



La Trobe University, Institute of Molecular Sciences (LIMS)
CSIRO or Victorian Department of Primary Industries (DPI) PhD Top-Up Scholarships

LIMS is a major research centre of La Trobe University. In partnership with CSIRO Molecular and Health Technologies and the Victorian Department of Primary Industries LIMS is offering a number of PhD Top-Up scholarships. Successful applicants will work primarily at University laboratories under the supervision of an academic staff member. Students will also work by arrangement at CSIRO or DPI facilities.

The scholarships are part of individual projects, mentioned below and are for 3 years and have a stipend of approximately \$5000 p.a. They are available to students who have successfully enrolled for PhD studies on one of the projects listed below at La Trobe University. La Trobe University provides travel allowances and other support for attendance at national and international chemistry conferences. Applicants must have a First-Class Honours degree (or equivalent in Chemistry. Experience in an appropriate area of Chemistry would be highly desirable.

More detailed information about the Department of Chemistry at La Trobe University is available at: <http://www.latrobe.edu.au/chemistry/>

More information, including application procedures, can be obtained by contacting Dr Conor Hogan, Department of Chemistry (613-9479-3747 or email: c.hogan@latrobe.edu.au). Enquiries should be made as soon as possible.

The closing date for applications is **October 31, 2009**.

The successful applicants will take up their scholarship and commence studies once they have satisfied the PhD admission requirements of La Trobe University. Studies must commence by March 31, 2010.

Top-Scholarship Projects commencing 2010

1. Safer MRI Contrast Agents - Dr Peter Barnard with CSIRO MHT

Gadolinium based MRI (Magnetic Resonance Imaging) agents currently used in the clinic have caused severe disease and fatalities and their ongoing use in humans is in question. The aim of this project is to prepare contrast agents for MRI with comparable effectiveness and improved safety over Gd based agents. Appropriately designed manganese based agents are expected to provide high levels of MRI contrast with lower toxic side effects. It is proposed that multinuclear complexes be constructed with the general shape of a turbine or paddle wheel to decrease their rotation rate in water, giving rise to enhanced contrast. The project will involve the design, preparation and study of a number of structures of varying size and geometry to examine the relationship between structure, rotation rate and contrast ability.

2. Bio-mimetic membrane coatings. - Dr. Adam Mechler with CSIRO MHT

This project will develop methods for the controlled deposition and specific anchoring of biomimetic phospholipid membranes from liposome/cubosome (self assembled lipid nanoparticle) precursor molecules that are doped with protein or cell targeting/ signalling lipid ligand molecules within their structure. This research has wide ranging applications and should advance the science of producing biocompatible surface coatings, targeted nanoparticle delivery systems and their characterisation by

developing surface immobilisation techniques on nanostructured interfaces and within self assembled nanoparticles (cubosomes/hexasomes).

3. HOMSi[®] Reagents in Novel C-N Bond Forming Reactions. - Dr. Andrew Hughes with CSIRO MHT

The Hiyama cross-coupling reaction is a modern variant of more well-known palladium coupling reactions. This new reaction exploits novel chemistry involving recyclable silicon reagents known as HOMSi[®] reagents. Under mild conditions these reagents can be induced to transmetallate to copper and thereby facilitate the formation of N-C bonds in new and known amine-based compounds that will be high-value compounds in numerous established and novel projects. The research proposed is of basic nature but has great potential to become an efficient approach to desired synthetic compounds.

4. Metal-Organic Framework Materials for Magnetic Resonance Imaging Applications – Dr. Peter Barnard with CSIRO MHT

Nanomedicine platforms for applications in molecular imaging are of great current interest. This project seeks to combine expertise in the development of inorganic imaging agents and high throughput techniques for the generation of metal-organic frameworks (MOFs) for the preparation new magnetic resonance imaging (MRI) contrast agents. MOFs are porous hybrid materials consisting of metal clusters bridged by rigid organic linkers. A library of new organic linker ligands with appropriate donor sets for gadolinium and manganese will be prepared. Using these ligands MOFs will be generated and these materials will be screened using laboratory and synchrotron based techniques for desirable MRI properties. Materials with appropriate properties will be progressed into animal imaging studies.

5. High Throughput Discovery of Novel Functionalised Self-Assembling Peptide Derivatives. - Dr. Andrew Hughes with CSIRO MHT

Materials that self-assemble are fascinating and have numerous applications in the modern era of nanochemistry. Self-assembling peptides that form hydrogels are the subject of this project. In the first instance a discovery program will seek to find new members of this family. These are required so that a range of properties can be defined. For instance some self-assembled peptides are rigid while others are flexible. A range of such entities will provide different media for tissue culture applications.

6. Plant bacteria as elicitors of plant defence compounds with human health benefits. - Dr. Ian Potter with Victorian DPI

This project will investigate and identify indole glucosinolates induced upon infection in cabbage plants using LC-MS and NMR with the aim of identifying compounds that can be used in screening and breeding programs within the Vital Vegetables project aimed at producing Brassica varieties with high human bioefficacy and plant disease resistance.