which is from the School of Chemistry – are both available on the School of Chemistry web page.

Please note that the project descriptions are quite short, and more comprehensive details can be obtained when speaking to supervisors.

We look forward to seeing you in the Honours course next year. Please contact me if you have any questions about the Honours year!

Assoc. Prof Mike Grace
Honours Coordinator
(Room G25c/19 School of Chemistry, 9905 4078, email: mike.grace@monash.edu)
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at: http://monash.edu/science/about/schools/chemistry/staff/Andrews.html

1. **Development of new bismuth-based anti-Leishmanial drugs**  
*with Dr Lukasz Kedzierski, Walter and Eliza Hall Medical Research Institute*

Leishmaniasis is a parasitic infection prevalent in the developing world. Current frontline drugs are based on Sb(V) compounds which show severe side-effects and for which resistance has begun to appear. This project focuses on developing and testing new bismuth compounds as more active and less toxic alternatives. **Read more:** Dalton Trans., 2014, 43, 12904 – 12916.

2. **Targeting Helicobacter pylori: overcoming antibacterial resistance with bismuth drugs**  
*with A/Prof Richard Ferrera, Monash Institute for Medical Research*

*H. pylori* is the bacterium responsible for gastritis, duodenal and peptic ulcers and stomach cancers. This project focuses on the synthesis of novel bismuth compounds which are highly active against the bacterium, and investigating their mode of action. **Read more:** Chem. Eur. J., 2013, 19, 5264 – 5275.

3. **Bismuth-Precursors for antimicrobial organic-inorganic hybrid materials**  
*with Prof. Michael Mehring at Technical Universität Chemnitz*

This project investigates the formation of novel bismuth(III) complexes which have high antimicrobial activity and their incorporation into functionalized polymeric frameworks. The antimicrobial activities of the new materials and their potential as ‘clean surfaces’ will be assessed. **Read more:** Eur. J. Inorg. Chem., 2014, 4218 - 4227.

4. **Tackling multi-resistant bacteria with metal complexes (Bi vs Fe vs Ga)**  
*with Prof. Ross Coppel and Dr. Paul Crellin, Dept of Microbiology*

In tackling the continued growth in multi-resistant bacteria and the increasing rate of antibiotic resistance, this project focuses on the development of bismuth(III) compounds which show high activities against common and resistant strains of bacteria (eg MRSA, VRE). **Read more:** Chem. Eur. J., 2014, DOI: 10.1002/chem.201404109.

5. **Development, efficacy and mode of action of new bismuth anti-cancer drugs**  
*with Dr. Carolyn Dillon, University of Wollongong*

The aims of this project are the synthesis of bismuth complexes with increased potency towards ovarian and bowel cancer cells, and identifying promising candidates for animal testing using chemical stability monitoring and cell culture screening. **Read more:** J. Inorg. Biochem., 2014, 135, 28–39.

6. **Targeting Novel Chiral Heterobimetallic and Metalallocyclic Main Group Complexes**  
*with Dr. Victoria Blair*

This project investigates the synthesis and full characterization of novel chiral hetero-di-anionic and hetero-bimetallic complexes of alkali metal, and d or p-block elements (Zn, Cu, Al, Ga, In, Sn, Sb). The second part will utilise dilithiated chiral allylamides as precursors to a new and unique family of chiral hetero-di-anionic metalloccycles. Requires inert atmosphere handling techniques. **Read more:** Organometallics, 2012, 31, 8135–8144.
Coordination Polymers and Supramolecules

We are designing and making coordination polymers (sometimes also known as metal-organic frameworks, or MOFs) and supramolecular species for a variety of interesting applications, including adsorption of gases such as hydrogen (for hydrogen fuelled cars) and carbon dioxide (greenhouse gas capture), long or short range magnetic ordering, molecular switching (for information storage or molecular sensing), and as new materials for molecular separations. We are pursuing a number of approaches to this, including:

• New classes of bridging ligands in which the bridging length can be controlled by the presence or nature of e.g. group I or II metals (Chem. Commun., 2009, 5579).
• Large (3 nm in diameter) spherical supramolecules (or ‘nanoballs’) (Angew. Chem. Int. Ed. 2009, 48, 2549 & 8919; ChemPlusChem 2012, 77, 616) which show a large variety of properties. For example, they can switch between two magnetic spin states. The change may be induced by change in temperature or, as a series of experiments in Bordeaux, France showed, irradiation of light. The molecular packing also creates cavities within the solid state, and thus the crystals will readily absorb solvent vapours, hydrogen, and CO2. Finally, the nanoballs also show catalytic activity.
• Incorporation of amine groups into porous MOFs in order to increase the selectivity of CO2 sorption over other gases, such as N2. This is part of a large multi-institutional program focussed on developing MOFs for “real world” CO2 capture.
• Porous MOFs for the chromatographic separation of molecules based on size, chirality or other chemical features. Surprisingly little work has been done in this field, and we are currently exploring this potential in depth (Chem. Commun. 2014, 50, 3735).

Chemistry of Small Cyano Anions

We have been investigating the chemistry of small cyano anions (Chem. Commun. 2011, 47, 10189). They have shown some remarkable chemistry, including the synthesis of a large range of transition metal and/or lanthanoid clusters which may have applications as single molecule magnets, interesting new coordination polymers and discrete complexes showing unusual packing motifs and ligand binding modes, new hydrogen bonding solid state networks, nucleophilic addition of alcohols and amines across the nitrile groups to give new anion families, and the production of ionic liquids containing either the free anions or even metal complexes of the anions. The versatility and range of applications of these simple anions is unprecedented.
My group undertakes applied chemistry research on topics that are, in some way, related to biomass and fossil fuel utilization. For example, new approaches to the preparation of industrial chemicals, specialty liquid fuels (eg, jet fuel), road bitumen, coke for steel making, and specialist high surface area active carbons are being developed in ways that minimize energy losses (and, hence, CO₂ emissions). The group also investigates the capture of CO₂ emissions by adsorption and, once captured, its transformation back into useful products by heterogeneous catalysis. In doing so, innovative new materials such as mesoporous silicas, metal organic frameworks (MOFs) and ionic liquids (ILs) are employed as adsorbents, catalysts and/or solvents. These novel materials are often sourced from other research groups within the School. Molecular modeling tools are also frequently applied in these studies, so that experiment and theory inform each other. Some potential projects for 2015 are identified below.

More information on my research can be found at:  
http://monash.edu/science/about/schools/chemistry/staff/CHAFFEE.html  

**Turning Carbon Dioxide into Fuel**

Waste CO₂, when combined with ‘renewable H₂’ (eg, from photovoltaic water splitting) over appropriate catalysts, leads to reduced C₁ products (eg, formaldehyde or methanol). Methanol can be used directly as fuel in petrol engines or be dehydrated to dimethylether, a diesel fuel substitute. Nanoparticulate catalysts of varying metal cluster size, supported on high surface area mesoporous substrates, will be investigated to determine structure-activity relationships.

**Chemicals from Biomass (with Dr Emma Qi)**

This project will make use of CO₂, both as a supercritical fluid in its own right and as one component of a novel series of recyclable ionic liquids (known as DIMCARBs) to selectively extract discrete chemical classes (phenols, carboxylic acids, aliphatic or aromatic hydrocarbons, depending on the conditions used) from various forms of biomass and/or coal. With biomass, this approach offers a renewable alternative to deriving these fundamental chemical feedstocks that are now mostly supplied from the petroleum industry.

**Capturing Carbon Dioxide from Air (with Dr Greg Knowles)**

Prior work in the group has identified amine-based adsorbents that have the ability to reversibly capture and release CO₂ at concentrations (~15 wt%) and temperatures typical of the flue gas from power stations. Another approach to controlling CO₂ in the atmosphere could be to adsorb it directly from air at atmospheric concentration (~400 ppm). This project will prepare and evaluate new adsorbent formulations for this purpose involving high surface area mesoporous silica as a support material.
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at:
http://monash.edu/science/about/schools/chemistry

**Development of Green and Sustainable Catalytic Strategies For Natural Products Synthesis and Drug Discovery**

Works in our laboratory are focused on the development of operationally straightforward and practical synthetic strategies for complex molecule formation that follows the principles of environmental sustainability and which is of broad utility to synthetic organic chemistry. In particular, we are interested in the design of stereoselective multiple bond forming synthetic methods that can be achieved under mild conditions with ecologically benign catalysts and significantly minimize and/or eliminate the consumption of a variety of material and energy resources as well as the production of chemical waste. We are also interested in the application of these novel catalytic methodologies to the construction of bioactive natural products and as practical synthetic tools for the assembly of complex molecules of current biological and materials interest. For example, we recently established a method to prepare 2,4a-dihydro-1H-fluorenes efficiently from gold(I)-catalyzed 1,2-acyloxy migration/cyclopropenation/Nazarov cyclization of 1,6-diyne carbonates and esters (Scheme 1a, Rao, W.; Koh, M. J.; Li, D.; Hirao, H.; Chan, P. W. H. *J. Am. Chem. Soc.* 2013, 135, 7926). The suggested reaction pathway provided rare examples of [2,3]-sigmatropic rearrangement in this class of compounds as well as the involvement of an in situ formed cyclopropene intermediate in gold catalysis. We also recently developed a method to prepare α-acyl-β-amino acid and 2,2-diacyl aziridine derivatives efficiently from Cu(OTf)₂ + 1,10-phenanthroline-catalyzed amination and aziridination of 2-alkyl substituted 1,3-dicarbonyl compounds with PhI=NTs (Scheme 1b, Ton, T. M. U.; Tejo, C.; Tiong, D. L. Y.; Chan, P. W. H. *J. Am. Chem. Soc.* 2012, 134, 7344). By taking advantage of the orthogonal modes of reactivity of the substrate through slight modification of the reaction conditions, control in the divergence of product selectivity was realized.

**Scheme 1.** Green and sustainable synthetic strategies for preparing (a) α-acyl-β-amino acid and 2,2-diacyl aziridine derivatives, and (b) 2,4a-dihydro-1H-fluorenes
Since the industrial revolution we have doubled the rate at which bioavailable nitrogen enters the biosphere. My research looks at what happens to this nitrogen.

**The role of cable bacteria in the nitrogen cycle**

In 2012, a new form of life was discovered that can oxidise hydrogen sulfide (eq 1) and transport electrons to the sediment surface where oxygen is reduced to water (eq 2).

\[
\begin{align*}
\text{H}_2\text{S} + 4\text{H}_2\text{O} & \rightarrow \text{SO}_4^{2-} + 10\text{H}^+ + 8\text{e}^- \quad \text{(eq 1)} \\
4\text{H}^+ + 4\text{e}^- + \text{O}_2 & \rightarrow 2\text{H}_2\text{O} \quad \text{(eq 2)}
\end{align*}
\]

We have found these organisms in the Yarra River and believe they also play a role in the nitrogen cycle. The liberation of protons associated with the oxidation of hydrogen sulfide leads to the liberation of Fe^{2+} (eq 3) which diffuses to the sediment surface and are oxidized by nitrate, which in turn is reduced to ammonium (eq 4).

\[
\begin{align*}
\text{FeS} + 2\text{H}^+ & \rightarrow \text{Fe}^{2+} + \text{H}_2\text{S} \quad \text{(eq 3)} \\
8\text{Fe}^{2+} + \text{NO}_3^- + 10\text{H}^+ & \rightarrow 8\text{Fe}^{3+} + \text{NH}_4^+ + 3\text{H}_2\text{O} \quad \text{(eq 4)}
\end{align*}
\]

This project will study the factors mediating this reaction, and we postulate that intermediated oxidation state iron oxides may play a role in this process.

*Figure 1 shows sediment colonized by cable bacteria. Oxidation of hydrogen sulfide (grey zone) leads to the dissolution of iron monosulfides (black zone) liberating Fe^{2+} where it diffuses to the sediment surface and is oxidized forming an orange iron oxydroxide layer at the sediment surface.*

**The role of worms in the nitrogen cycle**

Worms have a major effect on oxygen distribution and nutrient cycling in the sediment through the creation and ventilation of extensive burrow networks (Fig 2). This enhances processes such as denitrification, which remove bioavailable nitrogen from the biosphere. This project will investigate the rates and of nitrogen removal in sediments colonized by polychaete worms in the Gippsland Lakes. We postulate nitrogen removal is linked to iron oxidation.

*Figure 2. Show the oxygen distribution associated with a polychaete burrow network*
Rare earth elements (Group 3-Sc, Y, La and the lanthanoids Ce - Lu)

Rare earths are currently seen as the strategic materials of the 21st century, with considerable international concern over the Chinese domination of the supply of separated elements. Our group provides fundamental knowledge to underpin industrial developments in the area. Australia has abundant rare earth resources which have been mainly neglected despite their widespread uses, e.g. ceramic supports for exhaust emission catalysts, alloy magnets in all car engines, and catalysts for artificial rubber production. Potential applications include green corrosion inhibitors (below). Their metal-organic chemistry is a major new frontier and is generating great excitement, for example in the discovery of new oxidation states. We are particularly interested in high reactivity rare earth organometallics (Ln-C), organoamides (Ln-NR₂) and aryloxides (Ln-OAr), and have developed unique synthetic methods to obtain them. Features of these compounds include low coordination numbers and extraordinary reactivity. To prepare and structurally characterize the compounds represents a major challenge. The program involves extensive international collaboration. Some specific projects follow:

1. Heterobimetallic complexes (with Prof. Peter Junk (JCU) and Dr David Turner)
2. phosphido lanthanoid complexes – a bridge to unusual oxidation states (with Dr A. Stasch and Prof. Peter Junk (JCU))
3. New Approaches to Metal-Based Syntheses (with Prof. Peter Junk (JCU) and Dr David Turner)
4. Green Corrosion Inhibitors (with Prof. Peter Junk (JCU), Dr David Turner and Prof. Maria Forsyth (Deakin University))
5. New Materials Derived from Small Cyano Anions (with Prof. Stuart Batten)
6. Platinum Anti-Cancer Drugs (with Prof. Alan Bond, A/Prof Bayden Wood)

Novel recent structures

Some recent papers

Dr Alison Funston  
*Room No. G32B, Tel: 9905 6292, email: alison.funston@monash.edu*

This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at:  
[http://monash.edu/science/about/schools/chemistry/staff/funston.html](http://monash.edu/science/about/schools/chemistry/staff/funston.html)  

**Description of Project Areas**

When matter is divided into tiny, tiny particles, that is, into particles (or crystals) with dimensions in the nanometer size regime (1 nm = $1 \times 10^{-9}$ m), their physical properties can change. Our research is interested in the changes to the optical properties, or colour, of the resultant nanoparticles. For example, very tiny spheres made up of only 1000’s of gold atoms appear red. The colour is due to a phenomenon known as the localized surface plasmon resonance. There are many ways in which the colours of nanoparticles can either change or be controlled. These include:

- Changing the size or shape of the crystal
- Changing the environment of the crystal
- Bringing two or more nanocrystals into close proximity

These properties give the nanocrystals potential applications in nanoscale energy transfer (with metal nanocrystals acting as nanoscale optical fibres), sensing, colour responsive coatings for glass, solar photovoltaics and in medicine in the areas of drug delivery and cancer therapies.

Our research group synthesizes and investigates the optical properties of nanocrystals of the desired size and shape. We work mainly with metal nanocrystals, including gold and silver, but also some semiconductor quantum dots. In the area of nanocrystal synthesis, we have research programs investigating the mechanism of growth of the nanocrystals. These are combined with high-resolution transmission electron microscopy (TEM) and scanning electron microscopy (SEM). We aim to controllably assemble nanoparticles using chemical linkers (including DNA) into superstructures and understand the resultant assembly fundamental optical properties. Via the use of dark-field microscopy it is possible to detect and determine the optical properties of both single nanoparticles and single nanoparticle superstructures.

**Potential honours project titles include:**

*The Growth Mechanism of Gold Nanocubes and Nanobars (Nanoscale Gold Bullion Bars!)*  
*Metal Nanoparticles and Nanowires as Nanoscale Optical Fibres*  
*Changing the Colour of Nanoparticles: Nanoparticle Coupling*  
*Nanocrystal Sensors: Real-time Drug Transportation into Cells*  
*How does the Atomic Level Nanoparticle Shape Effect the Nanoparticle Colour?*  
*Fluorescent Polymer:Nanocrystal Hybrids for Solar Photovoltaics*
Assoc. Professor Mike Grace  
Room G25c (Water Studies Centre), Tel: 9905 4078, email: michael.grace@monash.edu

These projects can be modified to suit the interests of the student – from physical, analytical and/or environmental chemistry and biogeochemistry through to aquatic and/or restoration ecology. A project is available for students who wish to combine synthetic and environmental chemistry.

**Assessing the impacts of pharmaceuticals on aquatic ecosystems**

Awareness of the effects of common pharmaceuticals on organisms (insects, fish) living in streams and lakes has slowly emerged over the last decade. Despite their prevalence in urban waterways, there has been almost no published research on how these pharmaceuticals can affect rates of fundamental ecosystem processes. Work in our group has shown that some of these chemicals can have dramatic effects. This project will use novel pharmaceutical diffusing substrates and bioassay techniques to investigate effects of common drugs like antibiotics, mood modifiers, painkillers and antihistamines on photosynthesis, respiration and biomass formation in urban waterways.

**Constructed wetlands – environmental benefactors or villains?**

This project will examine the extent to which wetlands around Melbourne generate greenhouse gases (GHGs) including CH₄, N₂O and CO₂. The prevailing wisdom is that wetlands must be beneficial for the environment as they are designed to remove nutrients and other pollutants from stormwater in urban creeks. However, previous work in the Water Studies Centre has shown that under a range of relatively common conditions, wetlands can also generate significant quantities of GHGs. This project will measure rates of GHG production in several wetlands around Melbourne and develop understanding of the key wetland characteristics and conditions that control production. Links with nitrogen cycling will be explored. Experimental work will involve field measurements and laboratory mesocosm (sediment core) investigations.

**Developing luminescent probes to determine levels of environmentally relevant ions and reactive oxygen species**

*with Dr Kellie Tuck*

Please see Kellie’s project descriptions for more information. This project is ideally suited to a student with interests in both synthetic and environmental chemistry.
Current research focuses on sustainable Green Chemistry and its application in analytical chemistry, waste valorization, protein purification, synthetic chemistry and the development of bioactive compounds. Students who join the Hearn group will enjoy excellent supervision and state of the art laboratories in the new Green Chemical Futures precinct. Selected research areas are listed below and students are encouraged to contact Milton Hearn for further detail.

**Green analytical chemistry**

This research explores the use of new chromatographic modes including aqueous normal-phase chromatography for the separation of polar organic compounds e.g. pharmaceuticals, metabolites, nutraceuticals and natural products. The overarching aims are to develop methods for improved separations and reduce the use of organic solvents associated with traditional modes of chromatography in order to minimize the environmental footprint of analytical chemistry laboratories.

**Smart polymers**

This program focuses on developing smart polymers for the selective capture of valuable bioactive compounds from agricultural waste, for the fabrication of biosensors with application in medicine and as novel chromatography materials. The design of novel smart polymers typically involves a combination of molecular modelling, NMR spectroscopy, molecular imprinting, polymer synthesis and scanning electron microscopy.

**Green synthetic chemistry**

The development of synthetic methods that eliminate or minimise the formation of waste by-products and the use of hazardous solvents, reagents and processes is crucial to sustain the chemical and pharmaceutical industries. In this regard we explore the use of catalysis and microwave energy for more efficient synthesis, and flow chemistry for safe and practical synthetic processes. The molecular targets range from important synthetic building blocks to commercial pharmaceuticals.

**Green protein purification**

Bacteria, yeast and mammalian cells are used as expression systems to produce various protein-based therapeutics. One of the major contributors to the high cost of these medicines is their purification from host cell proteins. This project aims to develop novel, low molecular weight affinity chromatography ligands to reduce the number of purification steps and the cost of production.

**Synthesis of bioactive compounds**

This area of research includes the synthesis of analogues of the natural product rosmarinic acid as platelet aggregation inhibitors for treating stroke and heart attack. The synthesis of novel anti-cancer drugs based on small molecules that selectively disrupt glucose-based biosynthesis in cancer cells is also an area of interest.
Modern Main Group Chemistry

In the past 10 years remarkable progress has been made in the chemistry of very low oxidation state and low coordination number s- and p-block compounds. It is now possible to prepare and investigate the fascinating reactivity of compounds that were thought incapable of existence until a few years ago. The fundamental and applied aspects of this area are rapidly expanding in the Jones group (see group website for further details). Representative examples of the many potential Honours projects that are available within this exciting area are as follows:

(i) Low oxidation state Main group systems: replacements for transition metal catalysts.

In recent years "trans-bent" compounds containing multiple bonds between two p-block metal(l) centres have been stabilised by ligation with extremely bulky alkyl or aryl substituents (R). These include the remarkable heavier group 14 analogues of alkynes, viz. RE=EER (E = Si, Ge, Sn or Pb). In this project you will prepare examples of related bulky amido substituted "metalynes" (see picture), and related compounds, and explore their use for the reversible reductive activation of H2, CO2, NH3, ethylene etc. If this can be achieved, the exciting possibility exists to use such compounds as replacements for expensive and toxic transition metal catalysts in numerous industrial processes; and for the conversion of the Greenhouse gas, CO2, to useful chemical products such as methanol.


(ii) Stabilisation and application of complexes of Group 2 metals in the +1 oxidation state.

It has previously been only possible to prepare compounds containing the Group 2 metals (Be, Mg or Ca) with the metal in the +2 oxidation state. Recently, we have reversed this situation with the landmark preparation of the first thermally stable compounds to contain Mg-Mg bonds (e.g. see picture). The formal oxidation state of the magnesium centres in these compounds is, therefore, +1. As a result, these species are highly reducing, a situation which has lent them to use, in our laboratory, as specialist reagents in organic and organometallic synthetic methodologies. You will further explore this potential, in addition to examining the possibility of preparing the first dimeric calcium(l) compounds. Furthermore, you will examine the use of such systems as soluble models to study the reversible addition of dihydrogen to magnesium metal (yielding MgH2). This poorly understood process is of great importance for future hydrogen storage technologies which will be essential for viable zero emission vehicles powered by fuel cells. The activation of other gaseous small molecules (e.g. CO2, N2, NH3 etc.) will be investigated at high pressure (ca. 200 atm.) with the aid of high pressure sapphire NMR tube technology developed in the Ohlin group at Monash.

Supramolecular chemistry offers a paradigm shift for fundamental chemical research, taking the best of the bio-inspired science disciplines to study the development of emerging technologies in the materials sciences and related disciplines. My group’s research focuses on organic-based supramolecular systems. We combine the elegance of organic synthesis with state-of-the-art physical and analytical techniques to make new and exciting systems that function as a result of some form of stimulus. These techniques include electrochemistry and fluorescence spectroscopy.

We are a highly collaborative group with partners in many countries overseas and well as at Monash (Toby Bell, Jie Zhang, Phil Chan, Chris McNeill (Engineering), Xike Gao (Shanghai Institute of Organic Chemistry), Luca Prodi (Bologna, Italy), Lyle Isaacs (University Maryland), Zong-Quan Wu (Hefei University of Technology), Walid Daoud (City University HK), Bakri Bakar (UTM)). Our projects reflect the creativity and innovation of modern chemistry and aim to solve significant problems in the following areas of science:

- Photosynthetic mimicry
- Disease detection
- Organic field-effect transistors (OFET)
- Sensors and logic gates
- Molecular machines and devices
- Green chemistry
- Motor Neuron Disease (MND)

Below are a list of our more recent papers and the topics we cover. **If you are interested in combining all your chemistry knowledge for a well-rounded research training experience, come and talk to me about what might be possible.**

We study the discovery of catalytic reactions focusing on understanding the how and why of these processes.

1. Nucleophilic catalysis.


Transition metal catalysis has certain advantages over organocatalysis. Recent studies have uncovered a concise approach to tricycle 6, in 4-steps and high enantiopurity. In this project we will exploit our capacity to access this intermediate to develop a concise synthesis of the newly discovered antibiotic 7. 8) Gartshore, C. J.; Lupton, D. W. Angew. Chem. Int. Ed. 2013, 52, 4113; 9) Simpson, Q.; Konrath, R.; Lupton, D. W. Aust. J. Chem. 2014, 67, 1353.

4. Continuous flow catalysis (with T. Polyzos CSIRO) and reaction discovery with hypervalent iodine (with O. Hutt CSIRO).


5. Redesigning Enzymes (with C. Jackson ANU).

Conventional organo- and transition metal catalysis deliver impressive complexity, however a limitation relates to the relatively high catalyst loadings required. In this project we focused on reconfiguration of the active sites of known enzymes for new functions (Figure 1). 11) Grant, J.; Jackson C. J.; Lupton, D. W. Unpublished
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above). More information on my research can be seen at: www.chem.monash.edu.au/ionicliquids

**Solar Fuels (with Dr Xinyi Zhang)**

The ideal fuels of the future but needs to be generated in some sustainable way. Solar cells capable of directly supporting hydrogen or methanol production are one approach to this. The materials which support the photolysis of water and carbon dioxide are the key to a viable process. It is relatively easy to find materials which will work, but the challenge is to develop materials that will do so at high efficiency.

At Monash we are developing nanomaterials materials capable of harvesting photons at wavelengths around 450nm and below. The project will expand this range of materials and test them in prototype cells to quantify their catalytic performance and lifetime. One of the key aspects of this is the interaction of the electrode material with the electrolyte and the project will investigate a number of electrolyte types. The project will suit someone with interests in materials chemistry or energy chemistry.

**CO₂ Absorption by Ionic Liquids (with Dr Katya Pas)**

Ionic Liquids have a unique set of properties suited to the absorption of CO₂ from power station flue gases as part of a carbon sequestration process. We are developing new forms of such ionic liquids for this purpose. In this project we design new ILs based on quantum calculations of the structure and binding of the CO₂ complex and then prepare and test the target materials. This project would suit a student interested in both computational and practical chemistry.
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information: http://monash.edu/science/about/schools/chemistry/staff/marriott/

General area of project interests
The Marriott Group specializes primarily in Analytical Chemistry, and specifically Separation Science / Chromatographic methodology, supported by a broad repertoire of applications studies. We develop new methods in GC, including comprehensive two-dimensional GC (GC×GC), and multidimensional GC (MDGC), using a range of specific detection technologies, including mass spectrometry. We also study unusual processes and extend the chromatography analysis to complex samples. In 2013, two triple quadrupole MS systems were delivered; we have access to a Q-TOFMS. These transform our studies, and with our MDGC research we now lead the world.

Description of example Project Area(s) – brief general study focus

**Fatty Acids (FA):** FA are components in many different sample types – bacterial cell wall, fish, oil seeds, tissue – with diverse structures and we analyse them by using a number of new GC and GCMS methods; new GC methods and metrics for profiling FA will be developed for bacterial identification.

**Chiral analysis with essential oils (EO):** Chiral compound analysis can be used to authenticate the source of EO and to check for adulteration of the oil (e.g. lavender, tea tree oil) and we have recently completed a study in *Melaleuca* oils; we will develop chiral separation approaches for sandalwood, agarwood and similar oils.

**Novel interconversion-reaction processes in gas chromatography:** Interconverting molecules lead to fascinating peak shapes in GC; we will investigate a number of interconverting model compounds including essential oils to derive fundamental properties based on molecular fitting equations.

**Studies in Ionic Liquid & Metal Organic Framework (MOF)-based stationary phases:** MOF and IL phases offer a number of unique properties for separations in gas chromatography; GC columns will be prepared in this project and be evaluated according to their ability to provide separation performance unlike the usual retention mechanisms of other GC phases.

**General Drugs analysis:** Studies on analysis of illicit drugs such as ‘legal highs’ and synthetic cannabinoids by using GC and MS will be conducted to investigate structures and best analytical methods for their quantification.

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**HEROIN PROFILING**

Interconversion gives unusual shapes in GC → calculate energies

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Model IL and MOF phases to understand molecular interactions. Shown: IL111 GC column phase

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Shown: IL111 GC column phase
This page will give you an idea of some of the research we are undertaking within my group. Also, have a look on my research page: http://monash.edu/science/about/schools/chemistry/staff/martin.html

Bioinspired Chemistry: Many of the global challenges that now face us and in the future are in the medical and biological sciences; however the solutions to these problems require chemical understanding and knowledge of molecular and electronic properties. Lisa Martin’s research draws on these tools for applications in the following project areas. For information on specific projects please contact Lisa to discuss what is possible....

1. Novel Antimicrobial agents.
The rapid increase in bacterial resistance is one of the ‘top 3’ most serious threats to global health. In particular, the Gram-negative ‘superbugs’ *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and *Klebsiella pneumonia* are exceptionally capable of becoming resistant to virtually all available antibiotics. No new antibiotics against these critical Gram-negative bacteria will become available for many years to come, and modern medicine is at risk of reverting to a pre-antibiotic era! Strategies that employ combinations and novel peptides offer new potential and novel classes of molecules for therapeutic testing.

2. Can Alzheimer’s Disease be reversed?
A number of neurological diseases are linked to protein/peptide aggregation including Alzheimer’s Disease (AD). In fact, ~70% of all late-onset dementia cases are due to AD and with an aging population in Australia, intense research is therefore required to find better therapeutic approaches. Although there are several treatments available for AD, these can only manage the disease and offer no reversal, hence there is no cure. Thus, a fundamental molecular knowledge to control peptide aggregation is urgently needed.

3. Protein-protein interface inhibitors – new targets for breast and prostate cancers
The biomolecules that define life at the cellular level are proteins. They are involved in a myriad of dynamic behaviours including protein-protein interactions that support functionally active complexes. Nature has a number of natural born mutants and we recently found that among mammals the enzyme responsible for oestrogen biosynthesis from androgens, cytochrome P450 aromatase, has three natural born mutants. Aromatase in pigs has three isozymes; gonadal, placental and blastocyst. Although, the amino acid sequences of these isozymes are similar, their activities differ dramatically. The functional significance of these isozymes is not known however our research to date suggest that they can reveal new druggable sites that might reduce oestrogen – an important outcome for reducing levels in breast cancer patients. A related enzyme offers a similar strategy for prostate cancer.
Emeritus Professor Keith S. Murray

Room No. 171S, Tel: 9905 4512, email: keith.murray@monash.edu

This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above). More information on my research can be seen at: http://monash.edu/science/about/schools/chemistry/staff/murray.html

**Synthesis and Magnetostructural Investigations of Mononuclear and Polynuclear Spin Crossover Compounds of Iron and Cobalt**  
(Co-Supervisor: Dr. Stuart Batten)

Spin crossover centres are a well-known form of an inorganic electronic switch, for which a variation of temperature, pressure or light irradiation leads to a change in d-electron configuration (high-spin to low-spin) often accompanied by a change in structure, colour and magnetism. The project involves synthesis, structure (including the synchrotron) and magnetic measurements. Future applications of such materials are in “switchtronic” materials. A typical recent paper is one by Hayley Scott who has recently finished her PhD; it involves ‘multifunctional’ Fe(II) and Co(II) materials in which ferrocene groups are appended to the ligands. H. S. Scott et al. *Dalton Trans.* 2014, in press (see Figure below).

![Spin Crossover Compound](image1)

**Synthesis, crystal structures and physical properties of ‘spin-coupled’ Mn, Fe and M-Ln ‘metallosupramolecular’ cluster compounds**  
(Co-Supervisor: Dr. Stuart Batten)

This project involves the synthesis, structures and properties of new, large clusters of Mn, in mixed oxidation states, and of f-block-only or mixed d-block/lanthanide combinations, that display “quantum effects” (single molecule magnets, SMMs); with possible future uses in “spintronics”/molecular computers). A recent paper of Dr Stuart Langley’s (Post doc fellow) has revealed excellent SMM features in {Cr2Dy2} clusters. S. K. Langley et al. *Chem. Sci.* 2014, 5, 3246 (see Figure of magnetic ‘memory’).
Aqueous geochemistry and reaction dynamics of inorganic clusters

Geological processes happen on geological time scales. This means that the use of simulation and modeling is often necessary to predict the behavior of e.g. minerals under specific conditions. However, these predictions will only be reliable if the quality of our models is good. Because such models are used to predict everything from what happens when you store uranium waste for millenia to how groundwater wells will be affected by industrial spills, it’s a topic of more than just academic importance.

Our research explores the interfaces between solids, solutions, molecules and gases

Minerals are mainly extended metal oxide structures, which makes them difficult to study. On the other hand, discrete metal oxide clusters, such as polyoxometalates, can serve as models. Because they are discrete and well-defined structurally, the behavior of a cluster can be resolved to a much higher level of detail, allowing us to finally understand how minerals react on a molecular level. In addition, many of the metal oxide materials we study are known to be active catalysts in environmentally important reactions such as water splitting and carbon dioxide activation, and some are known to be bio-active, including having anti-viral properties.

In our group we can offer projects involving synthesis of new clusters, investigation of catalytic properties and/or the study of reaction dynamics using heteronuclear NMR methods.

If this interests you, please contact me (see above for details) or visit http://monash.edu/science/about/schools/chemistry/staff/ohlin/index.html and http://users.monash.edu/~andyo/
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at:
http://monash.edu/science/about/schools/chemistry

Description of Project Area(s)
My area of research is chemistry education. I am particularly interested in how students solve realistic and complex problems, the development of employability skills, attitudes to learning chemistry, and using problem-based learning to tackle topics such as sustainability and green chemistry. Some sample projects are listed below. Specific projects can be tailored to meet individual student’s’ interests.

Problem solving: Is it subject specific?
Do different disciplines approach solving problems differently? Do they bring distinct skills and knowledge? This project aims to explore these questions. We will identify a number of problems that cover content common to both chemistry and physics courses. Chemistry and physics undergraduates will then be asked to solve them using a ‘think aloud’ approach. Analysis of the data should expose commonalities and difference between the two disciplines.

A creative guide to creative problem solving
There is much research evidence that problem solvers can be described as either ‘experts’ or ‘novices’. We are interested particularly in how undergraduate chemists solve complex or open-ended problems and we have identified some features of expert and novice problem solving. The aim of this project is to produce an informative and interactive earning resource or guide that will lead problem solvers through the key stages of successful problems solving and to evaluate its effectiveness. The project will involve the design of the resource, trialling it with a range of participants and evaluating whether their approaches to solving problems is changed by the activity.

Attitudes to learning science: Do they matter?
There has been much research on attitudes to science and of learning science. We aim to bring these together to develop a tool to probe chemistry students’ attitudes and beliefs about learning chemistry and to see whether this has an impact on their performance or on their career aspirations. The project will involve designing and assembling the questionnaire and administering it to chemistry undergraduates in Hull, and at other institutions. You will analyse the questionnaires and looks for correlations with attitudes to careers and performance in the subject.
Description of Project Area(s)

**Development of robust optimization codes for large-scale ionic systems (with Dr Alister Page, University of Newcastle)**

Ionic materials consisting entirely of ions have generated a significant buzz in the area of renewable energies as “electrolytes of the future” due to their unique physicochemical properties. In our group we are developing new computational chemistry methods with a view of predicting thermodynamic and transport properties of ionic liquids. In our seminal work (*Chem. Commun.*, 2012, **48**, 1493) we have shown that large clusters of ionic materials can be accurately studied with state-of-the-art computational chemistry methods when combined with the Fragment Molecular Orbital (FMO) approach. You will extend on our original work by implementing robust algorithms for the computation of two-electron integrals and geometry optimisation.

**Development of new force fields for predicting properties of ionic liquids (with Dr Nikhil Medhekar, Computational Materials Lab, [http://users.monash.edu/~nikhilm](http://users.monash.edu/~nikhilm))**

In our recent work (*Phys. Chem. Chem. Phys.* 2014, **16**, 7209) we showed that despite ionic nature of ionic materials dispersion interactions were extremely important in governing their thermodynamic and transport properties. The current strategy for predicting properties of ionic liquids lies in utilising classical force fields in combination with the molecular dynamics (MD) approach. Currently available force fields for ionic liquids lack predictive power mainly due to inaccurate description of dispersive forces. In this project you will develop new and reliable force fields by fitting the well accepted Lennard-Jones potential to reproduce dispersion interactions in ionic liquids obtained with our newly developed method (*J. Chem. Theory Comput.*, 2014, **10**, 3111). These new force fields will then be tested in real-time MD simulations.

**Application of newly developed SCS-types methods for studying interactions in biological systems (with Dr Craig Morton, St Vincent's Institute of Medical Research)**

Our group have recently developed a series of computational chemistry methods for robust and accurate calculations of intermolecular interactions in peptides and proteins such as π-π stacking between aromatic rings, Watson and Crick hydrogen bonding. In this project you will apply these methods to studying energetics in real biological systems and contrast predicted results with topological approaches such as “Molecular Docking” that are currently used for the drug design. You will explore relationship between the molecular shape of the drug and the predicted strength of intermolecular interactions between the drug and targeted enzyme paving the way towards a robust computer-aided drug design.
Description of Project Areas

1. **Soil Organic Matter and Organic-based Fertilisers** (with Prof Roy Jackson and Dr Vanessa Wong - School of Earth, Atmospheric and Environmental Science)

   Understanding the role and dynamics of soil organic matter in soils is critically important in maintaining soil fertility, water retention, carbon sequestration and nutrient cycling.
   
   We have a number of project options for anyone interested in soil chemistry. These include: an evaluation of selected amendments on soil physicochemical and biological properties; efficacy of organic fertilizer blends; novel and improved methods for extracting and characterising organic matter from soils. Soil-plant interactions in the presence of selected amendments and/or fertilisers can also be explored through plant growth experiments for those interested.

2. **Chemical Conversions of Lignocellulose Biomass**
   
   a) **Fine chemicals from biomass waste** (with Professors Roy Jackson and Doug MacFarlane)

   The use of biomass to derive fine chemicals and fuels is of great importance for replacing fossil fuel sources. We have been investigating generating several key compounds including: 5-hydroxymethyl furfural, levoglucosenone and levulinic acid derivatives.

   ![5-hydroxymethyl furfural](image1) ![levoglucosenone](image2)

   This project will evaluate their potential for producing valuable chemical feedstock compounds from woody biomass.

   b) **Lignin Depolymerisation** (with Dr Kei Saito – see entry under Dr Kei Saito)

   This project will investigate the depolymerization of lignin derived from biomass, leading to potential useful building blocks for biodegradable polymers.

3. **Catalytic Wet Air Oxidation (CWAO)** (with Prof Leone Spiccia)

   The development of benign, versatile catalysts that can be used for both selective oxidations and/or capable of decomposing organic contaminants, pollutants, and harmful microorganisms is needed for various applications. Both photocatalysts and redox catalysts have been used independently, but there are fewer examples which combine both activities. This project will attempt to synthesise and characterise oxides which combine both photo- and redox catalytic properties and test their oxidation efficacy against a selection of organic compounds.
Our group’s research interests cover a wide range of disciplines all involving the design, synthesis and evaluation of *smart molecules*. Programs include total synthesis, synthetic method development, chemical biology, medicinal chemistry and new technologies. Some potential projects for Honours 2015 are briefly described below. More information on our research can be seen at: [www.chem.monash.edu.au/staff/perlmutter/index.html](http://www.chem.monash.edu.au/staff/perlmutter/index.html). We have active collaborations with many groups locally in Medicine, Engineering and Science at Monash, LaTrobe Univ. (as well as interstate (ANSTO) and overseas (Univ. of Oxford, UC San Diego, Univ. of Hyderabad, Shanghai Institute of Organic Chemistry and South East University in Nanjing China).

**Project Description.** Our group is very heavily focused on designing, synthesizing and evaluating new molecules. Shown below is a selection of targets which are on-going in our group. If any of these interests you please make a time to meet with me and we can discuss the project in more detail. Aside from synthesizing target molecules, we develop new chemistry as part of the synthetic design.

![Chemical Structures](image1.png)

- Zaragozic acids
- Salvinorins
- Profluorescent nucleotides
- Opatropanes
- Hydantoin
- Spirocyclic orthoamides

In addition we have programs in areas as diverse as asymmetric catalysis (collaboration with groups in China), new chemical reactor technology (based on Surface Acoustic Waves – collaboration with RMIT University), new polymer chemistry (in collaboration with a local company) and self-assembling fibres and gels (see image below).
Green Materials

Green chemistry is an academic field in chemistry that is concerned with the design of safe processes and products. Our projects will focus on developing new synthesis and production methods for novel sustainable/environment benign materials based on the principles of green chemistry by understanding naturally occurring mechanisms that can be extrapolated to synthetic systems using polymer, supramolecular, catalyst, and nano chemistry. If you have any further queries, please do not hesitate to contact me (details above). More information on my research can be seen at:

http://monash.edu/science/about/schools/chemistry/staff/saito/

1. Self-healing Polymers (Co-Supervisor: Prof. George Simon, Material Engineering)

Our group is working on creating smart polymeric materials for coatings, films, adhesives that have the ability to repair damage. We will investigate thermal and photo self-healing epoxy and acrylic resin using several cross-linkers with reversible units. This project will involve aspect of organic synthesis, polymer synthesis and polymer characterization techniques.

2. Developing a Novel Polymer Recycling System

Reversible polymers are polymers in which bonds can be easily broken. Most conventional polymers are structurally irreversible because their monomer units are connected by strong covalent bonds. Reversible polymers have a reversible bond within their structure that can be formed from the monomer units and cleaved back to the monomer units by heat or light. Such novel polymers are of interest because of their potential applications as recyclable environmentally benign materials, photo-resists, and biomedical materials. This project will investigate novel polymerization methods and also a novel polymer recycling method using the principles of green chemistry.

3. Lignin Degradation and its Biomass Application (Co-Supervisors: Assoc. Prof. Tony Patti)

Lignin, which composes 30% of wood tissue, is produced by the oxidative polymerization of phenol derivatives catalyzed by laccase, an enzyme in nature. Lignin is known as a stable and insoluble polymer and the disposal and recycle of lignin has been a big resolved issue for industries. This project will focus on lignin degradation and fine chemical production from lignin.

4. Ionic Liquid Polymer Syntheses (Co-Supervisors: Dr. Jie Zhang)

Ionic liquids (ILs) are generally defined as organic/inorganic salts with a melting point lower than 100 °C which present a good chemical and electrochemical stability, low flammability, negligible vapour pressure and high ionic conductivity. Although originally, most of the research and industrial activities related to ILs were associated to their applications in green chemistry. Combining ILs with polymer electrolytes offers the prospect of new applications e.g. in batteries and fuel cells, where they surpass the performance of conventional media such as organic solvents (in batteries) or water (in polymer electrolyte membrane fuel cells), giving advantages in terms of improved safety and a higher operating temperature range. We will focus on developing and synthesizing IL polymers and applying those as electrode.
Professor Leone Spiccia  
Room No.133C, Tel: 9905 4626, email: leone.spiccia@sci.monash.edu.au

Some of the research we are undertaking in my group is described below. If you have any queries, please contact me (details above). More information can be found at:  
http://monash.edu/science/about/schools/chemistry/staff/spiccia/

**Renewable Energy Projects**

Growing concerns about the impact of climate change and diminishing reserves of some fossil fuels are driving a push to develop renewable energy sources. We need to increase our energy production and concurrently achieve major reductions in greenhouse gas emissions. Our projects focus on the conversion of solar energy into either electricity or fuels.

**Dye sensitised solar cells (DSCs).** DSCs are viable alternatives to ‘classical’ photovoltaics which have a nanostructured oxide semiconductor film, coated with a photoactive dye, and an electrolyte containing a redox couple as key components. We are applying new non-toxic redox couples in an effort to improve the efficiency and stability of DSCs (e.g., *Nature Chem.*, 2011, 3, 211; *Angew. Chem.*, 2013, 52, 5527). Honours projects are available in the following areas: (1) Organometallic compounds and transition metal complexes as novel redox mediators for n- and p-type DSCs; (2) Metal iodide-based perovskite solar cells. These relatively new devices have taken the renewable energy field by storm, rapidly reaching efficiencies in excess of 15% (see *Angew. Chem.*, http://dx.doi.org/10.1002/anie.201405334).

**Solar Hydrogen.** We are interested in devices that utilize sunlight to produce hydrogen through the splitting of water into hydrogen fuel and oxygen (a by-product). For example, by combining a highly active catalyst with a light absorbing Ru(II) dye a device was created (Figure) which uses only sunlight to oxidize water (*JACS*, 2010, 132, 2892). Honours projects are available which seek to develop efficient water splitting catalysts and to integrate them into solar water splitting devices.

**Biological Inorganic Chemistry**

**Collaboration Drs B. Graham, MIPS, and H. Stephan, Helmholtz Centre Dresden-Rossendorf**

The assembly of nanomaterials which combine photoactive molecules with radioactive metal complexes and/or MRI contrast agents offers tremendous opportunities for the developing of effective medical diagnostics and therapeutic agents (*Adv. Mater.*, 2011, 23, H18-H40). We are developing nanoparticles capable of the multimodal imaging of cancer via a combination of positron emission tomography (PET), magnetic resonance imaging (MRI) and fluorescence imaging. Honours projects are available which aim to: (1) Prepare magnetic iron oxide or light upconverting nanoparticles and to decorate them with molecules facilitating their entry through the porous vascular structure of cancer cells, and macrocyclic ligands allowing the introduction of a radioisotope (e.g., $^{64}$Cu) and/or photoactive complexes for fluorescence imaging (see Figure, *JACS*, 2012, 134, 20376). (2) Explore the membrane permeability of new biomolecules and nanomaterials, an important consideration when developing new pharmaceuticals (collaboration with A/Prof LL Martin).
Our research topics in inorganic and organometallic chemistry focus on molecules with elements in rare oxidation states, unusually bonded fragments and rare metal hydrides. They generally show novel structures, have unseen properties and as a consequence often show a unique reactivity; also see: http://monash.edu/science/about/schools/chemistry/staff/stasch/research.html

**Main group chemistry with iminophosphorane and phosphinoamide ligands**

The development of new ligands for the access to novel, unusual complexes plays a pivotal role in discovering new functionalities and reactivity. Very recently, we have prepared new diiminophosphinate ligands that typically form very stable and sterically demanding complexes and allowed us to synthesize novel metal(I) dimer complexes, see picture. In this project you will design and synthesize a range of iminophosphorane (P V) and phosphinoamide (P III) ligands and study their chemistry with a range of main group elements. The products are typically well crystallizing and generally allow easy separation and structural characterization. The central P atom enables facile study by \(^{31}\)P NMR spectroscopy. Your project includes the synthesis of new compounds with elements in unusual oxidation states and rare molecular fragments, and to study their further reactivity towards a range of organic and inorganic molecules.

**Synthesis, structure and reactivity of molecular group 1 metal hydride complexes**

The ionic hydrides of the alkali metals, LiH, NaH, KH etc, are widely used laboratory reagents, but they are insoluble due to their high lattice energies and as a consequence have a relatively low reactivity. Soluble, well-defined metal hydride complexes of the alkali metals are very rare despite their potential importance for synthesis, catalysis and hydrogen storage. Recently, we have presented a convenient route to well-defined and hydrocarbon-soluble LiH clusters, e.g. see the picture for a \((\text{LiH})_4\)-type complex, prepared via organometallic synthesis. The presented complexes undergo hydrolithiations and other reactions with organic substrates. The goal of this project is to stabilize new types of soluble group 1 metal hydride complexes, possibly yet unknown molecular NaH and KH complexes, investigate their properties and reactivity, and test catalytic conversions.

**Reactivity studies of dimeric magnesium(I) compounds and related magnesium(II) hydride complexes (with Prof. Cameron Jones)**

We have previously prepared the first stable magnesium(I) compounds with the general formula \(LM\text{MgMgL}\), see picture left. These easy to synthesize, ‘bottleable’ and hydrocarbon-soluble reduced magnesium complexes can act as very selective reductants for organic and inorganic substrates. We have also studied closely related magnesium(II) hydride complexes (right) that are capable of Mg-H addition to many substrates. Both compound classes previously showed highly unexpected reactivity. In your project you will study the comparative reactivity of both dimeric magnesium(I) compounds and related magnesium(II) hydride complexes towards a range of organic, organometallic and inorganic substrates (incl. small molecules and gases), and will develop new stoichiometric and catalytic reactions.

*The project titles are only possible examples; please come in for a chat to discuss your interests.*
Computer-Aided Catalysts Design for Clean Energy

We aim to design high performance catalysts for energy conversion and storage, including solar fuels, fuel cells, lithium batteries and hydrogen storage. Different from traditional catalyst design, our design is guided by extensive computational calculations, particularly working on the following projects:

**Project 1: Catalysts for CO2 capture and conversion**
This project aims to search novel catalysts to adsorb and convert CO2 to hydrocarbons as usable fuel. The basic idea is to learn from nature – green plants and algae can convert CO2 to hydrocarbons through photosynthesis. Through computational calculations, we will investigate how plants and algae work and further design new catalysts.

**Project 2: Catalysts for hydrogen production**
This project aims to search novel catalysts to split water as oxygen (O2) and hydrogen (H2). Both O2 evolution and H2 evolution will be studied, and hundreds of candidates will be examined again established criteria by computational screening, with new catalysts identified and recommended for lab synthesis and tests.

**Project 3: Catalysts for better fuel cells**
Developing low-cost and highly stable catalysts for fuel cells is of great importance. This project aims to design new catalysts for H2 and methanol fuel cells based on computational searching. We are particularly interested in bio-inspired catalysts and low-dimensional structures with well-defined surface chemistry.

Learn from Nature. Starting from hydrogenases, novel catalysts can be designed on carbon nanotubes for the production of hydrogen. Computational calculations can help us for this.
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research and recent publications can be seen at: www.ricotabor.com

The chemistry of functional colloids, smart surfaces and nanomaterials

We are researching a range of topics in fundamental and applied colloid chemistry, including:
- Responsive materials that change their properties due to an internal or external stimulus such as pH, light or magnetic/electric fields.
- Novel optical techniques for exploring gel formation, nano-scale liquid films and functional surfaces.
- Nanomaterials (with particular focus on graphene oxide) for functional colloids – controlled surface chemistry, sensing substrates, capsules, liquid crystals, etc.

Some examples of possible projects are provided below. Projects can involve synthesis, analysis, visits to large scale facilities including the synchrotron and OPAL reactor. To find out more specific information, please get in contact.

Graphene oxide capsules for triggered release – graphene oxide in combination with nanoparticles and polymers will be used to form multifunctional capsules that can be controlled with magnetic fields and release their contents in response to a change in pH [1].

Liquid control at the flick of a switch – liquid films can be controlled in unique ways by applying electrical potentials and fields, developing their use in novel liquid optics. The underlying chemistry of this phenomenon remains poorly understood, and so your experiments will help to advance fundamental understanding whilst making systems for very applied problems, utilising quantum stabilised films [2].

Sweet surfactants with a sting in the tail – novel, sugar-headed surfactants [3] will be used to form micelles and droplets containing an active drug. The specificity of the sugar head-group allows recognition of specific cells for targeted delivery. In collaboration with Dr Brendan Wilkinson.

Assembly of concentration dispersions: gelling, drying and cracking – using a combination of scattering techniques including microscope-based correlation spectroscopy that will be developed in the course of your project, you will uncover the unique pathways available to flocculating nanomaterials, developing new porous materials [4] for catalysis and water treatment.

Dr Chris Thompson
Room No. 135B, Tel: 9905 9362, email: chris.thompson@monash.edu

This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at:
http://monash.edu/science/about/schools/chemistry/staff/.

Description of Project Area(s) (may include actual project titles)

**The effectiveness of inquiry-oriented learning in undergraduate science – perceptions versus reality**
w/ Dr Gerry Rayner, School of Biological Sciences

Inquiry-oriented learning (IOL) involves students in elements of experimental design, the framing of testable hypotheses, and the analysis, interpretation and presentation of experimental data. This form of learning, which has been shown to enhance students’ higher order thinking skills, including problem solving and critical thinking, provides a strong nexus between teaching and research. While IOL has re-established as a potent force for change in science, the student perspective has been largely overlooked, particularly for large enrolment, first year biology and chemistry units. This project will involve evaluation of IOL-related activities in biology and chemistry, and gathering of student perspectives for these activities compared to traditional recipe or cookbook-type practicals. This project has considerable potential to evaluate the effectiveness of IOL in science - in terms of the relationship between students’ self-efficacy of their research ability and their actual ability - thereby leading to enhanced curricula and inculcation of genuine, higher order thinking skills.

**A Goldilocks approach to problem-solving in physical chemistry**
w/ Dr Elizabeth Yuriev, Faculty of Pharmaceutical Science (Parkville)

Critical thinking and problem-solving are essential professional skills throughout STEM disciplines. Problem-solving in physical chemistry often appears daunting to students due to challenges of identifying (i) the appropriate information required for solving a given problem and (ii) steps needed to proceed towards a solution. Students often skip the necessary steps involved in reflecting upon a problem and “dive straight in” into indiscriminate formula usage, with considering the validity of their answer, as long as they can obtain a number at the end. Such obliviousness to a likelihood of an incorrect solution demonstrates a lack of critical thinking, a vital aspect of problem-solving.

Algorithmic approaches vs. conceptual understanding represent two main methodologies for overcoming such difficulties. Both involve developing and using problem-solving flowcharts. The main difference between the two methods is the level of instructional detail given to the problem solver, which in turn determines the extent of their independence and creative thinking required to solve a problem [5].

We have developed an alternative approach to problem solving - the Goldilocks flowchart - designed to be generic enough to be applicable to a wide range of problems, yet not algorithmically prescriptive. At the same time, it contains specific instructions/steps, making it student-centred and not rely on the provision of continuous scaffolding. Check-points along the problem-solving path provides opportunities for troubleshooting and critical assessment of the process towards a solution as well as of the solution itself.

This project will evaluate the instrument in 1st year chemistry units (PSC1031 and CHM1011) and generate ideas for its further improvement. Specifically, aspects of students’ implementation of the flowchart (including generation of their own problem-specific flowcharts) as well as their attitudes and problem-solving behaviours with and without the instrument will be evaluated. The use of the flowchart individually and in collaborative learning environment will be compared and evaluated. Also, different means of the instructors’ usage of the flowchart will be developed and tested. Finally, the opportunities to modify the flowchart for its application in the other areas of chemistry as well as for problem solving in other disciplines will be investigated.
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at: [http://monash.edu/science/about/schools/chemistry/staff/tuck/](http://monash.edu/science/about/schools/chemistry/staff/tuck/) and [http://www.kellietuckgroup.com/](http://www.kellietuckgroup.com/)

**Environmental and Biological Sensors** (projects in collaboration with Assoc. Prof. Mike Grace (Chemistry) and Dr Bim Graham (MIPS))

We are interested in the design, synthesis and analysis of luminescent sensors for the detection and quantification of analytes in environmental and biological samples. A particularly attractive and exciting feature of our sensors is the ability to carry out measurements where a short delay is introduced between excitation and detection of the emitted luminescence. This enables avoidance of initial short-lived background fluorescence and hence the luminescent signal depends only on the concentration of the probe and the target analyte. Figure 1 shows the ‘turn-on’ luminescence when the analyte of interest binds. Our current work is focused on developing novel zinc sensors however there is scope to develop sensors to detect other analytes of interest. Projects in this area will involve synthesis and subsequent analysis of sensors.

![Figure 1](image1.png)

**Figure 1:** Luminescent output in the A) absence of analyte. B) presence of analyte.

**Medicinal Chemistry** (projects in collaboration with Assoc. Prof. Peter Duggan (CSIRO) and Dr Adam Meyer (CSIRO))

Our work in this area investigates the development and synthesis of small molecules that have the potential to be new analgesics or anti-cancer drugs. We are developing mimics of a peptide found in the toxin of a cone snail (Figure 2 A); projects in this area will involve the synthesis of analogues of known potent compounds. Figure 2 (B and C) shows some of our recent findings in this area. We are also investigating the synthesis of small molecules that are designed to inhibit an important protein/protein interaction. This protein/protein interaction stops cancer cells dying and compounds that inhibit this interaction are potential anti-cancer drugs; projects in this area will involve the synthesis of compounds designed to inhibit the protein/protein interaction.

![Figure 2](image2.png)

**Figure 2:** A) Image of the backbone of the peptide of interest. B) Testing of two synthesized compounds vs the peptide. C) Fraction of blocked channels when 100 μM compound is added. Compounds that block the Ca,2.2 channel are potential analgesics.
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at: 
http://monash.edu/science/about/schools/chemistry/staff/turner.html (follow link to personal site)

Description of Project Area(s)
All research projects in my group are concerned with aspects of crystal engineering and supramolecular chemistry. Our research primarily aims to design porous coordination polymers - materials that resemble nano-scale scaffolding - which will be able to selectively store, sense or separate small molecules. All projects involve (i) the synthesis of organic ligands that will be able to bridge between metal atoms to construct the framework and which will possess additional sites for supramolecular interactions, (ii) synthesis of coordination polymers and/or coordination cages, (iii) structural characterization by X-ray crystallography (typically involving the Australian Synchrotron) and (iv) analysis of the physical properties of the materials for separation/storage/sensing where appropriate.

Current project areas include:
- Chiral coordination polymers for separation. Using quite simple bis-amino acid ligands, we have been able to construct several coordination polymers that are able to provide resolution of racemic mixtures in small-scale liquid chromatographic experiments.
- Heterotopic ligands in acentric frameworks. From a crystal engineering perspective, it is a challenge to create acentric or chiral frameworks using achiral precursors. We have adopted a strategy using low symmetry ligands to try and target such materials.
- Amine-based materials for CO₂ capture (with Stuart Batten). By including amine groups within the ligands, we aim to create materials with an enhanced selectivity for carbon dioxide with potential application in post-combustion capture.
- Coordination cages. In addition to coordination polymers, we are also interested in forming discrete cages that are able to trap small molecules inside.

Links to recent papers and more information about recent projects and results can be found on my website (http://users.monash.edu/~dturner).
This document will give you an idea of the type of research we are undertaking within my group. If you have any further queries, please do not hesitate to contact me (details above).

More information on my research can be seen at:
http://monash.edu/science/about/schools/chemistry/staff/wilkinson.html

Dynamic carbohydrate-based surfactants*

Carbohydrate-based surfactants (CBS) are an important class of amphiphilic molecule comprising a carbohydrate head group and a hydrophobic tail.\(^1\) As such, they display a strong tendency to aggregate in aqueous solvents.\(^1\) Such self-assembly is of significant interest in biotechnology and materials science as drug delivery vectors,\(^2\) biofilm inhibitors\(^3\) biomimetic membranes\(^4\) and nano-reactors.\(^5\) The application of external stimuli, such as pH and light for altering molecular structure and controlling reversible self-assembly is of particular interest, as it gives rise to responsive systems for targeted delivery applications.\(^6\) However, stimuli-responsive CBS are only now being realized.\(^7\) In this project, we will develop the first dual pH- and light-responsive CBS library using a dynamic “glycan capture” strategy (Scheme 1). We will use pH- and light as orthogonal stimuli for controlling aggregation and surface properties of the CBS libraries. Dynamic CBS surfactants (2a-g) will be synthesized in parallel using acyl hydrazone exchange in water between deprotected carbohydrate head groups (a-g) and a photo-switchable butylazobenzene tail (1). The properties of dynamic surfactants will be investigated using \(^1\)H NMR, tensiometry and small-angle neutron scattering, in collaboration with Dr Rico Tabor (Monash) and Dr Chris Garvey (ANSTO).

Skills acquired: • Organic synthesis • HPLC • NMR spectroscopy • tensiometry • UV-vis spectroscopy.

Scheme 1. pH- and photo-controllable dynamic carbohydrate surfactants.

*Other projects: Antifreeze glycopeptide surfactants • Self-assembled lectin inhibitors • PNA-based treatments for autoimmune diseases • New strategies for solid-phase peptide thioesterification

References
Biospectrosocpy, an emerging field within the spectrosocpic exmainatiuon of living tissue or body fluids, combines information from physical sciences with advanced computational analysis in order to shed new light on biological processes. This field is at the cutting edge of chemistry and biology research, continuulaly developing knowledge about the structure and activity of biological molecules. Crucially biospectroscopy has the potential to revolutionise clinical diagnostic processes, fulfilling the constant demand for new technologies that can identify diseases to a high level of objectivity, sesnitivity and specificity.

Operating in this context, the Centre for Bioepectroscopy, located in the School of Chemistry, has flourished over the course of the past decade. With its broad range of state-of-the-art equipment, strong roster of multidiscipline staff and robust collaborations with othe researchers, the world class Centre is driving the devlopment of biophysics and biotechnology.

The Centre of Biospectrosocpy, is dedicated to solving biomedical problems using vibrational spectrosocpic techniques including FTIR and Raman imaging spectroscopy, Attenuated Total Reflection spectroscopy, portable hand held Raman and FTIR spectrometers and near-field techniques including Tip Enhacend Raman Spectroscopy and nano-FTIR. We have a number of different research themes that broadly fall under the banner of vibrational diagnostics and monitoring. Specific research areas inlcude malaria diagnosis and treatment, dengue fever, cancer diagnsosis, IVF, stem cell research, heart disease, liver disease, phytoplankton studies, aquatic wet land studies and fundamental studies of how light interacts with matter. If you are interested in any of these research themes plase feel to contact me to discuss the specifics of the various projects.

More information on my research can be seen at: http://monash.edu/science/about/schools/chemistry/staff/wood/
This document will give you an idea of the type of research we are undertaking within our group. If you have any further queries, please do not hesitate to contact me (details above).

**Nanoporous hierarchical membranes for conversion of CO₂ to fuels (with Professor Douglas Macfarlane)**

Depletion of our fossil fuel reserves and increasing CO₂ emissions from fossil fuel combustion are two of the most serious concerns facing humanity today. The logical solution is to use renewable energy (e.g., solar, wind etc) but the complete transition of our economy to renewable energy sources for stationary and transport applications is likely to take many decades. One exciting bridging solution is to convert CO₂ to fuels using an existing renewable energy base. We are developing advanced catalysts based on nanomaterials for the conversion of CO₂ to fuels, therefore converting a pollution problem (CO₂ emissions) into a fuel source.

New materials hold the key to fundamental advances in energy conversion and storage. Porous materials with hierarchically ordered porosity, namely, macropores in combination with mesopores, are of particular interest because macropores allow access to large guest molecules and an efficient mass transport through the porous structures is enabled while mesopores enhance the active surface area. The aim of the proposed project is to design and fabricate novel classes of ordered nanoporous hierarchical membranes with fully controlled geometry and structure. High-performance membranes electrodes will be developed and used to convert carbon dioxide into liquid fuels and valuable chemicals.
GENERAL INFORMATION
This form is to be used by local/domestic students seeking admission to the following courses:
- Bachelor of Science (Honours)
- Honours Degree of Bachelor of Science (Science Scholar Program) – (internal students only)

This form can also be used by internal Monash local/domestic and international students seeking admission to the 4th year Honours component of:
- Bachelor of Biotechnology (students who commenced the course prior to 2014)
- Bachelor of Environmental Science (students who commenced the course prior to 2014)
- Bachelor of Science Advanced – Research (Honours)

For information on courses and entry requirements, please refer to the Monash Course Finder or the relevant Handbook entry.

This form is for:
- Australian citizens
- New Zealand citizens
- Australian Permanent resident visa holders
- Australian Permanent humanitarian visa holders

International students, including permanent residents of New Zealand, applying for one year Honours courses, must apply through Monash International Admissions.

COMPLETING THIS FORM
- Please print boldly in blue or black ink using block letters
- Please attach one set of supporting documentation (all documents must be hardcopy, original or certified documents (see Applicant checklist over the page)
- Faxed or emailed supporting documentation will not be accepted.

PSYCHOLOGY HONOURS DISCIPLINE
DO NOT use this application form. Please apply online via the School of Psychological Sciences by 31 October 2014. International applicants will also need to apply through International Admissions.

BACHELOR OF BIOTECHNOLOGY students
- Please get your form signed by Lynne Mayne, as well as your Honours discipline coordinator.

LODGEMENT OF APPLICATIONS AND ENQUIRIES
- Mail or hand-deliver to the relevant Science office on your campus as follows:
  - Clayton Campus:
    - Student Services Office
    - Building 19, G26
    - Faculty of Science
    - Monash University
    - Clayton VIC 3800
    - Email: sci-enquiries@monash.edu
    - Phone: + 61 3 9905 4604
  - Monash University Malaysia:
    - Science Course Management Office
    - Building 4, Level 8
    - Jalan Lagoon Selatan
    - 47500 Bandar Sunway
    - Selangor Darul Ehsan, Malaysia
    - Email: scienceenquiries.my@monash.edu
    - Phone: + 60 3 5514 6186/6187/6120

RECEIVED STAMP:
Please retain this copy as proof that your application has been submitted.

STUDENT ID number (Monash only) ______________________
NAME: ________________________________
APPLICANT CHECKLIST – CLAYTON CAMPUS ON LY

(For MONASH MALAYSIA application process go to: http://sci.monash.edu.my/honours-program/Honours-Applications.html)

INTERNAL DOMESTIC APPLI CANTS (and INTERNAL INTERNATIONAL applicants applying for the Honours components of 4 year degrees)

1. Contact the relevant Honours coordinator and supervisor to discuss your potential Honours program. At this point you must need to complete an internal school/departmental form to indicate your project preferences. This does not replace, but is in addition to, the Faculty Honours application form.

2. Complete Sections A and B of the Faculty of Science, Honours application form.

3. Come in to the Faculty of Science, Student Services office for an eligibility check to ensure that you are/will be eligible to commence the relevant Honours program in Semester 1, 2015. This should be done as soon as possible; do not wait until the last week before applications close.

4. Take the form to your Honours coordinator who will complete Section D including listing the relevant Level three units. (Depending on the project, Section C may need to be completed as well prior to Section D)

5. Read the applicant’s declaration and sign at the bottom of Section E.

6. Return the completed Faculty form to the Faculty of Science, Student Services office.

EXTERNAL DOMESTIC APPLI CANTS

1. Contact the relevant Honours coordinator and supervisor to discuss your potential Honours program. At this point you may need to complete an internal school/departmental form to indicate your project preferences. This does not replace, but is in addition to, the Faculty Honours application form.

2. Complete Sections A and B of the Faculty of Science, Honours application form.

3. Contact the Faculty of Science, Student Services office for an eligibility check to ensure that you are/will be eligible to commence the relevant Honours program in Semester 1, 2015. This should be done as soon as possible; do not wait until the last week before applications close.

4. Take the form to your Honours coordinator who will complete Section D including listing the relevant Level three units. (Depending on the project, Section C may need to be completed as well prior to Section D)

5. Read the applicants declaration and sign at the bottom of Section E.

6. Attach the relevant original or certified hardcopy documentation as follows:
   • Official academic transcript and, if not indicated on the transcript, an official statement or certificate confirming that you have qualified for a Bachelor of Science degree or a comparable qualification.
   • Proof of Australian citizenship or permanent residency, eg birth certificate, passport, citizenship certificate.
   • If previous tertiary study was completed overseas in a non-English speaking country, then proof of meeting English language proficiency requirements will also be required.

   Please seek advice from the Faculty of Science if you need clarification regarding required documentation. Faxed or emailed documents will not be accepted.

   NOTE: If final transcripts and course completion evidence are not available by the application closing date, please provide interim transcripts listing all completed and enrolled units. Final transcripts must be supplied at least five working days prior to commencement of the relevant School/Department Honours program. A full offer for the Honours program will not be made until all official documentation is received.

7. Return the completed Faculty form to the Faculty of Science, Student Services office.

EXTERNAL INTERNATIONAL APPLI CANTS (and INTERNAL INTERNATIONAL applicants applying for Courses 0051 & 2188):

1. Contact the relevant Honours coordinator and supervisor to discuss your potential Honours program. At this point you may need to complete an internal school/departmental form to indicate your project preferences. This does not replace, but is in addition to, the application process through International Admissions.

2. DO NOT Use this application form. Please apply through International Admissions via the following website: http://www.monash.edu/study/international/apply/

   When making your application through International Admissions, you are required to indicate the Honours discipline you are applying for and the name of the Honours coordinator and supervisor you have been in contact with. International Admissions will forward your application to the Faculty of Science for consideration. The Faculty of Science will determine if you have met the academic eligibility requirements and also contact the relevant school/department Honours coordinator to ensure you have arranged an approved project and supervisor.

PSYCHOLOGY HONOURS DISCIPLINE

DO NOT use this application form. Please apply online via the School of Psychological Sciences, by 31 October, 2014. International applicants will also need to apply through International Admissions.

WHAT HAPPENS NEXT – CLAYTON CAMPUS ON LY

• Students already complete or due to complete their course, science component or 3rd stage in Semester 2, 2014 will be notified via email of the outcome of their application by 4:00pm on Friday 12 December, 2014. (Internal students with deferred exams, enrolled in Summer units, or external students yet to supply full documentation, will be sent conditional offers only)

• Internal domestic students (and internal internationals applying for Honours component of 4 year degrees) will be notified via their Monash email account and, if successful, will need to accept their offer via return email. They will then be given further instructions via email regarding enrolment in their Honours program. You will not be required to attend in person for enrolment.

• External domestic students, provided all relevant documentation has been received, will be notified via email and, if successful, will be required to attend an enrolment session on 8 January 2015. If you are unavailable on that date, another date can be arranged in consultation with the Faculty.

• External International students (and internal internationals applying for courses 0051 & 2188) will be notified by International Admissions and, if successful, will be required to attend an enrolment session on 17 February 2015.

• Commencement dates vary depending on the Honours discipline. Please check with your school/department Honours coordinator.
### SECTION A

**Personal details**

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| *Are you an international student?* | Yes ☐ | No ☐ |

*Please note ALL International (external and internal) students applying for course 0051 or internal students applying for course 2188, on Australian campuses, must apply through [International Admissions](#), NOT via this form.*

**Postal address for correspondence:** (for external applicants only):

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#### Details of Previous or Current Course

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<th>Course Title:</th>
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- **Completed** Ugrad degree (or Science component of double degree or 3rd stage of 4 year Honours degree) **Yes ☐**

- **NO:** Expected completion: Sem 2, 2014 ☐

- Deferred Exam/s 2015 ☐ Summer 2014/15 ☐

### SECTION B

#### Honours program you are applying for

- **Clayton**
  - 0051 BSc (Hons) ☐
  - 2340 BEnvSci ☐
  - 3527 BBiotech ☐
  - 3520 BScAdv Research (Honours) ☐
  - 2188 BSc (Sci Schl Prog) (Hons) ☐

- **Malaysia**
  - 0051 BSc (Hons) ☐

#### Study Mode

The Honours program requires one year of full time study. Part-time study, **over two years** is available in some specialisations. Please indicate your intended mode of study, after consulting with the school/department Honours coordinator.

- Full-Time ☐
- Part-Time ☐

#### Details of Honours Study - *Please consult with Honours Coordinator in the nominated School/Department.*

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### FACULTY OFFICE USE ONLY

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Only complete this section if you are applying for an MIMR-PHI Institute of Medical Research OR Monash Medical Centre Clayton (MMC) OR Southern Clinical School (SCS) project.

Students applying for a research project with these entities will need to have this section authorised by A/Prof. Mark Hedger. Note that you must also get Section D signed by the relevant school/department Honours Coordinator of your honours discipline. You will be enrolled in the project code relevant to the Honours school/department in a location code of MMC.

| MIMR-PHI/MMC/SCS Honours Coordinator Name:  Associate Professor Mark Hedger |
| Name of Project: ______________________________ | Supervisor name: ______________ |

SECTION D

To be completed by the Honours Coordinator or nominated representative

School/Department Authorisation

Subject to the student meeting all course requirements and subject to availability of a supervisor and other relevant resources I recommend that the applicant be accepted as an Honours candidate.

Honours Coordinators, please list the enrolled or completed relevant level three units or equivalent that could count towards the 70% average. If the listed units are not part of the published major and prerequisite requirements for your discipline, please provide the Faculty with a supporting statement/documentation explaining the inclusion of these units.

COMMENTS:
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Honours Coordinator (or nominated representative)

Name: ____________________________ Signature: ____________________________ Date: __ / __ / __

SECTION E – Applicant Declaration

☐ I have consulted with the Honours Coordinator (or nominated representative) in regards to the proposed Honours Program

Student Acknowledgement, Agreement and Consent

- I warrant that the information on this form, or provided in support of my application, is correct and complete.
- I acknowledge that provision of incorrect information or the withholding of relevant information relating to my application, including academic transcript/s, might invalidate my application and that the University may withdraw an offer of a place or cancel my enrolment in consequence.
- Should the University determine that I have submitted a false document, I consent to the University disclosing this information to other relevant tertiary institutions.
- I consent to any educational institution at which I am or have been a student and/or any current or past employer providing Monash University with any information which that institution or employer holds about me concerning my attendance, conduct, grades and/or qualifications or experience to assess my suitability for an offer and/or enrolment.
- I have read the University’s statement on privacy and the purposes for which my personal information will be used (available at http://www.privacy.monash.edu.au/guidelines/collection-personal-information.html)
- If sponsored, I permit Monash University to release details of my academic progress to my sponsoring body on their request.
- I agree to abide by the statutes, regulations and policies of the university as amended from time to time and agree to pay all fees, levies and charges directly arising from my enrolment.
- I agree to access the correspondence of my University email account on a regular basis.

Applicant’s Signature: ____________________________ Date: __ / __ / __