MONASH University

ARMI
AUSTRALIAN REGENERATIVE MEDICINE INSTITUTE

Information on Honours and PhD by Research

Starting 2012

Research Degrees at the
Australian Regenerative Medicine Institute

Regenerative medicine is one of the most important and promising new arenas for research in the life sciences. Its potential to radically transform our understanding and treatment of disease is generating excitement in medical research laboratories throughout the world.

Underpinned by advanced science and new research technologies, regenerative medicine is an ideal platform for forging a career in the life sciences.

The Australian Regenerative Medicine Institute is one of the world's largest regenerative medicine and stem cell research hubs. We offer a great research environment, brand-new facilities, and the opportunity to work with a team of international experts in regenerative medicine.

ARMI also provides unique links to Europe as headquarters of EMBL Australia—the Associate Member of the European Molecular Biology Laboratory. Through EMBL Australia you can access training, collaborative and career prospects in Europe and beyond.

I encourage you to investigate the Australian Regenerative Medicine Institute for your further studies and as the launch-point for your career.

Professor Nadia Rosenthal
Director, ARMI

Programs available

Postgraduate research programs:

- Doctor of Philosophy

Honours programs available to students from the following disciplines:

- Biomedical Sciences
- Science
- Medicine and Health Sciences
- Engineering

We welcome enquiries from anyone holding or completing a degree in a relevant discipline.

About ARMI

The Australian Regenerative Medicine Institute is a state-of-the-art research facility established with support from Monash University, the Government of Victoria and the Australian Government. Located on Monash's Clayton campus, the Institute is part of the Faculty of Medicine and builds on the University's existing strengths in biomedical research.

The Institute focuses on understanding basic mechanisms underlying regeneration. Ultimately, this research aims to prevent, halt and reverse damage to vital organs due to disease, injury or genetic conditions. This will lead to treatments for conditions such as neurodegenerative disorders, diabetes, arthritis, musculo-skeletal and cardiovascular diseases.

ARMI integrates research in three key platforms: structural biology (molecular level), cell biology (cell level) and regenerative biology (organism level). Working with multiple centres and disciplines at Monash, including the neighboring Australian Stem Cell Centre and Monash Immunology and Stem Cell Laboratories, ARMI lays the groundwork for the development of future clinical applications, and pursues rapid commercial transfer for its technologies.

ARMI's Aim

Finding effective treatment for a range of diseases by supporting research programs that develop our understanding of the basic mechanisms behind the regenerative process.

About regenerative medicine

Regenerative medicine uses cells, genes or proteins found in the body, along with bioengineered materials and technologies, as building blocks to repair and restore damaged or degenerating tissue.

Techniques can involve injecting or implanting cells capable of tissue repair; protecting cells and tissue from damage due to disease or injury; encouraging regeneration within the tissues by recruiting a patient's own cells or using proteins or gene delivery to stimulate cell division; and preventing inflammation and scarring to allow tissue replacement.

> … access to state-of-the-art research laboratories with an outstanding suite of cutting edge core research facilities.

Why Choose ARMI?

The ARMI postgraduate program is designed to attract the very best students. At ARMI you will enjoy:

- access to state-of-the-art research laboratories with an outstanding suite of cutting edge core research facilities;
- a supportive and collegiate environment with mentoring by internationally recognised researchers; and
- all of the professional and personal support available through working on the campus of one of the world's leading universities.

We also provide:

- a generous travel allowance so that you can attend the very best scientific meetings in your chosen field; and
- computer (PhDs only) and personal desk space in our brand new laboratories in the heart of the innovation precinct.

All of this will allow you to start your career in the best possible way and provide everything you need to ensure your success.

Research Leaders and Groups

Professor
Nadia Rosenthal
Director

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Rosenthal Group

The Rosenthal Group's research concentrates on embryonic heart development, ageing mechanisms and stem cell-driven regeneration of neuromuscular and cardiac tissue, using the mouse as a model for human response to disease.

The Group's studies are designed to define the common nodal points of signaling in mammalian regenerative processes as they relate to embryonic development.

At the cellular level, the team are particularly interested in the role played by blood cell lineages in controlling inflammation and promoting tissue repair.

Professor
Peter Currie
Deputy Director

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Currie Group

A combination of genetic and embryological amenability has placed zebrafish at the forefront of attempts to understand how genes function to control vertebrate development.

The optical transparency of the zebrafish embryo provides the ability to visualise every cell in the forming embryo by simple optical inspection as well as enabling the use of a host of cell labeling and transgenic approaches to dissect embryonic development.

Furthermore, the large-scale mutagenesis of the zebrafish genome has also produced many different classes of mutations which disrupt gene function. We use the many advantages of zebrafish embryology to dissect molecular mechanisms that act to pattern the vertebrate embryo.

In particular, we are interested in how specific muscle cell types are determined within the developing embryo.

Research Leaders and Groups cont.

Associate Professor Tiziano Barberi, Group Leader
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Barberi Group

Stem cell biology is a relatively young discipline in biomedical research that offers extraordinary opportunities for finding therapeutic strategies in the treatment of degenerative diseases and cancer. In addition, stem cell differentiation studies are helping to reveal cellular and molecular mechanisms governing cell fate and tissue specification.

The group is focused on setting up methods to isolate specific stem/precursor cells originating from human embryonic stem cells (ESC) that will eventually have therapeutic applications. Using ESC as a research tool, they also aim to address fundamental questions in development, such as understanding how pluripotent cells undergo lineage restriction and fate specification.

In particular, the group is interested in the development and differentiation of striated skeletal muscle cells, as well as neural crest specification during early neurulation.

Dr James Bourne, Group Leader
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Bourne Group

The primary focus of the group is the development and maturation of the cerebral cortex of primates and other mammals. The adult cerebral cortex is formed as a mosaic of interconnected areas, but how the multiple of areas emerge seamlessly during ontogenesis and establish connections with other brain areas has yet to be determined.

In order to address these issues, the laboratory has been focussing on the development of the visual cortex, which includes areas that are responsible for visual perception and visual guidance of behaviour.

Understanding the early development of this important region will elucidate mechanisms that are relevant not only for understanding normal brain function, but also for clarifying the functional bases of disturbances of visual perception that emerge as a consequence of perinatal lesions (eg those associated with premature delivery, complications during labour, childhood accidents), abnormal visual experience in childhood, and neurological diseases.

Dr Julian Heng, Group Leader

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Heng Group

The Heng Group focuses on understanding the molecular and cellular mechanisms that control nerve cell production and maturation within the mammalian brain.

By understanding nerve cell development during embryogenesis, we will gain further insight into the pathogenesis of brain disorders (such as epilepsy and mental retardation) which can arise as a consequence of abnormal neural development. These studies could, in turn, lead to the development of novel drug treatments or gene therapies for these disorders. In addition, knowledge of the signalling pathways that control nerve cell production will inform on future therapies which exploit the limited endogenous capacity for self-repair within adult brain.

The Group uses cutting edge molecular techniques to study the birth and development of cerebral cortical neurons within fetal mouse brain in vivo as well as in vitro. These studies are combined with BioInformatics approaches to identify then characterise genes responsible for aspects of the maturation of newborn nerve cells.

Professor Graham Lieschke Group Leader

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Lieschke Group

The haemopoietic system, which makes blood cells, is the archetypal regenerative tissue, constantly supplying new blood cells throughout life. It is capable of large bursts of replenishment following injuries such as chemotherapy. Furthermore, white blood cells are a key cellular player in host defence, and as effectors of inflammation, their function plays a major role in determining the balance between ongoing tissue injury, scarring, healing and regeneration.

The Lieschke group uses zebrafish as the model organism for studying blood development and function. The team was one of the first groups in the world to take advantage of the genetic flexibility and imaging capacity of zebrafish for white blood cell research. Zebrafish mutants with faulty blood cell development provide handles for studying genes regulating the haemopoietic system, particularly its transcriptional regulation and regulation by microRNAs. Several mutants have proven useful for studying the role of particular types of white blood cell in inflammation and healing. A fungal infection model has

Research Leaders and Groups cont.

been developed to stress white blood cell function and to study innate immunity. The group uses genetic, cell biological, imaging and biochemical approaches in its research.

Professor Christophe Marcelle, Group Leader
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Marcelle Group

The Marcelle Group is interested in understanding the molecular and cellular mechanisms that regulate the morphogenesis and the growth of tissues during embryonic development using the chick embryo.

The group plans to follow two main lines of research:

- The first is a logic continuation of their in vivo analysis of muscle morphogenesis in vertebrate development, addressing questions as the molecular mechanisms underlying muscle fusion.
- The second aims to identify gene networks implicated in the maintenance or differentiation of muscle stem cells.

Dr Edwina McGlinn, EMBL Australia Group Leader
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McGlinn Group

The McGlinn Group uses the developing limb bud and axial skeleton to understand genetic hierarchies governing patterning mechanisms.

The reiterative use of key signaling pathways across multiple organs has meant that the limb, with its advantages of ease of manipulation and lack of requirement for embryonic survival, has provided fundamental contributions to our understanding of broader developmental processes.

More recently, it has become clear that a comprehensive understanding of these processes requires integration of all levels of gene regulation, including both protein-coding and non-protein coding mechanisms.

For this reason, we have pioneered a novel approach to investigate the role of microRNAs in development.

We aim to build a more complete molecular road-map of how the size, shape and number of bones form within the early vertebrate embryo.

Dr Nico Plachta, EMBL Australia Group Leader
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Plachta Group

The Plachta Group combines single-cell imaging and quantitative methods to discover how the dynamic behaviour of DNA-binding molecules controls the development of the first specialised cells in living mouse embryos. The group recently established new experimental assays to visualise the movement of transcription factors, which are key regulatory molecules controlling gene expression, in four dimensions (x, y, z and time).

The Group has also developed live imaging tools to study the cellular mechanisms governing the formation of the first tissue-like structures in the embryo, with a particular focus on cell movements and formation of the central nervous system.

Avnika Ruparella

Before starting my honours year at ARMI, I completed a double degree in Bachelor of Biomedical Science/Science at Monash University and University of California, Los Angeles (UCLA). I majored in Physiology and Zoology.

I am currently working on identifying and characterising a very interesting zebrafish muscle mutant in the hope that it will provide a model to study human diseases.

ARMI offers a platform for young researchers to get introduced to the world of Biomedical Research and learn from fantastic researchers who are very passionate about what they do. The diversity of research interests and expertise promotes a collaborative rather than a competitive atmosphere, which to me is the true essence of ARMI. At ARMI, not only will you have access to the best facilities and state of the art equipment, but you will get a chance to start your career with some of the finest researchers in the field of regenerative medicine.

Leon Teo

My project involves understanding how molecular guidance cues guide cellular migration and axonal navigation during the development of the visual system and to investigate their roles in regeneration and rewiring of damaged connections following injury to the brain.

Having received a Bachelors of Science majoring in medical biosciences at Monash University Sunway Campus in Malaysia, I joined the ranks of research students at ARMI under the Bourne group allowing me access to first-rate research facilities, modern and conducive working environment and most importantly, brilliant academic and scientific supervision by leaders in the field.

ARMI boast an inspiring integration of scientists from diverse nationalities and cultures that has greatly eased my transition from Malaysia. As an international student at ARMI, I have the privilege to not only connect with local researchers, but also to be part of the wider, international community of research scientists working towards a common goal, to advance our understanding in regenerative medicine.

Claire Warner

I did a double degree of Bachelor of Electrical and Computer Systems Engineering (Hons) and Bachelor of Science majoring in Biomedical Engineering and Physiology at Monash University.

At ARMI, I'm researching brain plasticity and its capacity for regeneration using the primate visual system as a model.

ARMI is vibrant and exciting with exceptional facilities, state of the art equipment, and a great atmosphere. ARMI's open design encourages interaction between different research groups while providing opportunities to form collaborations with high profile international researchers.

Studying at ARMI will not only fuel your passion for regenerative medicine, it will also provide you with the solid foundation needed for a successful career in research.

David Gurevich

My PhD project is based on investigating the cellular and genetic processes involved in myogenesis. Specifically, I'm interested in the role of satellite cells (muscle stem cells) in zebrafish post-embryonic muscle growth and regeneration.

Before joining ARMI, I completed a Bachelor of Biomedical Science at Melbourne University, majoring in molecular biology and genetics. I went on to do an Honours project at Melbourne University's Department of Zoology on optimising oxygen conditions for embryonic stem cell culturing.

ARMI has brought together a group of intelligent, motivated, professional researchers with some of the best technology available. The atmosphere is very conducive for high quality research and is a pleasure to work in. Anyone interested in a career in cutting-edge biological research or, in particular, regenerative medical research should give ARMI serious consideration.

The Australian Regenerative Medicine Institute at Monash University is supported by a grant from the Australian Government.

To discuss your Honours or PhD options at ARMI, please contact Dr James Bourne, ARMI HDR Coordinator or an individual Group Leader, or email positions@armi.monash.edu.au

More information and applications
Applications are processed through the Monash Research Graduate School. Please see: www.med.monash.edu.au/mbio-gradschool/

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