

SUPPORT UNITS & COLLABORATIVE CENTRES

ARC CENTRE OF EXCELLENCE IN VISION SCIENCE (ACEVS)

The ARC Centre of Excellence in Vision Science brings together major research programs in vision sciences at the Australian National University with cognate programs at the University of Queensland, the University of Sydney and the University of Western Australia. The research at the Centre is focused on unravelling the cellular basis of visual sensing and processing; on revealing the algorithms that underlie the visual control of behaviour and perception; and on discovering the cellular mechanisms that make the eye and retina stable, and whose breakdown causes blindness.

www.vision.edu.au/

ARC CENTRE OF EXCELLENCE FOR INTEGRATIVE LEGUME RESEARCH

The ARC Centre of Excellence for Integrative Legume Research (CILR) is a partnership that brings together leading plant research scientists located at The University of Queensland, The Australian National University, The University of Melbourne and The University of Newcastle.

Three of the ANU Chief Investigators are located within the Genomic Interactions Group, RSBS; Prof. Barry Rolfe, Dr Georg Weiller and Dr Michael Djordjevic. Research in the Centre is providing critical insights into mechanisms of meristem and organ differentiation and intercellular communication, utilising comparative genomics on the internationally recognised model legumes *Lotus japonicus* (Lj) and *Medicago truncatula* (Mt). Studies also focus on two major crop legumes – pea and soybean. New knowledge of plant growth processes through mechanistic analysis of organ induction will provide the tools to optimise the legumes' productivity, quality, and environmental adaptation. This in turn will have a direct impact on agricultural sustainability, environmental quality and potential value-added products for human health. In October the Centre was reviewed and received an excellent report on its work, resulting in the Centre's renewal, through to 2010, with a 15% increase in funding. www.cilr.uq.edu.au/our-centre

Loading a MALDI-TOF target prior to proteomic analysis.

ARC SPECIAL RESEARCH CENTRE FOR THE MOLECULAR GENETICS OF DEVELOPMENT

Director: Prof. Robert Saint

The ARC Special Research Centre for the Molecular Genetics of Development (CMGD) studies the molecular mechanisms and genetic processes that govern the behaviour of cells during animal development. It has laboratories within RSBS and at the University of Adelaide. A focus of the Centre is the use of outstanding experimental organisms (the vinegar fly, *Drosophila melanogaster*, the mouse, *Mus musculus*, the zebrafish, *Danio rerio*, the nematode, *Caenorhabditis elegans* and the honeybee, *Apis mellifera*) to study basic processes such as tissue patterning, cell differentiation, cell migration, neurogenesis and gene regulation and how their disruption can lead to human disease. The CMGD laboratories in RSBS are also studying the coral and honeybee genomes and the evolution of developmental mechanisms. Highlights of the research of the CMGD are presented within the reports of the Molecular Genetics and Evolution group (Prof. Saint, Dr Ball, Dr Campbell and Dr Arkell) and Visual Sciences group (Dr Maleszka). www.cmgd.adelaide.edu.au



AUSTRALIAN RESEARCH COUNCIL (ARC) CENTRE FOR KANGAROO GENOMICS

Research Director: Prof. Jenny Graves
ANU Scientists: Dr Amber Alsop, Dr Janine Deakin,
Dr Margaret Delbridge, Dr Edda Koina, Dr Paul Waters.

The ARC Centre for Kangaroo Genomics (KanGO) commenced operations in 2004 and operates under a nodal structure with coordinated research undertaken in the laboratories of all partner institutions. The Australian National University administers KanGO in partnership with the University of Melbourne, the University of New South Wales, the Australian Genome Research Facility and the Walter and Eliza Hall Institute – Bioinformatics.

Scientists within the Centre have a strong interest in mammalian reproduction, specifically fertility, pregnancy, lactation and sex determination and differentiation. Genes essential to these processes are located on two of the eight pairs of chromosomes that make up the tammar genome – the X chromosome and chromosome 5, which is homologous to a recently added part of the human X chromosome.

The Centre has rapidly built genomic resources and has good arrangements in place to collect and share difficult to obtain materials. Construction of cDNA libraries here and in Japan are almost complete and will be a major bonus in our work of characterizing the targeted chromosomes.

Further information about KanGo is available at kangaroo.genomics.org.au

CIMMYT CENTRE FOR IMPROVEMENT OF CEREAL CROPS

The prospect of capturing the increase in crop yield that occurs when inbred lines are first crossed, has led to the establishment of an international alliance which has located a substantial portion of the experimental effort in the Plant Cell Biology Group. Our key objective is to modify ovule development in cereals to create seed through a process termed apomixis which creates fertile seed that has the genetic make-up of the mother plant. This retains hybrid vigour and also fixes any new introduced genetic attribute that helps sustainable yield under Australian conditions of soil and changing climate. We draw funding from the ARC and other public-good agencies together with funding and the participation of scientists from companies based in Europe and the USA. The team contains top

international scientists including Dr Dean Rouse and Dr Anna Marie Sorensen and includes CIMMYT's top apomixis scientist Dr Enrico Perotti seconded to RSBS to play a key coordinating role in this international effort.
www.cimmyt.org

COOPERATIVE RESEARCH CENTRE FOR GREENHOUSE ACCOUNTING

The Cooperative Research Centre for Greenhouse Accounting, with its head office and parts of its research based within RSBS, officially ended its seven year term on June 30. The legacy of the Centre is available online www.greenhouse.crc.org.au

The CRC for Greenhouse Accounting created a network of participants from Western Australia, South Australia, Victoria, New South Wales, Queensland and the ACT, with participants from universities, CSIRO, State and Federal government departments. The Centre carried out research across a broad range of topics. At RSBS, experiments were focussed on two areas. Firstly, the effects of rising atmospheric CO₂ on plant growth and the interactions with temperature and nutrient stresses and secondly, the trend in evaporation. While increasing atmospheric concentrations of CO₂ generally enhance plant growth, this effect can disappear or even reverse when stresses occur. The media frequently report statements equating Global Warming to drying, which particularly resonates in the current drought. However, the decline in potential evaporation measured with pans over the last 30 years suggests that this is a misrepresentation of a complex system.

COOPERATIVE RESEARCH CENTRE FOR TROPICAL PLANT PROTECTION

Research in the CRCTPP (based at The University of Queensland - www.tpp.uq.edu.au) developed sustainable technologies for protecting Australia from exotic and endemic pests, and aimed to increase plant resistance to pests. During its final phase, the CRCTPP supported a PhD student, Ginny Lim, to work in the Plant Cell Biology Group on a collaborative project with other CRCTPP staff.

Ginny's project aimed to isolate a tomato gene that provides resistance to the fungal disease *Fusarium* wilt. The Centre terminated on June 30, using the final period of its activities to maximize opportunities for transfer to industry technologies generated during the life of the Centre. Significant aspects of the Centre's ongoing research are being continued under a variety of alternative support mechanisms.

CENTRE FOR VISUAL SCIENCES

The Centre brings together major research programs in vision sciences at four universities: The Australian National University, The University of Queensland, The University of Sydney, and The University of Western Australia.

Our research is focused on unravelling the cellular basis of visual sensing and processing; on revealing the algorithms that underlie the visual control of behaviour and perception; and on discovering the cellular mechanisms that make the eye and retina stable, and whose breakdown causes blindness.

The Centre receives the bulk of its funding from the Australian Research Council (ARC), with substantial additional funding from the four universities and several partner organisations.
cvs.anu.edu.au

MASS SPECTROMETRY FACILITY

The Molecular Spectrometry Facility (MSF) is an important element of research infrastructure for the biological and biomedical sciences, established and maintained by RSBS. It provides long-term support for researchers at the ANU and in the wider research community of the ACT region. This year the MSF has been involved with running a "*Functional Genomics Workshop: New Tools for Bioscientists*" (June 5-7), a "Mass Spectrometry Workshop" (November 16) and the "ACT Mass Spectrometry Symposium" (November 17) and the following projects:

- Identifying protein and peptide signals which regulate growth and development (with GIG and CILR)
- Monitoring the biosynthesis of cellulose (with PCB)
- Identification and quantification of fatty acids (with CSIRO Plant Industry and Entomology)
- Quantifying monosaccharides, flavonoids and other primary and secondary metabolites (with EB, GIG and the School of Biochemistry and Molecular Biology (BaMBi)).

The following instruments are housed in the MSF:

- Thermo Polaris Q GC/MS (EI and CI)
- Thermo LCQ Deca XP Plus 2D-LC/MS (ESI, nano-ESI, and combined APCI and APPI)
- Micromass QToF2 LC/MS (ESI and nano-ESI)
- Bruker Omnix MALDI-TOF MS

- Shimadzu LC-10 VP series HPLCs (UV/Vis diode array, fluorescence, ELSD).

The MSF is located in Rooms 060 and 106 in RSBS and is run by Dr Charles Hocart and Ms Carolyn McKinlay.
www.rsbs.anu.edu.au/Products&Services/MSF

MOLECULAR BIOLOGY FACILITY

Facility Manager: Dr Julie Christie.

The RSBS Molecular Biology Facility (MBF) was established in 2002 to give ANU researchers access to the newest techniques in molecular biology. The facility offers training, expert advice and access to the latest equipment.

The facility supports 2D gel proteomics, real-time PCR (qPCR) and laser capture microdissection (LCMD). This year the MBF ran workshops in LCMD (in collaboration with the EMU), qPCR and has been involved with running the "*Functional Genomics Workshop: New Tools for Bioscientists*".

Collaborative projects include:

- Cloning a mouse retinal gene (with CSD and The University of Sydney)
- Identifying protein expression differences in cancer cells (with Prof. Christopher Parish, JCSMR)
- Proteomic analysis of BALF from allergic mice (with Dr Di Webb and Ms Chantelle Dixon, JCSMR)

Key items of equipment in the facility:

- PALM laser capture microscope (joint-hosted with the Electron Microscopy Unit)
- Corbett Rotorgene real time thermal cyclers
- Nanodrop spectrophotometer
- 2D electrophoresis apparatus
- Protein fractionator

The Facility also offers access to general molecular biology equipment including a biological safety cabinet and a chilled multi-rotor centrifuge. The Facility also runs regular workshops in conjunction with the Mass Spectrometry Facility, the Electron Microscopy Unit and the National Institute of Bioscience.

www.rsbs.anu.edu.au/Products&Services/MolecularBiologyFacility

ANU ELECTRON MICROSCOPY UNIT

Facility Coordinator: Dr Sally Stowe

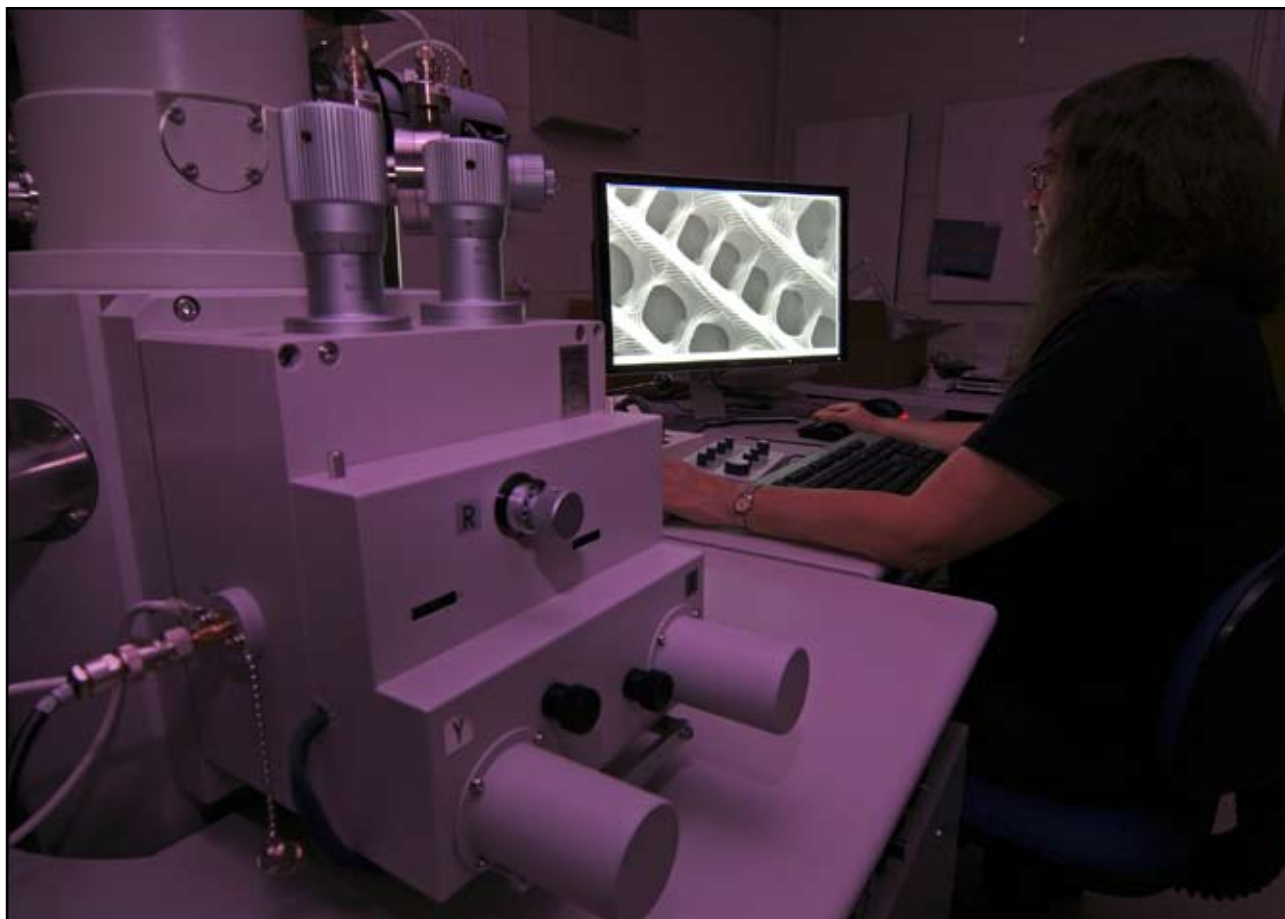
RSBS hosts the ANUEMU, which provides light and electron microscopy facilities to staff and students in biological and materials science across the ANU campus. The unit includes four scanning and three transmission electron microscopes, and a dual beam scanning EM/focused ion beam. Light microscopes includes a range of conventional and advanced instruments.

The unit is located within RSBS, is supported and administered by the school and provides access to the latest imaging technologies for our research. A full description can be found on the website www.anu.edu.au/EMU/index.html

HIGHLIGHT

- EMU installed a new multipurpose field emission scanning electron microscope. This instrument, which can be operated in variable pressure mode, is specialised for high resolution under analytical

Dr Sally Stowe views a scale on a butterfly's wing through the Hitachi 4300 analytical field emission scanning electron microscope (FESEM), a recent acquisition of the ANU Electron Microscopy Unit.



conditions and will be fitted with a cold stage and a number of detector modes including energy dispersive X-ray analysis and cathodoluminescence. It will give researchers state-of-the-art capability in many areas, including mapping ion distributions and imaging the interior of cells.