

THE INSIDE STORY - special edition

Issue 36, December 2018



In this special edition newsletter we celebrate our emerging and established staff and postgraduate students whose research and teaching excellence have been recognised with department, university and national honours.



Scientists receive national research honours

Professor Lisa Matisoo-Smith and Dr Helen Taylor (pictured above with University of Otago Deputy Vice-Chancellor, Research and Enterprise, Professor Richard Blaikie) have been honoured by the Royal Society Te Apārangi of New Zealand for their work in advancing science communication and relationships in their chosen fields of research.

Professor Matisoo-Smith (left) has received the Mason Durie Medal for her ground-breaking work that has, through strong relationships with New Zealand's Indigenous people, reshaped our understanding of the last great human migration into the Pacific.

Her research focuses primarily on identifying the origins of Pacific peoples and their commensal plants and animals in order to better understand the settlement, history and prehistory of the Pacific and New Zealand. She utilizes both ancient and modern DNA methods to answer a range of anthropological questions regarding population histories, dispersals and interactions.

Dr Taylor (centre) has received the Callaghan Medal for raising the profile and understanding of conservation genetics and threatened species management both within and outside of academia.

Her research spans conservation genetics, ecology, behaviour and reproductive biology. Her work in Professor Neil Gemmill's lab focuses on the impact of low genetic diversity and inbreeding on sperm health in native and introduced birds in New Zealand. Her research combines the data collection in the field with genetics and microscopy in the lab. She has also been involved in conservation genetics projects for kiwi management in New Zealand.

Marsden research grant success

Researchers in the Department are celebrating after gaining funding from the latest Marsden round for six research projects and two Fast-Start projects. The grants will bring a total of \$5.9 million into the Department over the coming three years. Overall, University of Otago researchers secured the highest number of grants awarded to any research institution in a funding round since the fund began in 1994.

The successful researchers and their projects are:

Professor Hallie Buckley, and Dr Peter Petchey (Anthropology and Archaeology) - \$827,000

The Best of Times, the Worst of Times: A biocultural investigation of 19th century frontier mining cemeteries in Australia, New Zealand and California.

Thousands of people left the Old World in the 19th century to take part in gold rushes in California USA, Victoria, Australia and Otago, New Zealand. While early participants were often of European descent, other ethnicities participated, especially the Chinese. It was both the best of times and the worst of times, with the promise of easy wealth but the risk of sickness or violent death. Although historical records document the hardships of mining life, they are often silent on roles played by women, children, and the disenfranchised. Goldfields archaeology is extensive, however, the distinct cultural identity of individuals is often masked by a common material culture and health is rarely examined. We will explore adaptations to mining life in all these Pacific Rim regions by analysing the mortuary ritual of the communities, quality of life of the people, and the landscapes in which they lived.



Associate Professor Stephen Bunn - \$911,000

Monitoring and manipulating neuronal activity in the maternal brain during lactation.

This proposal will challenge, and potentially overturn, our long-held understanding of the mechanism controlling prolactin secretion from the pituitary. Elevated prolactin levels are critical for lactation but mechanisms responsible for its secretion at this time are poorly understood. In non-lactating mammals, prolactin secretion is held in check by a negative feedback pathway mediated by prolactin-sensing hypothalamic dopaminergic neurons. It is currently believed that during lactation these neurons become insensitive to prolactin thus interrupting the negative feedback pathway and allowing prolactin levels to rise. We have published new evidence that this model is unlikely to be correct in that electrophysiological studies show that these neurons remain prolactin responsive during lactation. Surprisingly, however, they appear to undergo a lactation-associated change in phenotype and switch from releasing dopamine to releasing the opioid peptide enkephalin. Thus, we propose that contrary to becoming silent during lactation these neurons actually take on a new, but yet to be defined, role.



Professor John Reynolds and Dr Louise Parr-Brownlie - \$959,000

Beauty vs the Beast: How does our brain prepare us to respond appropriately to beauty or fear?

Classical conditioning, as demonstrated by Pavlov, is the process whereby a neutral stimulus that repeatedly precedes delivery of a reward begins to elicit behaviour. Intriguingly, by a mechanism as yet unknown, our perception in sensory areas adapts during conditioning to maximise detection of stimuli associated with rewarding outcomes. We hypothesise that changes in primary sensory areas occur in response to neutral stimuli that predict the arrival of both reward and punishment, but are driven by different neuromodulator systems. Here we will measure the response in the superior colliculus to visual stimuli predicting both reward and punishment, and use pharmacology and optogenetics to determine the cellular mechanisms underlying changes in sensory responsiveness. We will also measure the effect of altered sensory responsiveness in the basal ganglia, where sensory inputs are thought to be incorporated into the generation of behaviour. This work will increase our knowledge of how the perception of sensory information associated with behaviourally relevant outcomes is heightened and leads to the selection of particular behavioural reactions. It holds the potential of providing new therapeutic targets for disorders such as post-traumatic stress disorder, anxiety, or addiction, where heightened responsivity in primary sensory regions may trigger debilitating behaviours.



Associate Professor Siân Halcrow (and co-investigator Dr Melanie Miller) - \$826,000

Small beginnings, significant outcomes: A new life-course approach to understanding the impacts of social inequality on human health in ancient China.

Social inequality is the hallmark for state-level societies worldwide, which has significant repercussions for nearly half the world's population who now live in poverty, affecting women and children most severely. To understand health disparities today, we need to study how inequality developed and how it impacted people in the past. The fertile Yellow River valley, known as the "cradle of Chinese civilisation", witnessed the development of one of the most durable states in the world. Recent research in this region has shown a deterioration in health and diet for women in the Bronze Age compared with the preceding Neolithic period. To fully understand this change, we will assess health and diet in large skeletal samples that cover socio-political development from the early agricultural societies to the stratified Han Dynasty. Using new methods to uncover childhood gender and diet, we will develop an original model to explain the development of diet and health inequality over the life course during five millennia of profound social change. This research is the first New Zealand-run bioarchaeological project in China and will place us at the forefront of methodological and theoretical development in the field.



Dr Laura Gummy - \$938,000

Mechanisms regulating long-range intracellular transport in neurons.

Axons are the long protrusions of neurons that transmit information to other nerve cells and tissues. Long-distance transport of molecules within the axon is critical for neuronal function. Transport involves the movement of proteins, RNAs, lipids and organelles, by motor proteins that move along cytoskeletal microtubules. Despite the critical importance of long-range transport to proper neuronal functioning, the mechanisms regulating the distribution of cargoes in axons over long distances are poorly understood. Recently, we uncovered that microtubule associated proteins control motor-based transport in neurons. Given the ubiquitous presence of many microtubule associated proteins in axons, we hypothesise the existence of a "MAP code" where microtubule associated proteins provide signals to coordinate specific transport routes. To test our hypothesis we will use state-of-the-art high-resolution live-imaging microscopy techniques to create dynamic maps of molecule movement within full-length axons. Combined with biochemical and optogenetic assays we will identify how specific microtubule associated proteins regulate the activity of various motor proteins to direct transport. In addition to deciphering the fundamental mechanisms of long-range transport processes in neurons, our work has the potential to contribute to the discovery of new therapeutic targets for treatment of diseases associated with intracellular trafficking defects.



Dr Tim Hore - \$854,000

Epigenetic sex determination and inheritance.

The germ germline encodes all of the biological information to be passed to the next generation. While much of this information is genetic and therefore encoded in DNA sequence, it is becoming increasingly clear that non-genetic, or "epigenetic" traits can also be inherited. Inheritance of these traits is rare in mammals due to erasure of epigenetic information in the germline. However, using zebrafish as a model, we have discovered that germline epigenetic erasure is not obligatory. We plan to use targeted epigenetic editing to test if removal of germline erasure allows broad-scale transmission of epigenetic information, and we will uncover the effect this has on inheritance and subsequent development. Of these subsequent developmental processes, perhaps the most distinctive is sex determination. We have found that female differentiation in zebrafish is inextricably linked to the expansion of DNA encoding specialised cellular machines that make protein, and is likely controlled by epigenetic modification. We will define how epigenetic modification impacts upon this specialised machinery and sex determination, and further test the exciting possibility that this epigenetic determinant can be inherited, akin to a classical sex determining gene.



Fast-Start Grants (early career researchers)

Dr Rebecca Kinaston - \$300,000

Waves of change: Human migration and adaptation in prehistoric Indonesia.

Prehistoric human migration and adaptation were key drivers of genetic and cultural evolution. In Island Southeast Asia (ISEA) and the Pacific, Indonesia played a central role in the prehistoric settlement of the region during two major time periods of human dispersal: the arrival of anatomically modern humans during the Pleistocene (possibly beginning ca 73,000 years before present- BP) and sea-faring, pottery making, Austronesian speakers during the mid-Holocene (ca. 5500-3000 BP). For this project, we will excavate two newly-discovered Indonesian sites with exceptionally well-preserved human remains dating to these periods. We will use ancient DNA analysis to determine the genetic makeup of the prehistoric populations and assess patterns of human dispersal and interaction. Chemical analyses of bone (bulk and compound-specific stable isotope analyses) will be used to determine the diet of the people who lived at these sites and allow us to understand how humans adapted to their environments to obtain food. Our findings will help unlock the mysteries of how humans migrated to and lived in the changing climatic and cultural landscape of Indonesia in the past. This research has the potential to significantly transform our knowledge of prehistoric human origins, dispersals and dietary adaptations in the Asia-Pacific region.



Dr Mike Garratt - \$300,000

Sensory control of life history and ageing in mice.

Life history theory is built on the assumption that there are trade-offs between life-history traits, such as between early and late-life reproduction, and between reproduction and lifespan. How these trade-offs are mediated is poorly understood. We hypothesize that sensory detection of social cues is an important regulator of life histories, providing the stimulus that promotes reproductive processes, but also self-imposing costs that reduce lifespan. This project will use established mouse models to elucidate the role of olfaction – the dominant sense in most mammals – in control of reproductive life history and ageing. We will expose mice to either opposite-sex odours, indirect access to mates, or direct mating and test whether sensory cues are capable of stimulating life-history transitions and metabolic costs associated with reproduction. We will further utilise genetic models of impaired olfaction to define the role of specific olfactory systems in matching life-history responses to different social environments. Ultimately, we will test whether either olfactory stimuli, or sensory deficits, are sufficient to influence mouse lifespan and link early life reproduction to reproductive ageing. This research could provide a new framework for understanding life-history trade-offs and reproductive plasticity, operating via sensory perception of the external environment.



Outstanding research recognised



Associate Professor Siân Halcrow has ended the year on a high note, receiving the Hill Tinsley Medal for outstanding research by a young scientist from the New Zealand Association of Scientists.

Siân has achieved a lot in the eleven years since receiving her PhD in 2007. She has established herself as a world-leading expert on the bioarchaeology of children and developed research programmes in Cambodia, China, Laos, Thailand and Chile. She has an extensive network of international collaborators in Australia, the US and Europe.

Siân was appointed Lecturer in the Department of Anatomy in 2010, and rapidly rose to Senior Lecturer above the bar. She was promoted to Associate Professor in 2018.

In 2011 she received a New Zealand Fulbright Travel Award which enabled her to visit colleagues in the United States and attend a major bioanthropology conference in Minneapolis. In 2012 she received a University of Otago Early Career Award.

Her research received a major boost from the Marsden Fund in 2014 for a project she led in Chile.

Siân is the former co-convenor of the Otago O-Zone Research Group for outstanding young researchers, and was recently presented with the Carl Smith Research Medal.

(Inset above: The Hill Tinsley Medal)

Rutherford Foundation Fellowship



Our congratulations go to Dr Alana Alexander who has been awarded a two-year Rutherford Foundation Postdoctoral Fellowship from the Royal Society Te Apārangi of New Zealand to investigate, for the first time, whether hologenomic approaches can answer key questions in conservation biology.

Hologenomics takes a holistic approach to genome sequencing where the DNA of the host animal as well as its co-existing microbes are sequenced.

The Fellowship will enable Alana to investigate whether patterns of genetic diversity across the holobiome, also known as the hologenome, can be used in conservation biology.

The test case she proposes to use are the Māui and Hector's dolphins. There remains significant uncertainty about crossbreeding between these two subspecies, the degree of population fluctuation, inbreeding and disease susceptibility and the ongoing impact of human activities, such as fishing. Hologenomics could be an important tool for understanding the mechanisms behind these issues.

Alana is a Postdoctoral Fellow with the Gemmell research group.

University of Otago awards

Distinction in research



Dr Mike Pankhurst and Dr Rosie Brown have been awarded University of Otago Early Career Awards for Distinction in Research. They are two of just six rising researchers in the University to receive this award in 2018. They will each receive mentorship from the University's O-Zone group to help promote their research and to help facilitate networks and collaborations to grow their careers.

Mike's research investigates regulation of ovarian follicle development and the quality of the oocyte (egg) within. The role that Anti-Müllerian hormone (AMH) plays in this process is a key focus. AMH is secreted in an inactive form and the current aim is to determine how proAMH (the inactive precursor of AMH) is converted to AMHN,C in the extracellular environment. Mike was awarded a Health Research Council Sir Charles Hercus Fellowship in 2017.

Rosie's research seeks to understand how a mother's brain adapts during pregnancy to facilitate a change in behaviour to allow her to care for her young. Key to this behavioural adaptation is a change in hormone signalling in the brain during pregnancy and through into the postpartum period. Rosie was awarded a Marsden Fast Start grant in 2017.

OUSA and OUMSA Best Lecturer

Professional Practice Fellow Dr Latika Samalia was voted one of the best lecturers on campus by two student groups - the Otago University Students' Association (OUSA) and the Otago University Medical Students' Association (OUMSA).

Latika received a Premier Lecturer (Health Sciences) Award from the OUSA. On submitting their votes, many students commented on Latika's ability to explain anatomical structures and processes in a way that helped them understand and remember detailed anatomy, and her dedication and passion for teaching anatomy.

One comment read "She just never fails to make everyone laugh and smile and get excited about anatomy, I often find anatomy overwhelming but she breaks it down so that you're like, oh what was I so stressed about".

She was also voted OUMSA Best Lecturer by the third-year medical students, and second for Best Lecturer at second-year level.

In 2018 Latika was involved in teaching students in the second-year Medicine gross anatomy module, third-year Medicine regional and clinical anatomy (including ultrasound), and reproductive and developmental anatomy modules, as well as modules at fifth-year. She also taught second-year Dental, second-year Physiotherapy, and modules in the Postgraduate Diploma in Surgical Anatomy.



Rowheath Trust Award and Carl Smith Research Medal

Associate Professor Siân Halcrow was presented with the Carl Smith Research Medal at a special event in October. As part of the evening she gave a talk about how she became interested in bioarchaeology as an undergraduate student, and the development of her research as a principle investigator.

In accepting the medal, Siân made mention of the many people who supported and influenced her study choices throughout her undergraduate and postgraduate years, many of whom she now regards as special colleagues and co-investigators.

Health Research Council Fellowship

Dr Rosie Brown has been awarded a Sir Charles Hercus Health Research Fellowship from the Health Research Council of New Zealand. The Fellowship will enable Rosie to broaden her research into the role the hormone prolactin plays in the reward circuitry of the brain and its impact on how a mother cares for her infant after birth.

Rosie says this research has important implications for understanding how the brain regulates mood and behaviour during pregnancy and in the early postpartum period. It is hoped that understanding these pathways could lead to the development of more effective diagnostic tools and strategies to treat those who suffer from postpartum mood disorders.



Dr Rosie Brown

National Geographic Early Career Grant

PhD candidate Melandri Vlok has received an Early Career Grant from the National Geographic Society for her research on the implications of human interaction for the health of past populations in Asia.

Melandri recently travelled to Hanoi, Vietnam, to study the skeletal material collection held at the Institute of Archaeology in Hanoi.

Her research explores how a large migration of people which happened about 4,000 years ago, and the expansion of agriculture had the potential to spread infectious diseases such as tuberculosis, treponematosi and leprosy into South East Asia in prehistory, and the biological and social impacts this may have had. She is also looking at how this migration may have lead to a rise in malnutrition with the change from foraging to farming, which may have resulted in people being more susceptible to infectious diseases.

She is focusing her study on disease changes between skeletons of a hunter-gatherer population in an archaeological site called Con Co Ngua in Northern Vietnam, populated prior to the oncoming of agriculture, and a site called Man Bac that captures the migration with the change to agriculture.

Melandri says her research has the potential to reflect on modern day and future scenarios of the rise in infectious disease epidemics related to forced migrations and displacement of people around the world due to environmental and political instability. She hopes her research will aid the understanding of how humans and pathogens have evolved along-side each other.

Melandri is undertaking her research as part of an international team of researchers which includes Dr Ngyuen Thi Mai Huong (Institute of Archaeology, Hanoi, Vietnam), Professor Hallie Buckley (Department of Anatomy), Professor Marc Oxenham (Australian National University), Associate Professor Kate Domett (James Cook University, Australia), and Professor Hirofumi Matsumura (Sapporo Medical University, Japan).



PhD candidate Melandri Vlok



Anatomy t-shirts... Just \$20!

Great stocking fillers for Christmas!

To purchase a t-shirt email t-shirts@anatomy.otago.ac.nz. Please note that for out-of-town purchasers there will be an additional charge for postage.

Departmental postgraduate awards

Masters research wins paper prize



Ashim Maharjan (right) with Co-supervisor Dr Yusuf Cakmak

A journal article published by postgraduate student Ashim Maharjan on the potential effects of different frequencies of non-invasive vagal nerve stimulation in humans, has seen him awarded the Department of Anatomy Postgraduate Paper Prize.

Ashim is the first author of the publication, published in international journal *Frontiers in Neuroscience*. He completed the research as part of his Masters degree in Neuroscience. The article explores the potential benefits of electrical nerve impulses to improve olfactory senses in humans.

Olfactory dysfunction affects about half the population aged between 65 and 80 years, and is a common complaint for patients in the early stages of neurological diseases such as Alzheimer's and Parkinson's disease.

Eighteen healthy males (non-smokers) took part in a clinical trial to test the effectiveness of vagal nerve stimulation using three different parameters (high frequency, low frequency and placebo), and participants' orbitofrontal cortex activity was monitored with near-infrared spectroscopy. The results showed, for the first time in human research, that non-invasive high frequency vagal nerve stimulation could be an effective treatment for improving olfactory function.

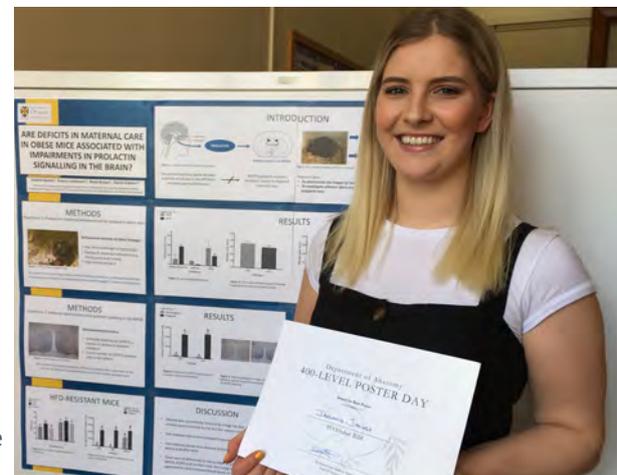
Ashim was supervised by Dr Yusuf Cakmak in collaboration with Dr Mei Peng from the Department of Food Science. He is currently in the early stages of his doctoral research, under the supervision of Dr Yusuf Cakmak, Dr Mei Peng and Associate Professor Bruce Russell (School of Pharmacy).

Poster-Day a celebration of postgraduate research

This year's poster-day was a huge occasion for our postgraduate students who presented the results of their 400-level research projects to the Department. Ten students took part in the event, which also doubled as an assessment component for those taking the ANAT 458 paper.

Head of the Department of Anatomy, Professor Lisa Matisoo-Smith, was impressed with the high quality of research presented. In congratulating the students on their presentations she commented that she had learnt a lot by talking to the students about their projects.

Neuroscience Honours student Ireland Jacobs was awarded the prize for the best poster for her presentation on the association of impaired prolactin signalling in the brain and deficits in maternal care.



Ireland Jacobs received the prize for the best poster



*Merry Christmas from Anatomy!
We wish you a safe and fun holiday,
and look forward to seeing you all
again in the new year!*