



Te Tari Kikokiko  
*The Department of Anatomy*



Photo: Surgical Approaches Workshop, April 2016.

## Surgical Approaches Workshop a hit with young surgeons.

Over the long Anzac weekend, while most of us were enjoying a relaxing time with family, eight young orthopaedic surgeons were toiling away in the Anatomy Department, up-skilling their knowledge of anatomy and surgical approaches for orthopaedic and trauma surgery.



*Dr. Stefan Klima*

The workshop was undertaken under the guidance of a distinguished orthopaedic and trauma surgeon, Mr Stefan Klima, from Leipzig (Germany) and clinical anatomist, Associate

Professor Niels Hammer (Anatomy Department). The group was kindly supported by Mr Simon Hadlow, an experienced orthopaedic surgeon working at Taranaki Base Hospital in New Plymouth.


Every patient needs to have confidence that their surgeon knows what lies beneath before making that first incision. The success of a surgical procedure is broadly based on a surgeon's chosen approach to a surgical site - preferably one that gives a comprehensive overview of the anatomical structures that lie beneath and which protects structures at risk such as

## The Anatomy Department in 2016. *A World of Choice!*

Anatomy has been taught at Otago since 1875. Initially it was taught as a core component of the University's medical degree but over the years it has evolved into the multi-disciplinary department it is today. *"Anatomy as practised today is a vibrant and exciting meld of clinical anatomy, neuroscience, developmental and reproductive biology, genomics and biological anthropology."* Neil Gemmell, Head of Department.

To reflect the diversity of the Department today we have commissioned a new identifier. It celebrates our place in the world - both as part of the University of Otago and our physical location on the coast - and it captures the diversity of who we are and what we do. The emphasis on 'MY' also creates a personal connection for every individual connected to the Department: past and present.





Workshops like 'The Surgical Approaches Workshop' are a critical component of the continued education health professionals engage in each year to learn new skills and integrate the constant flow of new research into their day to day practice.

Photo: Surgical Approaches Workshop, April 2016.



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Assoc. Prof. Niels Hammer overseeing a surgical incision

nerves or vessels. For this to happen, an in-depth knowledge of topographical anatomy is vital.

The course participants were given a hands-on opportunity to

observe and practice in a variety of surgical exposures of the upper and lower extremities of the body and pelvis, using cadavers generously bequeathed to the Department.

A total of forty surgical approaches were studied in theory and practically, using the unique environment the Anatomy Department provides to enhance their skills. The participants enjoyed the interactive learning environment and the gain of confidence they reached throughout the long weekend...

*"Learning approaches stated in an environment which resembles a situation similar to reality is very valuable"*

*"Very productive and informal and positive meeting and learning environment"*

*"This course helps avoiding mistakes in surgery."*

The next workshop will be offered later in 2016. For information please contact [niels.hammer@otago.ac.nz](mailto:niels.hammer@otago.ac.nz)

## A huge Congratulations to our Anatomy Graduates!



It has been a great year for our Anatomy students with 48 graduating in December and another 29 in May this year, including 15 PhDs.!





# ALUMNI PROFILE...

## Making Babies...

### Mina Vasilic is very happy in her work at Fertility Associates in Auckland.

As a Clinical Embryologist she helps patients through their fertility journey to having a family, and is part of a team which brings eggs and sperm together to make embryos. Mina's own journey to become a Clinical Embryologist began as an undergraduate student sitting in a lecture theatre, listening to a series of lectures on reproductive biology. *"I always had an interest in medical science but it wasn't until the early years of my studies at Otago University that I discovered my passion for embryology."*

She was so inspired by the topic she contacted the lecturer, Dr Peter Hurst (now retired), to discuss possible career options in reproductive biology. This was when she was first introduced to the idea of becoming a Clinical Embryologist.

She was offered a Biomedical Science Honours research project (majoring in Reproduction, Genetics and Development) under the supervision of Dr Hurst and Mr Peter Smith from AgResearch, Invermay. Her research project focused on steroid receptors in the fetal sheep ovary as a model of polycystic ovary syndrome.

Through her research she had the opportunity to work in a number of areas within the Department of Anatomy and she enjoyed the variety of practical work available to her. This experience has provided her with a wide range of knowledge and skills which she now uses daily in her job.

Upon completing her Honours degree, Mina applied for a place on the prestigious Master of Clinical Embryology course at Monash University in Melbourne, and was accepted. She feels that her experience and knowledge gained in the Department of Anatomy were invaluable to her gaining a place on the course. *"The theory I was provided with at Otago was diverse, from specific embryology, anatomy and genetics through to ethics and reproductive anthropology. The knowledge I gained in all these papers provided me with a strong foundation that was then built on during my Masters."*

While at Monash she completed a group mini research project which used a mouse model to investigate oocyte cryopreservation (egg freezing) by comparing the older method of slow-freezing and the newer more advanced method of vitrification.

Mina says she feels fortunate to have known so early in her studies what she wanted to do in her professional life. *"Working as an embryologist is much more than I imagined it would be, and working at Fertility Associates not only challenges my skills in the lab, but I also have the wonderful opportunity to interact with our patients through their IVF journey. It is so rewarding."*



Mina Vasilic

*"The field of clinical embryology is continually growing as technology advances, and I'm so excited for the future and opportunities that may come my way."*

Mina has now completed her training and is a fully-fledged registered embryologist. She

feels privileged to be able to work alongside and learn from experienced senior embryologists around her.

Mina's advice to anyone unsure of their own career path is to actively seek opportunities to talk to lecturers and others in the field of interest. *"Make a time to meet with them to discuss what interests you. You never know what wonderful opportunities that may bring."*

## Anatomy Alumni - where in the world are you?

Are you pushing back the boundaries of science? Are you educating our future leaders? Maybe you are involved in policy making or grant funding? Or you are part of a team making a difference in people's lives? Whatever you are doing we'd like to know where you are, what you do, and how you got there.

Get in touch with us ([anatomy@otago.ac.nz](mailto:anatomy@otago.ac.nz)), and don't forget to update your details on the University's Alumni page ... <http://www.otago.ac.nz/alumni/index.html>

# NEWS FROM THE RESEARCH GROUPS



## *Biological Anthropology...*

## **Learning from the past - the molecular way**

### **The Knapp Lab**

**Human settlement of New Zealand less than 800 years ago, and the fate of New Zealand's indigenous fauna and flora, are strongly linked.**

In their quest to establish and survive on the archipelago, humans have significantly shaped and changed the New Zealand environment, but the New Zealand environment has also shaped culture and health in human populations.

Through the centuries people had to adapt to new and changing food sources many of which responded poorly to hunting pressure. Furthermore, upon arrival on this last major landmass settled by humans, the first New Zealanders may have also been exposed to new diseases they had not encountered on their journey through remote Oceania.

The Knapp lab was established in the Department of Anatomy one year ago to study past human-environment interactions and find out what we can learn from these relationships for the future.

The research group uses ancient DNA and genomic tools to investigate human-environment interactions from both the anthropological and the ecological perspective.

PhD students Jessica Thomas and Denise Martini drive ecological and conservation research in the group.



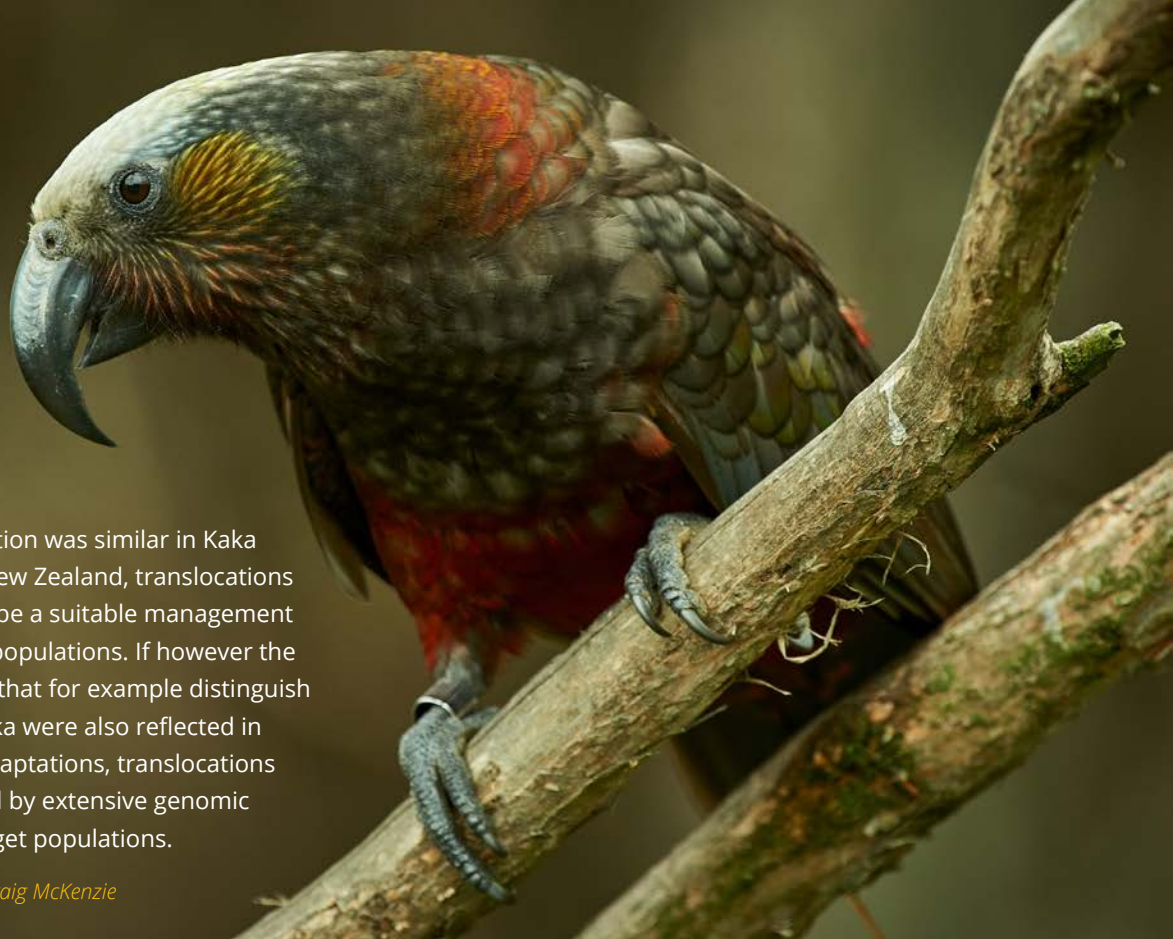
*Jess Thomas in the ancient DNA lab*

Jessica is investigating why bird species like the widely distributed Northern Atlantic Great Auk, and New Zealand's iconic Haast's Eagle went extinct. Supported by a UK NERC studentship, Jess is working on identifying population genetic markers that may predict the susceptibility of a species to extinction.

How, for example, can abundant and widespread species like the Great Auk succumb to hunting pressure and is there a way to predict the risk of population decline for other species that are still alive today?

Denise is studying birds that are threatened but still alive today to evaluate conservation management strategies. Within the framework of a Rutherford Discovery project, Denise is studying the population genomics of Kaka, to find out whether populations from different parts of New Zealand have adapted to different environments.





If functional genomic variation was similar in Kaka populations from across New Zealand, translocations between populations may be a suitable management tool to support struggling populations. If however the morphological differences that for example distinguish North and South Island kaka were also reflected in different environmental adaptations, translocations would have to be preceded by extensive genomic analyses of source and target populations.

*Photo of South Island Kaka © Craig McKenzie*

Besides population genetic and evolutionary studies supported by a Rutherford Discovery Fellowship, group leader Michael Knapp and lab manager Olga Kardailsky are also developing a new project aiming to investigate the antiquity and origin of tuberculosis (TB) in New Zealand.



*Dr Michael Knapp*

The project, coordinated by the Knapp lab, is a multidisciplinary collaboration of researchers from the Departments of Anatomy, Microbiology and Immunology, Biochemistry and Anthropology & Archaeology as well as the Max Planck Institute for the Science of Human History in Jena, Germany. Currently supported by a strategic start-up grant from the Otago School of Medical Sciences, the project aims at identifying TB DNA in historic and prehistoric human and faunal remains and seeks funding for evolutionary studies on these early New Zealand TB strains.

While the Knapp lab is in its infancy, team members are excited to be affiliated with the Department of Anatomy and hope to contribute exciting research outcomes to the Department's portfolio.

## The Biological Anthropology Group are also leading two of the 2016 University of Otago research themes.

13 University of Otago research themes were selected this year from a total of 34 applications, including two from the Biological Anthropology Research Group.

**'Allan Wilson at Otago'**, led by Prof Lisa Matisoo-Smith, unites world-leading scientists across the University with leading international researchers who seek to reconstruct the biological, linguistic and cultural history of humans using cutting edge tools and technologies in genomics and bioinformatics.

The study of human evolution, population origins, migrations, environmental interactions, and the resulting genetic and epigenetic variation are important scientific endeavours in their own right and have clear, yet often overlooked, implications for human health.

**'Asia-Pacific Biocultural Health: Past and Present'**, led by Dr Siân Halcrow and Assoc Prof Hallie Buckley, will investigate fundamental questions of the human past that have pressing implications for human health today in Aotearoa, the Pacific and Southeast Asia.

The University of Otago is the only place in the world to house leaders in health research focusing on these regions in one institution.

# NEWS FROM THE RESEARCH GROUPS



## *Clinical Anatomy...*

**Investigating the link between muscle architecture and lower back pain.**

**Jono Rowe is a fourth year Honours student working in Clinical Anatomy under the combined supervision of Dr Stephanie Woodley and Associate Professor Niels Hammer.**



Jono came to Otago University in 2012 on a Japanese scholarship, also studying chemistry. However, in 2013 he changed to Health Sciences and began his Biomedical academic path. It was his involvement in the ANAT331 Functional Anatomy paper

that cemented his desire to continue studying in an arena that focuses on clinically-relevant research.

Jono's Honours project is looking at the segmental architecture of the psoas major muscle (a deep hip flexor), using cadaver specimens. This muscle also functions over the lumbar spine, and is therefore relevant to consider in the context of low back pain, a problem that 80% of New Zealanders will experience at some stage in their lifetime.

With recent studies suggesting an association between low back pain and changes in psoas morphology, Jono's research will hopefully help form a better understanding of the anatomy of this muscle and provide a basis for psoas dysfunction.

For Jono, the Anatomy Department has seen him expand his learning and teaching. He has been given the opportunity to demonstrate in undergraduate Anatomy papers and finds engaging with students extremely rewarding. He has met numerous students from different departments, exposing him to other research disciplines, also allowing him to explore new social circles.

Highlights of Jono's week include forums, workshops, and journal club where other postgraduate students meet and discuss interesting articles over free pizza. The thriving social environment and academic opportunities in fourth year add great skills to your repertoire that you just don't get in studies as an undergrad!

## **Clinical Anatomy Image Selected for Cover of Prestigious Journal.**

Dr Ming Zhang and BSc(Hons) student Anu Kaw's research image appears on the cover of the May 2016 edition of the *American Journal of Obstetrics and Gynecology (AJOG)*. AJOG is ranked third out of seventy nine international journals on obstetrics and gynaecology, and has an impact factor of 4.704.

The image shows the configuration of the rectovaginal septum in a 2.5mm body slice preserved using epoxy sheet plastination technology. It is part of a journal article written by Dr Zhang and Ms Kaw which clarifies a clinical anatomy issue which has remained controversial for over a century.







# Avatar App To Aid Anatomy Learning...

Dr Yusuf Cakmak, of the Clinical Anatomy Research Group, has developed an interactive avatar app using 3D technology to mimic a user's hand and finger movements onto a laptop screen.

Muscle activation of the hand translates to a laptop image, and labels on the image indicate the muscles and tendons used to create the movement.

Dr Cakmak hopes that the interactive avatar will encourage students to learn their anatomy, and help them retain their anatomy knowledge through this fun process of learning and practice by doing.

He has received funding via a University of Otago CALT University Teaching Development Grant to help develop the app which is currently at the prototype stage. He is also working with overseas software engineers to develop the interactive aspects of the device.

The next step is to evaluate the app as a teaching tool. Students at the University of Otago and the University of Columbia will use the avatar as part of their Anatomy studies, and their feedback will be used to improve the device before it is launched onto the internet.

Dr Cakmak's big dream is to develop a full-body avatar to show muscle actions in an interactive way. Users would be able to dance, jump, lunge and move around in front of the camera, and the avatar would show which anatomical parts are used in the creation of the movement.

Jithendra Ratnayake has recently published two papers in the *Journal of Biomedical Materials Research Part B: Applied Biomaterials*. His PhD research focuses on developing a novel xenograft material (hydroxyapatite) from bovine bone for human bone regeneration.



Over two million bone graft procedures are carried out worldwide each year, and there is a massive global demand for bone graft materials that lead to rapid bone fusion and recovery times.

The first paper gives an insight on the development of a xenograft material (Bovine derived hydroxyapatite) from New Zealand sourced bovine cancellous bone. In vitro cell culture studies show the prepared material is not cytotoxic and has the potential to be used as a scaffolding material for bone replacement.

The second paper focuses on the mineral component of human bone, how the introduction of a minor substituent can alter its microstructure, and the influence colonising implants can have on new bone formation and bone remodelling processes.

Ratnayake JTB, Gould ML, Shavandi A, Mucalo M, Dias GJ. 2016. Development and characterization of a xenograft material from New Zealand sourced bovine cancellous bone. *J Biomed Mater Res Part B* 2016:00B:000-000.

Ratnayake JTB, Mucalo M, Dias GJ. 2016. Substituted hydroxyapatites for bone regeneration: A review of current trends. *J Biomed Mater Res Part B* 2016:00B:000-000.



*Neuroscience...*

## **Behavioural Work Reaps Rewards**

**Having completed his PhD at the end of last year, Simon Fisher is about to leave the Reynold's lab.**

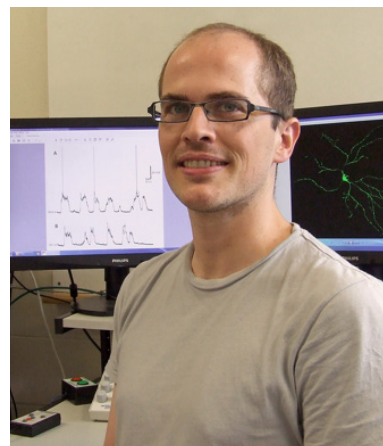
Simon undertook a difficult piece of work involving live recording from the brains of rats, and applying the findings to behavioural tasks. His work focused on understanding how the brain changes when learning new actions that result in getting a reward, and has provided new insights into how this occurs. Simon was awarded the 2016 Brain Health Research Centre's (BHRC) Young Investigator of the Year award for his work, and recently gave a talk on his work to the BHRC. A summary of his work is below.

"Synapses between the cerebral cortex and the striatum are thought to be critical for the ability to discover and learn new actions that lead to reward. Synaptic potentiation may underlie this learning, however clarification of the process has been hampered by unusual plasticity outcomes at corticostriatal synapses. While causal pairings of presynaptic activity followed by postsynaptic activity induces potentiation in most brain areas, the reverse has been found in vitro in the striatum.

Using intracellular recording from striatal spiny neurons in intact rats I demonstrated that causal pairings can induce robust Hebbian bidirectional corticostriatal plasticity but only when followed by a reward-conditioned sensory stimulus. This stimulus needed to arrive within two seconds of the pairing,

revealing a timing dependence to reinforcement-induced plasticity, and was validated in both computational and a behavioural model of action discovery. Potentiation was dependent on dopamine and adenosine signalling. My results suggest that Hebbian corticostriatal plasticity is induced by reinforcement learning, potentially underlying action discovery and learning."

For his next step, Simon is about to start a Postdoctoral position at the University of New South Wales in Sydney that will involve further investigation of the striatum and basal ganglia, with some new techniques and more of a focus on circuit manipulation during behaviour. He is also very interested in looking at how basic learning and motor processes go wrong in conditions such as obsessive-compulsive disorder, which is strongly linked to abnormalities in processing between the cortex and the striatum.



He says he has had a wonderful time in the Department but is keen to try life in a bigger city. Fairly sure there will be some reward based learning going on in Simon's brain circuitry when he gets there.

*Simon's PhD thesis was awarded Exceptional by the Division of Health Sciences.*





# Neuroscience Collaborations...

A collaboration between University of Otago departments could pave the way for Alzheimer's to be diagnosed by a simple blood test.



Photo by Peter McIntosh.

Dr Joanna Williams (Anatomy Department), in collaboration with Neurologist, Dr Nicholas Cutfield, Clinical Psychologist, Prof Bob Knight and

Prof Cliff Abraham (Psychology Department) and Prof Warren Tate (Biochemistry Department) have discovered that a small number of a large class of molecules called microRNAs — found in both the human brain and blood — are exceptionally good at detecting Alzheimer's disease.

Dr Williams led the screening of microRNA in the study participants' blood samples, supported by a member of her team, Diane Guevremont. The microRNA markers detected Alzheimer's correctly 86% of the time.

*"We know that the levels of these microRNAs differ in people who have Alzheimer's and people who don't. So if a GP took a blood sample from a patient who was beginning to show symptoms of memory loss, what we'd do is analyse that blood and see how that patient's pattern of microRNA compares against established patterns,"* said Dr Williams.

The full story can be found here <http://www.otago.ac.nz/news/news/otago603817.html>

## The Neuroscience Group is also strengthening its international collaborations

An ongoing collaboration between the research laboratories of Dr Beulah Leitch (Anatomy Department) and Professor Erin Schuman at the Max Planck Institute for Brain Research (MPI-BR) in Germany has created a strategic new initiative.

The project is based on the novel FUNCAT-PLA and Puro-PLA techniques recently developed in the Schuman laboratory for labelling newly synthesised proteins in cultured neurons. As part of this collaborative project, these techniques are being adapted for investigations at the ultrastructural level using expertise from Dr Leitch's lab at University of Otago in anti-biotin-immunogold electron microscopy.

Ultimately, this research may reveal whether local synthesis of neurotransmitter receptors contributes to synaptic plasticity, a process which is believed to be the cellular basis for memory. In addition, this research will lay the groundwork for studying whether defects in local protein synthesis contributes to synaptic dysfunction underlying various brain disorders such as Alzheimer's Disease.



# NEWS FROM THE RESEARCH GROUPS

“Oi, what are you doing with my sperm!?!“

## *Reproduction, Genomics and Development...*

The ‘Reproductive and Developmental Biology Research Group’ have changed their name to ‘Reproduction, Genomics and Development’ to better reflect the scope of research being done.

They’ve also been sharing their love of science and breaking some eggs...

### The Gemmell Lab

Dr Helen Taylor recently featured in an extensive interview for Radio NZ’s programme “Our Changing World”, where she explained her research on bird sperm, and what effects inbreeding might have in sperm motility. The interview’s focus was on the work Helen has been conducting at the Dunedin Botanical Gardens on dunnocks, along with PhD student Carlos Esteban Lara. Dr Taylor was able to show how birds are captured and sperm samples collected, and how sperm motility is accessed in her portable mini-laboratory!

Two new students have joined the Gemmell Lab – Jodi Thomas (Honours) investigating the molecular mechanisms of sex change in protogynous (female to male) fish and Alex Caulton (Masters) developing targeted genotyping-by-sequencing (GBS) in Atlantic salmon (*Salmo salar*). Bridget Martinez is also returning to the Department from the University of California Merced, where she was focusing on epigenetic changes between fasting and non-fasting elephant seals.



*Tomorrow's scientists*

### The Wilson Lab

Dr Megan Wilson organized a very successful school visit to Andersons Bay School with a fantastic team of helpers – Dave Bergin, Urooza Sarma and Natalie Matheson.

We set up a lab in the school hall and the children loved exploring all the models and activities such as the artificial heart balloon pump.

The Wilson lab group has also been very busy writing. In the past 6 months Tanya Cheung, Mitchell Weston and Jamie Ng have all completed their MSc degrees. Lisa Zondag submitted her PhD thesis in February. Lisa was the first PhD student in the Wilson lab! Lisa also recently had published the main paper resulting from her PhD work in *BMC Genetics*.

Three new students have joined the group – Kathy Sircombe (Gene MSc) studying the control of Lbx1 gene expression during spinal cord development, Jeremy McCallum-Loudeac (Anatomy Hons) is researching sex-dimorphic gene expression during puberty, and Susie Szakats (BBioMedSc (Hons)) is studying the expression of novel miRNAs during male and female brain development.





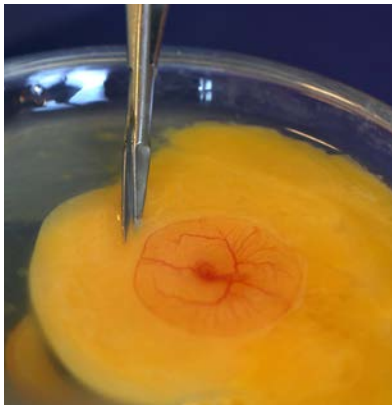
A promising batch of eggs!

## The Hore Lab

Masters (Gene) student Michael Collins from the Hore lab has used a recent batch of chick embryos (pictured above) to extract a special type of 'immortal' cell. These are the cells of the germline, which following arrival in the gonad, will eventually go on to make the reproductive

cells of an adult chicken, thus completing the circle of life.

Currently, we know very little about how germline is altered between generations. In humans, mice and other mammals the genetic code undergoes a dramatic cleansing process, where all the developmental marks and 'epigenetic memory' of prior function is stripped away, potentially allowing a new embryo to start development



Michael Collins



afresh. However, it is still not known how important this process is, or how it works, partially because extracting mammalian germline cells is so difficult.

By studying chick embryos, where development happens mostly inside an egg and not inside the mother, Mike has easy access to the developing germline and can better understand how it is altered between generations.

## Some Recent Publications.

Zondag LE, Rutherford K., Gemmell N. and Wilson MJ. 2016. Uncovering the pathways underlying whole body regeneration in a chordate model, *Botrylloides leachi* using de novo transcriptome analysis. *BMC Genomics*

Heenan P., Zondag L., and Wilson MJ. 2015. Evolution of the Sox gene family within the chordate phylum. *Gene*

Yang, Y and Wilson MJ. 2015 Lhx9 gene expression during early limb development in mice requires the FGF signalling pathway. *Gene Expression Patterns*

Rosengrave, P., Montgomerie, R., & Gemmell, N. (2016, March). Cryptic female choice enhances fertilization success and embryo survival in chinook salmon. *Proc. R. Soc. B*

**Coming**

**soon**

**...**

## Stylish new Anatomy t-shirts!

Printed on high quality AS Colour t-shirts.  
Tees come with a small identifier on the front  
and the larger design on the back.

**Two style options:**

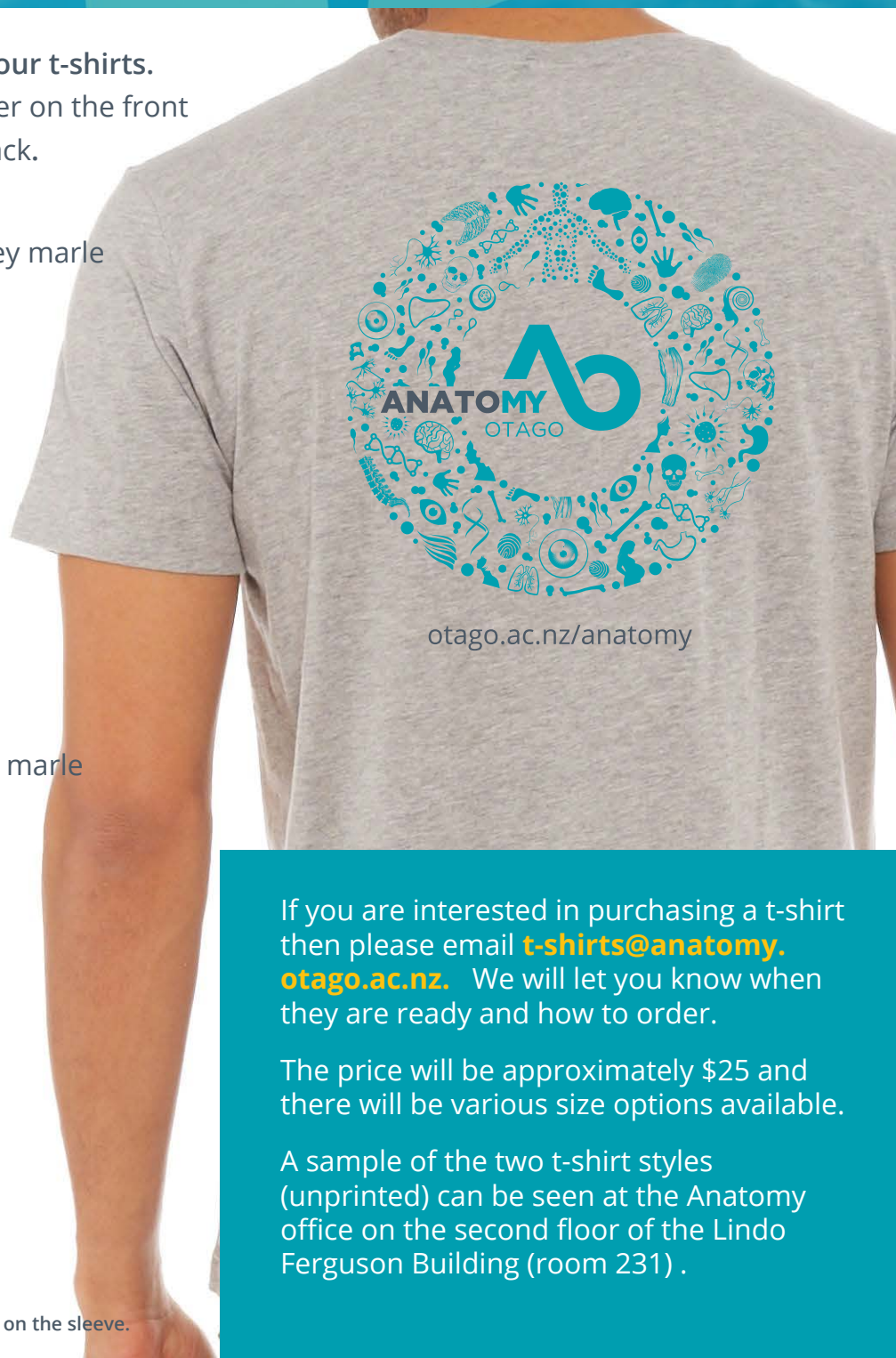
Mali women's shaped tee in grey marle



Staple men's/unisex tee in grey marle



Tees will also have a University of Otago logo on the sleeve.



If you are interested in purchasing a t-shirt then please email [t-shirts@anatomy.otago.ac.nz](mailto:t-shirts@anatomy.otago.ac.nz). We will let you know when they are ready and how to order.

The price will be approximately \$25 and there will be various size options available.

A sample of the two t-shirt styles (unprinted) can be seen at the Anatomy office on the second floor of the Lindo Ferguson Building (room 231).