The faculty has a proud history of research in animal and veterinary science. The activities and achievements of the first half century were summarised in a 1951 paper by the Dean Prof H.R. Carne (Australian Veterinary Journal, p258-261, September 1951). The report clearly identified the pillars that still stand today as the cornerstones of our research effort – animal health, animal husbandry, nutrition, anatomy, and it announced the beginnings of a new effort in animal genetics. At this time the CSIRO was newly established from its forerunner, CSIR, with our former Dean, Prof W.I. Clunies Ross as the chairman. He had been instrumental in establishing the McMaster Laboratories in the now heritage building located on the Camperdown campus. The building and research it housed were a showpiece of CSIRO Animal Health, a program that was to set the agenda for CSIRO and its close interaction with the Faculty of Veterinary Science into the 1990s.

Prof Carne was a highly motivated researcher who rather than stop work at the compulsory retirement age, moved to Cambridge were he continued well into his elder years. His passion was at the interface of bacteriology and pathology and he published seminal works on Corynebacterium ovis (‘cheesy gland’ in sheep) amongst other works. Carne inspired a new generation of veterinary bacteriologists and pathologists. Prof R.V.S. Bain was noted for his work in vaccine development, particularly against Pasteurella. Prof Cliff Gallagher (1960s-1980s) was recognised as the father of veterinary chemical pathology, and was the first to determine pathomechanisms for the action of carbon tetrachloride and many plant toxins. Along with Dr Vivienne Reeve, he also developed new insights into carcinogenesis related to ultraviolet light. Dr Margaret Sabine (1970s-1980s) was a noted veterinary virologist, particularly for work in feline leukaemia virus and herpes viruses. Associate Professor Daria Love (1970s-2000) had a remarkable career and publication record, particularly on infectious diseases. In the 1980s and 1990s, Prof Paul Canfield, alongside his research into many aspects of veterinary pathology, established an interest in wildlife. The group flourished and in recent times the wildlife theme has become a major component of research in the Faculty.

Prof David McFarlane was the first appointed in Veterinary Clinical Studies (1959 as Professor of Medicine). Clinical related research activities continue to be a feature of the Faculty and owe a great deal to leadership provided by the second longest serving Dean, Prof Marsh Edwards. Prof Edwards produced a series of seminal works in the 1980s that identified the effects of heat on the developing embryo. Also appointed in clinical studies, Prof John Egerton (1972) is celebrated for his work on footrot. Other veterinary scientists who held leadership positions in the Faculty through the 1980s and 1990s and made outstanding contributions to research included Prof Ruben Rose, in equine research, Prof Brian Farrow in veterinary neurology, Prof Michael Bryden in marine mammal research and Prof David Fraser in nutrition.

Following the first tenure of Prof Canfield as Dean (1947-1953), Prof R.M.C. Gunn held the position (1954-58). During this period the Camden rural campus was established by the Professor of Animal Husbandry, TJ Robinson on land that was previously held by John MacArthur the pioneer of animal science in Australia. The purchase was made possible with support from the Australian Dairy Produce Board, the Wool Board, and the Meat Board (with chairman R.L. Shute). With this development the future role of the Faculty in extensive farm industries research was cemented. The needs of the local industries were addressed through the establishment of The Dairy Research Foundation and The Poultry Research Foundation. The Dairy Research Unit and M.C. Franklin Laboratories were built for studies of animal husbandry and nutrition, and under the directorship of Dr W.G. Whittlestone and Prof A.K. Lascelles and their successors provided the platform for research in dairy science that continues as a strength to the present day.

Research in reproduction, initiated by the first artificial insemination reported in sheep by RMC Gunn in 1936, flourished under the leadership and guidance of Professors Robinson and CW Emmens, Head of the Department of Veterinary Physiology. Robinson led a team which ultimately (1965) was responsible for development of a method for large-scale synchronisation of oestrus in animals, thus facilitating the development of artificial insemination. Dr Steven Salamon was a crucial member of the team and...
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This year we are celebrating a century of sustained achievement since Professor JD Stewart established Veterinary Science at the University of Sydney. The research undertaken by our veterinarians and animal scientists has helped to underpin the growth, prosperity and good health of the Australian community and built a firm foundation for Australian veterinary science, enabling the profession to flourish. Our graduates have led national improvements in livestock productivity, the identification and management of animal disease, protection of human health from zoonotic disease, and advancement in the quality and diversity of veterinary clinical services. Today we face real and growing challenges of global food shortages, environmental degradation, loss of biodiversity and emergence of new human pathogens from animals, particularly wildlife. The concepts of “one health” (the shared pathobiology and links between human and animal health), ecosystem sustainability and health (which links land, water, plant and animal life), and food security (the sustainable and ethical production of high quality, healthy food from animals) drive our teaching programs, research and partnerships. Today, we lead international, multidisciplinary programs in farm animal health, biosecurity, poultry and dairy science, animal genomics, advanced reproduction, animal welfare science, ecosystems health, tissue repair, veterinary education, companion animal disease and clinical service, to name a few areas of expertise. We educate talented, diverse and committed undergraduate and postgraduate students who experience research as they learn through inquiry. I know you’ll find the breadth and impact of the research described in this report fascinating, and invite you to contact the Faculty to be a part of our passion for research.

Best regards,
Rosanne Taylor
I am pleased to present the Faculty of Veterinary Science Research Report for the period 2008- mid 2010. Research in the Faculty of Veterinary Science has continued to build over the past two years, developing in our traditional strengths and expanding in newer areas that align with our faculty and student interests. We continue to have a strong position in livestock health and production research, and have witnessed a strong growth in our veterinary public health research, wildlife and conservation studies, companion animal research, and animal welfare. It is also very pleasing to see the translation of faculty research strengths into developing countries, reflecting not only the contribution that animal and veterinary research and education can have, but also the commitment of our staff for the benefit of the global community.

Presently, approximately 70% of our research income is directed towards the health and performance of production animals. This has stabilized in recent years and provides the base for total research income of approximately $8M. Wildlife research has become an area of intense interest and activity with a fantastic diversity of species now being studied. We also have a strong core of biomedical research and this has been reflected in the way that our research student graduates have been valued by leading medical research institutes, both in Australia and overseas.

With the development of major research initiatives across the University, the Faculty is involved more than ever in multi-disciplinary research that holds very exciting prospects for the future. Our campuses at Camperdown, placed adjacent to the Centre for Obesity Diabetes and Cardiovascular Disease (CODCD) development, and Camden, within the emerging bioscience precinct, provide the infrastructure required to study a diverse range of species in a laboratory, farm and clinical context. The CODCD development will be the largest single investment in research infrastructure in the history of the University and will transform the Veterinary Science surrounds into a world-class life sciences research precinct. The existing research strengths within the faculty align with the substantial CODCD themes in sustainable animal based food production systems, metabolic disease and nutritional sciences, as well as translational and comparative medicine. Core technological strengths are similarly aligned in genomics, bioinformatics, molecular and cellular systems, medical diagnostics, feed technology, integrated food systems and statistical analysis. Other research strengths in infectious diseases, international aid, animal vaccine biology, wildlife disease, biosecurity and veterinary public health are core areas in the newly established University of Sydney Institute of Emerging Infectious Diseases and Biosecurity. These build on our central role in the The Centre for Plant and Animal Biosecurity, in partnership with the Faculty of Agriculture, Food and Natural Resources, and the state government department, NSW Industry and Investment (EMAI centre at Camden).

The Centenary year of the Faculty has been suitably marked by a number of occasions, including the recent Research Showcase that was a successful display of the diversity and depth of our research capabilities. It seems fitting that the major developments in research on our doorstep should be happening at a time when we look to the future for the next century of research.
Associate Professor Paul McGreevy’s research research findings have been published in 4 books, 7 book chapters and over 50 peer-reviewed journal articles. Among various topics, Paul’s group has been investigating motor laterality in quadrupeds; in dogs, this can be studied through paw use.

His most significant contributions to research are in the fields of behaviour and welfare in domestic animals, especially dogs and horses. He is one of only two veterinarians recognised worldwide by the Royal College of Veterinary Surgeons as Specialists in Veterinary Behavioural Medicine. His contribution to the field of animal welfare was acknowledged in 2000 when he was the co-winner of the Prince Laurent Prize - the most prestigious international prize for animal welfare scientists.

**BEHAVIOUR & WELFARE - HORSES**

Paul has led seminal studies into the prevalence of abnormal behaviours in horses in relation to stabling including geophagia, and the effects of observational learning on food selection horses as well as the first reports of crib-biting in foals. He developed new methods of assessing equine gut function and post-inhibitory rebound of motivation when he examined the behavioural and physiological consequences associated with the short-term prevention of crib-biting in horses. He has also shown how the digestive efficiency, behaviour and gut transit times of horses change as a result of crib-biting. These findings are critical in helping to explain the functional significance of equine stereotypy’s and are widely employed by practitioners in the field.

Paul’s interest in Equidae is not confined to abnormal behaviours. His work on laterality in free-ranging horses has demonstrated that motor laterality differs in breeds of horse. It has also shown that the absence in horses of a correlation between laterality of nostril use and motor bias indicates that lateralization in equine brains occurs on at least two levels - sensory and motor.

**BEHAVIOUR & WELFARE - DOGS**

Paul’s work with dogs established an intriguing relationship between the distribution of retinal ganglion cells and nose length in the dog. This demonstrates that many different breeds of dog have different visual fields. It has profound implications for dog trainers, handlers and keepers since all dogs cannot be expected to perceive the same visual stimuli or respond to the world in the same way. This work may help to explain some of the behavioural differences between breeds, with short-nosed dogs being less likely to act like a running predator and hunt in packs and more likely to be able to focus on human faces, using their area centralis.

Breed differences are of growing importance to veterinary science and indeed the genomic revolution, so Paul’s online Listing of Inherited Disorders in Animals (LIDA) initiative www.vetsci.usyd.edu.au/lida promises to provide critical data for vets and dog breeders alike. LIDA receives more than 25,000 hits per month.
STUDENT PROFILES

HANNAH SALVIN
Canine Cognitive Dysfunction in a neurobehavioural syndrome affecting older dogs. It has many similarities to Alzheimer’s disease including, pathology, physiology and behavioural changes. The dog has also proven to be a more faithful predictor of human response to pharmacological intervention for dementia than the current rodent models.

To further develop the dog as a model we have undertaken investigations into the prevalence and level of underdiagnosis in community dogs. Using this information we were able to develop a diagnostic and assessment tool to aid vets and researchers in assessing a dog’s level of cognitive dysfunction. We have also developed a new paradigm for testing a dog’s level of visuospatial memory and are currently developing a test for olfaction abilities in dogs.

It is hoped that this work will contribute to raising awareness of CCD in the community and further the dog as a potential model for human age-related cognitive decline.

LISA TOMKINS
Guide dogs provide an important service to the community by increasing the mobility and independence of people with visual impairment. The cost of training a guide dog (in Australia) is approximately AU$30,000 and training completions are only around 50%. So, methods of early detection of suitability of dogs for guide work are an attractive means of reducing production costs. Therefore, the aim of my PhD is to identify specific objective measures that can be employed by guide dog organisations to identify dogs with a high probability of success in the training program.

To do this, I am assessing three categories of behavioural, morphological and physiological measures comprising 11 different tests: lateralisation (Kong™, First-stepping, and Sensory Jump Tests, Hair Whorl Characteristics); temperament (Passive, Noise, Sudden Appearance and Dog Distraction Tests) and kennel responses (Salivary IgA Concentration, Activity Level, Kennel Behaviour Surveillance) in potential guide dogs (n = 114) at the NSW/ACT Guide Dogs training centre, Glossodia, NSW, Australia. The use of predictors of guide dog success, may increase the efficiency with which suitable dogs are selected and allow training resources to be spared for dogs with a greater potential.
Dr Greg Cronin’s research is focused on improving the welfare and productivity of livestock. Projects employ different techniques to study animal behaviour, such as direct observation, the use of video cameras, GPS tracking collars and accelerometers (motion sensors). In many projects, the behaviour observations contribute to a multidisciplinary approach to evaluate welfare issues, including stress physiology and growth measures.

HIGHLIGHTS
The Norwegian University of Life Sciences, as part of a collaborative research project with the University of Sydney, has provided four newly-designed, prototype farrowing pens for use in research and teaching at the Mayfarm Pig Unit, Camden. The generous gift of the farrowing pens will enable continued collaboration on the maternal behaviour of pigs, and piglet behaviour and survival, between the designer of the farrowing pens, Associate Professor Inger Lise Andersen, and Dr Greg Cronin.

CURRENT ACTIVITIES
Research projects, including Honours, Masters and PhD student projects, are investigating the behaviour, welfare and production of a range of farmed species. In addition, in an Honours project with Taronga Zoo, Ms Lauren Whitfield is investigating the effects of crowd numbers and noise levels on the behaviour and stress physiology of gorillas.

In relation to farmed species, two projects are being conducted in collaboration with Dr Russell Bush (University of Sydney) and Dr Mark Trotter (University of New England) to evaluate the use of remote sensing technologies (GPS tracking and motion sensors) to study spatial and resource use by beef cattle (Ms Lauren Williams) and sheep (Ms Niki van der Smagt) in the paddock. A third project involving Honours student Ms Amanda Sutton, which also incorporates the use of motion sensors, is investigating the behaviour of sheep with Batten’s disease, quantifying the temporal pattern of change as the neurological disease progresses. This research is being conducted in collaboration with Dr Imke Tammen (University of Sydney).

Strategic research to identify the best methods of pain management for routine husbandry procedures conducted on pigs is a major focus of collaborative work with Professor Peter Windsor and PhD student Ms Crystal Espinoza and Honours student Ms Emma Bradbury. Consumers are questioning the ethics of applying invasive husbandry procedures without appropriate anaesthesia and, or analgesia, and the move towards the use of pain relief for
these procedures, for example in Europe, is likely to follow in Australia.

The development and evaluation of practical farrowing pens for use in the Australian pig industry is the focus of a new collaborative research project between the University of Sydney and the Norwegian University of Life Sciences. Over the next few years, projects will be offered to improve understanding of the management of these pens for better sow and piglet welfare around parturition and during lactation.

The duck industry is growing rapidly in Australia. In collaboration with Dr Jeff Downing (Poultry Research Foundation, University of Sydney), duck behaviour is being studied by Ms Karen Williams to identify how the management of growing ducks can be improved while ensuring good welfare.

Studies involving native fish species are becoming more common in laboratories. However, very little is known about how the laboratory environment influences the behaviour of the fish. Under the co-supervision of Dr Joy Becker, an Honours project by Mr Joseph Lee is quantifying the behaviour of two native species, and investigating the effects on their behaviour of placing other (larger) native fish species that are potential predator species, in tanks within sight of the fish.
Enhancing livestock production through the provision of improved nutrition has favourable implications for farm profitability. Research being conducted in these areas incorporates key aspects associated with climate change and utilisation of grain by-products as well as applied strategies to improve on-farm productivity through better feeding and management.

**HIGHLIGHTS**

The by-products (distillers grains, pressed oil seeds and glycerol) resulting from the increasing production of biofuels from food crops (grains and oil seeds) are being tested as a cost-effective energy source in ruminant diets. The role of ruminants as a contributor to greenhouse gas emissions is also being investigated along with more efficient feeding practices.

The provision of research, development and extension in animal nutrition and livestock production is being delivered for projects in Pakistan, Cambodia and Lao PDR to improve the capacity of smallholder farmers. Improvement in buffalo and cattle productivity and profitability is being achieved through improved feeding practices, fodder conservation and access to feed resources.

Alex Chaves research has lead to international recognition as an expert in the measurement of ruminal methane emissions and I am privileged to be assisting researchers at the Brazilian Agricultural Research Corporation - Dairy Research Centre (EMBRAPA - CNPGL in Juiz de Fora/ MG, Brazil) to measure livestock emissions and create the requisite inventory for Brazilian’s compliance with the Kyoto Protocol.

**CURRENT ACTIVITIES**

Nutrition is regarded as a central science for improving animal production, health and reproductive performance. The team of Dr Alex Chaves and Dr Russell Bush combines expertise in ruminant nutrition with a sound knowledge of production systems. This network is further expanded with behaviour and welfare input from Dr Greg Cronin.

In a joint future project between The University of Sydney, the EMBRAPA – CNPGL (Dairy Research Centre) in Brazil, Federal University of Sao Joao and Agriculture and Agri-Food Canada our aims are to determine the effect replacing feed sources in livestock diets with press oils seeds and glycerol by-products of biodiesel production on ruminal fermentation patterns; feed digestibility; ruminal microbial populations; and methanogenic activity of ruminal archaea; animal performance; and the environmental safety and project sustainability. Expected results are 1 Environmental: (i) to determine the extent to which bio-fuel livestock feeds have the potential to reduce GHG emissions; (ii) to quantify the optimal proportion of these by-products that are required in farm animal diets to generate the best outcome. 2 Nutritional: By reducing methane production, animal performance is likely to improve. 3 Milk and meat composition: Increase the concentration of conjugated linoleic acid (CLA); a potent anti-carcinogenic. 4 Improve
public perception of the bio-fuel industry: Through scientifically demonstrating the bio-fuel contribution to improved food production and reduction in GHG.

A commitment to improving livestock production in developing countries to assist address the global food crisis has lead to an increased commitment to improving available nutrition for cattle and buffalo in countries such as China, Pakistan, Cambodia and Laos. These projects aim to improve the productivity and profitability of smallholder farmers producing milk and beef in these countries and are funded by federal government agencies such as the Australian Centre for International Agricultural Research (ACIAR), Australian Agency for International Development (AusAID) and the Department of Agriculture, Forestry and Fisheries (DAFF). Strategies used include growing and conserving forages as well as understanding the importance of meeting animal requirements. A combination of developing extension resources and participatory training is being used to provide effective capacity building within these countries.

Other domestically focused applied research activities associated with the sheep and cattle industries include investigating welfare implications and application patterns for SkintractionTM, a non- surgical alternative to mulesing; conducting a NSW sheep lice and caseous lymphadenitis (CLA) prevalence survey; and developing management strategies for extensive cattle production in central Australia.

Jorge Avila Stagno (PhD Candidate) is currently in Canada trying to identify the level of glycerol which may replace barley in the ruminant diet and verify lamb performance and sustainability, diet digestibility and green house gases emissions.
STAFF PROFILE
HANNAH SIDDELE

My research is focussed on Devil Facial Tumour Disease (DFTD), an aggressive and contagious cancer that is driving the Tasmanian devil towards extinction. The disease causes cancerous lesions to develop around the face and neck of affected devils and is passed between animals by biting. The tumours grow very rapidly, resulting in 100% mortality, due to starvation or organ failure. It is predicted that DFTD will result in extinction of the species in the wild within 20-35 years.

As part of a four year fellowship I am spending two years in the lab of Professor Jim Kaufman at the University of Cambridge, developing reagents and techniques that will help us understand why Tasmanian devils do not mount an immune response to DFTD. We are focussed on specialised immune molecules found on the outside of the tumour cells called major histocompatibility molecules. If there is something wrong with these molecules, or they are absent, this would help the tumour hide from the devil immune system. Understanding DFTD and its interactions with the devil immune system will help us develop strategies for saving the devil in the wild and potentially reveal how a contagious cancer can arise in a wild population.

The Australasian Wildlife Genomics Group studies the molecular genetics and evolution of gene and genomes of our native wildlife. They are particularly interested in the immune system.

AREAS OF RESEARCH
- Comparative Genomics
- Immunogenetics
- Molecular Evolution

THE TASMANIAN DEVIL
We are studying the immunogenetics of Tasmanian devil facial tumour disease (DFTD). DFTD has led to the loss of 80% of our devils and may lead to the extinction of the species in the wild. Further information can be found at www.tassiedevil.com.au.

THE TAMMAR WALLABY
We are studying the genome of the wallaby. Together with Prof Stephan Beck from the University College London we are sequencing the Major Histocompatibility Complex (MHC). We are also focusing on characterizing antimicrobial peptides, cytokines, NK receptors and other immune genes in wallabies and other marsupials.

THE KOALA
Together with the Koala Infectious Disease Group we are looking at the role the MHC plays in disease susceptibility of koalas to Chlamydia.

THE PLATYPUS
Together with researchers in Molecular and Microbial Biosciences we are characterizing the molecular composition of platypus venom.

THE GENOME PROJECT
The AWGG are working on the Tammar Wallaby, Opossum and Platypus genome projects

IMMUNOLOGICAL FITNESS OF ANIMAL POPULATIONS
The AWGG are measuring the immunological fitness of Australian animals to determine their ability to respond to infectious diseases. In particular we are focusing on cane toads, frogs, platypuses and even domestic cats.

STAFF PROFILE
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1. Photo of diseased Tasmanian Devil courtesy of the Tasmanian Department of Primary Industries,

2. Photo of wallaby courtesy of K. Belov,

3. Photo of platypus courtesy of A.M. Whittington,

4. Photo of koala courtesy of C. Herbert,

5. Hannah Siddle
The Dairy Research Foundation is located at the Camden Campus as part of the University of Sydney. It has a research laboratory known as the M.C. Franklin Laboratory with facilities for carrying out a wide range of research from applied and that focusing on pasture management, animal nutrition and whole farm systems to more basic studies. One of the roles of the Dairy Research Foundation is to inform the dairy and general community on the work undertaken by the University and this is achieved by running an annual Symposium at Camden.

THE IMPORTANCE OF DAIRY RESEARCH
The Dairy Research Foundation of the University of Sydney serves a unique role within Australia’s dairy industry by integrating a program of basic and applied research at the cutting edge of dairy science and production with extension activities to disseminate this information among dairy farmers nationwide.

The commercial competitiveness of our dairy producers relies heavily on the establishment of new technologies for managing and feeding cows to maximise productivity within our Australian environment. These programs would not be possible without the close co-operation and generous financial support of both dairy producers and corporate sponsors.

The Dairy Science Section has a proud record of research achievement in the areas of:
- Lactational Physiology.
- Lipid Metabolism.
- The Partitioning of Nutrients during Lactation.
- Control of Enteric Disease in Young Calves.
- Artificial Induction of Lactation.
- Control of Milk Fever.
- Regulation of Lactation at the Cellular Level.

At present the focus for research is on forage production, feed management and future farming systems and innovations. For further details please visit the FutureDairy website at www.futuredairy.com.au

RESEARCH
The Foundation has supported research in Dairy Science for over 5 decades, having celebrated its 50 year anniversary in 2009. In this time, the Dairy Science Section has achieved a reputation for excellence in animal research of worldwide standing. This has been due in no small part to the leadership provided by the Foundation Directors, namely Dr. W. Whittlestone, Dr. A.K. Lascelles, Dr. R.C. Kellaway, Emeritus Professor E.F. Annison, Dr. G.H. McDowell, Dr. Jim Gooden, Dr. Bill Fulkerson and at present Associate Professor Yani Garcia.

At present the focus for research is on forage production, feed management and future farming systems and innovations. For further details please visit the FutureDairy website at www.futuredairy.com.au

DAIRY RESEARCH FOUNDATION ANNUAL SYMPOSIUM
The Annual Symposium is the main fundraising event of the Dairy Research Foundation. Every year attendees have access to the latest research being conducted by the Dairy Science Group at Camden as well a vast variety of speakers from all over the globe. These speakers can be from Industry or Industry-related backgrounds, often including Australian dairy farmers.

More recently the focus has been on providing a forum for Australian speakers and showcasing successful on farm adoption of relevant practices. Both the practical topics and the low registration fees have meant a gradual increase in the number of dairy farmers attending.

The Symposium also offers the opportunity for young scientists to stage short presentations on their work. This provides the opportunity for young scientists to sharpen their presentation skills but also allows them to become familiar with the dairy industry. For further details please visit the DRF website at www.vetsci.usyd.edu.au/foundations/drf/symposium
FutureDairy is a research program to help Australia’s dairy farmers manage the challenges they are likely to face during the next 20 years. The challenges are expected to be related to:

• The availability and cost of land and water resources
• The availability and cost of labour and associated lifestyle issues

PROJECT STAGES

PHASE 1
From 2004 to 2008 was unique in that all work carried out considered science, systems and people issues and focusing on Forages, Feeding and Innovations. We explored how our findings work under commercial conditions through partner farms. Key outcome was the achievement of over 40 t DM/ha/year with complementary forage rotations (CFR) and the establishment of the first Automatic Milking System (AMS) research farm at Camden.

IN PHASE 2
From 2008 to 2011 and in alignment with the restructure of all RD&E investments by the dairy industry, FutureDairy is concentrating on Feedbase (more milk from home-grown feed) and Precision Farming (Automatic Milking Systems [AMS] and other new technologies). We continue working in direct collaboration with farmers and extension, with 2 new projects started in the Hunter Valley and Northern Victoria.

PHASE 3
(2011-2015) is being developed but will focus on Sustainable Automatic Milking Systems and how we can best support farmers adoption and adaptation of this technology.

For more information visit www.futuredairy.com or contact Assoc. Prof. Sergio (Yani Garcia) at sergio.garcia@sydney.edu.au or Admin. Assistants Michelle Heward at and Sherry Catt at michelle.heward@sydney.edu.au / sherry.catt@sydney.edu.au (Ph 02 4655 0631)

FUTUREDAIRY

ASSOCIATE PROFESSOR YANI GARCIA
Project leader
Science leader - Feedbase area

DR KENDRA KERRISK
Science leader - Precision Farming area

DR AJANTHA HORADAGODA
Forage preferences
Forage quality

SANTIAGO FARINA
PhD student (Feedbase)
Technical Officer

DR RAFIQ ISLAM (NOT PICTURED)
Forage options
Nitrogen x water interactions
Crop modelling
Faculty of Veterinary Science researchers have joined forces to form the SYDNEY DAIRY SCIENCE group.

The main goals of this new group are to:
- enhance Faculty’s outputs and outcomes in relation to dairy-related research
- highlight extensive capabilities in dairy research
- capture future research opportunities; and
- integrate research into teaching at both undergraduate and graduate levels

The formation of this group is the first step towards the consolidation of Sydney University as a centre of excellence in Dairy Science research, teaching and training.

The Sydney Dairy Science group is open to anyone interested in dairy science and comprises many individual researchers and lectures from the Faculty. It draws on core Faculty research strengths (Nutrition and Metabolism, Genetics and Reproduction, Livestock Veterinary Teaching and Research Unit, and Future Dairy) but it will logically include all the activities of the Dairy Research Foundation. Further collaborative linkages are being developed with other faculties of The University of Sydney, and external R D&E organisations.

For more information please contact Associate Dean for Research, Assoc. Prof. Peter Williamson (p.williamson@sydney.edu.au) or Dairy Research Foundation Director Assoc. Prof. Sergio (Yani) Garcia (sergio.garcia@sydney.edu.au).
EQUINE CLINICAL RESEARCH: RESEARCH AND CLINICAL TRIALS UNIT (REACT)

Diminishing funding opportunities for Equine Clinical Research and changes in the staffing and operations of the Teaching Hospitals has led to the need to approach clinical research from different a different perspective. The REaCT unit was formally recognised by the Faculty in 1997 and has developed to provide opportunities for the clinical undergraduates and post-graduates and Senior Clinical staff at Camden to undertake clinical research. The REaCT unit has largely been associated with the Teaching Hospital and shares facilities and activities which has limited growth and expansion of the unit. In 2010 we are active in developing the concept of a Clinical Skills Building which should provide a dedicated facility associated with the Teaching Hospital to allow greater opportunity to expand activities.

In the latter half of 2009 and in 2010 there has been an increased interest and increase in the number of undergraduate and postgraduate students undertaking research projects, and a large number of studies underway. There are currently strong associations with the Raymond Purves Bone and Joint Laboratory at Royal North Shore Hospital where we are collaborating on projects looking at tendinitis in horses and using animal models to study tendinitis and the effect of stem cells in humans. We are currently undertaking a collaborative study with the Orthopaedic Research Laboratory at Colorado State University evaluating new products for the treatment of osteoarthritis in humans. There have been exciting results investigating the effect of Manuka honey on wound healing in horses that will provide substantial benefits to the equine industry.

This year has seen a flurry of research activity in a variety of areas. There are projects underway looking at wound healing and airway disease in horses, tendinitis, spinal disease and techniques for cartilage resurfacing in humans using animal models, the efficacy of colloids for the treatment of hypovolaemic shock in horses, effects of different concentrations of inspired oxygen concentration during anaesthesia in horses, and investigations into various drugs for treatment of osteoarthritis in horses. Clinical studies looking at new disease entities in alpacas, use of compounded medication for the clinical treatment of horses and tick paralysis in horses are being investigated.

Professor Leo Jeffcott former Dean of the Faculty has joined Professor Andrew Dart and A/Professor Christina Dart in overseeing the activities in REaCT. There has been a focus on ensuring that the postgraduate clinical staff undertaking residency programs to prepare for examinations to become clinical specialists are able to complete their research obligations for credentials submission. However, there is also a variety of undergraduate students undertaking BSc (vet), AVBS honours projects and BVSc honours projects as well as overseas undergraduate and postgraduate students all participating in research activities.

The University Veterinary Teaching Hospital at Camden has installed new state-of-the-art equipment for the diagnosis treatment of large animals, particularly horses. These include digital radiography equipment, a high speed treadmill, a standing MRI scanner, a new facility for nuclear scintigraphy and two digital ultrasound machines which allow the centre to diagnose poor performance and lameness with greater accuracy. This new equipment will open new avenues for clinical research.

The REaCT unit is stimulating a renewed interest into clinical research. Clinical research is the activity that distinguishes Veterinary Teaching Hospitals from private practice and places the University at the pinnacle of the profession. The success of the equine research at the University is the commitment and enthusiasm of the students who have been involved in a wide range of research projects in various areas of equine veterinary science and science in general.

PROFESSOR ANDREW DART BVSC, PHD, DIP ACVS, DIP ECVS

Andrew is a graduate of the University of Queensland and an alumnist of the University of Sydney. He has been a veterinarian for 26 years and a registered equine surgical specialist in the USA, Europe and Australia for 17 years. After spending time in private practice and as a resident and an Equine Surgeon at the University of California, Davis he returned to the University of Sydney in 1994. Since then he has been Surgical Registrar, Head of Equine Services, Hospital Director and now Professor of Equine Veterinary Science and Director of the REaCT unit. Despite holding a full time Clinical position Andrew has published over 100 refereed scientific manuscripts and mentored over 40 clinical postgraduates. Amongst a variety of University, Faculty and External professional appointments he has held positions as Deputy Chair of the Animal Ethics committee and sits on the Animal Research Review Panel. His aims are to help develop a Clinical Skills Laboratory in the Faculty of Veterinary Science which in conjunction with the REaCT Unit will become an internationally recognised research and training facility. The aim is to mentor and encourage young veterinarians to aspire to providing excellent service to the public and profession by developing their passion for clinical and clinical research work.
2. Studying upper airway disease in horses on the treadmill

4. Creating osteochondral fragments in the corpus of horses to study the effects of drugs on osteoarthritis in horses.

5. Innes Halldane, a visiting French student undertaking research on the effect of different suture patterns on airway diameter.

3. Clinical research not only provides opportunity for students to undertake research, it also provides substantial opportunities for final year students to get hands on experience in technical procedures.

STAFF PROFILE

DARIEN FEAR

• Complications of intravenous catheterization in hospitalized equine patients
• Hemostatic and oncotic effects of modified gelatin solution in horses
• Neonatology
The Farm Animal and Veterinary Public Health group within The Faculty of Veterinary Science at The University of Sydney is internationally recognised for its expertise in animal biosecurity. Academics and support staff in Farm Animal and Veterinary Public Health form a critical mass that conducts a range of applied research projects and is able to provide service to the community across many species, industries and scientific disciplines. We work extensively with collaborators from other institutions and the private sector both in Australia and overseas. We have a large network of contacts in government, industry, academia and business and strive to ensure that our work is relevant and meets current and future community need.

Our group applies a range of disciplines, including epidemiology, immunology, microbiology and pathology to address problems confronting food security, disease control, public health and animal welfare. Our research and training programs produce benefits for the livestock industries (including sheep, cattle, pigs, chickens and aquatic species) and for the community in which we live.

Most of our staff are funded through external competitive research grants, illustrating the calibre of the projects. We place high value on our post graduate students. Following are some examples of current research.

**SUSTAINABILITY, THE ENVIRONMENT AND HUMAN HEALTH**

It is impossible to divorce animal health, human health and environmental health and our projects increasingly link these fields into “one health” for which there is major international support through the OIE (World Organisation for Animal Health). One example is the extension of research on viral diseases of farmed and pet fish to explore possible impacts for threatened species conservation in the Murray Darling Basin, an area of over 1 million square kilometres. A second example is our work in developing countries on the control of important human diseases, such as rabies in Bhutan and highly pathogenic avian influenza H5N1 in Indonesia.

**REGIONAL INTERNATIONAL PROJECTS**

Our group has been very successful in obtaining ACIAR (Australian Centre for International Agricultural Research) funding to conduct research projects to inform the development of the livestock industries and assist opportunities to address rural poverty in our region. Major projects in cattle and buffalo health and production are current in Laos and Cambodia With PhD and Honours students working on Biosecurity projects in both countries in close collaboration with the regional OIE office in Bangkok involved in the SEA-FMD control program. Our staff is also involved in health and production projects in Indonesia, China and Pakistan.

**LIVESTOCK WELFARE**

In response to the mulesing crisis that has divided the sheep industry; in 2007 we obtained ARC Linkage funds to develop practical solutions for delivery of analgesia for improved animal welfare during routine husbandry procedures involving surgery. This approach has been widely adopted for mulesing and our research is evaluating its application in other procedures including castration, tail docking, dehorning and ear notching in sheep, cattle and pigs contributing to national policy on pain management for better welfare outcomes.

**MAJOR RESEARCH PROGRAM IN JOHNE’S DISEASE**

In the most concerted effort yet to come to grips with a complex and frustrating disease, we have joined with Meat and Livestock Australia (MLA) to undertake intensive research into Johne’s Disease (JD), a devastating and ultimately fatal disease of ruminants already entrenched in south eastern Australia. The lack of basic knowledge about the disease is hindering the design of improved tests, treatment and vaccines. Support from MLA and the other sheep industry agencies has enabled a team of four leading post doctoral scientists and additional research students to be established to study both the basics of Johne’s infection and the application and efficacy of disease control tools including vaccination, contributing evidence to support national disease control programs.

**AQUATIC ANIMAL HEALTH**

There is a national goal for Australia to increase aquaculture production three fold to $2.5 billion by 2010. Our group is well-connected to the aquatic animal industries through national and international research projects, participation in the National Aquatic Animal Health Technical Working Group which advises government and the Fisheries Research and Development Corporation Scientific Advisory Committee. New research projects
FARM ANIMAL AND VETERINARY PUBLIC HEALTH

1. Proposed pigs movements, eastern Indonesia (courtesy Edwina Leslie)

2. Equine influenza (image NSW DPI)

3. Rabies in Bhutan (courtesy Tenzin)

4. Collection of vesicular fluid from the mouth of a cow for diagnosis of FMD in Cambodia by 5th year BVSc Honors student Dan Wills in January 2010

5. Johne’s disease research (courtesy R Whittington)

funded by Fisheries Research and Development Corporation, ACIAR and the Murray Darling Basin Authority commenced in 2007 and cover topics as diverse as best management practice in shrimp aquaculture through to environmental impacts of fish viruses in threatened species. Our group has an internationally-recognised role in epidemiology and diagnosis of the notifiable viral disease of finfish, epizootic haematopoietic necrosis virus, hosting the World Organisation for Animal Health Reference Laboratory for EHNV. We were asked to lead a second international reference laboratory in 2009, for ranavirus. This group of pathogens is one of the causes of global amphibian declines.

TRANSBOUNDARY DISEASE SPREAD

Our group has several projects focusing on why and how infectious animal diseases spread: analysis of the equine influenza epidemic that devastated the pleasure, racing and breeding horse industries in 2007; characterization of market chains and their role in the spread of avian influenza and classical swine fever in Indonesian; and the role of feral species, such as pigs, in the potential spread of foot-and-mouth disease in Australia. Molecular and spatial epidemiological techniques are combined with simulation modelling and risk assessment methodologies to address these issues.
STAFF PROFILE
DOUGLAS BEGG
After completing his BSc majoring in Zoology, Doug went on to do a Diploma for graduates with a major in Microbiology.
In 2000 Doug completed his MSc in the Disease Research Laboratory at the University of Otago, New Zealand. His thesis examined the effect that different experimental housing conditions and environmental enrichment had on stress and immune responses of brush tail possums.
Staying within the Disease Research Laboratory, Doug worked on experimental infection models for Mycobacterium paratuberculosis which causes Johne’s disease in sheep. The immune responses from infected, diseased and vaccinated animals were examined. Doug joined the Farm Animal Health Group in 2005 and is continuing to study the pathogenesis of Johne’s disease in sheep as well as advising on immunological studies carried out in other species of farmed animals.

STUDENT PROFILE
 SOPHIE CONSTABLE
Dogs are like family is a phrase you hear a lot in Indigenous communities, and sometimes it’s meant quite literally: dogs can be a formal part of Indigenous kinship systems. They can also have important roles in ceremony and spiritual guarding.

These kind of cultural differences are important to understand before undertaking a dog health program, but most people are unaware of the significance of dogs in Indigenous cultures. This lack of cross cultural understanding, together with continued poor access to veterinary services and socio-economic disadvantages cumulatively applied since colonisation are all factors in the current state of dog health in Indigenous communities today.

Sophie’s research is part of the Healthy Dogs, Healthy Communities program, investigating dog health in Indigenous communities and sustainable pathways towards better health. Specifically, Sophie has looked at the factors affecting dog health, the influence of different types of dog health programs, and the influence of culturally appropriate, locally relevant education and training programs.
MEMBERS OF THE GROUP 2008-2010
Principals: John House, Katrina Bosward, Alison Gunn and Paul Sheehy.
Post-graduate students: Sebastian Bowman, Matt Izzo, Andrew Thompson, Virginia (Jennie) Mohler
Honours student: Shahab Ranjbar

A comparison of post operative outcomes in dogs undergoing laparoscopic ovariectomy and prophylactic gastropexy with those undergoing standard open ovariectomy and gastropexy.
The aim of this project is to compare postoperative outcomes in female dogs undergoing ovariectomy and prophylactic gastropexy via a minimally invasive laparoscopic approach with those undergoing the same procedures via a standard open midline laparoscopy. Objective measures of post-operative pain/discomfort to be measured and compared include plasma cortisol levels in conjunction with

RESEARCH PROJECTS 2008-2010
- Moraxella bovis and Moraxella bovoculi DNA diagnostic tests to monitor species and strain prevalence.
- Molecular methods for detection of calf scour pathogens.
- Investigating causes of mortality in export cattle.
- Salmonella related research in the live sheep trade.
- Determining the causes and risk factors for lameness in dairy cattle.
- Mycoplasma spp. molecular diagnostic tests and investigation of the incidence of Mycoplasma in eastern Australia dairy herds.

STUDENT PROFILE
VIRGINIA (JENNIE) MOHLER
Jennie Mohler, a post-graduate PhD candidate at Livestock Veterinary Teaching and Research Unit.

Jennie is researching the cross protective efficacy of the dam attenuated live salmonella vaccines in calves and adult ruminants as well as developing a novel in-water vaccination strategy for mass medication of livestock

Efficacy of DNA Adenine Methylase Salmonella Vaccines in Livestock

Salmonella are important pathogens of livestock and humans. Worldwide, over three million human deaths are attributed to Salmonella infections. Increasing antibiotic resistance in food producing species; concerns about antibiotic residues; stock losses; and residual poor growth rates indicate that vaccination would be more economically effective in controlling salmonella infections in livestock. Traditional salmonella vaccines elicit limited protection against a single strain of Salmonella. There are over 2400 different types of Salmonella, livestock are often exposed to multiple Salmonella serovars capable of causing disease. A major challenge in the development of an effective commercial salmonella vaccine is to find a product that provides sustained cross-protective immunity.

Salmonella Typhimurium containing a deletion of the gene required for DNA adenine methylation (dam-) are avirulent yet confer protective immunity as modified live vaccines in murine, avian and bovine models of salmonellosis. dam-controls several important and diverse biological processes including DNA replication, methyl-directed mismatch repair, transposition, and the expression of pili required for colonization of host tissues. Experiments conducted in mice and poultry have demonstrated the capacity of dam- attenuated S. Typhimurium to induce cross protective immunity to a diversity of salmonella serovars. Jennie’s research has focused on evaluating cross protection in calves, vaccine stability in livestock drinking water, and oral delivery and efficacy in adult ruminants. The results of this work have been very promising indicating a potential for the application of this vaccine in animal agriculture to promote the health and welfare of livestock and the food safety of agricultural products.
We combine state-of-the-art molecular applications with knowledge of parasitology to redefine existing and describe new parasitic species and life cycles, and to understand their origin. The laboratory aims are directed towards better understanding parasitic diseases. Our aim is to understand the evolution of parasitic life cycles and machineries controlling them. Projects employ broad range of multidisciplinary techniques including experimental biology, cell biology, molecular biology, comparative genomics and bioinformatics. In parallel to these, the laboratory works closely with the veterinarians and the clinics (companion, farm and wild-life clinics) to develop methods to rapidly diagnose and identify parasitic organisms using molecular and experimental tools and generate data for better understanding their epidemiology.

HIGHLIGHTS
Recently, we co-authored Nature paper on Chromera velia, the closest free-living organism to apicomplexa that cause malaria and toxoplasmosis. Chromera velia is a novel photosynthetic alveolate that was discovered with corals living in Sydney Harbor and on the Great Barrier Reef. The paper has been reviewed by “Faculty of 1000 Biology” and received F1000 factor of 8 [Exceptional], with the following review comments “It may prove extremely beneficial in defining conserved pathways obtained from the endosymbiont, some of which are potential drug targets for medically important apicomplexans. Such comparative studies may also help define the specialisation that leads to parasitism vs. free living existence”.

STATEMENT OF CURRENT ACTIVITIES
Currently our laboratory offers projects for Honours and PhD students to better understand the transition from free living to parasitic life style. The study is supported by Australian Research Council. We are very pleased that we will be welcoming Giselle Walker (Department of Biochemistry, University of Cambridge, UK) to undertake ultrastructural work on Chromera velia and further our endeavors into the compartmentalisation and flagellation of this organism, the travel is being supported by the Network Researcher Exchange, Training and Travel Award (Australia Society of Parasitology). Moreover, we offer projects in the emerging parasitic disease with focus on recently indentified myxosporean parasites affecting Australian native frogs as well as the exotic Cane Toad. The study is supported by the Australian Academy of Sciences, and is a collaboration with the Camden’s Wildlife Health and Conservation Centre and the Taronga Zoo. Our PhD student has been awarded a prestigious JD Smyth Postgraduate Travel Award.

STUDENT PROFILE
JESSICA KING
Jessica King’s work on investigating the role of wild canids (dingoes, their hybrids and foxes) in transmission of Neospora caninum has received national interest after she presented a paper at the Global Biosecurity 2010 Conference: Safeguarding agriculture and the environment in Brisbane. Following a media release for the conference, a flurry of radio interviews and newspaper articles resulted, with the ABC radio broadcasting her work throughout Australia. Jess was responsible for 93.4% of all her funding body’s (Invasive Animals CRC) generated media relating directly to wild dogs and 15% of the total Invasive Animals CRC media coverage in February. Jessica has recently had her paper “Dingoes are definitive hosts of Neospora caninum” accepted for publication in the International Journal for Parasitology and a review accepted in The Veterinary Journal that outlines the implications of wild dog ecology on the sylvatic and domestic life cycles of Neospora caninum. She is the recipient of the Chief Executive’s prize for achievement as an Invasive Animal CRC student.
The Veterinary Pharmacology Group is involved in investigating the pharmacokinetics of drugs i.e. the profile of various drugs with reference to the rate of drug absorption, distribution, metabolism and excretion, in Australian native animals such as koalas and possums. The purpose of these investigations is to determine the most efficacious drug dose rate, dosing frequency and route of administration for various therapeutic drugs to optimize therapeutic outcomes. The Veterinary Pharmacology Group is also engaged in monitoring the development of resistance of bacteria from many veterinary species of animals to antibacterial drugs and investigating ways to prevent the selection of resistant bacteria due to the use of long-term antibacterial administration to animals.
Dr. Vivienne Reeve has played a major influencing role on research in Photobiology in Australia since the early 1980s. The research has been largely based on the hairless mouse, a model that is internationally acknowledged for its relevance to the responses of human skin to UV radiation exposure.

Dr Reeve and her group maintain the only viable inbreeding colony of these mice in Australia, in addition to other relevant genetically modified mouse strains. The research has focussed primarily on strategies for the prevention of photoinimmune suppression and the consequent development of photocarcinogenesis in the mouse, using dietary supplements or topical applications of a variety of sun screening ingredients, drugs and phytochemicals.

Endogenous pathways that protect against UV-induced photodamage have thus been identified for the first time. For example, the role of UV-inducible cutaneous antioxidants (haem oxygenase, metallothionein) and an important role for signalling by the oestrogen receptor-beta (a steroid hormone receptor that shares some properties with the nuclear vitamin D receptor) have been established.

The relationship of these endogenous mechanisms with specific UV wavebands, UVA and UVB, has also been an important focus for the research. The group’s expertise in modelling photocarcinogenesis in the mouse is well recognised. Overall, the group has published 79 peer-reviewed journal papers (6 have been cited more than 25 times, 4 more than 40 times), 8 book chapters and one book, the majority of papers being in the top dermatological journal (J Invest Dermatol) and in the major international photobiology journals (Photochem Photobiol and Photochem Photobiol Sci).

Dr. Reeve and her students have played a prominent role in the international photobiology societies (American, European and Asia-Oceania), and in convening the photobiologists of Australia at regular annual national conferences.

CURRENT RESEARCH PROJECTS

- The influence of oestrogen receptor signalling on skin responses to UV radiation.
- Dietary supplementation of goji berry (Lycium barbarum) juice and protection from UV radiation-induced skin damage.

The projects are based on campus, using mice from the Veterinary Science mouse colony.

TECHNICAL SERVICES

We have established reproducible models of skin carcinogenesis in the mouse, that we have used for testing of many potential anti-cancer agents, in pure basic research and in collaboration with industry partners, such as sunscreens, phytochemicals, antioxidants, anti-inflammatory drugs, dietary alterations, other natural compounds. We use a laboratory source of solar simulated UV radiation for acute and chronic non-burning exposure of the mouse skin that models human sunlight exposure.

Skin tumours (squamous cell carcinoma) can be induced in mice by chronic UV exposures, and systemic or topical agents tested for effects on the rate of tumour development. Transplantable tumours (melanoma, squamous cell carcinoma) are maintained as cultured cells, and can be injected into recipient mice intradermally, subcutaneously or intravenously, and agents tested for effects on rate of tumour growth.

As UV radiation is immunosuppressive, immune modulating drugs can be tested by their effects on the suppression of the contact hypersensitivity response in mice, an immune response that is relevant to human T cell mediated immune reactions. We have acknowledged expertise in this sensitive assay. Supporting evidence of immune status can be obtained by detection of immune mediators such as cytokines or key enzymes in the skin using molecular biology and immuno-histochemistry.
The Poultry Research Foundation was one of the original Foundations established within the University of Sydney by the University Senate, in October 1958. The purpose of the Foundation was and still is to provide an interface between the Australian poultry and allied industries, and the Faculty of Veterinary Science. The Foundation sponsors industry related research, assists in the training of scientific personnel and acts in an industrial liaison capacity. The Foundation’s contribution to the development of the Australian poultry and stockfeeds industries has been achieved through research programs directed at achieving better understanding of the metabolism and nutritional requirements of poultry.

The Foundation regularly hosts workshops, seminars and symposia. In 1989 the annual Foundation Symposium became the Australian Poultry Science Symposium through a joint collaboration with the Australian Branch of the World’s Poultry Science Association. It is now an internationally acclaimed annual scientific symposium bringing experts in their fields from all around the world together to present up to date information to up and coming post graduates, researchers and industry personnel.

CURRENT RESEARCH PROGRAMS

- AECL funded project “Salmonella control in commercial layer flocks”. A two year project looking at approaches to reduce intestinal colonisation of layer chickens by Salmonella with the use of live and inactivated vaccine in various combinations.
- Australian Poultry CRC funded project “Effects of incubation differences on broiler chicken skeletal integrity”. Short term study involving effects of differences in temperature and humidity at time of early incubation.
- Spotty Liver syndrome in free range and barn layer chickens. It was the first time a epidemiological study has been done on this syndrome and was conducted via a field survey by mail of a large proportion of the free range and layer flocks of New South Wales and Victoria.
- MLA funded project “Strategies to identify and develop bioactive peptides in meat and bone meal (MBM)” Utilising screened samples of peptides in of meat and bone delivered in-ovo re assessment of their bioactivity.
- RIRDC Chicken Meat funded project “Physiological and nutritional approaches to alleviate heat stress in broiler chickens”. Studies found that supplying oral hydration (glucose plus electrolyte saline) plus betaine to broilers during periods of high temperatures improved their performance.
- RIRDC New Animal Industries funded project “Efficient, environment and bird friendly duck production”. A three phase feeding program was evaluated where the finisher diet was introduced in weeks 5 and 6 of the production program.
- A behavioural study was run alongside the above study on the interaction by two-day-old ducks with two water provision devices in the pen (nipple drinkers and bell waterers).
- AECL funded project “Corticosterone concentration in egg albumen is being determined as a non-invasive measure of stress in hens maintained in different housing systems”. Barn, conventional cages and free range are being sampled at 10 week intervals throughout the full production cycle.
- RIRDC Chicken Meat funded project to investigate the effects of steam pelleting temperatures and grain particle size/texture on the performance of broilers offered sorghum-based diets.
- Collaborative projects with Massey University and AB Vista culminated in the publication of a ‘phytase and/or xylanase’ feeding study and reviews of (i) calcium interactions with phytate and phytase and (ii) the impact of phytate and phytase on endogenous nitrogen losses.
- Collaborative projects with the University of Melbourne and AECL resulted in two projects “The welfare of laying hens in cages” and “The importance of rearing environment, space and nests for laying hens in cages”.

POULTRY RESEARCH FOUNDATION
DR AARON COWIESON

Dr. Aaron Cowieson hails originally from Scotland where he read for his undergraduate degree in Agricultural Science and Management from the University of Aberdeen. Graduating in 1997 Aaron went on to read for an MSc in Analytical Chemistry and finally a PhD in Poultry Nutrition, both with the University of Aberdeen and the Scottish Agricultural College. After a two year post-doc where Aaron continued his studies on the effects of exogenous enzymes on the nutritional value of poultry diets, Aaron took on a research position in a large biotechnology business based in southern England. Aarons research has focussed on feed additive biochemistry for both poultry and swine and has led to more than 150 publications, over 40 of which appear in international peer-reviewed journals. To date Aarons most significant contribution has been to shed light on the complex interactions between dietary phytate and the digestive system in poultry. This research, which involves mineral and amino acid nutritional chemistry has been extremely instructive and has resulted in several important breakthroughs in tangible performance indices. Aaron joined the University in June 2010 as Associate Professor of Poultry Nutrition and Director of the Poultry Research Foundation and he plans to develop a significant research portfolio to investigate aspects of poultry nutrition, health, digestive physiology, immunology, microbiology and behaviour and welfare.

DR JEFF DOWNING

Jeff started at the poultry research unit in November 1996. Initially employed as Research Fellow and then in 2003 as a lecturer in Animal Science. He gained his PhD in 1995, studying the effects of nutrition on ovarian follicle development in the ewe. This work used an ovarian auto-transplant model where the ovarian was transplanted into the neck allowing access to the blood supply to and from the ovary. After moving to the faculty, his initial research was in ovarian follicle development in broiler breeders, fat metabolism in broilers and enhancing the tissue concentrations of omega-3 fatty acids in meat and eggs. Since 2003 his research efforts have focused on stress, its control and measurement in laying hens. The main emphasis of this work was the development of a non-invasive means of measuring stress in laying hens. Corticosterone concentrations in egg albumen are an indicator of stress in laying hens. Presently this procedure is being used to evaluate commercial industry practices and their effect on stress in laying hen. Recently he has been working on RIRDC funded projects investigating heat stress in broilers and aspects of commercial duck production. With Pork CRC funding Jeff has developed a procedure for induction of oestrus and successful mating in lactating sows.

Jeff is teaching in units of both the Veterinary and AVBS degrees. His teaching areas are assisted reproductive technologies, pig and poultry husbandry, animal welfare and stress physiology.
Technological advances in molecular and quantitative genetics, and reproductive and cell biology continue to be achieved at a bewildering pace. The implications for animal industries throughout the world are substantial, and could mean revolutionary rather than evolutionary changes.

To contribute to these advances, to harness their practical outcomes for the animal industries of Australia and to provide a technology focus for the region, a new research and commercial centre has been established in the Faculty of Veterinary Science in the University of Sydney.

CELL TECHNOLOGY

A developing area of research within the Faculty is the field of animal stem and progenitor cell biology. The applications of the fundamental understanding of cellular proliferation, differentiation and tissue renewal are broad and include regenerative medicine and delineation of the cellular dynamics of productive tissues like the bovine mammary gland. Regenerative medicine is a contemporary therapeutic approach in veterinary medicine and is a means to treat animals but utilising cells with significant regenerative potential or ‘stem’ cells. These cells when applied in a therapeutic context have been known traffic to sites of degenerative disease and upon localisation can proliferate and differentiate and facilitate repair. Canine osteoarthritis is a particular target of this approach. An understanding of the cellular or cytodynamic of productive tissue such as muscle of production animals or the mammary gland of dairy animals may lead to development of strategies to enhance these productive characteristics of these animals.

Current Projects:

- Characterisation of canine adipose derived mesenchymal stem cells for treatment of diseases and disorders in dogs. Canine Health Foundation
- Investigation of the role of bovine mammary stem cells in the lactation cycle of dairy cows. Dairy Australia

GENOMICS

The genetic researchers at Reprogen use an extensive range of animal models (e.g., sheep, cattle, horse, pig, mouse and their relatives) to map and characterize genes influencing economically important traits (e.g., meat, wool, milk and other aspects of performance). Genes which have an effect on biomedical conditions (e.g., zinc transport, dwarfism, blood clotting and heart development) and genes responsible for inherited disorders (e.g., Batten disease, chondrodysplasia and zinc deficiency).
Other areas of genetic research include the evolutionary origin and phylogeny of domesticated animals, the conservation and management of Australia’s native fauna (e.g., marsupials and monotremes), building comparative genomic maps between diverse animals species (e.g., kangaroo, human, mouse and bird) and the prospects of safely using animal cells and tissues for treatment of human diseases.

A broad range of molecular biological techniques, including DNA cloning, DNA sequencing, genetic marker analysis (e.g., STRs, SNPs, and microarray analysis), gene expression analysis and sophisticated statistical and bioinformatic methodology are routinely applied in achieving these objectives. Much of the work lies at the interface of molecular and quantitative genetics and the group maintains strong quantitative skills relevant to the discovery and application of molecular findings as well as to basic genetic improvement, extending even to genetic improvement in the crocodile industry.

**REPRODUCTION**

The Animal Reproduction Group is recognised internationally for the development of advanced reproductive technologies in numerous species, including sheep, goats, pigs, cattle, alpacas and horses. Research in this area includes the application of low-dose artificial insemination with cryopreserved and sex-sorted sperm, the assessment of sperm function and morphology in vitro to estimate field fertility, and the refinement of non-surgical embryo transfer techniques.

With facilities for processing gametes and culturing embryos at both the Camperdown and Camden campuses, increasing the efficiency of in vitro embryo production systems and understanding the molecular mechanisms involved are major research objectives. In vitro fertilisation systems using sex-sorted sperm are currently being developed to facilitate the production of embryos of predetermined sex in cattle, sheep and pigs. Models of good and poor oocyte quality are being used to investigate the acquisition of developmental competence during oocyte maturation. Embryos produced in vitro are routinely examined to determine the effects of sperm treatments and culture conditions on various aspects of early embryo development.

The results of recent studies on the effects of sperm sex-sorting on embryonic gene expression highlight the impact of the culture environment on embryo viability. Proteomic analysis of seminal plasma by mass spectrometry is also an active area of research that promises to reveal important
insights into the regulation and maintenance of sperm fertility.

Michael Bertoldo, who recently submitted his PhD thesis on “Seasonal effects on pregnancy loss and oocyte quality in sows”, has received several awards for his work, including the prestigious 2009 Science and Innovation Award for Young People in Agriculture, Fisheries and Forestry. His findings are the first to show that sow oocyte quality is reduced during the summer months and is associated with decreased follicular progesterone production.

**STATISTICAL GENETICS**

Because biological systems exhibit variability due to environmental, genetic, as well as experimental causes, it is essential that appropriate statistical procedures are used in the analysis of data so that results of any studies may be relied upon. A/Prof Peter Thomson, one of the principals of ReproGen, is a statistician who is also on the teaching staff of the Faculty. One of his roles is to provide advice to research students and staff within ReproGen to ensure that appropriate experimental designs and analysis procedures are used. This work is also done in conjunction with Dr Navneet Dhand, a fellow statistician in the faculty based in the Farm Animal Health group.

However, in some situations, standard “off the shelf” statistical procedures may not always be appropriate. Within the statistical genetics area in particular, a number of areas of advanced training and / or research are being conducted. All of these have developed from the need to address a particular biological research question. Some of these include:

- Statistical methods for quantitative trait locus (QTL) mapping studies
- Statistical methods for breed-level association mapping
- Experimental design and statistical analysis of microarray experiments
- Statistical computing: training and use of modern statistical packages such as R and ASReml.
- Application of advanced statistical methods: longitudinal data analysis (lactation curves); generalized linear mixed models (QTL mapping); survival analysis (genetics of trypanosome tolerance)

Recent postgraduate research projects with a supervisory / associate supervisory role in statistical genetics include:

- Evelyn Hall: Statistical modelling of lactation curves in Australian dairy cattle (PhD: 2008)
- Jie Song: The evaluation of false discovery in livestock genomic studies; (PhD: under revision)
- Bethany Wilson: Quantitative genetics of hip dysplasia in dogs. (PhD: current project)
- Mary Abdelsayed: Genomic Selection of Extended Lactation traits in Australian Dairy Cattle. (PhD: current project)

Recent postgraduate research projects with a supervisory / associate supervisory role in other statistical areas include:

- Richard Shephard: The development of a syndromic surveillance system for the extensive beef cattle producing regions of Australia. (PhD: 2006)
- Kathryn Bartimote-Aufflick: Analysis of ordinal repeated measures data: review and general recommendations for researchers in agriculture and related fields. (MScAgr: 2007)
STUDENT PROFILES

IZMIRA FARHANA MOHD ISMAIL

Neuronal ceroid lipofuscinosis (NCL) is a group of fatal inherited neurodegenerative diseases that occur in various species. South Hampshire sheep NCL caused by the CLN6 gene (CLN6) is a well-established animal model for the comparable human variant late-infantile NCL (vLINCL) in children. Absence of disease causing mutation in the CLN6 coding regions hypothesizes the mutation to be in regulatory elements found mostly in non-coding regions or regions flanking the gene. Due to limited CLN6 genomic sequence, ovine Bacterial artificial chromosome (BAC) clone containing CLN6 and flanking region (length ~120kb) was sequenced using the Next-generation sequencing 454 pyrosequencing™ method. This sequence information provides the required backbone sequence for mutation screening between 3 different NCL genotypes; affected, carrier and normal. Two mutation screening approaches of Genomic DNA capture on chip with 454 pyrosequencing™ method and resequencing of 14 long range PCR products using the SOLID™ platform will enable identification of genetic variation (SNPs, indels and copy number variation) between animals analysed. Identification of regulatory mechanisms and mutations in CLN6 is not only crucial for development and evaluation of therapeutic approaches in sheep but is likely to direct analysis for the human vLINCL where mutations have been found in non-coding sequences.

Better understanding and develop potential therapeutic approaches of the disease in both sheep and human vLINCL form. A number of human cases of vLINCL linked to the CLN6 gene appear to also have mutations in non-coding regions of CLN6.

BETHANY WILSON

Canine Hip Dysplasia (CHD) is an important developmental disease of domestic dogs, affecting the stability of their hips which can often lead to chronic joint pain and lameness. It is a common disease in many dog breeds and is widely considered a significant welfare concern. Because CHD is caused by a complex interaction of many different genes and aspects of a dog’s environment from its conception onwards, preventing puppies from being born at increased genetic risk of CHD is more complicated than simply looking at the hips of possible parents. Ideally, screening of potential parents will involve a survey of the hips of a large number of both close and more distant relatives. Using mathematical models widely used in livestock industries worldwide (including Australia), the results of this survey of relatives can be correctly integrated to calculate an index called an Estimated Breeding Value (or EBV) which gives a more accurate ranking of breeding dogs. Veterinary graduate Bethany Wilson is in the third year of a PhD project to develop protocols designed to optimise the calculation of such EBVs, given the unique challenges of CHD.

Bethany works under the supervision of Associate Professor Peter Thomson. This project is a significant work-in-progress which they, with many others including Emeritus Frank Nicholas, work towards. Her work has been made possible by the provision of data from the German Shepherd Dog Council of Australia and the Australian National Kennel Council.
INTRODUCTION

Glenn Shea is Senior Lecturer in Veterinary Anatomy in the Faculty of Veterinary Science. Whereas his teaching responsibilities are in the anatomy of domestic mammals and birds, his research interests have always diverged from this and are focussed on herpetology.

Glenn has been working on systematics and biology of the herpetofauna of Australia and the Pacific region since the late 1970s and as such, has a lot of experience in this area. His 1992 Ph.D. thesis is one example of this, where he investigated the systematics and reproduction of the bluetongue lizards of the genus Tiliqua.

Glenn is heavily involved in herpetology and research outside of the University too. He is an Honorary Research Associate of the Australian Museum, Sydney and of the Queensland Museum, Brisbane, and the Bishop Museum, Honolulu. He was involved in the development of the Action Plan for Australian Reptiles (Australian Nature Conservation Agency, 1993), and has been a consultant to Environment Australia. In the latter role he was involved in the development of survey protocols for endangered Australian reptile species, 2003; herpetological surveys for revision of Action Plans for two species of endangered lizard in the Norfolk Island group, 2005), Goro Nickel in New Caledonia (herpetological survey of the proposed Goro Nickel Mine, New Caledonia, 2003) and the Province Sud Government, New Caledonia (herpetological survey of several reserves in Province Sud, 2004).

Glenn is also the editor of the Australian herpetological journal Herpetofauna, and represents the Australian Herpetological Society on the Native Animal Keepers’ Consultative Committee (NSW National Parks and Wildlife Service) and private keepers of reptiles and mammals on the Non-Indigenous Animals Advisory Committee (NSW Agriculture).

AREAS OF RESEARCH

- Systematics
- Reproductive biology
- Diet and distribution of the reptiles of Australia, New Guinea and the Pacific

PROJECTS UNDERWAY

- Systematics of the scincid lizard genus Sphenomorphus in New Guinea and the Solomon Islands (collaboration with Fred Kraus and Allen Allison, Bishop Museum; Steve Richards, South Australian Museum)
- Systematics and natural history of the lizard fauna of New Caledonia (collaboration with Ross Sadlier, Australian Museum; Aaron Bauer, Villanova University; Hervé Jourdan, IRD, New Caledonia)
- Male reproductive cycles of Australian elapid snakes (collaboration with Rick Shine, School of Biological Sciences, University of Sydney)
- Systematics of the Australian skinks of the Egernia striolata species-group (collaboration with Sarah Smith, Charles Darwin University; Ross Sadlier, Australian Museum)
- Phylogenetic systematics of pygopodid lizards (collaboration with Arnold Kluge, University of Michigan)
- Reproductive biology of Australian lizards
- Systematics of Australian typhlopid snakes
- History of Australian herpetology
UVTHS SMALL ANIMAL
CLINICAL RESEARCH

Clinical research into diseases of cats and dogs has always been an important focus at The University of Sydney. With the completion of the state-of-the-art Valentine Charlton Centre, the Canine Centre, diagnostic imaging facilities and clinical specialist appointments, research capability has been enhanced. We collaborate within the Faculty and internationally on many areas of feline and canine disease research.

ANAESTHESIA UNIT
RESEARCH INTERESTS
• Complications occurring under anaesthesia particularly cardiovascular.
• Pain management in companion animals.
• Local anaesthesia techniques.
• Intravenous anaesthesia.
• Anaesthetic breathing systems.
RESEARCH CURRENTLY UNDERWAY
Risk factors for the development of hypotension in cats undergoing anaesthesia in a University Veterinary Hospital.

A retrospective study undertaken to investigate the incidence of hypotension during anaesthesia of cats and to explore factors which might have an effect on development of such a hypotensive episode. This was a case-control study using three consecutive years of data comprising the records of 766 cats accrued from anaesthesia records from the University Veterinary Teaching Hospital Sydney.

1. 3-D computed tomographic reconstruction of the skull of a cat with Neosartorya species infection causing bony lysis in the orbit and nasal bone. Courtesy A/Prof V Barrs
A comparison of propofol, thiopentone and a combination propofol/thiopentone to induce anaesthesia in the dog.
(BVSc Honours student: Racheal Bailey 2010, Supervisors: Sanaa Zaki & Kim Ticehurst)
The aim of this study is to compare three techniques used to induce unconsciousness in dogs undergoing general anaesthesia – propofol alone, thiopentone alone, and thiopentone and propofol in combination – in a clinical setting by using a controlled, randomised, prospective clinical trial. In order to compare the drugs the study will determine the amount of thiopentone required to induce unconsciousness when used in combination with 1mg/kg propofol; compare the quality of induction and recovery between the protocols; and compare the cardiovascular and respiratory effects of the 3 protocols.

Rebreathing and the Humphrey ADE System
(BVSc Honours student: Elizabeth Gale 2010, Supervisors: Sanaa Zaki & Kim Ticehurst)
The Humphrey ADE System is used to deliver oxygen and anaesthetic agents to both humans and animals during general anaesthesia. The main attraction of the Humphrey ADE System is that it is said to require significantly lower fresh gas flow rates (ie less mLs of anaesthetic agent and oxygen are introduced into the system per kg/min) than other commercially available breathing systems. The Humphrey ADE System is said to be safely used at only 100ml/kg/min. Hence, veterinary practitioners can save on the cost of anaesthetic agents and oxygen when using this system.

The aim of this study is to investigate whether these lower fresh gas flow rates are indeed safe, by evaluating respiratory pattern, end tidal CO2 levels and blood gas analysis in cats and small dogs under anaesthesia.

Understanding the Pain of Osteoarthritis of the knee joint
(PhD candidature: Sanaa Zaki, Supervisors: Dr Mark Connor & Dr Chris Little)
This research enquiry utilizes two established models of OA in mice to study changes in the properties of sensory neurons innervating the mouse knee joint and the associated development of nociceptive hypersensitivity. The first is a non-inflammatory surgical model and the second is an inflammatory antigen induced arthritis model.
By characterizing the nerves of the knee joint that transmit pain signals and identifying how the nerve signaling changes in a knee joint with acute or chronic arthritis, more effective strategies can be developed to treat the pain of osteoarthritis.

The key outcomes of this study are:
- To count and characterize the nerve cells that innervate the knee joint of the mouse using retrograde tracing techniques.
- To identify any changes in nerve cell number or characteristics in mice with acute or chronic OA, using immunohistochemistry techniques.
- To identify changes in gene expression in the dorsal root ganglia that innervate the knee joint in mice with acute or chronic OA using real time PCR.
• To relate any identified changes in the innervation of the knee joint to the pain and reduced limb function that mice with acute or chronic OA display using locomotive function tests and established pain assessment methods.

• The use of an inflammatory model of arthritis (AIA) will enable investigation of the role that inflammation plays in the pain mechanisms of arthritis and therefore validate that the findings we make with the surgically induced model of arthritis are specific to the “non-inflammatory” degenerative joint disease process (osteoarthritis).

**SMALL ANIMAL MEDICINE**

The unit’s research is focussed on three key areas – infectious diseases, renal disease and oncology. A major area of clinical research for our group is feline disease. Our unique feline-only referral facility (The Valentine Charlton Cat Centre), two feline medicine specialists on staff and a feline medicine residency training program make for a high case load and excellent clinical research opportunities.

Current research projects in these areas have received total funding of around $170,000. Productive collaborations have been formed with industry partners and other researchers in our faculty and beyond including the Australasian wildlife genomics group, the veterinary pathology group, The Universities of Bristol and Glasgow and Colorado State University.

**Current Research Projects**


- Use of posaconazole in multimodality therapy to treat feline upper respiratory aspergillosis: results of a prospective study

- Computed tomographic findings in feline upper respiratory aspergillosis

- Evaluation of serum galactomannan assay in diagnosis of invasive feline aspergillosis.

- Prevalence of progressive and regressive FeLV infections in cats at high risk from infection in the Sydney region.

- Histopathological and immunohistochemical evaluation of feline lymphocytic-plasmacytic enteritis and alimentary lymphoma.

RESIDENT RESEARCH

The investigation of the role of papilloma virus in the aetiology of oral squamous cell carcinoma in young dogs.

A 6-month old Golden Retriever puppy was presented to the UVTHS with an oral mass, diagnosed via incisional biopsy as a squamous cell carcinoma (SCC). This is an unusual clinical presentation; a review of the literature revealed only two similar cases reported previously and a link to papilloma-virus was tentatively made but not substantiated. The aim of this current project is to attempt to identify the presence of papilloma viral DNA in tissues obtained from an oral SCC from a young dog using advanced DNA detection techniques.

A comparison of post operative outcomes in dogs undergoing laparoscopic ovariectomy and prophylactic gastropexy with those undergoing standard open ovariectomy and gastropexy.

The aim of this project is to compare postoperative outcomes in female dogs undergoing ovariektomy and prophylactic gastropexy via a minimally invasive laparoscopic approach with those undergoing the same procedures via a standard open midline laparoscopy. Objective measures of post-operative pain/discomfort to be measured and compared include plasma cortisol levels in conjunction with a comprehensive, multiple assessment based pain scoring system. These two parameters will provide an objective assessment of post-operative pain, discomfort and stress. Once the data has been collected for all dogs, statistical analyses will be undertaken to identify any significant differences in pain levels between the treatment groups.

SOFT TISSUE SURGERY CLINICAL RESEARCH

A comparative study of laparoscopic ovariectomy and laparoscopic ovariektomy intracorporeal laparoscopic gastropexy in dogs.

The aim of this study is to investigate objective measurements of stress response and morbidity in dogs undergoing combined laparoscopic ovariektomy and gastropexy and compare this with dogs undergoing laparoscopic ovariektomy only and also with dogs undergoing open ovariohysterectomy and gastropexy procedures.

Clinical evaluation of coil embolization of intrahepatic portosystemic shunts in dogs.

This is a clinical report which will retrospectively evaluate dogs with single intrahepatic portosystemic shunts undergoing coil embolization supported with a caval nitinol stent.
The veterinary biomedical research unit is a collaborative group led by Associate Professor Peter Williamson, Dr Paul Sheehy and Professor Rosanne Taylor. The unit has a focus on canine biology and disease, with projects that also draw on comparative approaches in other species. The areas of research interest cover medical genomics, physiological genomics, molecular pathophysiology, stem cell biology and emerging therapies.

Members of the group 2008-2010
Principals: Rosanne Taylor, Paul Sheehy, Peter Williamson.
Senior Research Fellow: Dr Garry Lynch
Post-graduate students: Vinuthan Melakote, Jessica Fletcher, Rayson Tan, Hamutal Mazrui, Guathami Kondagari, Jerry Wei, Arun Jayappa, Mojtaba Moosavi.
Honours students: Christopher Meoli, Lesley Castillo, Jessica Yang, Christine Yee, Aimee Davenport, Amanda Wright, Katherine Gregory (BScVet).

Research Projects 2008-2010
- The Canine Biobank: a genomics resource for Australian dogs.
- Immune disorders and canine atopic disease.
- Genomic analysis of immunophenotype.
- PLE/PLN in Australian Soft-coated Wheaten Terriers.
- Breed prevalence and molecular pathology of canine mast cell tumours.
- Molecular pathogenesis of canine inherited neurological disorders.
- Brain pathology in canine fucosidosis and effect of intrathecal enzyme infusion.
- Analysis of neurological response to anti-inflammatory therapy in a model of demyelinating disease.
- Lactation genomics and neonatal growth.
- Bioactive proteins: proteomic analysis and cellular responses.
- Canine mesenchymal stem cells.
- Induced pluripotency in canine somatic cells.

STUDENT PROFILE
DR RAYSON TAN

Many dogs are diagnosed each year with cancer, a debilitating condition that leads to suffering, early death and euthanasia. Mast cell tumours (MCTs) are one of the most commonly diagnosed skin cancers in dogs. This particular type of cancer clinically mimics other skin growths and has an unpredictable biological behaviour, rendering treatment a challenging task for veterinarians. There is also a need for improved accuracy in the diagnostics of MCT, especially the most common type, grade II tumours, as up to 80% of them are biologically unpredictable, making treatment difficult.

Untreated disease, particularly grade II and III tumours can spread to other organs if left untreated, and typically results in death within 6 months.

Some breeds, such as the Boxer and Boston terrier, are overrepresented in MCT cases examined in the US and UK, suggesting a genetic component to the risk of developing this cancer. Rayson Tan, a post-graduate PhD student in the Faculty’s canine genomics program, has been awarded an international Veterinary Student Scholars award by the Morris Animal Foundation (USA) to study the prevalence of MCT in the Australian dog population.

The study will also characterise the molecular basis of MCT and examine how this varies between breeds.
The Wildlife Health and Conservation Centre (WHCC) opened in May 2007. The WHCC is actively engaged in both clinical, field and laboratory based research. Clinical research focuses on describing spontaneous diseases of wildlife and client owned exotic pets and improved medical and anaesthetic protocols for these species. The WHCC is also commonly involved in investigations into the causes of mortalities events in wildlife. The focuses of the field research relate to the structure of wildlife populations, key threatening processes that impact them, and scientifically assessing wildlife rehabilitation practices. The laboratory based research is focused on emerging, introduced, and zoonotic infectious diseases of exotic pets and wildlife and environmental toxicology.

Research is conducted by the WHCC clinical staff, PhD students, veterinary students, volunteers from the community, and students in the Applied Masters of Wildlife Health and Population Management under the supervision of the director. Our staff also collaborates with the other members of 18 faculty in the Veterinary Science Faculty with research interests in wildlife and wildlife health. The WHCC also has extensive research collaborations with the School of Biological Sciences, other Australian and international universities, veterinary practitioners, pet industry groups, and government and non government institutions.

Examples of current activities
- Investigation into the role that heavy metals play in clench-claw syndrome of lorikeets
- Improved anaesthetic protocols for Australian crocodiles
- Chemotherapy for the Tasmanian Devil Facial Tumour
- Koala population structure and genetic diversity in New South Wales and Victoria
- Investigation into the diversity of avian herpesviruses in Australia and around the world
- Detection of introduced and species specific strains of the Psittacine Beak and Feather Disease Virus in captive and wild parrots
- Evidence for and impact of introduced haemotozoa on nature avifauna
- Myxozoan infections in endangered Australian frogs

HIGHLIGHTED GROUP MEMBER

Annabelle Olssen is a PhD student and an exotic animal and wildlife veterinarian based in Tropical Queensland. She is working on humane and effective immobilization of estuarine and Australian freshwater crocodiles. Immobilization of these animals is increasingly necessary because of conflicts with humans, movement of animals between farms and studies of these animals in the wild. Past immobilization protocols have been variably effective and often inhumane relying solely on paralytic agents. Annabelle’s work has shown that medetomidine is an effective immobilization agent resulting in a predictable induction time and duration of immobilization. Her work has shown that it is readily reversed and there are no adverse effects on their post-immobilization behaviour. She has also discovered that it is only effective if given in the front half of the crocodile, explaining why other protocols where drugs were administered in the back legs or tail have had such variable effects. Annabelle is also investigating the use of alfaxalone as a short term immobilizing agent and the use of midazolam to reduce stress in these species.
Dr Gongora’s team was established in 2008 after he was appointed as a permanent academic staff member of the Faculty of Veterinary Science in the areas of wildlife and animal genetics, conservation, management and sustainable use of wildlife. The core genetic research programs that Dr Gongora has established relate to peccaries from the Americas and suids from Africa and Eurasia. These programs have uncovered crucial aspects of the natural history of these species, with significance for conservation and taxonomy. Dr Gongora has added to the impact of his work by exploring emerging topics related to endogenous retroviruses, immunogenetics, phylogeography, evolutionary biology as well as genetic diversity in crocodiles, platypus and chickens.

As director of this vibrant team, Dr Gongora has supervised various research students who have provided new insights into these areas. The current team members include: Mr Weerachai Jaratlerdsiri, who has been characterising the major histocompatibility complex in the saltwater crocodile; Ms Amanda Chong and Ms Sarah Atkinson, who have been studying the distribution and expression of endogenous retroviruses in the same species; Mr Imtiaz Randhawa, who has been studying the variation of milk genes in cattle; Ms Shannan Langford-Salisbury, who is looking into the origins and genetic relationships of Australian domestic and feral chickens; and Ms Laura Mazurkijevic, who is investigating and mapping genes which are possibly related to sex determination in the saltwater crocodile.

Dr Gongora has also contributed to a number of collaborative projects and cosupervised students with Faculty colleagues: Prof Herman Raadsma on cattle milk genetics; Dr Damien Higgins on sea lion immunogenetics and Prof Chris Moran in relation to pig genetics.

Dr Gongora has progressively increased the foundations of his research program with the establishment of international and local collaborations as well as links with industry and successful grant applications, including a collaborative research grant from the Rural Industries Research & Development Corporation to study crocodile viruses and immune diversity with relevance for diseases.

Dr Gongora has also been involved in two key international initiatives: sequencing the genome of Crocodylians in collaboration with the University of Georgia and the Mississippi State University; and characterising genomic regions of interest among suids in collaboration with the National Institute of Agronomical Research (INRA) of France.

Over the past 3 years, Dr Gongora and his team, as a result of their own and collaborative research, have published 6 papers, 2 book chapters, more than 15 conference abstracts and 1 diversity assessment for the IUCN. Two of Dr Gongora’s key publications, on chicken genetics, have been in the prestigious journal PNAS. Dr Gongora’s opinion on similar topics has been featured in some other equally influential journals, Science and Nature.

Dr Gongora has also been involved in building capacity in developing countries by providing training opportunities to international visitors and engaging in collaborative studies, including with colleagues from South-East Asia and Latin America.
AWARDS

STAFF AWARDS – 2008
Paul McGreevy - Australian Learning and Teaching Council (ALTC) citation; Vice Chancellors Award for Outstanding Teaching.
Merran Govendir - Society Fellowship from the Higher Education Research and Development Society of Australasia Inc (HERDSA)
Imke Tammen, Kathy Belov, Denise Wigney, David Griffin & Helen Hughes - Grace Mary Mitchell Awards for teaching, research, research support and teaching support respectively.

STUDENTS AWARDS 2008
Kao Castle - Student presentation award at the Australasian Equine Science Society.
Jessica King - Runner up at the Invasive Animals CRC conference in Darwin.
James Neal - Young Dairy Scientists Communication Award, Australian Dairy Science Conference.
Camilla Whittington - Mayo Award for best student presentation at the Genetics Society of Australasia.
Kath Briscoe, Amy Aspley Davis & Shanaka Saratchandra - Passed the Australian College of Veterinary Scientists (ACVSc) Membership Examinations in small animal and feline medicine.

STAFF AWARDS - 2009
Paul McGreevy - Ian Clunies Ross Memorial Award - the Australian College of Veterinary Scientists’ most prestigious award for research accomplishment. It is awarded to an Australian or New Zealand veterinarian for making an outstanding contribution to the veterinary profession during the preceding five years. Paul has made an outstanding international contribution to animal behaviour and welfare research in range of animal species. His work is fundamentally practical, applicable and ready for translation to solve problems experienced in the field.
Kathy Belov - University of Sydney’s Thompson Fellowship – for two semesters starting Semester 1, 2010 for her project, “Investigation into the significance of biomarkers in koala blood, as detected by liquid chromatography, to identify infectious disease and response to treatment”.
David Phalen - TJ Lafeber Avian Practitioner Award – presented to an outstanding private practitioner for advancing the quality of health care for companion birds. David has contributed most significantly to this field for the last 26 years. He is only the 7th recipient of the award and this is the first year that practitioners in an academic setting have been eligible. The prestigious award is announced each year at the international meeting of the Association of Avian Veterinarians, and is the only award given to avian practitioners; the Faculty congratulates David on this great honour.
Vanessa Barrs - Australian Small Animal Veterinary Association Distinguished Scientist Award (2009) Animal Welfare Awards - AFAR Award
Paul McGreevy, Vanessa Barrs, Peter Thomson and Frank Nicholas - won the University’s Federation for Animal Welfare (FAW) inaugural Companion Animal Welfare Award for outstanding innovation in animal welfare science to the benefit of companion animals (LIDA)

Kathy Belov - 2009 People’s Choice Award for the Australian Museum Eureka Prizes. Kathy heads the Australasian Wildlife Genomics Group at the Faculty of Veterinary Science has been voted Australia’s most popular scientist winning th ‘Oscar’ of the Science world; the prestigious Australian Museum People’s Choice Eureka Award. Kathy who won the Eureka award for her research into the Devil Facial Tumour which is decimating the Tasmanian devil population, was presented with her award by actress Cate Blanchett on 18 August.

Kathy Belov - Australian Research Council Future Fellowship
Then on 9 September, Kathy joined Senator the Hon Kim Carr in Parliament House, Canberra to speak at the announcement of the ARC Future Fellows. As the recipient of a prestigious $740 000 Fellowship over 4 years, Kathy will use her fellowship to determine the genetic nature of DFTD resistance, and the feasibility of breeding resistant animals for release into the wild.

Kathy is also a driving force behind Devil Rock, the music industry campaign to save the devil launched by Hon Peter Garrett and veteran rocker Jon English earlier this year. The first Devil Rock concert will be held at the University of Sydney in the second half of 2010 and the Faculty congratulates Kathy on her significant achievements this year.

Merran Govendir - University of Sydney Thompson Fellowship – for two semesters starting Semester 1, 2010 for her project, “Investigation into the significance of biomarkers in koala blood, as detected by liquid chromatography, to identify infectious disease and response to treatment”.
Paul McGreevy - also received the prestigious BSAS/RSPCA Innovative Developments in Animal Welfare Award 2009 in recognition of his research in dogs and horses behaviour and welfare, as well as his innovative approaches to education and teaching.

Vice-Chancellor’s Awards for Teaching & Learning in 2009: The Teaching Innovations Unit received monetary award of $10,000, shared by the cross-faculty team which includes current staff: Paul Sheehy; Rosanne Taylor, Jacqui Norris; Mark Krockenberger; Peter Windsor; Paul McGreevy; Max Zuber; Damian McMonigal; Katrina Bosward; Vanessa Barrs; Sanaa Zaki; Sally Pope and others, but also acknowledges the contributions of past contributors including Reuben Rose, Paul Canfield, Cindy Wilkinson, Gerard Marcus and Federico Costa

The second 2009 Vice-Chancellor Award, for Outstanding Teaching was awarded to Merran Govendir

STUDENTS AWARDS 2009

Camilla Whittington- Fulbright Postgraduate Scholarship. The prestigious scholarship is the largest educational scholarship of its kind and will allow her to study at the Washington University Genome Sequencing Centre (GSC). Camilla will investigate the genes coding for mammalian venom, hoping to provide insights into platypus basic biology, and evolution of mammalian venom. This will not only extend the scientific knowledge of the venom but it could eventually lead to the development of new compounds for medicines. After a year in Washington, Camilla will return to the University of Sydney and carry out further studies of the new venom compounds identified.

Emily Wong accepted into a prestigious course EMBO-Institute Pasteur Bioinformatics and Comparative Genome Analysis at the HKU- Pasteur Research Centre, Hong Kong.

Anna Do- Received an award for her poster presentation at the International Symposium on Genetics in Aquaculture (ISGA) in Bangkok.

STAFF AWARDS - 2010

Professor Leo Jeffcott who has been appointed to the Chair of the National Veterinary Exam (NVE) Board of Examiners at the Australasian Veterinary Boards Council (AVBC).

Professor Michael Ward who has received an International Science Linkages Academies program 2010-11 grant for his research into infectious disease.

We are delighted to announce that the T G Hungerford Award for 2009 was presented to Prof Boyd Jones BVSc FACVSc DECvim MRCVS at a ceremony held in The Refectory at the University of Sydney on Friday 19 February 2010.

The T G Hungerford award was instituted by the Council of the Post Graduate Foundation in Veterinary Science, now known as the Centre for Veterinary Education (CVE), on the retirement of Dr T G Hungerford OBE who was the first Director of the Foundation. The award was in recognition of his enormous contribution to the veterinary profession and to the Australian community. The award recognises excellence in continuing veterinary education and was first awarded in 1987.

STUDENTS AWARDS 2010

Santiago Farina has won the "Australian Government Department of Agriculture, Fisheries and Forestry 2010 Young Dairy Scientist Communication Award" at the Australian Dairy Farmers Conference in Wollongong. There were over 350 dairy farmers from all over Australia and several other countries and international speakers from North and South America, Europe and China.


Jessica King for the top student award at the Invasive animals CRC, Chief Executive’s prize for achievement as an IA CRC student. Ms Jessica King, IA CRC-supported student with the University of Sydney (affiliated with the UTS and ANU) Jess has significantly enhanced our knowledge of invasive animals during her candidature. Her work is crucial to our current understanding of the lifecycle of Neospora. She has a remarkably successful publishing record and has actively communicated her findings.
PHDS AWARDED

POSTGRADUATE RESEARCH DEGREES AWARDED

PhD 2008

Brendan Cowled - Feral pig ecology and control
Kerry Daly - Innate immunity and antimicrobial responses in the Tammar Wallaby (Macropus eugenii)
Navneet Dhand - Studies on epidemiology of ovine Johne’s disease
Evelyn Hall - Statistical modelling of lactation curves in dairy cattle
Georgina Learmonth - Glycoproteins of equine herpesvirus 1 (EHV-1)
Peter Moate - Studies on the ruminal transformations and intestinal digestion of long chain fatty acids in dairy cows
Mariana Pedernera - Energy balance and reproductive performance in early lactating dairy cows fed to produce contrasting milk yields on pasture-based system of farming
Richard Shephard - Epidemiology - extensive area disease surveillance
Amanda Warren-Smith - Applied learning theory in horses

PhD 2009

Lara Batt - Management and behavioural factors influencing success in guide dog training
Robert Curtis - Equine respirometry and electro-laryngeography: Technical advances and evaluation
Gwilym Haynes - Population genetics of the common carp (Cyprinus carpio) in the Murray-Darling basin
Peter Houweling - Neuronal ceroid lipofuscinoses in Australian ruminants
Arun Sondur Jayappa - Lactation genomics: Identification analysis of key gene product
Satoko Kawaji - Genomic and proteomic analysis of Mycobacterium avium subsp. Paratuberculosis living under various circumstances
Jennifer Kelly - Developmental competence of oocytes and in vitro produced embryos derived from prepubertal lambs using juvenile in vitro embryo transfer (jivet)
Susan Matthew - Veterinary students’ transitions to practice through clinic based learning
Helen McGregor - Aspects of the biology, transmission and control of ovine Johne’s disease
Lee Miles - Linkage mapping and QTL analysis in saltwater crocodiles
Yvette Miller - Specialised management of gilts and their progeny

Alison Morgan - Identification of novel bioactives in bovine colostrum regulation of gut development

Peta Philips - Investigation of recombinant gene transfer and expression in bovine mammary epithelial cells

Palaniappan Ramanathan - An integrative genomics approach to lactation gene discovery and function

Nathan Saul - Molecular ecology of Cryptococcus gattii in the Australian environment

Hannah Siddle - Major Histocompatibility Complex Genes of Two Australian Marsupial Species.

Nicole Spiegel - Factors influencing meat quality from kangaroos

Shelley Underwood - Flow cytometric sorting of frozen-thawed bull spermatozoa

Stephanie Xavier - The Notch signalling pathway and mesenchymal cell fates during wool follicle initiation in the sheep

Ling Zhong - Gene expression in blood in Ovine Johne’s Disease

PhD 2010

Ravneet Kaur Jhajj – Effects of forage type, mixed diets and feeding practices on the efficiency of feed utilisation in sheep

Gauthami Sudhamayee Kondagari – An experimental study of combined enzyme infusion in canine fucosidosis and investigation of other storage diseases in animals

Tamara Leahy - Effect of seminal plasma on sperm integrity

Mohamed Abd E-Hammed Sayed - Physiological and nutritional approaches to alleviate heat stress in broiler chickens

Fabricia Nascimento - Origin, evolution, transfer and recombination of porcine endogenous retroviruses (PERVs) DNA sequences in their natural host (family Suidae)

Nicole Schembri - Peri-urban and remote regional surveillance for biosecurity for the pig industry in Eastern Australia.

2008 MASTER’S DEGREES AWARDED – MScVETSc

Michelle Marshall - Developmental orthopaedic disease in thoroughbred foals

Pancha Shrestha - Studies on complimentary crop rotation systems and pastures for dairy farms in the future

2009 MASTER’S DEGREES AWARDED – MScVETSc

Bertin Kabore - Soil nutrient and physical characteristics under complementary forage rotation


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Conference Proceeding, Review Abstract, Case study or commentary note 2009


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Reddcliff, L. A., I. B. Marsh, S. A. Fell, S. L. Austin and R. J. Whittington "Isolation of Mycobacterium avium subspecies paratuberculosis from muscle and peripheral lymph nodes using acid-pepsin digest prior to BACTEC culture.” Veterinary Microbiology.
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was responsible for developing techniques for sheep semen storage and large scale AI which are in widespread use today. Dr Neil Moore and his postgraduate students pioneered embryo transfer technology in sheep, cattle and goats and by 1976, had developed techniques for cryopreservation of embryos for long-term storage and international transport. Professors Gareth Evans and Chis Maxwell continued the tradition in applying artificial reproductive technologies up until their recent retirements, and pioneered the science of sex selection in Australia.

The first geneticist in the Faculty was Dr (later Prof) Stuart Baker, who had trained under Dr Jim Rendel. Rendel was a PhD graduate from J.B.S Haldane’s laboratory in London, and later a member of the “legendary” genetics research group in Edinburgh. He had been recruited by Clunies-Ross in 1951 to establish an animal genetics research unit in CSIRO and to establish a course at the University of Sydney. Stuart Barker’s work on genetic simulation was outstanding and his studies using Drosophila as a model are now regarded as very important tests of the application of quantitative genetics theory to artificial selection. When Dr Barker left for the Chair in Animal Science in Armidale, Frank Nicholas continued the tradition and inspired the next generation with characteristic enthusiasm. Frank’s theoretical research in genetic selection showed how to account for genetic drift, and in a seminal publication, how multiple ovulation and embryo transfer (MOET) could be used to substantially increase the rate of genetic improvement in dairy cattle. He was instrumental in the establishment of the Australian Dairy Herd Improvement Scheme, and showed great foresight in the use of information technology; what we now consider as bioinformatics. His database recording inherited diseases in animals now resides within the framework of the National Center for Biotechnology Information (USA) as the web resource, Online Mendelian Inheritance in Animals. In addition to inspiring the next generation, Frank also brought his peers and elders to the faculty to create a rich research environment. Most notably, Prof John Edwards of Oxford, Prof John James, formerly of UNSW, and Dr Ian Martin, a doyen of the Faculty who began as a veterinary student in 1950, and is still contributing to our research effort, particularly through the development of new inbred mouse strains.

The research achievements of the Faculty mentioned in this article are certainly not an exhaustive account. For reasons of space, the contributions of present day faculty and others still actively associated with research are not mentioned. The scientists named in this account worked with colleagues and students, many of whom went on to make their mark in science nationally and internationally. Further, since 2000 the Faculty has grown in research in traditional areas and has developed new areas of interest driven by student interests and demand, by a remarkable rise in technology, and by the changing trends in veterinary science and the role of animals in our society. Amongst these, wildlife research, animal genomes, and public health are particularly strong. More than anything, this was highlighted in the 2010 Centenary Research Showcase which demonstrated the breadth and depth of our current excellence in research and how it reaches back to our history and the foundations of the Faculty.

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- Peter Williamson, July 2010.