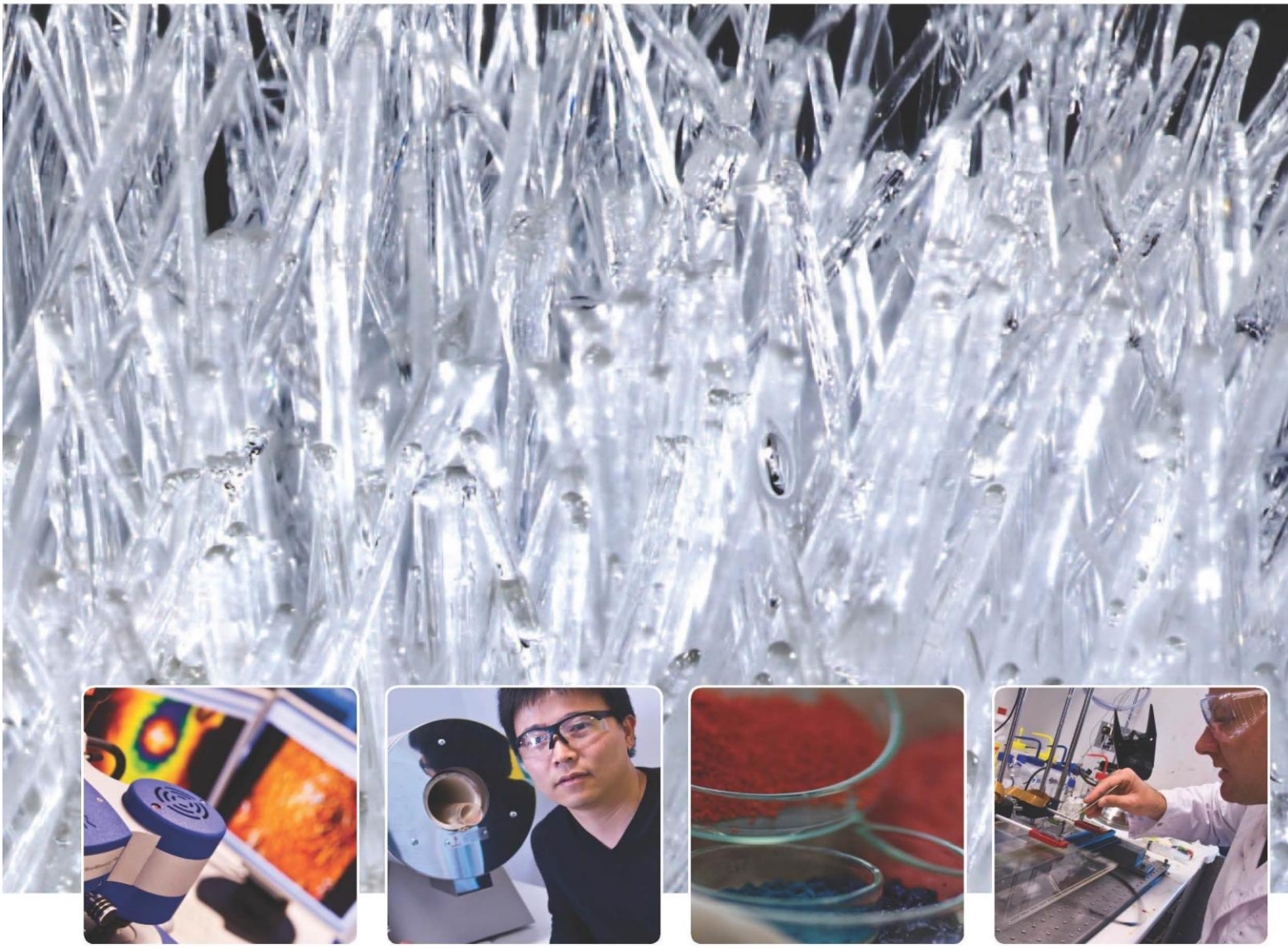


Annual Report 2010

ARC Centre of Excellence for
Electromaterials
Science

creating advanced materials

materials synthesis · energy conversion · energy storage · bionics

Contents

Welcome to ACES

The Australian Research Council Centre of Excellence for Electromaterials Science (ACES) brings together eminent scientists to develop the nano-science and nano-technology related to the movement of electric charge within and between materials. The approach provides an alternative to varying the composition of a material to alter physical and biological properties – instead we alter dimensions and shape in the nanodomain. These processes are fundamentally important to a diverse array of phenomena important in medicine and industry.

The Partners

The Centre currently comprises of five organisations and draws together researchers from a range of disciplines, including biologists, clinicians, chemists, physicists and engineers. Each of the nodes possess key research strengths, which, when combined with one another and developments in nanotechnology, will revolutionise the way we look at materials and future material applications.

In 2010 ACES welcomed its newest partner organisation in Deakin University. They come on board to join the existing partners University of Wollongong (including the Intelligent Polymer Research Institute and the Institute for Superconducting & Electronic Materials), Monash University (Clayton), St Vincent's Health (Melbourne), La Trobe University (Melbourne) and University of Tasmania.

Research Programs

The core research programs supported by the ARC Centre of Excellence are four in number: Electromaterials, Energy, Bionics and Ethics. The integrated research projects within each program provide the capability to design, synthesise and characterise new electromaterials.

Electromaterials: The key challenge of this electromaterials program is the development of innovative routes to functionalised nanomaterials that enhance both the chemical and physical properties required for the targeted areas. This program continues to encompass materials synthesis, fabrication and characterisation.

Energy: The Energy program utilises advances in our design, synthesis and fabrication of new light harvesting and electrocatalytic materials and organic nanostructured electrodes for applications such as: Solar Hydrogen Generation and Metal/Air Batteries

Bionics: The Bionics program will continue to exploit new electromaterials in the areas of stimulation and neuromuscular repair and in the design and development of an advanced cochlear electrode implant.

Ethics: The Ethics program will continue its role in developing a critical social and ethical response to the emerging science and its applications.

Funding

ACES was established in 2005 and received federal funding from the ARC of $12 million over five years. From July 2010 until December 2013 ACES will receive a further $7.7 million in federal funding by the ARC.

ACES also receives support from the NSW Department of State & Regional Development to achieve technology transfer to NSW and Australian industry (SLF grant 2010-2013: $360k).

ARC Centre of Excellence for Electromaterials Science

Mission Statement Aims

- Expand upon our reputation in electromaterials science and to see the centre recognised as a world leader in the area.
- Explore the sicence of nanomaterials having an electron or charge transfer functionality: to prepare such nanomaterials, study and develop therories for their behaviour and exploit these new behaviours in a number of selected applications.

Message from the Director

During 2010 we embarked on an exciting transition to a new level in all of the ACES areas of activity. We have identified significant new research opportunities and developed strategies to maximise the outcomes; from the generation of fundamental knowledge to the fabrication of prototypes and assisting others exploit commercial opportunities.

Research

The core funded ACES activities include the development of novel electromaterials based on nanostructured carbons, metal oxides and conducting polymers as well as ionic liquids and other novel electrolytes. In the energy area we are building on a wealth of knowledge in solar cell science and technology to tackle the highly challenging area of water splitting. In the area of medical bionics we have launched an integrated research activity to help realise the next generation cochlear implant electrode as well as conduits for nerve repair.

Our Ethics research is of great importance. It integrates a group of researchers with a very different perspective working alongside scientists and engineers. This is proving a highly productive environment – enabling issues related to the social impact and adaptation of technologies to be confronted at the lab bench, and providing ethicists with an understanding of new technologies as they emerge.

In addition to our core funded research activities, ACES provides the knowledge, skills and facilities that make a range of ARC Discovery, Linkage and NHMRC projects possible.

End User Engagement

Industry and community engagement are keys to sustaining ACES beyond 2013. Our industrial engagement activities in 2010 have been focussed on the development of a potential commercial opportunity in the area of water splitting. Our focus in 2011 will turn to the engagement of a strategic partner in Medical Bionics.

Collaborative research activities continue with a range of companies including BlueScope, CAP-XX, Cochlear, SMR Automotive, Dotmar and Elton Longwall in Australia as well as Applied Nanotech Inc, Boston Scientific and Konarka Technologies Inc in the USA, and Honda in Japan.

ACES scientists continue to make significant contributions to the CRC for Polymers and the Hearing CRC.

End-User engagement activities will be taken to a new level with the establishment of the Processing and Device fabrication facility on Wollongong's Innovation Campus in 2011.

Community Awareness

ACES researchers regularly engage with the community through hosting visits, participation in collaborative activities with the Wollongong Science Centre, involvement in community based focus groups, and through the print, radio and television media.

Development of Next Generation Researchers

We continue to attract talented young researchers from around the world to carry out research of the highest calibre. One of the most critical roles of the ACES organisation is the further development of these younger researchers.

Many of the crucial challenges facing us in the areas of Energy and Medical Bionics will require us to "hand over the baton" in an effective and efficient manner to the

next generation to ensure timely returns to the community. This is being achieved by equipping the next generation of researchers with the skills (both research and communication) as well as the facilities necessary to perform the tasks.

Acknowledgement

While 2010 was a highly successful year, 2011 started on a very sad note for ACES.

We lost our friend and fellow researcher Professor Leon Kane-Maguire.

Leon was instrumental in the establishment of ACES. He provided a combination of research skills, leadership and enthusiasm that was unique. His zest for mentoring the next generation of researchers has been instilled in us all and will live on in ACES for many years to come.

In forever pushing forward we often forget to look behind and acknowledge those who are pushing us on – thank you Leon.

Beyond 2013

We have commenced activities to ensure the development of an ACES strategic plan to ensure the continued growth of ACES over 2014-2020. There is no doubt that ACES has become a critical national resource. We will work together with all of the ACES stake-holders during 2011 to develop strategies that can be implemented through the 2012-2013 period to ensure the ability to return the benefits of this exciting research investment to the community for some years to come.

It will be with Leon's spirit and values, that we will go forward in 2011, continuing to build a sustainable ACES. There is still much to do on all fronts but we are confident that, at the end of 2011, we will hear one of Leon's favourite phrases ring out:

"This was the best year (for ACES) ever".

Bring on 2011.

Professor Gordon Wallace

Executive Director ACES.

From the International Advisory Board

The International Advisory Board reviewed the 2010 progress of the ARC Centre of Excellence for Electromaterials Science (ACES) on 11th February 2011 and received an update on progress in the new AIIM processing & devices building (due for completion mid 2011) as well as the groundwork being undertaken to secure the ACES position over the next 3 years and beyond. Those in attendance were: Dr (Dame) Bridget Ogilvie (Chair), Prof Siegmar Roth, Prof Richard Kaner, Prof Ray Baughman, Dr Abid Khan, Prof Keiichi Kaneto and Prof Judy Raper. The Board congratulated Gordon Wallace and the ACES team on the quality and quantity of outcomes achieved by the Centre in 2010.

Key Performance Measures

In general the performance of the Centre has exceeded the 2010 targets. In particular, there were 90 refereed publications of which 67 (74%) had an impact factor greater than 2 (46 had an impact factor greater than 4), 15 postgraduate students were recruited, 9 PhD and 2 Masters completions, 3 international workshops, 1 ACES in-house workshop, 5 national workshops, 53 invitations to present at international conferences, 45 visits to leading international laboratories, 91 media interest stories (27 print (5 magazine), 7 radio, 4 TV, 53 on line /web) published and 7 patents lodged.

The ACES entity enabled success in initiatives that were in addition to the core funded activities reported: 2 superscience fellowships, 1 APF, 3 ARF, 2 APD, 1 APDI, 8 Discovery grants, 2 ARC Linkage grants, 4 LEIF grants, 2 SLF grant and 1 EIF grant.

Progress in 2010

The ARC core funded activities in the Energy Program went from the previously established solar cell research activities into highly exploratory water splitting research. Solar cell research activities were not halted in the latter half of 2010, instead progressing with funding from alternate sources (Victorian Organic Solar Cell Consortium (VICOSC), CRC Polymers and an ARC Linkage grant).

In 2010 ACES, through collaboration with the University of Ulm, were able to realise world record efficiencies for photocathodes (0.42%) and tandem DSCs (2.42%) [***Nature Materials (2010, 9(1), 31-35)***]. Alternate p-type semiconductors, such as $CuAlO_2$, were employed and provided higher open circuit voltages (up to 330mV) than NiO (~220mV) ***[Journal of Photonics for Energy, accepted]***. ACES developed the first solar cell based on an organic ionic plastic crystal electrolyte with an efficiency $>5\%$ ***(Energy and Environmental Science in preparation)***. They also demonstrated that electrodeposited PEDOT could act as a catalyst on the cathode of these devices with performances equivalent to platinum and the additional benefit that it can be laid onto flexible films making it suitable for high speed reel to reel processing of solar cells.

It is important to note that without the initial ARC core funded activities, results such as these would not have been achievable and subsequently ACES could not have attracted the alternate sources of funding to progress work in this area further. However, as a result of attracting alternate sources of funding for solar cell research, ACES core funding received mid 2010-2013 is being redirected to undertake more fundamental and highly exploratory water splitting activities.

The shift of emphasis to water splitting created significant challenges as the ACES staff were required to instigate a highly exploratory materials program to satisfy the needs of ACES going forward to 2013, yet maintain a supply of materials developed over the previous five years. The board noted that this was achieved by further integration of the ACES and Australian National Fabrication Facility (ANFF-Materials Node) programs.

The board understands that as part of the new processing and device fabrication facility (courtesy EIF funding) improved materials synthesis and hardware for device fabrication will be available by the end of 2011. This includes: 3D rapid prototyping equipment for polymers and metals, wet fibre spinning facilities, advanced electrospinning and inkjet and extrusion printing capabilities. In addition, the purchase of new characterisation tools, such as the EQCM, a force controlled rheometer and new bio-AFM systems coupled with optical and fluorescent microscopes will allow development of new protocols for analysing the interactions of the new materials in given applications.

MATERIALS PROGRAM

Material supply to ACES and collaborators was the main focus in the first half of the year with supply of porphyrins for solar cell dyes and electrocatalysts, functionalised thiophene and terthiophene monomers

and polymers for batteries, capacitors, electrochromic devices and bionics, and graphenes for solar cells, batteries, capacitors and bionics. From July-Dec 2010 new material development was added to the workload and included synthesis and supply of porphryin structures with metals as electrocatalysts, soluble poly(terthiophenes) functionalised with charge-transfer indandione groups for Bionics, electrochemically and photochemically switchable polythiophenes, new water soluble thiophene monomers to develop biodegradable conducting polymers for Bionics and the large scale production of chemically converted graphene.

ENERGY PROGRAM

In addition to attracting alternate funding sources to continue the solar cell research, Honda invested $0.75M in aspects of the energy program at Deakin and Monash for 2010-2013.

Cathode materials: In a major breakthrough in the electrocatalysis of proton/water reduction, researchers showed that PEDOT /polyethylene glycol composites could out perform platinum ***(Adv Materials 2010, Patent App 2010)***. This work was highlighted in ***Chemical and Engineering News in May 2010*** which quoted Charles Desmukes from Rutgers as describing the new catalyst as "the most active undoubtedly the cheapest catalyst reported so far for the production of hydrogen from water".

Investigation into potentially using enzymatic processes in water splitting led to successfully achieving direct electron injection from the REDOX enzyme (glucose oxidase) 'wired' into a conducting polymer matrix (PEDOT) ***(Macromol. Rapid Commun. 2010, 31, 1293).***

Anode materials: By using multiple layers (up to 15) of cubane nafion material as much as 1% of the solar flux was harvested. This could be driven by two series connected dye sensitised solar cells (DSSCs) to provide the energy input required for the reaction.

Lithium batteries: Solid state lithium batteries made with plastic crystal electrolytes exhibited a cycle life exceeding 40 days. These electrolytes are solid at operating temperatures and hence enable the possibility of thin film printed lithium cells.

Flexible silicon/single-walled carbon nanotube (Si/SWCNT) composite paper was used as a flexible anode material, yielding a capacity of > 160 mAh/g.

BIONICS AND ETHICS PROGRAM

Studies within the Bionics program looked at fabrication and characterisation of 3D structures using a simple 1st case involving alginate gels; studies on the biocompatibitility of carbon nanotubes and aspects related to controlled release of bioactive molecules.

Electrical stimulation of neural cells on micro and nanostructured platforms based on conducting and biodegradable polymers showed an increased rate of axonal growth which, when applied in vivo, could possibly accelerate neural regeneration.

NHMRC funding was obtained to establish a second-generation peripheral nerve conduit. A novel evaluation protocol devised by ACES Bionics researchers provided this project with an important insight – that the cells preferred to adhere to each other ("clump") rather than the material substrate being evaluated – so now studies going forward will investigate materials with optimal hardness for nerve cell adhesion. In addition, positive changes in molecular pathways associated with muscle differentiation and cell proliferation were revealed when the effects of electrical stimulation on the molecular level were looked at using whole genome microarrays.

The advanced cochlear electrode implant design and fabrication protocols were developed. Electrode modification studies involving the use of selected conducting polymers to decrease impedance of the electrode-cellular interface commenced. Electromechanical actuators based on conducting polymers were attached to thin film electrodes and effective in bending the system, showing progress in developing a possible steering mechanism.

Within Ethics the research emphasis focussed on the position on the ethical issues surrounding clinical trials in medical bionics, clearly important in order to make progress beyond the laboratory and safely and efficiently obtaining uptake of new devices or methods.

The first of three publications to demonstrate the argument on an integrated position on the development of bionics, human health and ethical relations was published in 2010 ***(K. L. Kjølberg and F. Wickson (eds.) NANO meets MACRO: Social Perspectives on Nano Scale Sciences and Technologies PAN Stanford; pp. 263-282)***.

Education, Training and Outreach

One of the most important aspects of the ARC Centre of Excellence for Electromaterials Science (ACES) operations is their undertaking to provide a dynamic, multidisciplinary research training environment for PhD students and early career researchers (ECRs). The ACES research training programs are aimed at providing high level technical training within internationally recognised state of the art facilities.

The Education program continued to be an important platform for training and value-adding for staff, as well as attracting participation in some events from the broader community. For example a special public session was well attended as part of the 2nd Asia Pacific Symposium on Nanobionics held in June 2010. There was a steady stream of visitors who turned up to visit the Innovation Campus for their Inaugural Exhibition Day and 36 members of the public participated in tours of the ACES facilities.

The ACES highly successful and valued workshop program targeted both the professional development of research staff and postgraduate students, from all six ACES nodes, as well as key areas of continuing technical and scientific education. The annual international symposium remains a 'must attend' event on many international collaborators calendars.

In 2010 the ACES full centre meeting brought researchers from the six nodes together to talk about and plan their collaborative research together, continue their ongoing education and this meeting provided tools for them to assist in carving out a rewarding and satisfying career pathway. Topics discussed included: building a successful research academic career, commercialisation, IP/NDA, grant writing, project management, communicating science as well as the research talks.

In the most recent years ACES has aimed to instil in their graduate students the communication skills necessary to work across traditional academic disciplines and to carry out effective inter-laboratory collaborative research. For example, the newly introduced 'burster' sessions at the annual ACES symposium highlighted how ACES have been effective in being able to help PhD students and ECRS in presenting their research clearly, concisely in everyday language without trivialising or 'dumbing-down' the science. It was also pleasing to note that an ACES PhD student won a university competition 'The 3 minute Thesis' in front of an audience of 130 people for his talk 'Printed Patches for a Broken Heart'. He presented a compelling oration of his thesis studies and its significance in a language appropriate to an intelligent but non-specialist audience.

Towards 2013

Both energy and human health rank highly in the research priorities of most (if not all) industrialised countries, and electromaterials, energy, bionics and ethics remain the focus of ACES. Electromaterials are still at the core of a wide range of technologies that will generate future energy supplies and form the basis of the bionic medical devices.

The ACES core-funded research projects are on track to enable development of:

- a knowledge base in electromaterials science that is effectively utilised for developments in the Energy and Bionics programs.
- an efficient, easily manufactured water splitting device
- a high capacity printable metal-air battery
- an effective nerve repair conduit (proven) in an animal model
- an advanced cochlear implant electrode
- evaluated public engagement processes on nano-medicine, by end of 2013.

ACES will appoint associate program leaders in 2011 as a measure towards planning for beyond 2013.

In building the AIIM P&D (due for completion end 2011) an extra dimension has already been added to the centre; not only in terms of new equipment but also in the calibre of multidisciplinary scientists it has been able to attract to work alongside them.

End-Users

ACES changed its method for interaction with End-Users in 2010. In 2010 ACES held an End-User Technology Forum where current End-Users spoke of their interactions with ACES and this was considered very successful. During 2011 ACES aims to continue to hold End-User round table discussions, on specific targeted research topics, with ongoing advice from a revised End-User committee.

Throughout 2010, ACES partners have worked with Mr Chris Gilbey (Perceptic) to undertake commercialisation activities in the area of water splitting. They have identified an early engagement client; are presently negotiating the initial agreement; are assembling the IP bundle that relate to both catalysts and to manufacturing techniques involving polymers; are assembling the first prototype and have worked with Uniquest to develop a robust business case.

The IAB understands that this venture has the support of the lead node university, Wollongong, and that the exercise has already been a valuable educational exercise just by the nature of the exercise itself and the financial considerations required.

These End-User links in the water splitting area are being undertaken in parallel with the ACES core funded Energy program and external funding is needed to continue with the commercialisation prototype. ACES have succeeded in obtaining an initial Skills and Knowledge grant application with Commercialisation Australia to continue the exercise through 2011.

Expansion of the ACES End-User links is critical for continuity in 2013. ACES executive will attempt to attract national and international interest to look for opportunities to progress research (other than water splitting) being undertaken in both the energy and bionics program. Fostering key partners is very important to build trust and understanding.

Governance

Other than changes to the End-User committee the governance of ACES remained largely unchanged. The SLF funded Director of Strategic Development should be on board in 2011. The ACES executive will begin to look at the current governance structure / leadership team over the next 3 years to determine if it can be improved upon or if it will be suitable for ACES beyond 2013.

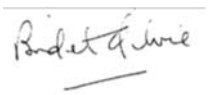
International Links

In 2010 ACES was unable to gain concensus on the formation of a global research consortium on Electromaterials Science, however in the short term they obtained funding for an international exchange program MASK (Materials and Advanced Sensor Knowledge Exchange) from the Marie Curie International Research Staff Exchange Scheme (IRSES). This exchange programme brings together research teams from three European (Finland, Ireland and France) and three Australian Universities with complementary skills and knowledge.

ACES continues to have an open and vibrant research environment that ensures close interaction with other Australian and international scientists. The large number of international research visits and invitations to address international conferences from ACES and the number of international guests hosted at ACES in 2010 is testimony to this. ACES remains a truly International Centre of Excellence.

"*Whilst the IAB was delighted to see continued excellent scientific progress in ACES, the highlight of its work this year was to see progress in the essential effort to get scientific advances into the public benefit. Solar cell research which had been funded by the core ARC grant until late 2010 is now funded from other sources, allowing core funding to be redirected to more fundamental work on water splitting. The integration of the programmes of ACES and ANFF-Materials node bringing with it equipment to improve device fabrication and materials synthesis and the construction of the new AIIM P&D building during 2010 to be completed in 2011 are major steps towards better interactions with End-Users. This transition also requires the employment of scientists with expertise in this area and here too there is progress.*

Therefore, the IAB was happy to commend the work of ACES in 2010 both in fundamental science and its transition to use."



Dr (Dame) Bridget Ogilvie AC, DBE, FAA, FRS, FMedSci

Chair International Advisory Board for ACES

Highlights of ACES Core Funded Activities

The Materials Program

A significant shift in emphasis in both the Energy and Bionics Programs during our year in transition has presented significant challenges to our Materials development and supply program.

It has been necessary to instigate a highly exploratory materials program to satisfy needs going forward while also maintaining a supply chain for more established materials. This has been achieved via further integration of the ACES and Australian National Fabrication Facility (ANFF-Materials Node) programs and we are now set to expand the materials supply base substantially during 2011.

ACES researchers were instrumental in attracting Federal grant funding (EIF) to construct a new facility for materials processing and device fabrication on Wollongong's Innovation Campus.

As part of this development ACES will acquire dramatically improved materials synthesis facilities as well as hardware for fabrication that includes:

- 3D rapid prototyping equipment for polymers and metals
- State of the art wet fibre spinning facilities
- State of the art electrospinning
- Inkjet and extrusion printing capabilities

Advances in printing of conducting polymers were covered in an invited review by ACES researchers ***(Analyst, 2010, 135, 2779-2789).***

Also within the Materials program we have made significant advances in the development of new characterisation tools.

For example:

- **An Electrochemical Quartz Crystal Microbalance (ECQCM).**

During 2010 QCM techniques were developed for the study of protein and cell interactions with a range of organic conducting polymer materials.

- **Force controlled rheometer with temperature control** (TA instruments ARG2).

This rheometer enables accurate and rapid assessment of the rheological properties of nanodispersions and polymer solutions as required for printing or spinning. For the first time, we are able to conduct non-destructive mechanical characterisation of polymer membranes and scaffolds in biological media.

- State of the art **Atomic Force Microscopy (AFM)** equipment combined with Optical and Fluorescent Microscopes that enables characterisation of living cells *in vitro.*

The new Bio-AFM systems along with novel probes are under development to implement highly localised drug delivery, electrochemical stimulation-detection and electrophysiology measurements on single living cells with nanometre precision.

These capabilities have been initiated to strengthen our bionics research program by elucidating the communication pathways between our electromaterials and living cells at the nanoscale domain.

SUPPLY OF NEW MATERIALS

The key focus of the Electromaterials programme in the first half of the year was the continued supply of materials for Energy and Bionics, as well as to our international collaborators in New Zealand, Japan, Ireland and the US.

The key material areas are porphyrins for solar cell dyes and electrocatalysts, functionalised thiophene and terthiophene monomers and polymers for batteries, capacitors, electrochromic devices and bionics, and graphenes for solar cells, batteries, capacitors and bionics. A detailed description of these materials, as well as new materials developed in the 2nd half of the year, is given in the 2010 Activity Report.

PORPHYRINS

A variety of porphyrins were supplied in the first half of the year for solar cell research in both the ACES and international laboratories, leading both to new patents(PCT application WO2010-AU105) as well as publications (J. Phys. Chem. C

2010, 114, 3276; J. Phys. Chem. C 2010, 115, 317-326; Chem. Commun. 2010, 46, (18), 3146).

Similar porphyrin structures that typically contain a metal such as Sn or Co and have higher oxidation potentials were supplied to the new Energy programme as potential electrocatalysts as were a number of other materials such as Mn cubane, which shows great potential for water splitting ***(J. Am. Chem. Soc., 2010, 132, 2892)***

FUNCTIONALISED THIOPHENES/ POLYTHIOPHENES

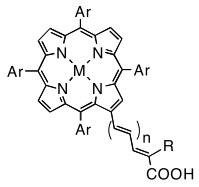
The development of a strategy to produce processable functionalised polythiophenes using functionalised terthiophenes as the monomers culminated this year with the collaborative development of novel soluble poly(terthiophenes) functionalised with charge-transfer indandione groups ***(Macromolecules, 2010, 43, 3817)***. The significance of this work was recognised with it being highlighted in Synfacts, a journal devoted to highlights in current synthetic organic chemistry ***(Synfacts 2010, 7, 764)***. This approach to functionalised polythiophenes is being used to develop useful materials for bionics.

This approach also yielded exciting new electrochemically and photochemically switchable polythiophenes such as poly(TTh-SP1) with researchers at Dublin City University (DCU). The combined strengths of the ACES and DCU laboratories led to a detailed understanding of the properties of these types of materials ***(J. Am. Chem. Soc. 2010, submitted)***.

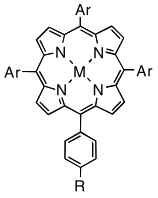
The development of biodegradable conducting polymers, critical for bionics applications, continued with the synthesis of new water soluble thiophene monomers. New polymers such as **POMPT** offer the possibility of biodegradability with better conductivity for muscle and nerve cell growth.

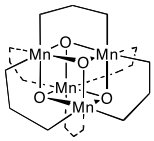
GRAPHENES

The large scale production of chemically converted graphene (CCG) continued with its supply to all programmes as well as a number of international collaborators. The development of organic solvent-dispersible anionic CCG- as well as cationic CCG+ opened up the range of applications for these unique materials. As a result,

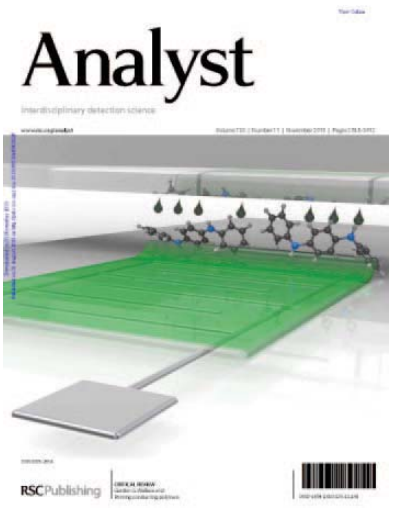


Porphyrins for solar cells





Materials for electrocatalysts



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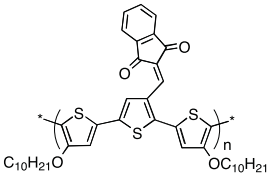
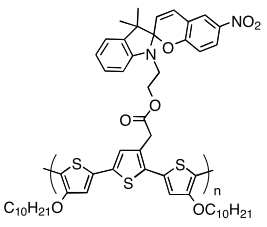
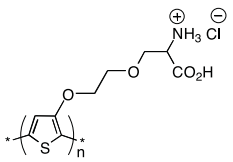


Indandione polythiophene



polyTThSP1



POMPT

new funding was obtained in the areas of graphene-polymer composites and graphene papers for heavy ion accelerators.

The Energy Program

Activities with the core funded Energy program have seen transition from solar cell research to water splitting. This transition has required us to maintain the momentum in solar cell research now supported substantially by Victorian Organic Solar Cell Consortium (VICOSC), CRC Polymers and an ARC Linkage grant while opening up a more exploratory approach in water splitting.

FUNDING

Major funding outcomes during 2010 included the investment by Honda of approximately $0.75M in aspects of the Energy program at Deakin and Monash for the period 2010 -2013.

The Dye Sensitised Solar Cell group at Monash also successfully completed the VICOSC program in June 2010. A further tranche of funding was committed to this work for the period 2010-2013.

WATER SPLITTING CATALYSTS

CATHODE MATERIALS

In a major breakthrough in the electrocatalysis of proton/water reduction, the team led by Dr Bjorn Winther-Jensen demonstrated that conducting polymer composites such as PEDOT with polyethylene glycol composites could outperform Pt as a catalyst for this reaction (Adv Materials 2010, Patent App 2010). The work was highlighted in Chemical and Engineering News in May 2010 which quoted Charles Desmukes from Rutgers as describing the new catalyst as “the most active undoubtedly the cheapest catalyst reported so far for the production of hydrogen from water”.

As a means of potentially using enzymatic processes in water splitting we have investigated methods of achieving direct electron injection from the REDOX enzyme into a conducting polymer. This work proved successful in the case of glucose oxidase which was ‘wired’ into a PEDOT matrix via an enzyme stuffing approach (Macromol. Rapid Commun. 2010, 31, 1293).

ANODE MATERIALS

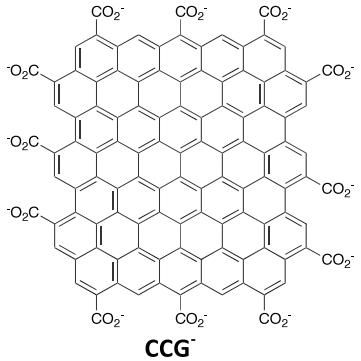
Work this year in the area of cubane based materials has shown that multiple layers, up to 15, of the cubane nafion material can harvest as much as 1% of the solar flux. It was also shown that this could be driven by two; series connected dye sensitised solar cells (DSSCs) to provide the energy input required for the reaction. Further work on the structure of the catalyst indicates that the material transforms once in the Nafion to form dispersed nanoparticles of a birnessite-like phase (MnOx).

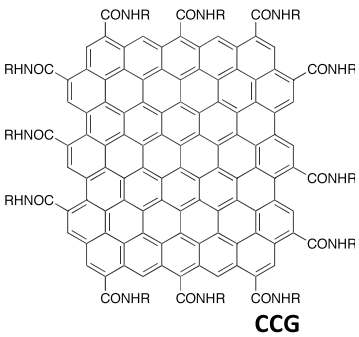
SOLID STATE SOLAR CELLS

Work by CI Pringle and student Vanessa Armel developed the first ever solar cell based on an organic ionic plastic crystal electrolyte. This type of material is the ideal electrolyte for a long lifetime device. The efficiency achieved was > 5%.
Work by Pringle also demonstrated that electrodeposited PEDOT could act as a catalyst on the cathode of these devices to facilitate the tri-iodide to iodide redox reaction. Performance of the PEDOT was equivalent to that of the traditionally used platinum (Pt) layer. These PEDOT layers can be deposited in flexible films and hence are suitable for high speed reel to reel processing of solar cells.

LITHIUM BATTERIES

Plastic crystal electrolytes have also provided a breakthrough in the field of solid state lithium batteries. Cycle life exceeding 40 days have been achieved. These materials are similar to ionic liquids and offer the same low volatility and stability, but are solid at operating temperatures and hence enable the possibility of thin film printing of lithium cells. Flexible silicon/single-walled carbon nanotube (Si/SWCNT) composite paper as a Flexible Anode Material for





Lithium Ion Batteries was prepared using the pulsed laser deposition. These yield a capacity of > 160 mAh/g.

The Bionics and Ethics Program

Within the Bionics program we have initiated studies into the fabrication and characterisation of 3D structures using alginate gels. In parallel, studies on the biocompatibitility of carbon nanotubes have been completed and aspects related to controlled release of bioactive molecules have been further developed.

Within Ethics the research emphasis has become focussed on the ethical issues surrounding clinical trials in medical bionics. In order to make progress beyond the laboratory there is a phase of research involving humans to assess the safety, efficacy, side effects and practicality of new devices or methods.

ADVANCED COCHLEAR ELECTRODE IMPLANT

Work on the development of an advanced cochlear electrode implant has progressed on several fronts during 2010.

The electrode design has been developed and fabrication protocols agreed with ANFF.

In parallel electrode modification studies involving the use of selected conducting polymers to decrease impedance of the electrode-cellular interface have commenced.

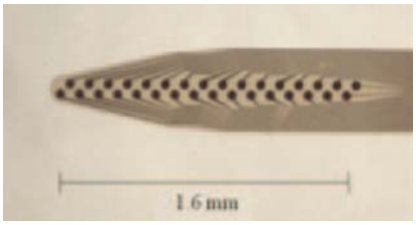
In a further aspect of this work electromechanical actuators based on conducting polymers have been attached to thin film electrodes and shown to be effective in bending the actuator with a view to developing a steering mechanism.

ELECTRICAL STIMULATION STUDIES (NERVE AND MUSCLE)

The effects of electrical stimulation on neural cells have been investigated on micro and nanostructured platforms based on conducting and biodegradable polymers. These platforms have been specifically developed to control and guide axonal growth.

Stimulation on these platforms can increase the rate of axonal growth which, when applied in vivo, could significantly accelerate neural regeneration.

The effect of electrical stimulation at the molecular level has also been investigated using whole genome microarray. These experiments revealed positive changes in molecular pathways associated with muscle differentiation and cell proliferation, suggesting that conducting polymers can be used to control the rate and extent of muscle development *in vitro* and *in vivo.*



New Cochlear Electrode Design

Education and Training

Professional Education Program

The Education program continued to be an important platform for training and value-adding for staff, as well as attracting participation from the broader community. The ACES workshop program targets both the professional development of research staff and postgraduate students as well as key areas of continuing technical and scientific education. The complete list of events organised by ACES in 2010 is outlined in the table below, others are discussed in more detail throughout this report.

Communication of science to ensure the engagement of others is no trivial task, it requires a level of training and innovation akin to that required to carry out scientific research. We are committed to providing our research students and early career researchers with opportunities for training in these areas.

MINI SYMPOSIUM ON MULTIFUNCTIONAL MATERIALS

A Mini Symposium on Multifunctional Materials was held on 16 February 2010 in Wollongong preceding the 5th Annual International Electromaterials Science Symposium. The program included local as well as visiting international speakers with plentiful discussion surrounding the talks from the 50 researchers in attendance.

International presentations included: Harvesting Waste Thermal Energy Using a Carbon-Nanotube-Based Thermal-Electrochemical Cell by Prof. Ray Baughman (University of Texas, Dallas); Multifunctional Systems based on Conducting Polymers by Prof. Ric Kaner (UCLA); Creeping and Memory Effect of Artificial Muscles based on Conducting Polymers by Prof. Keiichi Kaneto (Kyushu Institute of Technology in Japan); Graphene and Carbon Nanotubes by Prof Siegmar Roth (University of Korea).

ACES ELECTROCHEMICAL COURSE

The annual ACES Electrochemical Course was extended in 2010 to run over March and April 2010. ACES were honoured to have Prof Dennis Tallman, from North Dakota State University, who has worked in the area of electrochemical science for over 35 years, with particular interests in analytical and physical electrochemistry, and the science of materials and interfaces.

NANODAY

Australian Institute of Innovative Materials (AIIM) hosted the inaugural NanoDay on 9 April. Organised by Prof Geoff Spinks (ACES/IPRI), NanoDay was an opportunity for year 12 high school students to gain hands-on experience and knowledge about nanotechnology.

11 students and one teacher attended the full day event. After an introductory lecture from Prof Spinks on the latest developments in nanotechnology, the students spent the morning session learning about electron microscopy and atomic force microscopy.

The afternoon session began with a lab tour and then involved hands-on activities constructing a ferro-fluid and a lithium battery. A great deal of positive feedback was received from the participants.

Date in 2010	Workshop Name	Venue
16 February	Mini Symposium on Multifunctional Materials	AIIM, iC campus, Wollongong
17-19 February	5th Annual International Electromaterials Science Symposium held jointly with the 4th Australasian Symposium on Ionic Liquids (ASIL-4)	Monash University, Clayton
March - April	ACES Electrochemistry Course	AIIM, iC campus, Wollongong
2 June	ANFF USER Forum	AIIM, iC campus, Wollongong
8 June	Ethics workshop	AIIM, iC campus, Wollongong
19 July	Scanning Probe Microscopy (SPM) workshop	Flinders University, Adelaide
9-11 June	2nd Asia Pacific Symposium on Nanobionics	iC campus, Wollongong
13 October	ACES full centre meeting	AIIM, iC campus, Wollongong
13 October	ACES in-house water splitting forum	AIIM, iC campus, Wollongong
14 October	ACES Technology Showcase	iC campus, Wollongong

ETHICS WORKSHOP

ACES held an Ethics workshop on 8 June 2010, preceding the 2nd Asia Pacific Nanobioncs symposium. Research in bionics aims ultimately at developing useful medical devices, medical delivery systems or monitoring tools, to improve human health, functioning and well being. Inevitably, research needs to develop beyond the lab and into clinical settings, but in order to make progress there will need to be a phase of research involving humans to assess the safety, efficacy, side effects and practicality of new devices or methods.

This workshop focused on some of the ethical issues associated with clinical trials in bionics. Speakers included Dr Anita Quigley, Dr Simon Moulton, Prof. Dick Fox, Dr Peter Keller. Prof. Susan Dodds and A/Prof Rob Kapsa.

SCANNING PROBE MICROSCOPY WORKSHOP

The Scanning Probe Microscopy Workshop preceded the joint ARC Australian Nanotechnology Network and ARC Australian Research Network for Advanced Materials (ARCNN/ARNAM) 2010 workshop, at Flinders University in Adelaide on 19 July and was co-sponsored by ACES and was geared towards teaching early career researchers. The program was co-organised by Flinders University (Prof. Joe Shapter) and the ARC Centre of Excellence for Electromaterials Science (Dr Michael Higgins).

Dr Michael Higgins gave an invited presentation at the ARCNN/ARNAM workshop on Conducting Polymers on the Nanoscale for Medical Bionics Applications and Probing Single Cell and Protein Interactions at Conducting Polymer Interfaces using Atomic Force Microscopy at the SPM workshop. Dr Higgins focused on the use of Scanning Probe Microscopy (SPM) techniques, such as Electrochemical AFM and Dip Pen Nanolithography, which are currently generating significant interest in the field of Nanobionics.

ACES PhD students Cathal O'Connell (Probing Dynamic Nanomechanical Properties of Single Living Cells at Biomaterial Interfaces using Atomic Force Microscopy) and Amy Gelmi (Measuring the Adhesion of Proteins on Conducting Polymer Surfaces as a Function of Dopant and Electrical Stimulation) also presented at this event.

(http://www.materials.com.au/arnam2010/sponsors.php)

ACES FULL CENTRE WORKSHOP

The program for the ACES Full Centre Workshop, held on 13 October in Wollongong, was aimed towards early career researchers.

Session one was aimed at disseminating knowledge about building successful academic and research careers to an audience of over 80 people. The talks covered diverse areas such as:

- Building a successful research career
- Commercialisation
- Grant Writing
- Project Management, and
- Communicating Science.

Speakers at the ACES Ethics workshop in June included L to R: Prof. Dick Fox, Prof. Susan Dodds, Dr Anita Quigley, Dr Peter Keller, Dr Simon Moulton and A/Prof Rob Kapsa.

Session two treated the audience to a snapshot of research being carried out by the newer members of ACES, who were in their 1st or 2nd year of their post-graduate studies. Talks were kept to a snappy 10 mins. The audience found this session to be highly informative and a fun, informal way to learn more about their colleagues' work.

PHOTO-ELECTROCHEMICAL WATER SPLITTING FORUM

In October 2010, ACES held a Photo-Electrochemical Water Splitting Forum focussed on fundamentals, experimental techniques and applications.

ACES is uniquely positioned internationally to address one of the "Holy Grails" of science – the replication of photosynthetic processes - affording devices that not only sustainably produce electricity from the sun but also generate hydrogen from solar water splitting.

Speakers from ACES and other groups at Monash University, Otago University, and Bluescope Steel made this forum a truly collaborative and educational exercise.

12TH AUSTRALASIAN POLYMER SUMMER SCHOOL

The 12th Australasian Polymer Summer School was held on the Innovation Campus in Wollongong, December 2010. This school is hosted by the RACI polymer division and the CRC for Polymers. Prof Gordon Wallace was invited to speak on "Biological Aspects of Intelligent Polymers" and following his talk laboratory tours through ACES/IPRI were arranged for the 30 participants.

Pictured below left: Dr Troy Coyle (Commercial Research Unit at UOW) speaking to ACES staff/students about maximising End-User engagement.

Below: Participants from the 12th Australasian Polymer Summer School ready for a laboratory tour of the ACES/IPRI.

ACES PROGRAM MEETINGS

Monthly ACES program meetings (for Materials, Energy and Bionics & Ethics) are held. All ACES members are invited to participate and contribute ideas and advice to their peers (see ACES program meeting schedule in Table 3).

At each meeting every ACES program member is invited to discuss their 'research highlights' for the previous month.

CSIRO MANAGED SCIENTISTS IN SCHOOLS PROGRAM

Throughout 2010, Assoc Prof Marc het in Panhuis (ACES CI) was active in the local community through the CSIRO managed Scientists in Schools Program. The national program is an educational experience that allows scientists and schools to work together across Australia with the aim of providing inspiration, fun and learning for students, teachers and scientists alike. Scientists in Schools creates and supports long-term partnerships between scientists/ engineers and teachers.

SCIENCE CENTRE ACTIVITIES

Glen Moore, Director of the Science Centre & Planetarium at University Of Wollongong's Innovation Campus knows the value of community participation in science and technology. Each year the centre hosts an audience consisting of public (64%), schools (28%); and mature aged adult groups (8%).

He says "we concentrate on getting the public to visit using high rotation of exhibitions and a variety of communication vehicles to get the message out there. Without the support of our exhibit sponsors such as ACES the hand's on science exhibits just aren't possible."

The iDome exhibit at the centre is a partnership between the ARC Centre of Excellence for Electromaterials Science (ACES), the Intelligent Polymer Research Institute (IPRI) and the Wollongong Science Centre. The Nanomaterials for Energy exhibition allows the public to have an up-close virtual tour inside the Intelligent Polymer Research Institute's laboratories and explore the research. This exhibition is due to be updated in 2011.

Internships are made available to students of the University of Wollongong. Two research students from ACES/IPRI, Cameron Ferris and Joseph Giorgio have been involved in this program, as part of their project and thesis work. From their work a static display 'nanomachines' was completed in 2010 and the static display as an introduction to the iDome is due for completion in 2011.

Research Training

In 2010 the centre encouraged international research experiences. For a list of visits by ACES members and nominated conference attendances in 2010 see Table 1. For a list of ACES member's visits between nodes in 2010 see Table 2.

In addition, research fellows were encouraged to apply for Fellowship funding to allow them to spend extended periods of time in developing an international research experience.

In 2010, Dr Michael Higgins was awarded a scientific grant to participate in an Australia-Germany Researcher Mobility project. The award from The Australian Academy of Science, on behalf of the Department of Innovation, Industry, Science and Research, allowed Michael to spend one month in the laboratories of Dr Christine Kranz at the University of Ulm this December.

As part of the Monash University-the University of Warwick 2009-2010 Strategic Funding Initiative for Joint Research and Education Programmes, Dr Jenny Pringle spent July at the Warwick University in the UK.

Dr Jenny Pringle also spent 25-28 January 2010 in Keith Gordon's lab in Otago University to work as part of the ICOS DEST ISL grant.

ACES/IPRI researchers Dr Jun Chen and Dr Andrew Minett were awarded a University of Wollongong internal grant for establishing Thai affiliated international links. This will allow them to spend time with Thai collaborators to further their research opportunities with Chiang Mai University.

Dr Jun Chen travelled to China in September 2010 to spend time in Shanghai Jiao Tong University courtesy of the DEST Australia-China Special Fund for Scientific & Technological Cooperation - International Science Linkages (ISL) Programme.

TABLE 1: LIST OF 2010 VISITS/SEMINARS TO OTHER RESEARCH ORGANISATIONS AND NOMINATED CONFERENCE PRESENTATIONS

Month in 2010	ACES member	Visit and purpose
January		
January	Dr Simon Moulton (QEII,IPRI)	Dr Simon Moulton continued to extend his collaborative research on carbon nanotube (CNT) biocomposites, with Dr Philippe Poulin at Centre de Recherche Paul Pascal (CNRS), Bordeaux. He stayed for 3 weeks.
19 January	Prof David Officer (CI, IPRI)	Gave an invited lecture on 'Porphyrin-sensitised Titanium Dioxide Solar Cells' during his visit to the Linz Institute for Organic Solar Cells, University of Linz.
21 January	Prof David Officer (CI, IPRI)	Prof David Officer gave an invited lecture entitled 'Towards Artificial Photosynthesis: Light Harvesting with Nanostructured Porphyrins' in UNCSR seminar series at NCSR, Dublin City University, during his visit.
23-30 January	Torben Daeneke (PhD Monash)	Visited Imperial college London (James Durrant group) to work on IPCE front back analysis.
25-28 January	Jenny Pringle (CI Monash)	Visit to Keith Gordon labs New Zealand to work on variable temperature Raman of some plastic crystal samples.
February		
8-13 Feb	Klaudia Wagner (RF, IPRI)	Visited Prof Alan Bond group at Monash University to undertake training and perform measurements in Fourier Transform AC Voltammetry, then onto ACES symposium at Monash University.
10-12 Feb	Kerry Gilmore (RF, IPRI)	Attended the Annual meeting of the Australasian Society for Biomaterials and Tissue Engineering, Brisbane and inspected the Zeiss Confocal microscope system at Queensland Brain Institute at the University of Queensland.
22-26 Feb	Charles Mire (PhD, IPRI)	Attended ICONN 2010, Sydney: oral presentation; networking opportunities
	Philip Whitten (RF, IPRI)	Attended ICONN ▶ presented orally on *Biomimetic Artificial Muscles - from Nanofibers to Bundles* ▶ presented Artificial Muscles, Robotic Fish and Nano-Guitars at the ICONN 2010 video conference organised by the NSW Department of Education and Training.
	Javad Foroughi (RF, IPRI)	Attended ICONN and presented a poster on *Nanostructured Electrically Conducting Biofibres produced using a Reactive Wet-spinning Process*
	Amy Gelmi (PhD, IPRI)	Attended ICONN and presented a poster on *Quantifying the Physical and Electrochemical Properties of Composite Polypyrrole Biomaterials using AFM*
	George Lee (PhD, IPRI)	Attended ICONN and presented orally on *Photomorphic Silver Nanoparticles*
	Grace Stephenson (PhD, IPRI)	Attended ICONN and presented a poster on *Nanostructured Polythiophenes for Controlled Drug Release*
	Robert Breukers (PhD, IPRI)	Attended ICONN and presented a poster on *Aligned Polythiophene Fibres for Tissue Engineering Applications*
	Marc in het Panhuis (CI, UOW)	Attended ICONN and presented orally on *Conducting hydrogel bio-materials.*
	Cameron Ferris (PhD, IPRI)	Attended ICONN and presented a poster on *Gellan gum hydrogel bio-scaffolds*
	Cathal O'Connell (PhD, IPRI)	Attended ICONN and presented a poster on *Investigating Dynamic Nanomechanical Properties of Single Living Cells at Biomaterial Interfaces using AFM*

Month in 2010	ACES member	Visit and purpose
	Dr Simon Moulton (QEII, IPRI)	Attended ICONN and presented orally on *Controlled Drug Release from Nanostructured Conducting Polymers*
	Ben Mueller (PhD, IPRI)	Attended ICONN and presented a poster on *Cell Compatible Conducting Coatings of Self-Assembled Graphene*
	Alberto J. Granero (PhD, IPRI)	Attended ICONN and presented a poster on *Elastic conducting carbon nanotube-laden SIBS fibers*
28 Feb - 3 March	Prof David Officer (CI, IPRI)	Visited the Sekisui Chemical Co., in Tokyo. Whilst there he gave a lecture on 'Research at ACES/IPRI' and held research discussions.
March		
22-29 March	Attila Mozer (RF, IPRI)	Visited Prof. Shogo Mori at Shinshu University, Japan
29-31 March	Attila Mozer (RF, IPRI)	Attended and gave a contributed talk at the meeting of the Japanese Electrochemical Society (ECSJ), Toyama, Japan.
April		
1-2 April	Attila Mozer (RF, IPRI)	Visited Prof Furube and Dr. Katoh, AIST, Tsukuba, Japan and gave 90 min seminar.
12-23 April	Benny Kim (RF, IPRI)	Korea: Benny spent time at Hanbat National University working with Prof Ko's group to conduct experiments and discuss the publication of a joint paper.
14 April	Robert Kerr (PhD Monash)	Spent one week at ACES/IPRI learning to fabricate bucky paper electrodes from MWNT's
15-30 April	Benny Kim (RF, IPRI)	Spent time in laboratories of Prof Ko group at Hanbat National University, Korea, undertaking collaborative experiments. Visited Korean Institute of Machinery and Materials in Korea to partake in collaborative talks towards the establishment of an international cooperation research project funded by Korean government.
April	Patrick Howlett (RF, Deakin)	Visit to Ellwangen (Germany): Varta Microbattery for presentation of research, tour of the facilities and meeting with collaborators on joint metal-air battery project, April 2010.
April	Prof Douglas MacFarlane (CI, Monash)	Prof MacFarlane an Adjunct Professor at University of Alabama visited Prof Robin Rogers.
April	Prof. Leone Spiccia (CI Monash)	Visited with (i) Professor Franco Arena, Dipartimento di Chimica Industriale e Ingegneria dei Materiali, Università degli Studi di Messina to participate in a PhD student examination and (ii) Dr Lorenzo Spadaro, Istituto CNR-ITAE "Nicola Giordano", S. Lucia, Messina, whose research activities also cover the fields of chemistry, electrochemistry and materials science. Whilst at both universities Leone gave a seminar on 'Solar Water Oxidation by a Bioinspired Molecular Catalyst'.
May		
May 1, 2010 – Nov 22, 2010	Matt Griffith (PhD IPRI)	Spent 6 months in Associate Professor Shogo Mori's lab at Shinshu University in Ueda, Japan. Work involved detailed measurements of electron lifetime, diffusion coefficients and TiO_2 conduction band potentials for a range of porphyrin dye-sensitised solar cells under a wide variety of experimental conditions.
11 May	Alex Harris (RF La Trobe)	Toured Minifab facilities
12 May	Alex Harris (RF La Trobe)	Toured facilities of MCN

Month in 2010	ACES member	Visit and purpose
17 May- 6 June	Benny Kim (RF UOW)	With Korean collaborators at Hanbat and Gangneung. Benny also hosted an ACES exhibition booth at the International Exhibition on Green Hi-Tech, held concurrently with the 27th IASP World Conference on Science and Technology 2010 in Daedeok, Korea.
19 May	Alex Harris (RF La Trobe)	Tour of RMIT with Anthony O'Mullane
May	Paul Keller (CI, UOW)	Visit to Dr Natalie Solladie at University of Toulouse France. Gave seminar and had collaborative talks.
June		
1-30 June	Tanmaya Joshi (PhD, Monash)	Visited Institute of Inorganic Chemistry, University of Zurich, Switzerland to conduct experiments.
6-18 June	Dr. Patrick Howlett (RF, Deakin)	Visited collaborators Varta Microbattery in Ellwangen, Germany, to present his research, tour their facilities and attend a meeting with collaborators on joint metal-air battery project.
22 June -21 July	Prof Hugh Brown (CI, UOW)	Spent from in the Materials Research Laboratory at University of California, Santa Barbara working with Professors E. J. Kramer, C. Hawker and P. Pincus on the rheology of triblock hydrogels.
28 June	Prof David Officer (CI, IPRI)	Gave an invited seminar on 'Developing Multifunctional Electromaterials for Energy-related Applications' at North Dakota State University as part of his visit.
28-30 June	Prof. HK Liu (CI, ISEM)	Visited the Fuel cell labs, Materials & Thermochemistry labs, Dalian Institute of Chemical Physics, Chinese Academy of Sciences
June	Prof David Officer (CI, IPRI)	Prof David Officer attended the 1st Nanomaterials for Alternative Energy Applications workshop at the University of British Columbia at the end of June and gave an invited lecture on 'Nanostructured Porphyrins for Energy Applications'. Following the workshop, he spent time with John Madden's and Tom Beatty's research group at University of British Columbia discussing their work on artificial photosynthesis.
July		
1-4 July	Prof. HK Liu (CI, ISEM)	Visited the State Key Laboratory of Superhard Materials, at Jilin University, China.
1 July	Prof David Officer (CI, IPRI)	Visited Prof Les Dutton, the Director of the Johnson Research Foundation at the University of Pennsylvania, to discuss their collaborative project on artificial photosynthesis and give a seminar on "Saving Australia with Nanostructured Porphyrins".
4-9 July	Dr S. Moulton (QEII, IPRI)	Attended ICSM2010 and presented his research on drug delivery devices for epilepsy.
5-9 July	Prof. HK Liu (CI, ISEM)	Visited Northeastern University, invited talk *Energy materials program at ACES/ ISEM*.
10-14 July	Prof. HK Liu (CI, ISEM)	Visited Institute of Materials Science, Shanghai University
12-30 July	Dr Benny Kim (RF, IPRI)	Korea: with collaborators
15-17 July	Prof. HK Liu (CI, ISEM)	Visited Institute of Physics, Chinese Academy of Science and gave an invited talk: *Advanced materials for Li-ion batteries* on 16 July.
18-19 July	Prof. HK Liu (CI, ISEM)	Visited Institute of Nonferrous Metals and gave invited talk: *Advanced materials for Li-ion batteries* on 19 July.
21-22 July	Jenny Pringle (CI, Monash)	Hosted by Prof Pat Unwin, Warwick University, toured NMR facilities; the school of Chemistry labs and gave a seminar about ACES research

Month in 2010	ACES member	Visit and purpose
23-31 July	Mr. Tim Khoo (PhD Monash) Prof Leone Spiccia (CI, Monash)	Attended IPS‐18 at Korea University 23-31 July 2010 and the Post‐IPS 18 symposium at POSTECH, Pohang, Korea, where they presented their work.
24 -30 July	Torben Daeneke (PhD Monash)	Travelled to Seoul (South Korea) to attend IPS-18 conference
27 July	Dr Michael Higgins (RF, IPRI)	Presented *Nanobionics: Advances with Scanning Probe Techniques* at the XE-Bio AFM/SICM Workshop held in Suwon, Korea.
July	Assoc Prof Paul Keller (CI, UOW)	Visited Dr Nathalie Solladie at the University of Toulouse, France in July 2010. He gave a seminar and had discussions on the collaborative research being undertaken.
July	Prof Douglas MacFarlane (CI, Monash)	Visited Prof Yong Soo Kang at the Center for Next Generation Dye-Sensitised Solar Cells in Hanyang University, Seoul.
August		
2-5 August	Prof Leone Spiccia (CI, Monash)	Travelled to Andong in Korea to visit Professor Jong-Ha Choi, at Andong National University and whilst there gave a seminar on “Solar driven water oxidation by a bioinspired manganese catalyst”.
September		
6 Sept	Alex Harris (RF La Trobe)	Tour of Bandwidth Foundry in Sydney to discuss electrode manufacture
6-8 Sept	Prof Leone Spiccia (CI Monash)	Spent with Dr Gilles Gasser at the University of Zurich and delivered a seminar entitled “Solar Water Oxidation by a Bioinspired Molecular Catalyst”.
7 Sept	Alex Harris (RF La Trobe)	Visited Andrew Dzurak at UNSW for a tour and discuss electrode manufacture
17 Sept	Dr Joselito Razal (RF, IPRI)	Travelled to the University of Surrey, Guildford in the UK, to visit the Nanostructured Materials Group.
13-19 Sept	Prof Leone Spiccia (CI, Monash)	Visited Drs Klaus Lips and Alexander Schnegg at the Helmholtz-Zentrum Berlin für Materialien und Energie GmbH for collaboration on ‘Water oxidation catalysis by Mn clusters’.
22-24 Sept	Alex Harris (RF La Trobe)	Tour of Australian synchrotron and did rabbit CT imaging on medical imaging beamline
22 Sept- 1 Oct	Benny Kim (RF IPRI)	Hanbat National University (experimental work and gave lectures) Korean Institute of Machinery and Materials in Korea (KIMM):accompanied Gordon Wallace for collaborative talks Hanyang University (experimental work and gave lectures) Education and Science department: accompanied Gordon Wallace for collaborative talks Gangneung TIC (experimental work and gave lecture) ETRI
September	Prof Douglas MacFarlane (CI Monash)	Prof MacFarlane visited Prof Urs Welz-Biermann in the Dalian Institute of Chemical Physics at the Chinese Academy of Sciences
September	Dr Joselito Razal (RF IPRI)	Visit to Regae-Institute for Regenerative Medicine, University of Tampere in Finland, to deliver seminar on his work in ACES. It was well received with further interest in ACES materials for their research.
October		
6 Sept -10 Oct	Prof Hugh Brown (CI UOW)	Worked in the research labs of the Dutch polymer company DSM.

Month in 2010	ACES member	Visit and purpose
11-15 Oct	Torben Daeneke (PhD Monash)	Spent 4 days at ACES/IPRI working with Attila Mozer taking laser measurements of ferrocene derivative mediated DSSC. Also presented work on ferrocene mediated DSSC in a seminar.
15 Oct-15 Nov	Usman Raman (PhD Monash)	Spent time at Prof Masayoshi Watanabe's lab in Yokohama national University, Yokohama Japan. Undertook training in power generation testing experiments and gave 2 seminars on ACES research.
Oct	Prof Douglas MacFarlane (CI Monash)	Prof Douglas MacFarlane visited with Prof George Malliaras at the Centre Microélectronique de Provence in October 2010.
November		
11 Nov	Prof. HK Liu (CI ISEM)	Visited the School of Chemical Sciences and Engineering, UNSW and gave an invited talk: *Nanomaterials and nanotechnologies for lithium rechargeable batteries* at the Energy storage workshop.
16 Nov-13 Dec	Torben Daeneke (PhD Monash)	Visited EPFL in Switzerland to work on ferrocene electrolytes.
28Nov - 4 Dec	Usman Rana (PhD, Monash)	Invited speaker at MRS fall meeting Boston USA. Oral presentation on plastic crystal electrolytes as potential candidates for fuel cell electrolytes.
22 Nov 2010 until 22 Feb 2011	Matt Griffith (PhD IPRI)	Spending 3 months with Prof Ryuzi Katoh's group at the National Institute of Advance Industrial Science and Technology (AIST) in Tsukuba, Japan. Work involved measuring the fast injection and recombination kinetics of porphyrin dye-sensitised solar cells under various conditions.
24-26 Nov	Joselito Razal (RF, IPRI)	Gave invited presentation at 4th Annual Meeting of AUS-CRS *Advances in science and technology of bioactive delivery systems*, held at the Monash Institute of Pharmaceutical Sciences, Melbourne. Visited St Vincents Melbourne for collaborative update.
29 Nov	Elise Stewart (RF, IPRI)	NSW Stem Cell Network 14th Stem cell workshop *Ethics and the regulations for the use of stem cells* at Sydney University.
December		
5-18 Dec	Usman Rana (PhD, Monash)	Spent time working alongside researchers in the magnetic resonance group at the University of Warwickshire, UK.
15-20 Dec	Torben Daeneke (PhD Monash)	Oral presentation on *Transition metal complexes as alternative redox couples for dye sensitised solar cells showing record performance* at Pacifichem 2010 in session for Materials & Nanotechnology, Polymer/Organic Solar Cells held 15-20 December, 2010, Honolulu, Hawaii, USA.
Dec	Attila Mozer (RF, IPRI)	Attila Mozer and Tracey Clarke (UOW/IPRI) visited Prof Gordon, their partner investigator on recent ARC discovery projects, at Otago University. Attila and Tracey gave invited talks at the Lasers and Applications Research Theme (LART) meeting.

TABLE 2: LIST OF 2010 VISITS/SEMINARS WITHIN ACES NODES

Month in 2010	ACES member	Visit and purpose
February		
9 Feb	Graeme Clark (CI, La Trobe)	To UOW to present Bill Wheeler Scholarship and receive a bionic program update
16-24 Feb	Shannon Little (PhD, IPRI)	Visited Monash University to undertake collaborative experiments (with Brianna Thompson- characterisation of hydrated ionic liquid choline dihydrogen phosphate using GC-MS, density, viscosity and conductivity measurements for paper) and attended the ACES symposium, presenting a poster on *Glucose Oxidase Catalysis in Hydrated Choline Dihydrogen Phosphate.*
17-19 Feb	Delegation of 15 people from ACES/UOW	To Monash to attend the 5th Annual International Electromaterials Science Symposium
22 Feb-16 April	Elise Stewart (RF IPRI)	To ACES/ St Vincents Hospital: Spent 3 months in laboratories performing protein analysis; whole genome array analysis of stimulated cell samples and analysis of growth factor effects on myoblasts.
May		
4 May	Doug Mac Farlane (CI Monash)	To UOW to: ▶ attend water splitting update meeting ▶ attend the ACES executive meeting
4 May	Maria Forsyth (CI Monash)	To UOW to: ▶ attend water splitting update meeting ▶ attend the ACES executive meeting
18 May -4 June	Elise Stewart (RF IPRI)	To St Vincents Hospital (SHVM) to undertake laboratory work I
June		
7-11 June	Alex Harris (RF La Trobe)	Visit to IPRI /UOW to :– ▶ tour of the facilities ▶ undertake lab work on actuators and electrode coatings ▶ attend the Nanobionics symposium
8 June-11June	Susan Dodds (CI, UTas)	To UOW to ▶ host the ACES Ethics workshop ▶ attend the Nanobionics symposium
8 June-11 June	Catriona Sinclair (RF, SHVM)	To UOW to: ▶ attend ACES Ethics Workshop ▶ attend Nanobionics symposium ▶ held lab discussions.
8 June-11 June	Doug Mac Farlane (CI Monash)	To UOW to: ▶ attend ACES Ethics Workshop ▶ attend Nanobionics symposium ▶ hold lab discussions.
8 June-11 June	Maria Forsyth(CI Monash)	To UOW to: ▶ attend ACES Ethics Workshop ▶ attend Nanobionics symposium ▶ hold lab discussions.

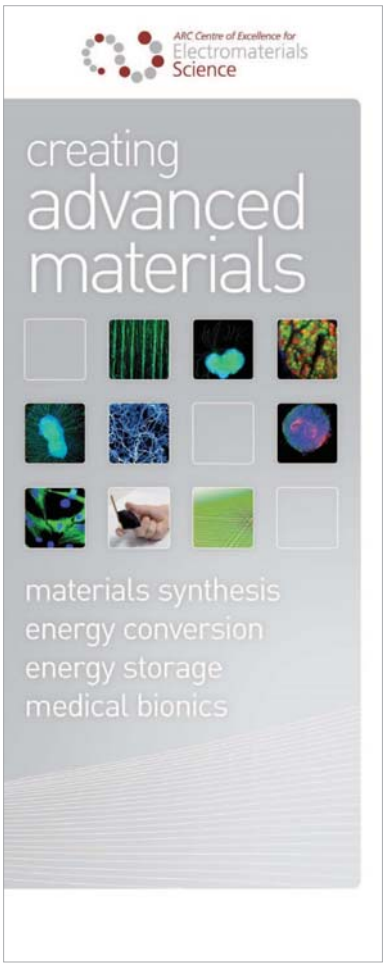
9 June -11 June	Mark Cook (PI, SHVM)	To UOW to: ▶ attend Nanobionics symposium ▶ hold lab discussions.
July		
13July	Mark Cook (PI, SHVM)	To UOW: to give seminar in IHMRI seminar series
August		
3 August	Robert Kapsa (CI SHVM)	To UOW: brought up St Vincent's hospital delegation for meetings, discussions and lab tour
17 August	Doug MacFarlane (CI Monash)	To UOW: to ▶ attend ACES executive meeting ▶ to participate in program meeting updates
	Maria Forsyth (CI Deakin)	To UOW: to ▶ attend ACES executive meeting, ▶ to participate in program meeting updates, ▶ ACES interview panel member in interviews for the director strategic development.
September		
1 Sept	Andrew Nattestad (PhD Monash)	To UOW to: ▶ give seminar ▶ hold lab discussions
8-10 Sept	Alex Harris (RF La Trobe)	To UOW to undertake lab work on actuators and electrode coatings
October		
13 October	ACES members from Monash: 6 members UTas 2 members	To UOW to attend: ▶ ACES full centre meeting ▶ ACES technology showcase
13 October	ACES members 13 staff and students from Monash University	To UOW to attend: ▶ ACES water splitting workshop
13-15 October	ACES members SHVM Robert Kapsa (CI SHVM)	To UOW to: ▶ attend ACES full centre meeting ▶ attend ACES technology showcase ▶ hold Lab discussions
19 October	Mark Cook (PI, SHVM)	To UOW for lab meetings

TABLE 3: ACES PROGRAM MEETING SCHEDULE FOR 2010

MATERIALS	5 March 2010	2 April 2010	30 April 2010	28 May 2010	25 June 2010
	Review of targets and milestones (David Officer, UOW)	***Good Friday Holiday***	***Double network gels*** (Hugh Brown, UOW)	***Q Sense and Dip Pen lithography*** Dr Paul Molino (UOW) ***in-situ XRD synchotron work*** Dr Jim Efthimiadis (Monash)	***Advances in graphene*** (Sanjeev Gambhir, UOW)
ENERGY	12 March 2010	9 April 2010	7 May 2010	4 June 2010	2 July 2010
	Review of targets and milestones (Doug MacFarlane, Monash)	***Advances in water splitting*** (Jun Chen UOW) (Rosalie Hocking, Monash)	***Characterisation of water splitting process*** (Attila Mozer, UOW)	***The development of a fuel cell*** (Dr Jun Chen, UOW)	***Toward flexible energy storage devices based on nanocomposite paper*** (Lukman Noerchim, ISEM) ***Solvent-assisted solid state synthesis of LiFePO4 composite cathode*** (MD Mokhlesur Rahman, ISEM)
BIONICS AND ETHICS	19 March 2010	16 April 2010	14 May 2010	11 June 2010	9 July 2010
	Review of targets and milestones (Rob Kapsa, SHVM)	***Bioprinting*** (Charles Mire UOW)	***Advanced cochlear implant electrodes*** (Tony Paolini and Alex Harris, La Trobe)	***Nanobionics symposium***	***Nerve cell regrowth*** (Anita Quigley, SVHM)

MATERIALS	23 July 2010	20 August 2010	17 September 2010	14 October 2010	12 November 2010
	Porphyrins new challenges and opportunities David Officer (UOW)	***Advances in graphene*** Rao Yepuri (UOW) Dan Li (Monash)	***Tough Gels and stretchable electrolytes*** Phil Whitten (UOW) ***Dip pen lithography*** Hiroshi Nakashima (UOW)	***ACES full centre meeting in Wollongong***	***Advances in Spinning techniques*** Joselito Razal (UOW) ***Advances in printing technologies*** Stephen Beirne (UOW)
ENERGY	30 July 2010	27 August 2010	24 September 2010	22 October 2010	19 November 2010
	Detailed investigations of the light exposure effect of porphyrin-sensitised solar cells Attila Mozer (UOW) ***Plastic Crystal Based Lithium Batteries*** Pat Howlett (Monash)	***Catalyst in Nafion Matrix for Water Splitting*** Jun Chen (UOW) ***Multilayer Water oxidation electrodes*** Alex Izgorodin (Monash)	***Novel Fuel Cell Membranes*** Usman Rana (Monash) ***Advances and opportunities in water splitting*** Gerry Sweigers (UOW)	***Metal Air Batteries*** Tim Khoo (Monash) ***IL Properties Relevant to Thermocells*** Vanessa Armel (Monash)	***Thermocells*** Mark Romano (UOW) ***Polymer Batteries/ Capacitors*** Caiyun Wang (UOW)
BIONICS AND ETHICS	6 August 2010	3 September 2010	1 October 2010	29 October 2010	26 November 2010
	Muscle actuation Paul Molino (UOW)	***Novel substrates for nerve cell growth*** Xiao Liu (UOW)	***Bio-AFM*** Michael Higgins (UOW)	***Ethics*** Sue Dodds (UTas)	***Drug release for epilepsy*** Courtney Suhr (SHVM)

International Profile



ACES continues to attract research scientists from around the globe and participates in a number of international research collaborations.

The ARC Centre of Excellence for Electromaterials Science has developed global research connections in Canada, China, Finland, France, Germany, Ireland, Iran, Italy, Japan, Korea, Malaysia, Netherlands, New Zealand, Philippines, Sri Lanka, Sweden, Switzerland, United Kingdom and USA.

International Symposia hosted/co-hosted by ACES

5TH ANNUAL INTERNATIONAL ELECTROMATERIALS SCIENCE SYMPOSIUM HELD JOINTLY WITH THE 4TH AUSTRALASIAN SYMPOSIUM ON IONIC LIQUIDS (ASIL-4)

Over 130 registrants from around the world attended the 5th Annual International Electromaterials Science Symposium which was held jointly with the 4th Australasian Symposium on Ionic Liquids (ASIL-4) at Monash University, 17-19 February 2010. The Symposium theme was: "Ionic Liquids and Electroactive Devices".

We were pleased to host the plenary speakers: Prof. Diana Golodnisky from Tel Aviv University, Israel (Advanced Materials For 3D Concentric On-Si Microbatteries); Prof. Austen Angell from Arizona State University, USA, (Superacidic Ionic liquids: properties and applications); Dr. Steven Baldelli, University of Houston, Texas (Structure of Ionic Liquids at Interfaces) and Prof. Robert Slade, The University of Surrey, UK (The alkaline membrane electrolyte approach to low temperature fuel cells - a breakthrough technology).

Other prominent international and national speakers included: Prof. Patrice Simon (University Paul Sabatier, Toulouse, France); Prof. Ric Kaner (University of California, USA); Prof. Frank Endres (Clausthal University of Technology, Germany); Prof. Keiichi Kaneto (Kyushu Institute of Technology, Japan); Dr. Masahiro Yoshizawa-Fujita (Sophia University, Japan) ; Dr. Maria Assunta Navarra (Università degli Studi di Roma"La Sapienza"); Prof Siegmar Roth (School of Electrical Engineering, Korea University); Dr. Tony Pandolfo (Energy Technology, CSIRO, Australia).

Pictured right on next page: Speakers at 5th Annual International Electromaterials Science Symposium held jointly with the 4th Australasian Symposium on Ionic Liquids (ASIL-4) at Monash University were a mix of international guests and ACES researchers.

The Symposium Dinner was well attended and included a local jazz musical talent as entertainment throughout the evening. The best poster awards (Electromaterials & Ionic Liquid) were presented to the winners Usman Ali Rana, S.R. Sivakkumar, Peter Newman and Uditha Bernard.

The last session focused on talks from ACES research fellows and PhD students. Professor Austen Angell judged that the best presentations were by Vanessa Armel (Monash University) and Dr Jun Chen (UOW).

2ND ASIA PACIFIC SYMPOSIUM ON NANOBIONICS

The 2nd Asia Pacific Symposium on Nanobionics was held at the University of Wollongong's Innovation Campus on 9-11 June. The bionic eye, implants for epilepsy detection and control and the next generation of cochlear implants were just some of the highlighted topics of the meeting, attended by over 100 people hailing from 12 different countries.

Professor Mary O'Kane, NSW Chief Scientist, gave the opening address and this was followed by a range of speakers, both international and domestic, covering a diverse range of topics. Key speakers included: Professor Peter Choong (St Vincent's Hospital, Melbourne) on 'challenge of limb reconstruction in tumour surgery'; Dr Nicholas Mano (CRNS France), one of the few experts in the world in electrical 'wiring' of enzymes on 'Engineering Hybrid Nanotube Wires for High Power Biofuel Cells.; Dr John Madden (University of British Columbia, Canada) on 'Materials and Devices for Bionics: Actuation, Flexible Electronics and Energy Storage'; Dr Christine Kranz (University of Ulm,

"I thought the event was excellent - one of the few that brings together clinical and scientific researchers focused on solving real problems with cutting edge technologies. Parts of the jigsaw that possibly need to be strengthened would be industry partners. If you could bring all of these together you could not only have the great discussions on the challenges, the emerging technologies and fundamental science that could provide solutions, but also define focused initiatives/proposals that go into the agencies for support; even to influence calls for example down the line."

Prof Dermot Diamond (DCU)








'Thanks to you and your team for an exceptional conference. I was most impressed by the quality of the talks and its potential relevance to our future work.'
Prof Nigel Lovell, Graduate School of Biomedical Engineering, University of New South Wales.

'I would like to see a larger GLOBAL focus on bionics, as I firmly believe it is our present and our future, and regretfully, we are inept at preparing scholars and practitioners for meaningful contributions in these highly multidisciplinary areas.

The presenters were of course all stellar, with a good balance between fundamental and applied topics as well as practitioner perspectives. The involvement of students and post docs was excellent. ….great opportunities to socialise and get to know each other.'
Anthony Guiseppi-Elie

Germany) about 'Microelectrochemistry at the AFM Tip' ; Prof. Robert Shepherd (The Bionic Ear Institute) about 'Medical Bionics: Applications in Neurological Diseases'; Prof. Seon Jeong Kim (Hanyang University Korea) on 'DNA/Fullerene Hybrid Molecular Machine'; Prof. Keiichi Torimitsu's (Nippon Telegraph and Telephone Corporation, Japan) on 'Neurobionics: Biomimetic Neural Interface' and Prof. Dermot Diamond (Dublin City University, Ireland) 'Realisation of Next Generation Biomimetic Analytical Devices - Key Challenges in Fundamental Materials Science.'

A special public session was well attended. Presenting were Professor Mark Cook (St Vincent's Hospital in Melbourne) on 'Novel Strategies for the Treatment of Epilepsy'; Associate Professor Mario Romero-Ortega's (University of Texas, USA) on 'Smart Bionics: Using Molecular Nanotechnology to Achieve Control at the Neuro-electrode Interface'; and Professor Susan Dodds (University of Tasmania) talking about 'Neural Stimulation Implants: Ethical Issues for Clinical Trials'.

At this symposium, 'burster' sessions were held for the first time. A 'burster' was a short 10 min talk on research activities by PhD students and early career researchers.

Collaborations by Country

AUSTRIA

Prof David Officer gave an invited lecture on 'Porphyrin-sensitised Titanium Dioxide Solar Cells' during his visit to the Linz Institute for Organic Solar Cells, University of Linz on 19 January 2010.

CANADA

Prof John Madden (University of British Columbia) visited ACES/IPRI in February to strengthen collaborative research activities between the two institutions. John has been a regular collaborator over many years in the area of actuators, now extending to sensors and solar cells.

Prof David Officer attended the 1st Nanomaterials for Alternative Energy Applications workshop at the University of British Columbia at the end of June and gave an invited lecture on 'Nanostructured Porphyrins for Energy Applications'. Following the workshop, he spent time with

The NSW Chief Scientist, Professor Mary O'Kane, (foreground) with the Executive Director of ACES, Professor Gordon Wallace (L) and UOW Deputy Vice-Chancellor (Research), Professor Judy Raper (R) at the start of the three-day nanobionics symposium.

John Madden's and Tom Beatty's research group discussing their work on artificial photosynthesis.

Prof Douglas MacFarlane (ACES/Monash) visited Prof Robin Rogers at the University of Alabama in April. Prof MacFarlane is an Adjunct Professor at the University of Alabama.

CHINA

Dr Xiuying Qiao from State Key laboratory for Metal Matrix Composites at Shanghai Jiao Tong University in China spent 11 weeks in the laboratories of ACES/IPRI with Dr Jun Chen to participate in collaborative research aimed at investigating magnetic nanomaterials.

ACES/ISEM hosted Ms Ya Mao, a visiting PhD student, and Ms Chunxiu Hua, a visiting Masters student, both from the Institute of Physics in China for one month from 22 August 2010.

Prof Shulan Wang from the Northeastern University in China is spending 6 months with ACES/ISEM from 15 November 2010.

Prof Douglas MacFarlane (ACES/Monash) visited Prof Urs Welz-Biermann in the Dalian Institute of Chemical Physics at the Chinese Academy of Sciences in September 2010.

Prof Hua Liu (ACES/ISEM) visited China in June and July; visiting several universities to talk about research opportunities. From 28-30 June she visited the Fuel Cell Laboratories and the Materials & Thermochemistry laboratories at the Dalian Institute of Chemical Physics within the Chinese Academy of Sciences.

Prof Liu was at the State Key Laboratory of Superhard Materials at Jilin University from 1-4 July; the Northeastern University where she gave an invited talk on 'Energy materials program at ACES/ISEM' from 5-9 July; the Institute of Materials Science, Shanghai University 10-14 July; the Institute of Physics, Chinese academy of science, where she gave an invited talk: 'Advanced materials for Li-ion batteries' 15-17 July.

DUBAI

Professor Gordon Wallace visited Dubai, United Arab Emirates, in February 2010. Whilst there he gave a seminar co-hosted by UOW Dubai and Dubiotech. Gordon's seminar was on 'Organic Medical Bionics – A New Capability'.

Professor Rob Whelan, President of UOWD, who welcomed Professor Gordon Wallace, said the kind of research work being done by the ARC Centre of Excellence for Electromaterials Science, epitomises the crucial role academics play in developing new techniques and equipment for the betterment of humanity (http://www.ameinfo.com/223036.html)

FINLAND

Dr Joselito Razal (ACES/IPRI) followed up a visit to UOW in 2009 by researchers from the Regae-Institute for Regenerative Medicine, University of Tampere in Finland by visiting their institute in September 2010. Joe delivered a seminar on his work in ACES and it was well received with further interest in ACES materials for their research. Joe's presentation on 'Nano- and Micro-Structured Hybrid Platforms for Stimulation and Guidance of Skeletal Muscle Cells' at the ESB2010 conference was also well received.

Professor Gordon Wallace was co-hosted by UOW Dubai and Dubiotech in February 2010. Gordon spoke about 'Organic Medical Bionics - A New Capability'.

FRANCE

Dr Simon Moulton (ACES/IPRI) continued to extend his collaborative research on carbon nanotube (CNT) biocomposites, with Dr Philippe Poulin at Centre de Recherche Paul Pascal (CNRS), Bordeaux, after receiving an Australian Academy of Science Scientific Visits to Europe travel grant in 2009. Simon was in Bordeaux for January 2010. A better understanding into the interactions between CNTs and biomolecules during the formation of ordered phases in solution under electric field was used to fabricate CNT biomaterials containing aligned CNT domains.

ACES/IPRI was pleased to host Nicholas Mano (CNRS, France) in February 2010. Nicholas was here to strengthen ACES collaborative research to further develop the field of bionsensors and biofuel cells. This work follows on from ACES/IPRI PhD student Shannon Little working in the CNRS laboratories in Bordeaux in 2009.

Mr. Stephen William Gramet from Ecole Europeenne De Chimie, Polymeres Et Materiaux (ECPM) in Strasbourg spent 12 months with the researchers at Monash University, from 10 August 2009 to 9 August 2010.

Monash University hosted Mr. Adrian Bernard from Polytech, Nantes France, for 3 months from 17 May 2010.

Assoc Prof Paul Keller visited Dr Nathalie Solladie at the University of Toulouse, France in July 2010. He gave a seminar and had discussions on the collaborative research being undertaken.

Prof Douglas MacFarlane visited with Prof George Malliaras at the Centre Microélectronique de Provence in October 2010.

GERMANY

Monash University has collaborative ties with University of Leipzig. Dr Dorothea Golze visited Monash April- August 2010, with follow up visits from Prof. Mark Gordon, Ms. Jeanne Miriam Kohangen and Mr. Sebastian B. C. Lehmann, 20-25 November 2010.

Dr. Patrick Howlett (ACES/Deakin) visited collaborators Varta Microbattery in Ellwangen,Germany, 6-18 June 2010 to present his research, tour their facilities and attend a meeting with collaborators on joint metal-air battery project.

Prof Leone Spiccia spent 13-19 September 2010, visiting Drs Klaus Lips and Alexander Schnegg at the Helmholtz-Zentrum Berlin für Materialien und Energie GmbH for collaboration on 'Water oxidation catalysis by Mn clusters'.

Gina Gebhardt, a masters student from the Friedrich-Alexander University Erlangen-Nurnberg completed a 6 month research practicum with ACES/IPRI in June. Gina worked with Dr's. Philip Whitten and Surreya Saricilar and Professor Geoffrey Spinks on tough hydrogels for artificial muscles.

Benedikt Rösner, a Masters student from the University of Erlangen in Germany spent 6 months in IPRI from May to work with Assoc Prof Andrew Minett as part of the Erlangen/UOW exchange program on the spectroscopic characterisation of carbon nanomaterial dispersion chemistry and optimisation of thin transparent electrodes.

IRAN

ACES/ISEM hosted PhD student Mr. Masih Razaee, from Amirkabir University of Technology, Iran for 3 months from 2 June 2010.

IRELAND

The partnership between the ACES/IPRI and the National Centre for Sensor Research at Dublin City University (DCU) has enabled an exchange of complementary expertise which began when Professor Malcolm Smith (DCU) was invited to UOW to start a research collaboration involving the control of biomolecular conducting polymer interactions. This link rapidly developed into further collaboration, which has contributed greatly to the emerging field of nanobionics.

In recent years chief investigators Prof Gordon Wallace (IPRI) and Prof Dermot Diamond (DCU) have investigated and developed novel fluid management systems for microfluidics. This was to form the basis of remote and/or mobile sensing technologies. Prof Diamond was a guest of ACES/IPRI in June 2010.

ACES/IPRI hosted Jeremy Galineau, a PhD student from Dublin City University, in March, to work with Dr Michael Higgins to investigate the nanoscale properties of polypyrrole and polyaniline inverse opal films incorporated into microfluidic devices for separation applications.

Dr Robert Byrne, a post doctoral researcher from the National Center of Sensor research at Dublin City University (DCU), again visited ACES/IPRI, in November for 2 weeks, to continue the collaboration started in 2009 on the development of stimuli-responsive ionogels for light driven actuators.

Michele Zanoni (PhD student from DCU) visited ACES/IPRI for 3 months beginning in November to work on light actuated surfaces for cells.

Prof Ken Seddon from Queens University in Belfast visited Monash University in April 2010. Following up on this collaboration Prof Douglas MacFarlane then visited Prof Ken Seddon at Queens University in Belfast in October 2010.

Prof David Officer gave an invited lecture entitled 'Towards Artificial Photosynthesis: Light Harvesting with Nanostructured Porphyrins' in UNCSR seminar series at NCSR, Dublin City University, during his visit on 21 January 2010.

ITALY

Prof. Leone Spiccia (CI ACES/Monash) in April 2010, visited with (i) Professor Franco Arena, Dipartimento di Chimica Industriale e Ingegneria dei Materiali, Università degli Studi di Messina to participate in a PhD student examination and (ii) Dr Lorenzo Spadaro, Istituto CNR-ITAE "Nicola Giordano", S. Lucia, Messina, whose research activities also cover the fields of chemistry, electrochemistry and materials science. Whilst at both universities Leone gave a seminar on 'Solar Water Oxidation by a Bioinspired Molecular Catalyst'.

JAPAN

ACES/IPRI has a fruitful on-going collaboration with Prof. Shogo Mori (Shinshu University, Japan), Prof. Akihiro Furube and Dr. Ryuzi Katoh (AIST, Tsukuba) in Japan. ACES/IPRI PhD student Matt Griffiths, a recipient of an Australia Asia Endeavour Award in 2009, has spent 6 months of 2010 in Prof Shogo Mori's laboratories developing his research in nanotechnology applied to solar energy.

Dr Attila Mozer (ACES/IPRI) visited Prof. Shogo Mori at Shinshu University in Japan 22-29 March 2010, where they compared electrochemical techniques and discussed the publication of 2 joint manuscripts.

Attila visited Prof Furube and Dr. Katoh 1-2 April where he gave an invited talk, conducted femtosecond injection and microwave conductivity experiments on titanium dioxide nanoparticles and discussed the preparation of joint publications.

Whilst in Japan, Attila also delivered a contributed talk on 'The effect of molecule size and shape on free charge generation, transport and recombination in all-thiophene dendrimer: fullerene bulk heterojunctions', at the Japanese Electrochemical Society of Japan Meeting (ECSJ) held 29-31 March in Toyama.

The work between ACES and Japanese collaborators on 'Electron Injection in Efficient Zinc Porphyrin Dye sensitised Solar Cells: Comparison with Free-Base Porphyrin' was presented by Kenji Sunahara, who has previously spent 2 months working at ACES/IPRI, at the IPSà18 conference at Korea University held 23-31 July 2010.

Usman Rana (PhD Monash) spent one month from 15 October in Professor Masayoshi Watanabe's laboratory in Yokohama National University, Yokohama, Japan to obtain skills in power generation testing; test membranes from ACES work for suitability in fuel cells and gave two formal presentations. Whilst there he learned MEA fabrications, optimising gas flows, current loads and voltage control parameters as well as understanding the issues associated with various voltage losses during fuel cell runs. Currently a joint manuscript on work carried out is in progress.

Michele Zanoni a visiting research student from Dublin City University, spent 3 months from November at ACES/IPRI, to work on light actuated surfaces for cells.

Keiichi Torimitsu, from the Nippon Telegraph & Telephone Corporation (NTT) in Japan visited in March for further talks and to arrange for a collaborative agreement with ACES. Dr Hiroshi Nakashima (from NTT) is subsequently working with researchers in ACES/IPRI for 1 year (commenced May).

Prof David Officer visited the Sekisui Chemical Co., in Tokyo on 28 Feb - 3 March 2010. Whilst there he gave a lecture on 'Research at ACES/IPRI' and held research discussions.

KOREA

Prof. Seon Jeong Kim, from Hanyang University in Korea, spent 3 weeks in ACES/IPRI in January 2010 to continue the collaboration into nano-bio-artificial muscles including bio-gel actuators and hybrid materials utilising carbon nanotubes and hydrogels.

Prof Douglas MacFarlane visited Prof Yong Soo Kang at the Center for Next Generation Dye-Sensitised Solar Cells in Hanyang University, Seoul in July 2010.

Prof Leone Spiccia travelled to Andong in Korea 2-5 August 2010, to visit Professor Jong-Ha Choi, at Andong National University and whilst there gave a seminar on "Solar driven water oxidation by a bioinspired manganese catalyst".

Dr Benny Kim had 4 trips to Korea in 2010: 12-23 April; 17 May- 6 June; 12 -30 July and 20 September to 1 October with colleagues in Korea.

In April, Benny spent time at Hanbat National University. Some of this collaborative research work was presented at at the Tech Connect world Conference & Expo 2010, Anaheim, US, 21-24 June 2010:

Carbon nanofiber supported Pt-Ni alloy nanoparticles as catalyst for direct ethanol fuel cells, and

Photoelectrochemical cell study on closely arranged vertical nanorod bundles of CdSe and Zn doped CdSe films.

Benny spent time undertaking research activities at Hanbat and Gangneung on all his trips.

In May, Benny hosted an ACES exhibition booth at the International Exhibition on Green Hi-Tech, held concurrently with the 27th IASP World Conference on Science and Technology 2010 in Daedeok, Korea. This event attracted a record 1140 participants from over 50 countries, with 100 green technology-related booths set up. The exhibition was designed to create business opportunities for attendees.

Talks were held with Director Song at the Korean government Education and Science department (ETRI) and with Prof Park at KAIST. Prof Park is the president of the Korean Electrochemical Society.

Prof. Gordon Wallace and Dr Michael Higgins (ACES/IPRI) gave invited presentations at the XE-Bio AFM/SICM Workshop held in Suwon, Korea (July 2010). The workshop was organised by Prof. Seong Jong Kim (Hanyang University) and Dr S-J Cho (Park Systems) and hosted by Park Systems, a manufacturer of Atomic Force Microscopes in Korea. The aim of the workshop was to discuss the latest developments and emerging applications of Scanning Ion Conductance Microscopy (SICM) and other AFM techniques in the field of Bionics and the Life Sciences. These techniques have the capability of performing "patch clamping" and "neurophysiology" studies on the nanoscale", which presents exciting possibilities. The presentations were followed by a tour of Park Systems and demonstration of live cell/SICM imaging with the company's XE-Bio AFM.

Director Song (L) with Prof Gordon Wallace (R) at ETRI

Dr Michael Higgins gives his talk at the XE-Bio AFM/SICM Workshop held in Suwon.

Dr Benny Kim (ACES/IPRI) lecturing at Hanbat University.

The trip included a visit by Dr Higgins to the Centre for Nanoscale Science and Technology, Hanyang University (Prof. Seon Jong Kim and Prof. Haiwon Lee).

Mr. Tim Khoo (PhD ACES/Monash) and Prof Leone Spiccia (ACES/Monash) attended IPSà18 at Korea University 23-31 July 2010 and the PostàIPS 18 symposium at POSTECH, Pohang, Korea, where they presented their work. Tim spent 2-5 August with Professor Jong-Ha Choi at Andong National University, in Andong, Korea for collaborative research talks.

Prof Gordon Wallace, Prof David Officer, Prof Leon Kane-Maguire and Dr Benny Kim from ACES/IPRI, as well as Senior Lecturer Dr Trevor Lewis from University of Tasmania, made video lectures at Hanbat National University on 19th September 2010, as part of the World Class University (WCU) program. These lectures will be available to interested staff and students.

MALAYSIA

Monash University hosted Dr Yatimah Alias from the University of Malaysia in March 2010.

NETHERLANDS

Prof Hugh Brown spent from 6 September -10 October working in the research labs of the Dutch polymer company DSM. Whilst there he gave two seminars; one on the ACES work 'Toughening Mechanisms in Polymer Hydrogels'.

NEW ZEALAND

Dr Jenny Pringle (ACES/Monash) spent 25-28 January 2010 in Keith Gordon's lab in Otago University to work on variable temperature Raman of some plastic crystal samples. This visit was part of the ICOS DEST ISL grant.

Keith Gordon and Samuel Lind from Otago University (New Zealand) visited ACES/IPRI in October to attend the ACES water splitting workshop and continue the collaborative relationship in the area of solar energy.

Attila Mozer and Tracey Clarke visited Prof Gordon, their partner investigator on recent ARC discovery projects, at Otago University in December 2010. Attila and Tracey gave invited talks at the Lasers and Applications Research Theme (LART) meeting.

PHILIPPINES

Karen Santiago, from the University of Santo Tomas, completed a year of research in ACES/IPRI in January 2010. She presented the work from this joint collaboration entitled 'Piezoelectric-driven Inkjet Printing for Loading Dexamethasone on a 3D Biodegradable PLGA Platform' at the 25th Philippine Chemistry Congress in tandem with the International Symposium on Microscale Chemistry, 8-10 April 2010 in Zambales.

SRI LANKA

Dr Iresha Kottegona from the Materials Technology Section of Industrial Technology Institute in Sri Lanka received an Endeavour Fellowship to spend 6 months with ACES/ISEM from 21 March 2010.

SWEDEN

ACES/Monash University hosted Mr. Faiz Ullah Shah from Lulea University of Technology in Sweden in their laboratories for 3 months from 14 June 2010.

SWITZERLAND

Prof Leone Spiccia (CI ACES/ Monash) spent 6-8 September 2010, with Dr Gilles Gasser at the University of Zurich and

Pictured: Karen Santiago from the University of Santo Tomas in the Philippines, talks about her collaborative work with ACES at the International Symposium on Microscale Chemistry, in Zambales.

delivered a seminar entitled "Solar Water Oxidation by a Bioinspired Molecular Catalyst".

UNITED KINGDOM

As part of the Monash University – The University of Warwick 2009-2010 Strategic Funding Initiative for Joint Research and Education Programmes, Dr Jenny Pringle (CI ACES/Monash) visited Warwick University in July and spoke about her work on "Synthesis of Conducting Polymers in Ionic Liquids, and their Application in Dye-Sensitised Solar Cells".

Usman Rana (PhD ACES/Monash) spent 5-18 December 2010 with the magnetic resonance group at the University of Warwick in the UK. On previous visits the group successfully used the CODEX NMR technique to investigate the transport mechanism in choline dihydrogen phosphate plastic crystals (Cahill, L. S., U. A. Rana, et al, 2010 Physical Chemistry Chemical Physics 12(20): 5431-5438).

This trip was to conduct similar studies on new plastic crystal electrolytes synthesised as part of ACES going forward. The other aim was to learn the CODEX NMR technique further with the intention to apply it to the NMR based at Monash University.

Dr Joselito Razal travelled to the University of Surrey, Guildford in the UK, to visit the Nanostructured Materials Group on 17 September 2010.

UNITED STATES OF AMERICA

Researchers from ACES/IPRI have been collaborating with researchers from the US and India to develop more efficient thermocells. Work on this project has been published in the American Chemical Society's journal *Nano Letters* revealling that thermo-electrochemical cells using relatively inexpensive carbon multiwalled nanotube electrodes can harvest low-grade thermal energy (temperature below 130 degrees Celsius).

Professor Ray Baughman, the Robert A. Welch Chair in Chemistry at the University of Texas and Director of the Alan G. MacDiarmid NanoTech Institute visited ACES/IPRI in February.

He commented that "being the Energy State in the future must increasingly include discovering new means for extracting all forms of energy. Harvesting waste thermal energy is just one direction our NanoTech Institute has taken with our international team of researchers to help provide an energy enabled future for Texas and the world".

ACES were once again pleased to host long time collaborator Prof Dennis Tallman, from North Dakota State University in the USA, back to ACES/IPRI in March 2010 for 2 weeks. During his time with us, Dennis ran the ACES Electrochemical Course for any interested students and staff members.

Baratunde Cola, from George W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology in Atlanta, spent one week at ACES/IPRI in January to continue collaborative discussions on developing thermocells. Two undergraduate students of Baratunde, Theo Hicks (Non-aqueous thermogalvanic cells using lithium intercalated nanostructure electrodes) and Brantly Fulton (Thermogalvanic Cells with Ionic Liquids) presented their collaborative work first started at NanoTech and ACES/IPRI at the 2010 SACNAS (Society for Advancement of Chicanos and Native Americans in Science) national conference, held 30 Sept-3 October, Anaheim, California.

Prof Dennis Tallman from North Dakota State University visited ACES/IPRI in March and April 2010.

Two members of the thermal energy harvesting research team Professor Ray Baughman (L) and Professor Gordon Wallace (R).

PhD student from UCLA Jonathan Wassei at ACES/IPRI

Prof Paul Calvert from the Department of Materials and Textiles at Massachusetts Institute of Technology in Dartmouth (USA) followed on with the collaboration undertaken in 2009, when he worked in ACES/IPRI under an ARC Linkage International Award on inkjet printing of functional biomaterials, with a 2 week visit in February 2010 and a further 2 week visit December 2010. This collaborative work between Paul and ACES/IPRI was presented as 2 oral presentations at NIP 26 the 26th International Conference on Digital Printing Technologies held in Austin, Texas between 19-23 September 2010. Those presentations were entitled:

- Rapid Deposition of Hydrogel Layers by Inkjet Printing (Focal) and
- Inkjet Printing of Self-Assembled Hydrogels for Bionic Devices.

ACES (IPRI/ISEM) were pleased to host Prof Nestor Zaluzec, from the Electron Microscopy Centre at the National Laboratory in Chicago for 3 days in February. Whilst in Wollongong, Nestor gave a seminar as well as valuable advice on the design and fabrication of the new electron microscopy unit, currently being constructed here in Wollongong in 2010.

Collaborator Richard Fink, the VP of Engineering at Applied Nanotech Inc (ANI), Austin, gave a contributed talk about the collaborative research he undertakes with ACES entitled 'Graphene-based Stripper Foils for Next Generation Rare Isotope Beam Facility' at 21st International Conference on the Application of Accelerators in Research and Industry (CAARI2010). The conference was hosted by the University of North Texas and Sandia National Laboratories from 8-13 August 2010.

Timothy Hanks from the Furman University in USA, a recipient of a Fulbright senior scholarship, awarded by the Australian-American Fulbright Commission, visited ACES/IPRI in August of this year, prior to coming for 8 months to undertake research in 2011.

Tim intends to explore materials aimed at improving the interface between biological cells and electronic devices in his six months exchange from January to June next year.

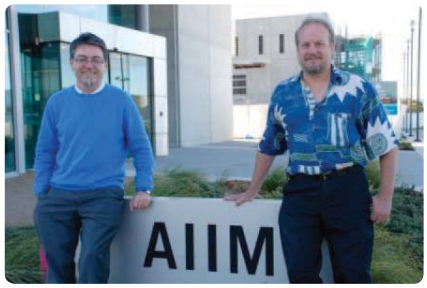
Jonathan Wassei (UCLA, USA), a student from ACES long time collaborator Prof. Ric Kaner's group, is working alongside researchers in ACES/IPRI for 5 weeks from November 2010. They will work on cellular interactions on graphene.

Prof Douglas MacFarlane (CI ACES/Monash) visited the USA in April for collaborative talks with: (i) the Kaner group in UCLA in April 2010 and (ii) Prof Gloria Elliott at the University of North Carolina.

Prof Hugh Brown spent from 22 June -21 July in the Materials Research Laboratory at University of California, Santa Barbara working with Professors E. J. Kramer, C. Hawker and P. Pincus on the rheology of triblock hydrogels.

Prof David Officer gave an invited seminar on 'Developing Multifunctional Electromaterials for Energy-related Applications' at North Dakota State University on 28 June 2010 as part of his visit.

Prof David Officer visited Prof Les Dutton, the Director of the Johnson Research Foundation at the University of Pennsylvania on 1 July 2010, to discuss their collaborative project on artificial photosynthesis and give a seminar on "Saving Australia with Nanostructured Porphyrins". Prof Dutton followed this up with a return visit to ACES/IPRI early in December, highlighting his leading work in artificial protein systems in a seminar entitled "From-scratch design and expression of artificial protein constructions for solar energy conversion".



Left: Prof David Officer (left) and Prof Gerry Swiegers (right) welcome Prof Les Dutton, the Director of the Johnson Research Foundation at the University of Pennsylvania, to ACES/IPRI.

Right: Gordon Wallace (L) welcomes Tim Hanks (R) to ACES/IPRI in August.

Invited International Conference Presentations by ACES Personnel

JANUARY

Prof Hugh Brown gave an invited talk on 'Toughening Mechanisms in Polymer Hydrogels' at the Advanced Polymeric Materials and Technology conference held on Jeju Island, Korea, 23-27 January.

FEBRUARY

Prof Gordon Wallace gave an invited talk at the 2nd International Conference on Drug Discovery & Therapy, February 1st - 4th 2010 in Dubai, United Arab Emirates, on 'Printing, spinning and weaving our way into a new world of delivery systems'. The conference was attended by more than 800 delegates from all over the world.

Prof Gordon Wallace talked on 'New Materials, New Possibilities for Membrane Technologies' at the First Membrane Society of Australasia (MSA) Student Symposium 2010 held 18-20 February 2010 at Innovation Campus, Wollongong, Australia.

Prof Gordon Wallace gave an invited talk at ICONN 2010, International Conference on Nanoscience and Nanotechnology held 22-26 February 2010, Sydney Convention & Exhibition Centre on 'Organic Nanobionics – A New Capability'.

Prof Maria Forsyth was an invited speaker at the International Bunsen Discussion Meeting (IBDM) held in Muenster, Germany, 24-26 February 2010.

Prof David Officer gave an invited talk at ICONN2010 entitled 'Saving the planet with nanostructured porphyrins' which was held at the Sydney Convention and Exhibition Centre.

MARCH

Prof Gordon Wallace gave an invited talk entitled 'Can we LEAP tall buildings? Electroactive Polymers: An alternative Platform for Bionic Devices' at the SPIE Smart Structures/NDE 2010 conference held 7-11 March 2010, San Diego, California, USA.

Prof Doug MacFarlane was an invited speaker at the Physical Chemistry of Ionic Liquids Symposium, American Chemical Society National Meeting held in San Francisco, March 2010, speaking on 'When is an ionic liquid not an ionic liquid? - Ion Association in Protic and Aprotic Ionic Liquids'.

Prof Doug MacFarlane was an invited speaker at the Green Chemistry Symposium, American Chemical Society National Meeting held in San Francisco, March 2010, talking about 'Ionic liquids for "green" approaches to semiconductor synthesis'.

Prof Maria Forsyth was an invited speaker in the Physical Chemistry of Ionic Liquids at the 239th ACS Spring National Meeting in San Francisco, 21-25 March 2010.

APRIL

Dr Michael Higgins attended the 2010 MRS Spring Meeting in San Francisco, CA (April 5-9) to give an invited presentation on "Regenerative Nanobionics: The Electrode-Cellular Interface at the Nanoscale".

Assoc Prof Andrew Minett was invited to present his work on 'Nanostructured Carbon Electrodes' at ChemOnTubes 2010, Arcachon, France 11-15 April 2010.

Prof Gordon Wallace g ave an invited talk 'Organic Nanobionics - Electrical Stimulation of Mammalian Cells using an Organic Platform' via video to the Spring Meeting of Korean Electrochemistry Society meeting that ran 22-24 April 2010 on Cheju Island, Korea.

MAY

Prof Maria Forsyth gave an invited talk at the 12th Asian Conference on Solid State Ionics and 15th Chinese Conference on Solid State Ionics (12ACSSI & 15CCSSI) held in Wuhan, China, 2-6 May 2010.

Prof David Officer gave an invited lecture on 'Porphyrin-sensitised Titanium Dioxide Solar Cells' to the Centre of Polymer Electronics at the University of Queensland, Brisbane, on 17 May 2010.

Prof Gerhard Sweigers gave an invited lecture on 'Homogeneous Catalysts with a Mechanical ("Machine-like") Action. Catalytic Solar Water Splitting Inspired by Photosynthesis' at the Australia-China Symposium on 'Nanomaterials for

Clean Energy' held at the University of Queensland, Brisbane, on 27 - 28 May 2010.

Prof Maria Forsyth gave an Invited talk in Australia-China Symposium on Nanomaterials for Clean Energy held at the University of Queensland, 27-28 May 2010.

Prof David Officer also gave an invited lecture on 'Mimicking Photosynthesis Using Nanostructured Electromaterials' at the Australia-China Symposium on 'Nanomaterials for Clean Energy' held at the University of Queensland, Brisbane, on 27 - 28 May 2010.

JUNE

Prof Gordon Wallace's invited presentation to the 2010 IEEE International Symposium on Technology and Society (IEEE ISTAS '10), held 7-9 June 2010, Wollongong, was entitled 'Nanotechnology: Will it Revolutionise Health Care?'

Prof Maria Forsyth gave an invited talk at the International Conference on Ionic Liquids for Electrochemical Devices, ILED-2 held in Rome, Italy, 9-11 June 2010.

Dr Patrick Howlett (RF ACES/Monash) gave an invited talk at the Ionic Liquids for Electrochemical Devices 2 conference (ILED 2) held in Rome, Italy, 9-11 June 2010.

Prof Gordon Wallace gave an invited presentation on 'Nanostructured Electromaterials' at the Australia-India Workshop on Nanotechnology, held 14-15 June 2010, at The Australian National University in Canberra.

Prof Gordon Wallace gave an invited talk 'Organic Bionics - Nanodimensional Topographical Cues for Nerve Cell Growth' at the International Nanomedicine Conference held 30 June-2 July at Coogee Beach, Sydney.

Prof David Officer gave an invited lecture on 'Nanostructured Porphyrins for Energy Applications', at the Nanomaterials for Alternative Energy Applications conference, 20-23 June 2010, University of British Columbia, Vancouver, Canada.

JULY

Prof David Officer gave an invited lecture on 'Porphyrin-sensitised titanium dioxide solar cells', at 6th International Conference on Porphyrins and Phthalocyanines, 4-9 July 2010, Santa Ana Pueblo, New Mexico, USA.

Prof Doug MacFarlane was a Plenary Speaker at the Solar Energy Utilization Workshop at Hanyang University Korea in July 2010.

Prof Leone Spiccia gave an invited talk on 'Solar driven water oxidation by a bioinspired manganese catalyst' at the 18th International Conference on Photochemical Conversion and Storage of Solar Energy (IPS-8) held in Seoul, Korea, 25-30 July and 'Light driven water oxidation by a bioinspired manganese catalyst' at the PoståPS 18 symposium at POSTECH, Pohang, Korea, 23-31 July.

Prof Gerhard Sweigers gave an invited lecture on 'Homogeneous Catalysts with a Mechanical ("Machine-like") Action. Catalytic Solar Water Splitting Inspired by Photosynthesis' at the 39th International Conference on Coordination Chemistry (ICCC) held at the Adelaide Convention Centre, South Australia, 25 - 30 July 2010.

Pictured far left: Dr Simon Moulton (L) and Prof Gordon Wallace (R) enjoying the festivities at ICSM 2010.
Pictured left: Prof Wallace giving his plenary lecture at ICSM 2010.

Prof Leone Spiccia gave an invited talk 'In situ XAS studies of sustained water oxidation catalysis by birnessite (MnOx): Implications of Mn biogeochemical cycling to the evolution of PSII' at the ICCC, 25-30 July 2010 in Adelaide.

Prof Gordon Wallace gave a plenary lecture on " Conducting Polymers: A Platform for Organic Medical Bionics" at the 20th International Conference on Science and Technology of Synthetic Metals 2010 (ICSM 2010) in Kyoto 4-9 July. Dr Simon Moulton (ACES/IPRI) also presented his research.

AUGUST

Prof Gerhard Sweigers gave an invited talk on 'Homogeneous Catalysts with a Mechanical ("Machine-like") Action. Catalytic Solar Water Splitting Inspired by Photosynthesis' in the Solar Symposium at 240th ACS National Meeting in Boston (PHYS Division) held 22-26 August, 2010.

Prof Gerhard Sweigers gave an invited lecture on 'Homogeneous Catalysts with a Mechanical ("Machine-like") Action. Catalytic Solar Water Splitting Inspired by Photosynthesis' at Rutgers The State University of New Jersey, Piscataway, New Jersey, 27 August 2010.

Prof Maria Forsyth gave an invited talk at XII International Symposium on Polymer Electrolytes, held in Padova, Italy, 29 August- 3 September 2010.

Prof Graeme Clark gave the Opening Plenary Address 'Psychoacoustics and Cochlear Implant Speech Perception' at the International Acoustics Congress, Sydney on 23 August 2010.

SEPTEMBER

Prof Douglas MacFarlane was a Plenary Speaker, talking about 'Ionicity in Ionic Liquids' at the 2nd Asia Pacific Conference on Ionic Liquids held in Dalian, China in Sept ember 2010.

Prof Douglas MacFarlane was a keynote speaker at the International Society of Electrochemistry Annual Conference held in Nice, September 2010, where he spoke about 'Ionic Liquids for Electrochemical Applications'.

OCTOBER

Prof Gordon Wallace's invited talk on 'The Merging of Advances in Materials, Biology and Electronics – The Impact on Ageing' was presented by Dr Bridget Munro at the Taiwan Australia Workshop on Bilateral Cooperation in Gerontechnology, held in Taipei 25-26 October 2010.

Prof Douglas MacFarlane was a plenary speaker at the QUILL Annual Meeting held in Belfast in October 2010, talking about 'Ionic Liquids'.

NOVEMBER

Prof David Officer gave an invited lecture on '*Porphyrin-sensitised titanium dioxide solar cells'*, at POEM 2010: International Photonics and OptoElectronics Meetings, 3-5 November 2010, Wuhan, China.

Prof Graeme Clark gave the Lister Oration on "What can electrical stimulation with a cochlear implant tell us about Brain Function and Human Consciousness" in the UK, 4-5 November 2010.

Prof Graeme Clark addressed a Cochlear™ meeting of surgeons at St George's Hospital London, November 2010.

Prof Leone Spiccia presented his work on 'Light driven water oxidation by a bioinspired manganese catalyst' in an invited talk at the Boden Research Conference 2010, held November 2010 at The Australian Academy of Science, 'The Shine Dome' in Canberra, Australia.

Prof Maria Forsyth gave an invited talk and was an invited chair at the 4th International Conference on Electroactive Polymers:

Materials and Devices ICEP2010, held 21-26 November 2010 in Surajkund, Faridabad, India.

Prof Gordon Wallace gave a plenary lecture 'Organic Bionics - Nanodimensional Topographical Cues for Nerve Cell Growth' at the 7th annual conference on 'Advances in Functional Nanomaterials', held 25-26 November in Surfers Paradise, Gold Coast, Australia.

Prof Leone Spiccia gave a keynote address on 'Photo-electrochemical Solar Energy Conversion' at the 7th Conference "Advances in Functional Nanomaterials", 25-26 November in Surfers Paradise, Gold Coast, Australia.

Prof Hua Liu gave a keynote address on 'Nanomaterials for lithium rechargeable batteries and supercapacitors' at the 7th Conference "Advances in Functional Nanomaterials", 25-26 November in Surfers Paradise, Gold Coast, Australia.

Prof Gerhard Sweigers gave an invited talk on 'Homogeneous Catalysts with a Mechanical ("Machine-like") Action. Catalytic Solar Water Splitting Inspired by Photosynthesis' at the 7th Advances in Functional Nanomaterials Conference, held on the Gold Coast, Australia on 25-26 November 2010.

Prof Gordon Wallace invited talk 'Controlled Release from Polymer Fibres and Printed Structures' was given by Dr Joselito Razal at the Australian Chapter of the Controlled Release Society (AUS-CRS) 4th Annual Meeting, held at the Monash Institute of Pharmaceutical Sciences, Melbourne, 25-26 November 2010.

DECEMBER

Prof Maria Forsyth gave an invited talk at the 9th International Symposium on Advanced in Electrochemical Science and Technology (ISAEST-9), 2-4 Dec 2010, held in India.

A/Prof Robert Kapsa gave an invited address to the Annual Step Ahead Australia Research into Spinal Cord Injury Forum (December 8) on 'Building Neuro-Responsive Polymer Systems: Selection of Neuro-Optimal Materials as a Bionic Basis for Building Pro-Neuroregenerative Scaffolds for the Spinal Cord'. The forum included key international scientists and clinician/surgeons actively involved in the solution of spinal cord injuries in humans.

Prof Leone Spiccia gave an invited talk on 'Development of a bio-inspired manganese water oxidation catalyst' at the Pacifichem 2010 Conference, Area 10: Alternate Energy Technology, Session Title: Light Driven Generation of Hydrogen from Water (#238), 15-20 December 2010, Honolulu, Hawaii, USA.

Prof Douglas MacFarlane was an invited speaker at Pacifichem 2010, 15-20 December 2010 giving three talks: (i) 'Green Synthesis of Semiconductors using Ionic Liquids'; (ii) 'Analytical Challenges In Ionic Liquids' and (iii) 'Ionic liquids for extraction of lignin and valuable aromatics'.

Dr Jenny Pringle also gave an invited talk at Pacifichem in the ionic liquids session.

National Profile

Beyond the six nodes making up the ACES entity, ACES continues to enjoy national collaborative activities with other research groups. Some of these are highlighted below.

PROF. ALAN BOND'S ELECTROCHEMISTRY GROUP AT MONASH UNIVERSITY

ACES has close ties with Prof. Alan Bond's Electrochemistry Group at Monash University.

In February 2010 Dr Klaudia Wagner (ACES/IPRI) spent time in Prof Bond's laboratory using Fourier Transform AC Voltammetry to probe the electrochemistry of new porphyrin dyes to understand their role in dye sensitised solar cells.

ARC CENTRE OF EXCELLENCE FOR FUNCTIONAL NANOMATERIALS (ARCCFN)

ACES researchers are involved in active discussions and collaborations with ARCCFN.

Further work was undertaken in 2010 on the two projects initiated in 2009 with Prof. Rose Amal's group at UNSW. This work primarily focused on developing TiO_2 nanomaterials (nanoparticles and tubes) for applications in dye-sensitised solar cells.

Jung Ho Yun, PhD candidate working in the ARC Centre of Excellence for Functional Nanomaterials, Particles and Catalysis Research Group UNSW, presented some of the collaborative work on 'TiO_2 Nanotubes (TNT) as Photoanode of Dye-Sensitised Solar Cells (DSSCs)' at ICONN2010.

ACES hosted discussions with Prof Max Lu (University of Queensland), Prof Rose Amal (UNSW) and other researchers from the ARC Centre of Excellence for Functional Nanomaterials with a view to developing a collaborative venture in water splitting.

UNIVERSITY OF TASMANIA

Working with researchers from ACROSS, a University of Tasmania centre headed by Prof Paul Haddad, ACES researchers have established a powerful capillary electrophoresis technique for characterising graphene dispersions.

CRC FOR POLYMERS

Prof Officer (CI, ACES) led one of the four research programmes in the CRC-P five year extension funding application submitted in July. This resulted in selection of the extension bid for interview in November. Although the application was unsuccessful, it will be resubmitted in 2011 with continued ACES involvement.

ANSTO

PhD candidate Tim Khoo (ACES/Monash) visited ANSTO, 22-24 June 2010, at the Bragg Institute, Lucas Height, NSW.

ACES/IPRI was pleased to host a visit from Michael James from ANSTO on 29 October 2010.

ACES and ANSTO also collaborated together within the CRC polymer research program mentioned above.

UNIVERSITY OF NEWCASTLE

Collaborative studies involving graphene were undertaken together with Prof Paul Dastoor, at the Centre for Organic Electronics at the University of Newcastle, in 2010.

This group and ACES also collaborated together within the CRC polymer research program mentioned above.

CSIRO

Working with Dr Pascal Vallotton, head of the Biotech Imaging Group of CSIRO (Mathematics, Informatics and Statistics Division, Nth Ryde), ACES Bionics have been developing high throughput methods for the evaluation of Bionic effects of electromaterials on the growth and differentiation of neurons.

ACES Bionics researchers are actively collaborating with Dr Louis Kyratzis, who heads the Biomedical Textiles Materials Science and Engineering Group (CSIRO Materials Science and Engineering – Geelong) in the refinement of a nerve repair prototype for peripheral nerve injury.

Prof Maria Forsyth (ACES, CI Deakin) has ongoing collaborations with these researchers from CSIRO:

- Dr. Adam Best and Dr. Tony Hollenkamp in the area of Lithium metal batteries;
- Dr. Anita Hill in characterisation of plastic crystal electrolytes using Positron Annhiliation lifetime Spectroscopy and
- Dr. Tony Hughes and Dr. Ivan Cole in the area of corrosion mitigation of aerospace alloys.

DSTO

Working with DSTO, ACES researchers continue to optimise actuator technologies for the Wireless Aquatic Navigator for Detection and Analysis (WANDA), an autonomous mobile fish with sensing capabilities. Dr Tan Truong from DSTO spent four weeks in 2010 with researchers in ACES/IPRI.

UNIVERSITY OF SOUTH AUSTRALIA MAWSON INSTITUTE

Our links with the Mawson Institute and UniSA expanded in June 2010 as we began collaborative research using the coating and surface modification technologies at Mawson with ACES activities influencing cell behaviour on conducting substrates.

IAN WARK RESEARCH INSTITUTE

Dr Michael Higgins (RF, ACES) is collaborating with Prof Hans Griesser at the Ian Wark Research Institute on AFM characterisation of thermoresponsive

poly(NIPAM) coatings. The research involves AFM imaging and protein adhesion measurements as a function of dynamically switching the polymer's temperature phase transition.

UNIVERSITY OF SYDNEY

Dr Michael Higgins (RF, ACES) is collaborating with Prof Marcela Bilek from the School of Physics at the University of Sydney on the plasma immersion ion implantation (PIII) of conducting polymers for linker free covalent attachment of proteins and enhanced cell adhesion. The merging of Dr Higgins's work on conducting polymers with Prof Bilek's pioneering methods for manipulating ionised matter (plasma) by means of electric and magnetic fields has led to the development of high-performance biocompatible and conductive surface coatings for medical implants.

UNIVERSITY OF NSW AND UNIVERSITY OF MELBOURNE

In 2009 ACES established collaborations with Prof Margaret Morris (University of NSW) and Prof Terry O'Brien (University of Melbourne) to design and synthesise polymer micro- and nano-spheres for the delivery of anti-epilepsy neuropeptide. This collaboration strengthened in 2010 and so now both are part of the epilepsy drug delivery team formed. Margaret brings her expertise in peptide treatments and Terry his GAERS animal models for implantation studies.

Other Involvements

NANOTECHNOLOGY IN AUSTRALIA: TRENDS, APPLICATIONS AND COLLABORATIVE OPPORTUNITIES

The Australian Academy of Science released its report, *Nanotechnology in Australia: Trends, applications and collaborative opportunities,* in early 2010. Prof Gordon Wallace (Director, ACES) was one of three Academy Fellows who were involved in steering and guiding the preparation of the report. The report highlights the need for national strategy supported by effective collaborative research and commercialisation networks.

"Australia is well placed to use the rapidly-developing field of nanotechnology particularly in the fields of energy and medical technology provided a co-ordinated approach is adopted", Professor Wallace said.

NEW TECHNOLOGIES UNDER THE MICROSCOPE

The National Enabling Technologies Strategy seeks to provide a framework for the responsible development of enabling technologies.

To fully understand the benefits and risks, twenty-one Australian experts will put new technologies under the microscope and present their findings to the Gillard Labor Government. Their advice will inform the implementation of the $38.2 million National Enabling Technologies Strategy.

An eight-member Expert Forum and thirteen-member Stakeholder Advisory Council has been formed; with ACES CI Prof Susan Dodds (UTas) a member of that advisory council.

The Stakeholder Advisory Council brings together key Australian business, union, non-government, industry, science and research representatives who will use their expertise to advise the Government on the full range of enabling technologies.

Senator Kim Carr said it is important that the Australian community understands new technologies and are confident in their use.

Presentations by ACES personnel

FEBRUARY

Prof David Officer gave an invited lecture at the Mini-symposium on Multifunctional Electromaterials held 16 February 2010 at the University of Wollongong. His talk was entitled Synthesising Multifunctional Electromaterials - Challenges and Prospects.

The 2010 International Conference on Nanoscience and Nanotechnology (ICONN 2010) was held in Sydney from 23-26 February 2010. This event brought together the Australian and International community working in the field of nanoscale science and technology to discuss new and exciting advances in the field. ICONN 2010 covered nanostructure growth, synthesis, fabrication, characterisation, device design, modelling, testing and applications.

ACES was well represented and the most recent advances from the ARC Centre of Excellence for Electromaterials Science were presented; including developments in nanobionics – especially the new platforms for nerve and muscle regeneration, and also energy, in particular solar cells and fuel cells.

"The event also gave IPRI the opportunity to build on its already impressive international collaborative network to ensure that the opportunities to be provided by the establishment of the new Federal Government-funded Processing and Device Fabrication Facility at the University of Wollongong's Innovation Campus are realised", Prof Wallace said.

MARCH

Prof Gordon Wallace gave an invited Lecture at the Bionic Ear Institute, Melbourne, on 22 March 2010, entitled 'New Materials for Bionics - Streamlining materials processing and device fabrication issues...a short story'.

APRIL

Prof Gordon Wallace gave an invited talk at Deakin University on 30 April 2010 on 'Organic Nanobionics Electrical Stimulation of Mammalian Cells using an Organic Platform'.

MAY

Prof David Officer was invited to give a seminar at the Centre of Polymer Electronics, University of Queensland on 17 May 2010. His talk was on Porphyrin-sensitised Titanium Dioxide Solar Cells.

JUNE

Prof Gordon Wallace gave an invited presentation on 'Organic Bionics', at the multidisciplinary forum, sponsored by University of Wollongong Research Council at UOW and the Institute for Superconducting & Electronic Materials (ISEM), to join experts in the field of Advanced Materials for Health Protection held at iC campus 24 June 2010. This multidisciplinary forum was held in light of comments by Kevin Rudd (Prime Minister Australia 2007-2010), in highlighting 'that the Federal Government will face an extra US$180 billion in health expenses by 2050 as a result of the ageing population'.

JULY

ACES partner investigator, Melbourne neurologist **Prof Mark Cook and Prof Gordon Wallace** gave a joint presentation, 13 July 2010, at the Illawarra Health & Medical Research Institute (IHMRI). IHMRI is a joint initiative of the University of Wollongong and the Illawarra South East Area Health Service. The topic 'Translational Research' was in response to feedback received by IHMRI that the term 'translational research' is much used but little understood. The presenters took a case study approach to illustrate the translational research process, focusing on their collaborative research looking to control epilepsy.

AUGUST

A/Prof Robert Kapsa delivered an invited presentation (August 2) to the CSIRO Computational Group (North Ryde) on 'Development of Hybrid Systems for Cell-Mediated Muscle Regeneration: Advanced Electromaterials and Wet-Spun Biodegradable Fibres'.

OCTOBER

Prof Gordon Wallace gave an invited address on 'creating effective multidisciplinary research teams' at the Sydney Business School Higher Degree Research Student conference 2010 on 2 Oct.

NOVEMBER

Prof Gordon Wallace spoke at the Seminar Series held at the O'Brien Institute (OBI), located at St Vincent's Hospital Melbourne on 4 November 2010. The research at OBI is focused on tissue engineering and organogenesis, stem cell research, vascular biology, stroke, extracellular matrix biology in health & disease and diabetes. The audience; roughly a 1:3 ratio of clinicians to scientists, enjoyed this seminar on 'Organic Bionics'.

DECEMBER

Assoc Prof Marc in het Panhuis 2010 gave a talk "Hydrogel Electrode Materials" at the conference on Optoelectronic and Microelectronic Materials and Devices (COMMAD 2010), held in Canberra, 12-15 December. This event provides a forum for Australian and international semiconductor communities to meet and discuss topics related to microelectronic and optoelectronic materials, processes and devices including nanotechnology.

Pictured (left to right): Speakers at the Advanced Materials for Health Protection forum (June); ACES epilepsy research presented at IMHRI (July) and Marc in het Panhuis talking at COMMAND 2010 (Dec).

Outreach

Message from the Director

As an ARC Centre of Excellence we are committed to carrying out research of relevance to Australia and in so doing contribute to the global research effort in our chosen areas of endeavour. We continue to strive to identify new electromaterials and systems that will impact on the critically relevant areas of Energy and Medical Bionics.

Of course we cannot do this in isolation. We do not have the resources, facilities nor the human energy required to tackle the vast challenges in front of us. We need the support of a range of partners including funding agencies, research collaborators, and indeed the community at large.

To encourage these partners to engage requires on-going communication of our endeavours at many levels – this is a responsibility we do not take lightly.

Communication of science to ensure the engagement of others is no trivial task, it requires a level of training and innovation akin to that required to carry out scientific research. We are committed to providing our research students and early career researchers with opportunities for training in these areas.

We appreciate the privilege to carry out research under the umbrella of a national Centre of Excellence. We at ACES acknowledge that with that privilege comes the responsibility to communicate across all levels of our community and to engender engagement at a level that will mean we have all of the resources needed for success.

We regularly open our doors for general community tours and for specialised visits. Come and visit us, learn of our ventures and I am sure you will share our excitement and hopefully become engaged in this important area of research.

FEBRUARY

Marc het in Panhuis (ACES CI) and Cameron Ferris (ACES/IPRI PhD student) participated in the University of Wollongong Discovery Day on 2 February. The Discovery Day aims to provide year 12 students, who are intending to attend university, with an opportunity to experience, for a day, life as a university student. They get to find their way around the UOW campus, read timetables and attend classes.

MAY

7 May 2010: Professor David Officer addressed the Wollongong branch of the University of the 3rd age (U3A) at Kanahooka about "IC the Future: Bionic Bodies, Artificial Muscles and Plastic Plants: an update".

7 May 2010: ACES/IPRI staff and students participated in the 'Heart foundation treadmill challenge', winning it for the second consecutive year.

12 May 2010: The newly-arrived Consul for Science and Technology Affairs at the Consulate-General of the People's Republic of China in Sydney, He Fuxiang, visited ACES/IPRI, on his first official visit to an Australian university.

JUNE

Cameron Ferris (PhD student ACES/IPRI) believes one of the best ways to engage the community is to start at the school level. Most recently, Cameron gave the students at the Macarthur Anglican School an insight into nanotechnology and in particular his experiences as an undergraduate. Also at the University of Wollongong Faculty Science Open Night, Cameron spoke to the numerous high school students in attendance about the "fun stuff' involved in completing the nanotechnology degree and his experiences moving onto becoming an ACES PhD student.

Showcase of Innovation

8 June 2010: The 'exhibition day' for Innovation Campus attracted a high level of interest. There was a steady stream of visitors for an exhibition in the foyer of iC central and in tours through ACES/IPRI.

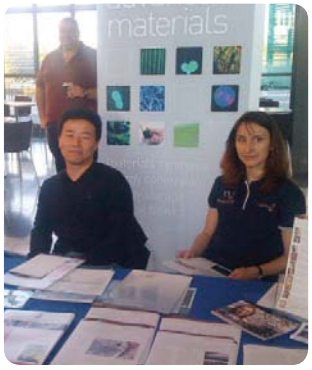
Director, Prof Gordon Wallace welcomed all the tour groups that were made up of a mix of people such as South Coast promoters, students, academics and members of the public.

Public session at the 2010 Nanobionics Symposium

Members of the public as well as delegates took the opportunity to hear: Professor Mark Cook (St Vincent's Hospital Melbourne) speak on 'Novel Strategies for the Treatment of Epilepsy'; Professor Mario Pacific Romero-Ortega (University of Texas, USA) spoke on 'Smart Bionics: Using Molecular Nanotechnology to Achieve Control at the neuro-electrode Interface' and ACES CI Professor Susan Dodds (University of Tasmania) spoke on 'Neural Stimulation Implants: Ethical Issues for Clinical Trials'. Following the presentations, speakers fielded questions from the audience.

22 June 2010: **Top level Chinese delegation makes first visit to UOW.**
A Chinese delegation, organised by the Investment Promotion Agency, Ministry of Commerce of the People's Republic of China (CIPA) visited the University of Wollongong and ACES/IPRI at the Innovation Campus.

The purpose of the visit by the 62 delegates, led by the Deputy Director General of CIPA, Ms Zhang Yingxin, was to explore opportunities for two-way investment/ collaboration and partnership opportunities.



28 June 2010: NSW Minister for Science and Medical Research, Ms Jodi McKay, paid a special visit to the ARC Centre of Excellence for Electromaterials Science (ACES) at the Innovation Campus after the centre received funding of one million dollars through the NSW Science Leveraging Fund (SLF). The SLF was set up to help NSW researchers attract national and international investment to NSW. The ANFF project was founded to provide researchers and industry with access to state-of-the-art fabrication facilities.

JULY

ACES research was featured at Expo 2010 held in Shanghai China

Representatives from the University of Wollongong attended the World Expo 2010, in Shanghai, to participate in the NSW Research showcase, 13 July 2010. UOW submitted a video, theme 'sustainable cities' and ACES research featured under clean energy. Prof David Officer (CI ACES) and ACES/IPRI PhD student Lei Tong showcased 'integrated photovoltaics' and 'Biomimetic Energy Generation – Hydrogen Production from Water Splitting'. The video can be viewed at http://www.uow.edu.au/research/profile/UOW087863.html

Prof Graeme Clark had a speaking engagement (July 2010), where he addressed the question: "Can a distinguished scientist believe in God?" to the East Ivanhoe Baptist Church.

Mentorship for student at Siena College, Brisbane, Queensland.

Assoc. Prof Rob Kapsa, took part in a mentorship program for students at Siena Catholic College. Rob mentored a year 11 student who has shown interest in the ACES Bionics research.

"The students have been inspired by your interest in them and their projects", said Julie Bolton (teacher). "We thank so many of you who are going to quite a bit of trouble to give constructive feedback. Your knowledge and expertise is greatly valued"

Advanced Medical Science (AMS) workshop benefits Medical Students of Universitas Indonesia (Jakarta).

The Advanced Medical Science (AMS) workshop, run by ACES partners at St Vincents Health Melbourne, is of great benefit to the Medical Students of Universitas Indonesia (Jakarta).

The workshop is held on an annual basis in conjunction with the University of Melbourne's Advanced Medical Science course. Twenty-nine second year medical students attended the workshop, run in the July to September period.

Co-program leader of the ACES Bionics program, Assoc. Prof. Robert Kapsa delivered a Masterclass Lecture (July 7), at University of Melbourne, covering aspects of ACES research. Rob particularly focussed on muscle regeneration, towards the development of a solution for muscular dystrophies, in particular Duchenne's dystrophy, muscle damage and other neuromuscular disorders.

ACES scientists then provided a workshop on introductory techniques for wet-lab research activities.

AUGUST

In August, at the workshop for Higher Degree research students at University of Wollongong, Cameron Ferris (PhD student ACES/IPRI) was asked to present on "Getting Published'. This is something in which Cameron comes highly credentialed, as he published his research in 'Soft Matter' as an Honours student.

SEPTEMBER

2 September: ACES/IPRI PhD student Cameron Ferris was selected, along with 20 other higher degree students from UOW, to present a 3 minute snapshot of his thesis studies. They were required to present a compelling oration and their presentation had to be in language appropriate to an intelligent but non-specialist audience. Cameron's talk was titled 'Printed Patches for a Broken Heart'.

Cameron added to his impressive academic credentials by winning this 'Three Minute Thesis Final' competition in front of an audience of about 130 people.

ABC Radio Illawarra also interviewed Cameron, on 3 September, and aired his three-minute thesis topic.

Pictured previous page (left to right): Consul for Science and Technology Affairs at the Consulate-General of the People's Republic of China in Sydney, He Fuxiang, visited (May); ACES/IPRI was represented at the 'exhibition day' for Innovation Campus (June); Chinese delegation (CIPA) visit (June).

Cameron won $1000 and was automatically entered into the National Trans-Tasman competition held at the University of Queensland on Tuesday 21 September.

Cameron commented that the experience and networking from the event in Queensland was valuable to his career development.

Local Business identities hosted by ACES

7 September: ACES/IPRI hosted members associated with the Illawarra Business Chamber. The following local business identities were given a laboratory tour by Prof Gordon Wallace: Mr Greg Fisher (CEO, Illawarra Business Chamber); Mr Les Dion (President, Illawarra Business Chamber); Mr Walter Immoos (CEO Novotel Northbeach); Mr Kevin Ayres (Manager Corporate Banking, Commonwealth Bank Australia, Wollongong); Mr John Grace (Innovative Regions Facilitator – Illawarra / Shoalhaven, Innovative Regions Centre, Enterprise Connect Division, Department of Innovation, Industry, Science and Research) and Mr Adam Cole (Partner KPMG -Research Tax incentives).

International Conference on "Molecules of life: from discovery to biotechnology" (26 Sept -1 Oct, Melbourne).

A/Prof Robert Kapsa was asked to participate as a senior mentor for a speed mentoring activity workshop session conducted at the OzBio Biotechnology conference. The more senior researchers were given 4 minutes to talk with each younger researcher to offer sage advice as to what they should do for themselves.

OCTOBER

Public Engagement Exercise, Canberra

ACES/IPRI PhD student Binbin Zhang and post doctoral researcher Dr Zhilian Yue travelled to Canberra, 1st October, to take part in a workshop on 'Public Engagement in Enabling Technologies'. Participants were social scientists, practitioners in communications, outreach and public engagement and biophysical researchers.

The development and implementation of the framework is the responsibility of the National Enabling Technology Strategy - Public Awareness and Community Engagement (NETS-PACE) section of DIISR. This workshop was the second in a series of stakeholder workshops that is planned to lead to a multi-stakeholder event in 2011.

Second Annual 'Stumping Serious Diseases' weekend at UOW, held to raise funds to support it's health and medical research programs.

25 October: Prof Gordon Wallace attended the gala dinner held after the big 'Stumping Serious Diseases' Twenty20 celebrity cricket match (http://media.uow.edu.au/videonews/celebritycricket/index.html).

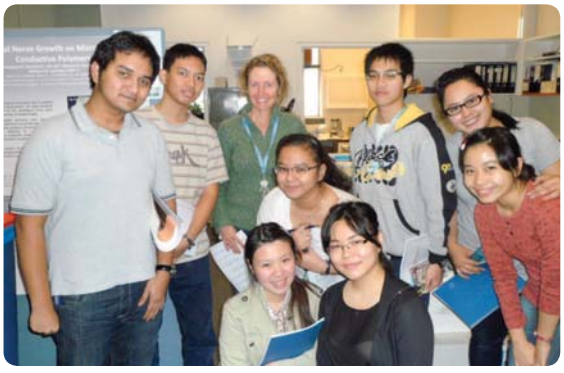
UOW organised the match as part of its second annual Stumping Serious Diseases weekend to raise funds to support its health and medical research programs.

Career Advisors shown through ACES/ IPRI

The Illawarra Careers Advisors Annual meeting was held in ACES 16 November, where 24 high school careers advisors attended. This networking opportunity allowed the advisors to tour the ACES facility and meet ACES researchers to discuss opportunities which would lead to an increased interest in Electromaterials Science and the nanotechnology degree.

NOVEMBER

Prof David Officer gave a talk on *Saving Our Planet*, to a Year 6 class at Holy Cross Primary School, Glenwood, Sydney on 12 November 2010.



Pictured: The Advanced Medical Science (AMS) workshop, run by ACES partners at St Vincents Health Melbourne, is of great benefit to the Medical Students of Universitas Indonesia (Jakarta).

Prizes and Awards

FEBRUARY

ACES Chief Investigator Professor Graeme Clark was among guests at a scholarship presentation ceremony for an honours student working in the critical new medical bionics research area on 9 February.

The Bill Wheeler Scholarship was presented to support final year University of Wollongong honours student, Leo Stevens. The late Bill Wheeler took a special interest in the further development of the cochlear implant for deafness and new research at UOW on spinal cord repair in which Professor Clark is also helping to play a significant role along with researchers from IPRI and ACES.

This news item was featured on the UOW Media site: '**Bill Wheeler scholarship aids vital medical bionics research'**, as well as in the Kiama Advertiser newspaper.

MARCH

ACES QEII Fellow Dan Li won the engineering and technology section of '**Scopus young researcher of the year award**', worth $5.5k. This was reported in 'The Australian' newspaper. Dan found an efficient way to make large amounts of graphene. The award was presented at Parliament House in Canberra 3 March 2010.

APRIL

Leon Kane-Maguire, a Chief Investigator of ACES, has made his mark in the aviation literary sphere. Since cutting back to part-time work, Prof Kane-Maguire has been able to more actively pursue his passion as an aviation war historian buff. He has now been rewarded with the RAAF Heritage Award First Prize in Literature for his book, "Lost Without Trace".

MAY

Spanish honour for bionic ear pioneer

On Friday 21 May 2010, Professor Clark received an honorary doctorate from Zaragoza University in Spain, one of Europe's oldest, and most prestigious universities. Last year this honour went to French Nobel Prize physicist, Professor Albert Fert.

In Spain, Professor Clark was recognised for his pioneering research, carried out at the University of Melbourne during the 1970s, to develop the multi-channel cochlear implant.

Professor Clark is now continuing his research in Bionics at La Trobe University through his Australian Research Council's Centre of Excellence where they are making advances in the physiology of electrical stimulation of the hearing nerves in preparation for the next generation of cochlear implants. This research is in collaboration with the Intelligent Polymer Research Institute at the University of Wollongong. Led by Professor Gordon Wallace, the Institute is using nanotechnology and smart plastics to develop these stimulating electrodes.

Bill Wheeler scholarship recipient Leo Stevens with (L-R) Professor Graeme Clark, Margaret Clark, Lexie Wheeler, June Dark and Barry Dark.

Scopus young researcher of the year award recipient Dan Li.

Prof Leon Kane-Maguire receiving his RAAF Heritage Award

JUNE

Prof Gursel Alici (CI ACES) received the **Faculty of Engineering Award for Outstanding Contribution to Teaching and Learning (OCTAL) in 2010**. These awards recognise staff that have made a major contribution to teaching and learning excellence within the University of Wollongong. The award winners were judged by the Excellence, Diversity and Innovation in Teaching Subcommittee (EDITS).

SEPTEMBER

2010 UOW Higher Degree Research Student Three Minute Thesis Competition Winner was Mr Cameron Ferris (ACES/ IPRI) with his talk entitled 'Printed patches for a broken heart'.

Australian Academy of Science Award for Australia-Germany Researcher Mobility Dr Michael Higgins was awarded a scientific grant to participate in an Australia-Germany Researcher Mobility project. The award from The Australian Academy of Science, on behalf of the Department of Innovation, Industry, Science and Research, allows Michael to spend one month in the laboratories of Dr Christine Kranz at the University of Ulm. Whilst in Ulm, Michael will look at 'Organic nanoelectrode probes for neural interfacing applications.'

NOVEMBER

Australasian Corrosion Association - Best Research Student Award 2010.

ACES PhD student Wayne Neill won the award from the ACA for a paper based on his thesis. Wayne has now taken up a position at DSTO.

Cochlear implant pioneer wins surgical award

Professor Graeme Clark, the pioneering surgeon who has helped hundreds of thousands of profoundly deaf patients to hear, was awarded the prestigious Lister Medal at the Royal College of Surgeons on 4th November 2010 in recognition of his contribution to surgical science.

Awarded triennially, the Lister Medal is named after Englishman Joseph Lister, whose work on antiseptics established sterile surgery. The two other Australians to win the Lister Medal are Sir Peter Morris for transplant surgery and Sir Howard Florey for his work in penicillin.
In receipt of the Lister Award, Professor Graeme Clark gave the historic Lister Oration at the event on his research and development of the cochlear implant entitled: "What can electrical stimulation with a cochlear implant tell us about Brain Function and Human Consciousness?"

The Lister Medal and Oration is considered the most distinguished award in UK surgery, it was founded as a lasting mark of respect to Joseph Lister, whose work on antiseptics established the basis of modern sterile surgery. The selection for the award is made by a committee, with members appointed by the Royal Society, the Royal College of Surgeons of England, the Royal College of Surgeons in Ireland, the University of Edinburgh, the University of Glasgow and the Society of Academic and Research Surgery.

Professor Graeme Clark, Honorary Fellow of the Royal College of Surgeons said: "I am honoured to receive such a prominent award on behalf of all the researchers that are engaged in the fight against deafness. We have achieved amazing success with the cochlear implant and have brought the world of sound to thousands of children and adults worldwide."

Prof Gursel Alici receiving his Faculty of Engineering OCTAL Award.

Prof Graeme Clark receiving the prestigious Lister Medal in recognition of his contribution to surgical science.

DECEMBER

Humboldt Research Award

Professor Spiccia from the School of Chemistry at Monash University has joined an elite group of researchers by being honoured with a 2010 Humboldt Research Award. He was recognised for his ongoing research into solar energy conversion - water splitting devices and dye sensitised solar cells.

A major recent focus of his research, currently being supported through the Australian Research Council Centre of Excellence for Electromaterials Science (ACES), concerns the development of bio-inspired water oxidation catalysts that could form the basis of efficient solar water splitting devices – one of the Holy Grails of Chemistry. These devices have the potential to provide a cheap and renewable source of hydrogen - considered by many as the "fuel of the future".

The award is granted in recognition of a researcher's entire achievements to date and to academics whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future. As part of his award, Professor Spiccia will spend time with Professor Annie Powell at the Karlsruhe University and with Professor Wolfgang Ebehardt and Dr Klaus Lips the Helmholtz Zentrum Berlin for Materials and Energy to explore new avenues in the area of water splitting devices and solar fuels; research areas which are of major interest to ACES.

See also: http://www.monash.edu.au/news/monashmemo/assets/includes/content/20101215/stories-lead.html

EMERITUS PROFESSOR

Professor Leon Kane-Maguire of ACES was the guest speaker at the University of Wollongong graduation ceremony on 17 December 2010. Leon officially retired from UOW in November. He was awarded an Emeritus Professorship at this graduation ceremony.

He is very much thanked for his contribution to ACES.

Pictured above: Leon Kane-Maguire (left) at UOW Graduation Ceremony (Dec).

Pictured above right: Professor Spiccia.

Pictured below right: Cameron Ferris, winner of the 3 minute thesis.

Industry/End-User Liason

Activities in 2010

ACES END-USER TECHNOLOGY SHOWCASE

ARC Centre of Excellence for Electromaterials Science (ACES) End-User Technology Showcase was held in Wollongong on Thursday 14 October 2010.

This event was attended by 100 delegates, consisting of a mix of researchers, patent trademark attorneys, government officials, industry representatives as well as potential and existing research collaborators. A guest speaker at the Expo was The CEO of the Australian Research Council; Professor Margaret Sheil was a guest speaker and outlined possible funding opportunities. Other guests included the Consul General of Korea, Jinsoo Kim, and China's Consul in charge of Science and Technology from Sydney Consulate, Dr He Fuxiang.

As reported by Meng Hu (Xinhua reporter) 'Australian researchers call for stronger cooperation with Chinese counterparts'.

Dr He Fuxiang said "that the industrialization of frontier scientific research outcomes, involved a huge potential and broad market prospects. The various forms of mutually beneficial scientific and technological cooperation between Australia and China, would promote the bilateral cooperation in other fields"

Other speakers at the showcase included: UOW's Deputy Vice-Chancellor (Research), Prof Judy Raper, who welcomed guests as well as providing an overview of the University's strategic research direction and current partners jan Weber (Boston Scientific), James Nicholson (SMR Automotive), Martin Svela (Cochlear) and Ina Dagley (CRC Polymers).

Prof. Gordon Wallace, executive research director of ACES, said "the new $50 million AIIM Processing and Devices Facility at UOW's Innovation Campus provide a collaboration platform for international organizations and Chinese companies with Australian scientists".

Participants were invited to tour the state-of-the-art facilities, listen to our current research partners and discover potential applications of the research being currently undertaken. An opportunity for one on one discussion was provided.

EXTENDED FUNDING FOR THE ANFF FACILITY HOSTED BY ACES

In 2010 there has been an ongoing investment and expansion in characterisation and fabrication tools accessible to ACES members. Notably IPRI's flagship leadership in the Materials Node of the Australian National Fabrication Facility (ANFF) has received an additional $3.2M equipment investment, under the Federal Government EIF, to be housed in the Australian Institute of Innovative Materials (AIIM) and AIIM Processing & Device facility that houses ACES members. Specifically this will include the acquisition of: (i) a pilot-scale gel fibre spinning system, (ii) fibre knitting/braiding machines and (iii) a further expansion in the scale up of the synthetic organic facility hosted at the ANFF. Like UOW's other fabrication capabilities, the new equipment will be made available to end-users on a fee-for-service basis.

This new capability, unprecedented in Australia, will provide both researchers and external users with state-of-the-art facilities to produce and characterise low cost components or whole devices that can be printed on flexible substrates for use in application areas such as chemical/

At the ACES technology showcase were the CEO of the Australian Research Council; Professor Margaret Sheil; the Consul General of Korea, Jinsoo Kim, and China's Consul in charge of Science and Technology from Sydney Consulate, Dr He Fuxiang.

biosensors, flexible solar cells, flexible batteries/capacitors, electrochromic devices, fuel cells, wearable energy storage and human movement devices.

ANFF USER FORUM

On 2 June 2010 an ANFF User forum was held at IPRI/ACES. The 20 -25 participants were a mix of researchers, local businessmen, Invest Australia and representatives from IP & patent attorney firms.

Rosie Hicks (CEO ANFFL) welcomed the participants. Assoc Prof Peter Innis (ACES/IPRI) who gave an overview of the facilities now in ANFF located at ACES/IPRI and explained 'what the materials node could do for you?'

A selection of case studies on materials development, materials characterisation and device fabrication followed with Glen Bryant (UON) and Prof David Officer (UOW) explaining 'How was the Materials Node helping Australian researchers?' Participants were welcome to tour the facilities afterwards.

AIIM P&D FACILITY UPDATE

During 2010 the construction of the AIIM Processing and Devices facility continued with anticipation that the new building would be ready to be used mid 2011.

The new AIIM P&D facility will also receive an investment of a further $10M in equipment, $5M of which ACES will be a direct beneficiary. This building should be completed in June 2011 and will provide customised state-of-the-art laboratory infrastructure to house the characterisation, fabrication and scaled-up synthesis capabilities. The characterisation and fabrication areas within the new facility will comprise both sterile and non-sterile laboratories biological laboratories, as well as engineering and design facilities, and staffed workshops, affording an integrated device development capability unique in Australia.

In addition, UOW and ACES (IPRI) will be relocating its electron microscopy facilities into a purpose built facility located between the existing AIIM and AIIM P&D buildings. This facility will provide space for up to 7 electron microscope (SEM/TEM) systems.

ACES RESEARCHERS CONTINUE TO BUILD STRONG LINKS AND COLLABORATIVE PROJECTS WITH APPROPRIATE CRCS.

Through the CRC Polymers we continue to build strong links with commercial partners in the area of solar cell research and will be part of the CRC Polymers bid for extended funding in 2011.

ACES researchers have also been instrumental in driving a bid for a new CRC that encompasses research into new technologies for Active Ageing. ACES/IPRI will host a workshop on collaborative research opportunities in this area on 14 February 2011.

At the ANFF User forum held 2 June 2011 and AIIM P&D facility under construction July 2011

WATER SPLITTING DEVELOPMENTS

Water splitting was determined to be an area of research activity where the momentum and value of existing research could be leveraged most successfully to build strong end-user engagement in parallel with the research platform.

An initial Skills and Knowledge grant application with Commercialisation Australia was submitted.

A draft Business Plan has been completed along with a market analysis. This was undertaken by students in the MBA school at UQ and will form part of a more robust business currently being developed.

A number of patents have been filed that relate to both catalysts and to manufacturing techniques involving polymers.

ENGAGEMENT BEYOND THE WALLS OF ACES

Communication of our science to ensure the engagement of others is no trivial task, it requires a level of training and innovation akin to that required to carry out scientific research. Senior researchers conducted talks with a range of people not previously hosted at ACES. For example, ACES hosted representatives from:

- ELMARCO Ltd Japan at IPRI in January
- Securency International Pty Ltd at IPRI in February
- Barrell Engineering and Mikoh Inc, Melbourne at IPRI in March
- Aqua Diagnostics and ITEK at IPRI in April
- Innovative Design Technologies Group Pty Ltd and State Administration of Foreign Experts at IPRI in May
- Sekisui's William Clark from Japan at IPRI in June
- Jennifer Becker from the US Army Research Office at IPRI in July
- Orica visitors Richard Goodridge (Global Technology Manager), Geoff Brent (Sustainability Manager) and Brent Eichler (Sustainability Engineer) at IPRI in July
- Dr Mookken and Mrs Mookken from *Indian Oil*, India and Mrs Helen Woodall, Deakin University were welcomed at ACES/Monash University in July.
- Greg Twemlow from Datatrace was hosted at IPRI in August.
- Organovo (USA) and Illawarra Business Chamber at IPRI in September
- Johnson & Johnson Medical Pty Ltd, Truck Group of Daimler AG and Resmed at IPRI in October
- Duracell (Procter & Gamble) Research and Development, KERI, Korea, AUTO CRC, JETRO Sydney and Sony Corporation, Japan at IPRI in November.

For a full list of visitors to ACES see Appendix 4.

Innovation in Japan - Kanagawa Business Seminar (JETRO)

The Governor of Kanagawa, Shigefumi Matsuzawa, visited Sydney on 24 November to explore opportunities for business partnerships between Japan and Australia, focusing on Kanagawa Prefecture as a destination.

Kanagawa is a centre for technological development, boasting excellent research facilities along with some of Japan's most successful companies.

Speakers at this JETRO forum were:

- Shigefumi Matsuzawa - Governor of Kanagawa Prefecture, Japan
- Dr. Osamu Kumagai - Sony Operating Executive Officer and Chairman of the Kanagawa R&D Network
- Trent Rowe, Group General Manager Product & Marketing, Ceramic Fuel Cells Limited
- Professor Gordon Wallace, ACES.

Dr Kumagai visited ACES/IPRI the following day to explore potential collaborative opportunities between ACES and Sony.

Creating Value from Excellence Forum

Prof Gordon Wallace was an invitee to the 'Creating Value from Excellence Forum', held 22 November 2010. This forum

was organised by the State & Regional Development and Tourism, Industry & Investment NSW.

Department of Industry and Investment (DII) visit to UOW

Thirteen staff from DII visited UOW on 22 March 2010. Prof David Officer (CI, ACES) and Dr Toni Campbell (COO, ACES) attended. Each member of DII and a representative from 22 different UOW research strengths gave short presentations about their work and interests. This event was an opportunity for information exchange in order to connect similar research strengths.

Boardroom Dinner with senior US journalists

Dr Toni Campbell presented an overview of ACES research activities to 4 journalists here in Australia as guests of the Australian Department of Foreign Affairs and Trade on 6 December.

The journalists were from Sky News Canada, Scientific America, a freelance science writer from Canada and the editor of Physics Today.

Exhibition booth at the 27th IASP World Conference on Science and Technology

In May, Dr Benny Kim hosted an ACES/ IPRI exhibition booth at the 27th IASP World Conference on Science and Technology Parks 2010 held in Daedeok, Daejeon, Korea. A record 1140 participants from over 50 countries attended this event. At the International Exhibition on Green Hi-tech, held concurrently with the conference, 100 green technology-related enterprises set up booths attracted over a thousand people and was designed to create business opportunities for attendees.

ACES in the Media

A full list of ACES media coverage for 2010 is listed in Table 4. In summary articles about ACES appeared in local, national and international newspapers, on blogs, on a range of websites, on radio and TV as well as some profiles of ACES staff in magazines and journals.

Prof Graeme Clark gave several interviews in 2010. These included a 2 page news story in The Illawarra Mercury (28Aug10) entitled 'Sound Success'. COMOS magazine also carried a tribute to Professor Graeme Clark, who won the 2010 Lister Medal.

Assoc Prof Dan Li (QEII recipient) 'epitomises the modern researcher' as reported in the Australian newspaper (3Mar10).

Dr Michael Higgins and Dr Attila Mozer did a Q&A for readers of the Illawarra Mercury (Nov and Dec 2010)

Innovation Campus tours were reported to be 'a hit' in the Illawarra Mercury (12June10).

These media events raise the profile of ACES in the community. ACES were fortunate to receive only positive press coverage in 2010.

TABLE 4: ACES IN THE MEDIA 2010

Date	Medium	Source	Description	Journalist	Page#/web link
01 Jan 10	Magazine	Research and Innovation Newsletter	Reported on Science Centre's summer scholarship collaboration wth IPRI students Joesph Giorgio, Tim Buckhorn and Ankita Raiyani		13
01 Jan 10	Magazine	Research and Innovation Newsletter	Article on Dr Xiao Liu first member of ACES Bionics team to receive PhD		13
18 Jan 10	Print	Illawarra Mercury	International research hub at Fairy Meadow taking off		
03 Feb 10	web	AIME info	reported on Organic Medical Bionics research seminar and mentioned Gordon Wallace who presented at the		http://www.ameinfo.com/223036.html
09 Feb 10	Print	Kiama Advertiser	Bill Wheeler scholarship aids vital medical bionics research. The inventor of the cochlear ear implant, Professor Graeme Clark was among guests at a scholarship presentation ceremony for an honours student working in the critical new medical bionics research area.		
09 Feb 10	web	UOW media unit	Bill Wheeler scholarship aids vital medical bionics research.		http://media.uow.edu.au/news/UOW073220.html
24 Feb 10	print	Illawarra Mercury	Article on Hydrogen production using sunlight. Quotes Gordon Wallace. Mentions Jun Chen, Dr Chee Too and Gerry Sweigers.	Courtney Trenwith	
26 Feb 10	web	UOW media unit	Wollongong research team's pivotal role in thermal energy harvesting		http://media.uow.edu.au/news/UOW074112.html
03 Mar 10	print	The Australian	Article on Dan Li, winner of the 2010 Scopus Young research of the year award	Jill Rowbotham	7
10 Mar 10	TV	WIN news	Report on research into making hydrogen production more efficient – leads to cheaper solar cells. David Officer, Gerry Sweigers. A process using sunlight that makes a giant leap forward in the cheap and efficient production of hydrogen. highly efficient chemical process, via novel electrocatalysts, to reduce water into hydrogen gas.		
24 Mar 10	print	Illawarra Mercury	Reported on the start of construction for the second AIIM Building at the Innovation Campus, quoting Cunningham MP Sharon Bird claiming iC could become the "silicon valley of health services". Deputy Vice-Chancellor (Research) Professor Judy Raper quoted about the commercialisation opportunities that the building will provide for AIIM researchers.	Matthew Jones	http://www.illawarramercury.com.au/news/local/news/general/mp-predicts-health-care-silicon-valley/1787603.aspx

Date	Medium	Source	Description	Journalist	Page#/web link
25 Mar 10	TV	WIN news	Reported on the start of construction for the second AIIM Building at the Innovation Campus		
26 Mar 10	Radio	I98FM	Reported on the start of construction for the second AIIM Building at the Innovation Campus		
26 Mar 10	Web	UOW Media Unit	Reported on the start of construction for the second AIIM Building at the Innovation Campus. Prof Judy Raper quoted.		http://media.uow.edu.au/releases/UOW075999.html
31 Mar 10	web	Materials Views	The cover with ACES research featuring was voted the best Advanced Functional Materials cover of 2009	Adrian Miller	http://www.materialsviews.com/details/news/673699/AFM_Cover_of_the_Year_2009_The_Winners.html
01 Apr 10	magazine	UOW Campus News	Article on Hydrogen production using sunlight. Quotes Gordon Wallace. Mentions Jun Chen, Dr Chee Too and Gerry Sweigers.	Bernie Goldie	6
15 Apr 10	magazine	The Chemical Engineer	The Intelligent Polymer Research Institute (IPRI) at the University of Wollongong has won two of the federal government's new Super Science Fellowships.	Simon Grose	
20 Apr 10	radio	ABC Illawarra	Gordon Wallace Interview with Laura from ABC Illawarra regarding AIIM P&D facility and Fellowships awarded.	Laura	
21 Apr 10	print	UOW Media Unit	The Mercury and ABC Illawarra reported that the Intelligent Polymer Research Institute has attracted $557,000 in Super Science Fellowships funding to attract talented research staff. Professor Gordon Wallace quoted.		http://media.uow.edu.au/news/UOW081924.html
06 May 10	web	La Trobe University	Reported Professor Graeme Clark will receive an honorary doctorate from Zaragoza University in Spain, on Friday 21 May 2010. Last year this honour went to French Nobel Prize physicist, Professor Albert Fert.		http://www.latrobe.edu.au/news/articles/2010/article/spanish-honour-for-bionic-ear-pioneer
13 May 10	web	UOW media unit	UOW research strengths impress Chinese officials. The newly-arrived Consul for Science and Technology Affairs at the Consulate-General of the People's Republic of China in Sydney, He Fuxiang, visited UOW yesterday (12 May) on his first official visit to an Australian university. The visitors were given a tour of the main campus and also the Innovation Campus		http://media.uow.edu.au/news/UOW081404.html
18 may 10	Web	Ecodiario	"Graeme Clark, "padre" del implante coclear, doctor honoris causa por la universidad de zaragoza " (Graeme Clark, "father" of the cochlear implant, doctor honoris causa by the University of Zaragoza)		http://ecodiario.eleconomista.es/sociedad/noticias/2154115/05/10
18 may 10	Web	Solidaridad digital	"Graeme Clark, "father "of the cochlear implant is an honorary doctorate" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://solidaridaddigital.discapnet.es/SolidaridadDigital/Noticias/Cultura%20y%20ocio/DetalleNoticia.aspx?id=8690
19 May 10	web	www.implantecoclear.org	El "padre" del Implante Coclear moderno en Zaragoza (The "father" of modern cochlear implant Zaragoza) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		www.implantecoclear.org/index.php?option=com_content&view=article&id=218:el-qpadreq-del-implante-coclear-moderno-en-zaragoza&catid=1:latest-news&Itemid=50
20 May 10	Web podast	Argon Radio	Graeme Clark, doctor honoris causa por la Universidad de Zaragoza, entrevistado en Aragon Radio (Graeme Clark, doctor honoris causa by the University of Zaragoza, interviewed on Aragon Radio) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.aragonradio2.com/podcast/emission/32844
21 May 10	Web	www.gozazaragoza.com	"Investidura del profesor Graeme Clark como Doctor Honoris Causa por la Universidad de Zaragoza" (Professor Graeme Clark investiture as Doctor Honoris Causa by the University of Zaragoza). Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.gozazaragoza.com/contenido.php?id=7496
21 May 10	Web	www.20minutos.es	"El profesor Graeme Clark trabaja con nanotecnología para crear implantes que permitan percibir mejor la música" (Professor Graeme Clark is working with nanotechnology to create implants that allow better perceive music) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.20minutos.es/noticia/713835/0/

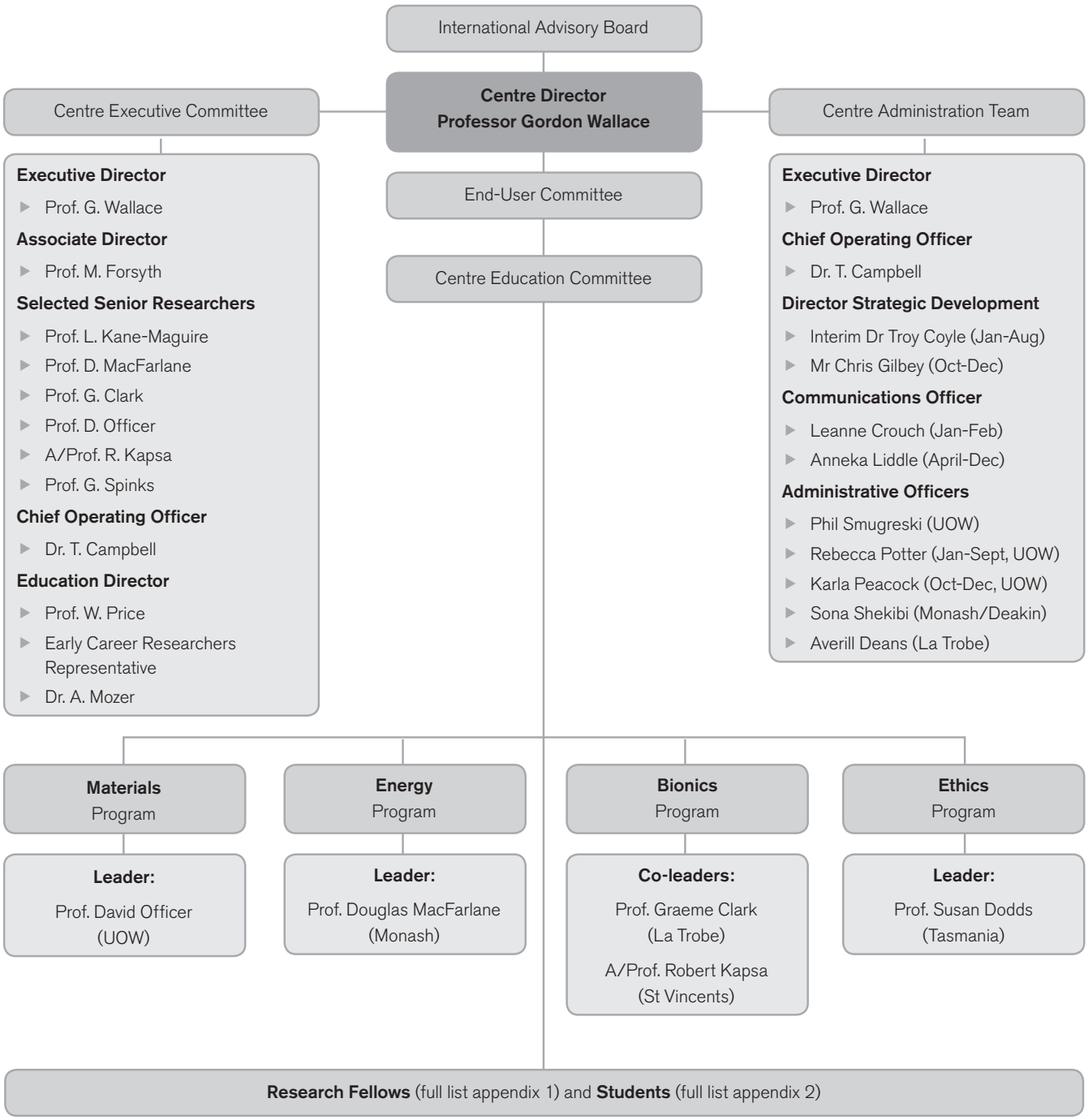
Date	Medium	Source	Description	Journalist	Page#/web link
21 May 10	Web	noticias.lainformacion.com	El profesor Graeme Clark trabaja con nanotecnología para crear implantes que permitan percibir mejor la música (Professor Graeme Clark is working with nanotechnology to create implants that allow better perception of music) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://noticias.lainformacion.com/salud/investigacion-medica/el-profesor-graeme-clark-trabaja-con-nanotecnologia-para-crear-implantes-que-permitan-percibir-mejor-la-musica_gBxOnF484sLrg4f20r7Sh3/
22 May 10	Web	www.implantecoclear.org	"El Profesor Clark, Doctor Honoris Causa por la Universidad de Zaragoza" (Professor Clark, Doctor Honoris Causa by the University of Zaragoza) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.implantecoclear.org/index.php?option=com_content&view=article&id=219:el-profesor-clark-doctor-honoris-causa-por-la-universidad-de-zaragoza&catid=1:latest-news&Itemid=50
21 May 10	print	The Adelaide Advertiser	Reported that a South Australian electronics company had entered into a partnership with UOW's Institute for Superconducting and Electronic Materials to develop car batteries for electric/hybrid applications.		
21 May 10	Web	Aragoninvestiga	"The father of the cochlear implant, Graeme Clark, Doctor Honoris Causa by the University of Zaragoza" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.aragoninvestiga.org/el-padre-del-implante-coclear-graeme-clark-doctor-honoris-causa-por-la-universidad-de-zaragoza/
21 May 10	Web		"University of Zaragoza invests Doctor Honoris Causa cochlear implant pioneer" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.tecnosord.com/2010/05/19/universidad-de-zaragoza-inviste-doctor-honoris-causa-pionero-implante-coclear/
21 May 10	Web	Aragon digital	"The father of the cochlear implant works in a new device for the deaf to hear music" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza	María José Crespo Roig	http://www.aragondigital.es/asp/noticia.asp?notid=73214
21 May 10	Web	Unizar	The father of the cochlear implant, Professor Graeme Clark, an Honorary Doctorate from the University of Zaragoza" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.unizar.es/actualidad/vernoticia.php?id=1178&idh=504#
22 May 10	Print	Aragon	"Clark, honoris causa by the cochlear implant" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		12
22 May 10	Print	Aragon	"An implant seeks to improve the hearing in the deaf musical" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza	Chema R Morais	14
22 May 10	Print	Heraldo De Aragon	"The Right ear of Dr Clark" Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza	Chema R Morais	72
24 May 10	web	UOW media unit	Reports on 3 year grant received by ACES to develop world's first successful biodegradable stent. Prof Jan Weber from Boston Scientific and Gordon Wallace quoted.		http://media.uow.edu.au/news/UOW079188.html
24 May 10	Web	Larioja	Graeme Clark, pionero en uso implante coclear, doctor Honoris Causa de la UZ (Graeme Clark, a pioneer in cochlear implant use, Doctor Honoris Causa of the UZ) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.larioja.com/agencias/20100520/
28 May 10	Print	Heraldo de Aragon	El Padre del implante coclear, doctor honoris causa (The Father of the cochlear implant, doctor honoris causa) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza	A.A	24
28 May 10	web	El periodico de Aragon	Y los sordos oiran (and the deaf hear) Article on Professor Graeme Clark on receipt of Honorary Degree from Universidad of Zaragoza		http://www.elperiodicodearagon.com/noticias/noticia.asp?pkid=585351
08 Jun 10	web	UOW Media Unit	Reported on Illawarra Innovation Festival where ACES had a display table and conducted laboratory tours for the community	Kate McIlwain	http://media.uow.edu.au/news/UOW079673.html

Date	Medium	Source	Description	Journalist	Page#/web link
08 Jun 10	radio	ABC Illawarra	Interview with David Fuller regarding Illawarra Innovation Festival. Mentioned ACES had a display table conducted laboratory tours for the community		
08 Jun 10	print	Illawarra Mercury	Reported on Illawarra Innovation Festival where ACES had a display table and conducted laboratory tours for the community	Greg Ellis	37
09 Jun10	radio	ABC Illawarra	Nick Rheinberger interviews Gordon Wallace regarding Asia Pacific Conference on Nanobionics being held at Innovation campus over the next 3 days.	Nick Rheinberger	
09 Jun 10	web	UOW Media unit	The 2nd Asia Pacific Symposium on Nanobionics which will highlight the latest findings across a range of areas including the bionic eye, implants for epilepsy detection and control and the next generation of cochlear implants is being held at the University of Wollongong's Innovation Campus from 9-11 June.	Bernie Goldie	http://media.uow.edu.au/news/UOW080292.html
12 Jun 10	print	Illawarra Mercury	Article on the success of the Illawarra Innovation Festival with photos	Greg Ellis	76
14 Jun 10	web	ABC	Video of Prof Mark Cook (PI ACES) as part of story on trial epilepsy implant at St Vincents Hospital		http://www.abc.net.au/7.30/content/2010/s2926698.htm?site=melbourne#
14 Jun 10	TV	ABC	Interviewed Prof Mark Cook (PI ACES) as part of story on trial epilepsy implant at St Vincents Hospital	Kerry O'Brien	http://www.abc.net.au/7.30/content/2010/s2926698.htm?site=melbourne#
17 Jun 10	web	UOW Media unit	Trailblazer innovation competition results published with a Highly Commended awarded to IPRI Student Peter Sherrell	Bernie Goldie	http://media.uow.edu.au/news/UOW080751.html
23 Jun 10	web	UOW Media unit	Reported on VIP Chinese delegation from Ministry of Commerce of the People's Republic of China's visit to the University of Wollongong and the Innovation Campus. The delegation met researchers and received a presentation from Professor Raper and Professor Shixue Dou (Institute for Superconducting and Electronic Materials) and Professor Gordon Wallace (ARC Centre of Excellence for Electromaterials Science)	Bernie Goldie	http://media.uow.edu.au/news/UOW081404.html
24 Jun 10	web	UOW Media unit	Reported on Forum on innovative materials for health protection hosted by ISEM. The forum was to address the various important health issues by introducing a new cross-disciplinary approach, which involved biomedical applications of non-traditional multifunctional materials.	Bernie Goldie	http://media.uow.edu.au/news/UOW081610
28 Jun 10	web	UOW Media unit	NSW Minister for Science and Medical Research, Ms Jodi McKay, has paid a special visit to the ARC Centre of Excellence for Electromaterials Science (ACES) at the Innovation Campus.	Bernie Goldie	http://media.uow.edu.au/news/UOW081924.html
14 Jul 10	web	UOW Media unit	Leon Kane-Maguire, a chief investigator of ACES has made his mark in the aviation literary sphere. Since cutting back to part-time work, Professor Kane-Maguire has been able to more actively pursue his passion as an aviation war historian buff. And he has now been rewarded with the RAAF Heritage Award First Prize in Literature for his book, "Lost Without Trace".	Bernie Goldie	http://media.uow.edu.au/news/UOW077196.html
13 Aug 10	web	Times of India	The Times of India reported on how Australian researchers are using food thickener used in yoghurts and jellies to develop artificial muscle. Also reported on ABC Online.	Anon	http://timesofindia.indiatimes.com/life-style/health-fitness/fitness/Jelly-thickener-may-help-grow-artificial-muscles/articleshow/4776043.cms
16 Aug 10	web	La Trobe University	Article on 'Towards the 'hi-fi' bionic ear'		http://www.latrobe.edu.au/news/articles/2010/article/towards-the-hi-fi-bionic-ear
18 Aug 10	radio	ABC Radio 774 Melbourne	Interview with Professor Graeme Clark on receipt of Lister Medal	Red Symons	http://blogs.abc.net.au/victoria/2010/08/red-symons-and-30-years-of-the-cochlear-implant.html?site=melbourne&program=melbourne_breakfast
24 Aug 10	print	Leader	Professor Graeme Clark: "Eltham's Mr bionic is quietly iconic" on receipt of Lister Medal		http://diamond-valley-leader.whereilive.com.au/news/story/mr-bionic-is-quietly-iconic/

Date	Medium	Source	Description	Journalist	Page#/web link
25 Aug 10	web	UOW media unit	Bionics researcher and Senior Fulbright Scholar visits IPRI to plan research stay in 2011. Prof Timothy Hanks, Furman University, South Carolina, this week paid a preliminary visit to the Intelligent Polymer Research Institute (IPRI) based at UOW's Innovation Campus to make arrangements for his six months exchange from January to June next year.	Bernie Goldie	http://media.uow.edu.au/news/UOW085963.html
26 Aug 10	web	Channel 7 news	Carried story on the 2000th Cochlear Implant Celebration at Eye and Ear Hospital Melbourne. Prof Graeme Clark quoted.		http://www.eyeandear.org.au
26 Aug 10	web	UOW media unit	Konarka and IPRI collaboration on solar cell research reported. General media release issued.	Bernie Goldie	http://media.uow.edu.au/news/UOW086045.html
03 Sep 10	web	UOW media unit	Reported on ACES PhD student Cameron Ferris placing first in the three minute thesis competition.	Bernie Goldie	http://media.uow.edu.au/news/UOW086482.html
03 Sep 10	Radio	ABC Illawarra	Interviewed ACES PhD student Cameron Ferris and aired his three-minute thesis talk.		
14 Sep 10	web	Preston Leader website	Article on Graeme Clark "Professor's drive pays off, breaking the silence". Reports the La Trobe University professor gave the opening address at the triennial International Congress of the Acoustics in Sydney last month. Reports on 'working with the University of Wollongong in intelligent plastics and nanotechnologies ...'		http://preston-leader.whereilive.com.au/news/story/professors-drive-pays-off-breaking-the-silence-graeme-clark/
16 Sep 10	web	La Trobe University	Professor Graeme Clark, Lister Medal related press		http://www.latrobe.edu.au/news/articles/2010/article/transforming-lives
16 Sep 10	print	The Age	Professor Graeme Clark, Lister Medal related press	Julie Medew	http://www.theage.com.au/national/bionic-ear-inventor-clark-honoured-20100915-15cnw.html
16 Sep 10	magazine	COSMOS	Cosmos magazine carried a tribute to Professor Graeme Clark, who has won the 2010 Lister Medal. The article mentioned his association with UOW's Intelligent Polymer Research Institute and included quotes from IPRI director Professor Gordon Wallace.	Andrew Letten	
17 Sep 10	web	ABC Stateline	Video of Interview with Professor Graeme Clark on receipt of Lister Medal		http://www.abc.net.au/news/video/2010/09/17/3015283.htm
17 Sep 10	TV	ABC Stateline	Interview with Professor Graeme Clark on receipt of Lister Medal	Joesphine Cafagna	
24 Sep 10	radio	ABC Illawarra	Reported that the Intelligent Polymer Research Institute had received a grant to study organic solar cell technology.		
26 Aug 10	web	UOW media unit	Story on Professor Graeme Clark's celebrating his 75th birthday at UOW's Intelligent Polymer Research Institute.	Bernie Goldie	http://media.uow.edu.au/news/UOW086070.html
27 Sep 10	web	University of Melbourne	Professor Graeme Clark, Lister Medal related press		http://cms.unimelb.edu.au/?a=360935
27 Sep 10	web	ict4lifesciences	Professor Graeme Clark, Lister Medal related press		http://ict4lifesciences.org.au/top-award-for-graeme-clark.html
28 Sep 10	print	Illawarra Mercury	The Mercury's Weekender magazine on Saturday carried a feature story on Professor Graeme Clark's work on cochlear implants. The hearing pioneer celebrated his 75th birthday, but continues to work with UOW's Intelligent Polymer Research Institute.	William Verity	Weekender magazine
01 Oct 10	print	Australian Doctor	Professor Graeme Clark 'in the hot seat' Q&A		13
05 Oct 10	web	ISCAST	Professor Graeme Clark, Lister Medal related press		http://www.iscast.org/node/456
07 Oct 10	web	Official website Governor-General	Reported on the Launch of First Voice, a coalition of hearing services at Admiralty House, Sydney. The Governor-General, Ms Quentin Bryce AC, unveiled a bust of cochlear implant (bionic ear) inventor Professor Graeme Clark AC during the launch of First Voice, a coalition of hearing services including the Hear and Say Centre.		http://www.gg.gov.au/event.php/view/id/1085/title/the-launch-of-first-voice

Date	Medium	Source	Description	Journalist	Page#/web link
11 Oct 10	web	UOW media unit	Reported on the Enduser Technology Expo held at University of Wollongong Innovation campus. Showcase the commercial potential of the AIIM P&D building	Bernie Goldie	http://media.uow.edu.au/releases/UOW089270.html
14 Oct 10	web/print	Surgical News	Professor Graeme Clark, Lister Medal related press		Page 14 or http://www.surgeons.org/media/223842/surgicalnewsv11_09.pdf
14 Oct 10	web	NEWS.CN web	Australian researchers call for stronger cooperation with Chinese counterparts. The Chinese News Agency reporter published an article about ACES technology showcase held today.	Meng Hu	http://news.xinhuanet.com/world/2010-10/14/c_13557927.htm
16 Oct 10	print	The Illawarra Mercury	Reported how the CEO of the Australian Research Council, Professor Margaret Sheil, praised the development of the AIIM Processing and Devices Facility when she visited the Innovation Campus to speak at an expo. Prof Sheil was in Wollongong to speak at an expo highlighting marketplace opportunities for the new $50 million Australian Institute for Innovative Materials Processing and Devices Facility.	Greg Ellis	30
16 Oct 10	web	Veski	Professor Graeme Clark, Lister Medal related press		http://www.veski.org.au/NewsView.aspx?id=214
25 Oct 10	web	UOW media unit	Reported on Australian Research Council (ARC) funding of researchers from the Intelligent Polymer Research Institute (IPRI) winning more than $2.1 million in funding for three Discovery grants, including two Australian Research Fellowships, an Australian Postdoctoral Fellowship and one Linkage grant.	Bernie Goldie	http://media.uow.edu.au/releases/UOW090008.html
03 Nov 10	web	The Royal College of Surgeons website	Cochlear implant pioneer wins surgical award		http://www.rcseng.ac.uk/news/cochlear-implant-pioneer-wins-surgical-award
16 Nov 10	web	Deaf blog	Professor Graeme Clark, Lister Medal related press		http://www.thedeafblog.co.uk/2010/11/professor_graeme_clark_father_1.html
18 Nov 10	web	Gavin Blue blog	Photographer's blog on the Governor of Victoria's Reception to congratulate Graeme Clark on receiving the Lister Award	Gavin Blue	http://gavinblue.com/blog/archives/1053
23 Nov 10	print	The Illawarra Mercury	Reported on ARC research grantees Michael Higgins (ACES/IPRI) and Shulei Chou (ACES/ISEM). Interviews and photos.		25 IQ section
14 Dec 10	print	The Illawarra Mercury	Tomorrow's Power Solution? Reports on Dr Attila Mozer's research history, including at ACES/IPRI and his recent ARC award in IQ section. Photo and interview questions		25 IQ section
17 Dec 10	print	ASOHNS Newsletter	Feature Article: Tribute to Professor Graeme Clark on receipt of Lister Medal		Vol.7 No. 2 Summer 2010
17 Dec 10	web	Asia Today	Asia Today magazine reported that Japan's Sony Corporation was considering working with Professor Gordon Wallace's research group at the Australian Centre of Excellence for Electromaterials Science on green technology initiatives.		

Governance


International Advisory Board
Centre Director
Professor Gordon Wallace
Centre Executive Committee
Centre Administration Team
End-User Committee
Centre Education Committee
Executive Director
Prof. G. Wallace
Associate Director
Prof. M. Forsyth
Selected Senior Researchers
Prof. L. Kane-Maguire
Prof. D. MacFarlane
Prof. G. Clark
Prof. D. Officer
A/Prof. R. Kapsa
Prof. G. Spinks
Chief Operating Officer
Dr. T. Campbell
Education Director
Prof. W. Price
Early Career Researchers Representative
Dr. A. Mozer
Executive Director
Prof. G. Wallace
Chief Operating Officer
Dr. T. Campbell
Director Strategic Development
Interim Dr Troy Coyle (Jan-Aug)
Mr Chris Gilbey (Oct-Dec)
Communications Officer
Leanne Crouch (Jan-Feb)
Anneka Liddle (April-Dec)
Administrative Officers
Phil Smugreski (UOW)
Rebecca Potter (Jan-Sept, UOW)
Karla Peacock (Oct-Dec, UOW)
Sona Shekibi (Monash/Deakin)
Averill Deans (La Trobe)
Materials Program
Energy Program
Bionics Program
Ethics Program
Leader:
Prof. David Officer (UOW)
Leader:
Prof. Douglas MacFarlane (Monash)
Co-leaders:
Prof. Graeme Clark (La Trobe)
A/Prof. Robert Kapsa (St Vincents)
Leader:
Prof. Susan Dodds (Tasmania)
Research Fellows (full list appendix 1) and Students (full list appendix 2)

The centres governance structures involve stakeholders in planning and management processes. The chart (Page 60) illustrates the current governance structure and relationships.

CENTRE INTERNATIONAL ADVISORY BOARD (IAB)

The Centre's Advisory board provides valuable advice on scientific and commercial opportunities relevant to the centre, as well as monitoring the centre's progress. Members of the IAB also provide regular comment and guidance to the Director, Professor Gordon Wallace. In 2010 the advisory board membership was as listed in the table.

INTERNATIONAL ADVISORY BOARD

- **Dr (Dame) Bridget Ogilvie**: Chair, AC, DBE, FAA, FRS, FMedSci
- **Prof. R. Baughman:** University of Texas, Dallas
- **Prof. S. Roth:** Korean University, Korea
- **Dr. A. Mau:** CSIRO
- **Dr. G. Smith:** SciVentures
- **Prof. J. Raper:** DVC Research, UOW
- **Dr. A. Khan**: Monash University
- **Prof. R. Kaner:** University of California
- **Prof. Thomas W.H. Kay**: St Vincent's Hospital, Melb.
- **Dr. I. Sare:** DSTO
- **Prof. N. Ogata:** Chitose Institute of Science and Technology, Japan
- **Prof. K. Kaneto:** Kyushu Institute of Technology, Japan

THE CENTRE EXECUTIVE

The Centre Executive met 6 times in 2010 as well as attending the IAB meeting. The role of the executive is to provide ongoing operational management of the Centre; plan the Centre scientific program; review the progress of the Centre; as well as the procedures used to facilitate the dissemination of research findings and to maximise the use of skills within the Centre and externally. The intellectual property register is given in Appendix 3. Seven patents were lodged in 2010.

END-USER COMMITTEE

The End-User committee remained as it was in 2009, however as ACES moves into the extension phase, it was agreed that the current form of the End-User committee was no longer the best way forward.

ACES wishes to thank those members of the current committee, listed in the table, for their time and contribution and extend an invitation to them to continue their relationships with the centre as we form new End-User associations.

In 2010 an ACES End-User Technology Forum was very successful. Therefore, the aim in 2011 is to hold End-User round table discussions on specific targeted research topics, with ongoing advice from a revised End-User committee.

ACES END USER COMMITTEE	
Greg Smith	Chair, SciVentures
E. Evans	BlueScope Steel
J. Patrick	Cochlear
P. Aitchison	Cap-XX
T. Truong	DSTO
R. Shaw	Rio Tinto
J. Nicholson	SMR Automotive
P. Murphy	IWRI, UNISA
A. Hill	CSIRO

EDUCATION COMMITTEE

This committee initiates and implements strategies to attract and engage high calibre research students to the centre. Chaired by Prof. William Price, the committee met twice in 2010.

At each of the monthly ACES program meetings (for Materials, Energy and Bionics & Ethics) every member was invited to discuss their 'research highlights' for the past month with their peers. Previously monthly research highlights were circulated, however no formal discussion occurred.

EDUCATION COMMITTEE MEMBERS	
Prof W. Price	(Chair, UOW)
Dr T. Campbell	(UOW)
Dr J. Pringle	(Monash)
Dr. A. Minett	(UOW)
Ms. A. Liddle	(UOW)
Ms. S. Shekibi	(Monash)

Publications

The target number of publications for 2010 was 60 with 50% of journal articles in journals with an impact factor greater than 2. In 2010, the centre has published 3 book chapters and 90 journal articles, as well as having another 5 journal articles still in press. Of the 90 journal articles published, 67 or 74% were in journals with an impact factor greater than 2 and 46 or 51% with an impact factor greater than 4.

Book Chapters

Ambient mass spectrometry for the detection of chemical hazards, M. Paine, A. McAnoy, S. Ellis-Steinborner, S. Ellis, S. Blanksby and M. in het Panhuis, in Novel Applications of Mass Spectrometry to Research in Chemical Defence, Commonwealth of Australia, 39-55 (2010).

Renée Kyle and Susan Dodds 2010. 'Inside, outside: Nanobionics and human bodily experience' in K. L. Kjølberg and F. Wickson (eds.) NANO meets MACRO: Social Perspectives on Nano Scale Sciences and Technologies PAN Stanford; pp. 229-246.

Inherently Conducting Polymers via Electropolymerization for Energy Conversion and Storage, Wallace, G.G., Tsekouras, G., Wang, C. in Electropolymerization. Concepts, Materials and Applications, Edited by Serge Cosnier and Arkady Karyakin, WILEY•VCH Verleg GmbH &Co KGaA (2010), 215-240.

Journals

67 PUBLICATIONS IMPACT FACTOR >2 ; 46 IMPACT FACTOR >4

Nanostructured carbon electrodes, Wallace, G.G., Chen, J., Li, D., Moulton, S.E., Razal, J.M. Journal of Materials Chemistry 2010, 20, 3553-3562. IF=4.795

Chiral conducting polymers, Kane-Maguire, L.A.P., Wallace, G.G. Chemical Society Reviews 2010, 39 (7), 2545-2576. IF=20.09

Highly efficient sensitizers for dye-sensitized photocathodes and tandem solar cells, A. Nattestad, A.J. Mozer, M. K. R. Fischer, Y.-B. Cheng, A. Mishra, P. Bäuerle and U. Bach. Nature Materials 2010, 9, 31. IF=23.1

Injection Limitations in a Series of Porphyrin Dye-Sensitized Solar Cells, Dos Santos, T., Morandeira, A., Koops, S., Mozer, A.J., Tsekouras, G., Dong, Y., Wagner, P., Wallace, G., Earles, J.C., Gordon, K.C., Officer, D., Durrant, J.R. Journal of Physical Chemistry C 2010, 114, 3276-3279. IF=4.224

Photolithographic patterning of conducting polyaniline films via flash welding, Henderson, R.D., Breadmore, M.C., Dennany, L., Guijt, R.M., Haddad, P.R., Hilder, E.F., Innis, P.C., Lewis, T.W., Wallace, G.G. Synthetic Metals 2010, 160, 1405-1409. IF=1.901

The mechanical and the electrical properties of conducting polypyrrole fibers, Foroughi, J., Ghorbani, S.R., Peleckis, G., Spinks, G.M., Wallace, G.G., Wang, X.L., Dou, S.X. Journal of Applied Physics 2010, 107, 103712-1 -103712-4. IF=2.072

Charge Transport in Dye-Sensitized Solar Cells Based on Flame-made TiO_2 Nanoparticles, G. Tsekouras, M. Miyashita, Y. K. Kho, W. Y. Teoh, A. J. Mozer, R. Amal, S. Mori, G. G. Wallace. IEEE Journal of Selected Topics in Quantum Electronics 2010, 16, 6, 1641.

The effect of molecule size and shape on free charge generation, transport and recombination in all-thiophene dendrimer:fullerene bulk heterojunctions, Mozer, A.J., Ma, C.-Q., Wong, W.W.H., Jones, D.J., Bauerle, P., Wallace, G.G. Organic Electronics 2010, 11, 573-582. IF=3.262

Visualisation of chemical processes during corrosion of zinc using magnetic resonance imaging, Davenport, A. J., M. Forsyth, Britton M. M. Electrochemistry Communications 2010, 12(1), 44-47. IF=4.243

Electrodeposited PEDOT-on plastic cathodes for dye-sensitized solar cells. Pringle JM, Armel V, MacFarlane DR. Chem. Commun. 2010, 46(29),5367-5369. IF=5.504

Functionalised polyterthiophenes as anode materials in polymer/polymer batteries, Wang, C.Y., Tsekouras, G., Wagner, P., Gambhir, S., Too, C.O., Officer, D., Wallace, G.G.. Synthetic Metals 2010, 160, 76-82. IF=1.901

Preparation and enhanced stability of flexible supercapacitor prepared from Nafion/Polyaniline nanofiber, Kim, B.C., Kwon, J.S., Ko, J.M., Park, J.H., Too, C.O., Wallace, G.G. Synthetic Metals 2010, 160, 94-98 IF=1.901

Conducting polymers, dual neurotrophins and pulsed electrical stimulation – Dramatic effects on neurite outgrowth, Thompson, B.C., Richardson, R.T., Moulton, S.E., Evans, A.J., O'Leary, S., Clark, G.M., Wallace, G.G. Journal of Controlled Release 2010, 141, 161-167 IF=5.949

EPR characterization of platinum nanoparticle functionalized carbon nanotube hybrid materials. Dennany, Lynn; Sherrell, Peter; Chen, Jun; Innis, Peter C.; Wallace, Gordon G.; Minett, Andrew I. Physical Chemistry Chemical Physics 2010, 12(16), 4135-4141. IF: 4.166

Crosslinking neat ultrathin films and nanofibres of pH-responsive poly(acrylic acid) by UV radiation, Gestos, A., Whitten, P.G., Spinks, G.M., Wallace, G.G, Soft Matter 2010, 6, 1045-1052. IF=4.869

Physical surface and electromechanical properties of doped polypyrrole biomaterials, Gelmi, A., Higgins, M.J., Wallace, G.G. Biomaterials 2010, 31, 1974-1983 IF=7.37

Evaluation of thrust force generated for a robotic fish propelled with polypyrrole actuator, McGovern, S.T., Abbot, M., Emery, R., Alici, G., Truong, V.-T., Spinks, G.M., Wallace, G.G. Polymer International 2010, 59, 357-364 IF=2.137

Flexible and Compressible Goretex - PEDOT Membrane Electrodes for Solid-State Dye-Sensitized Solar Cells, Mozer, A.J., Panda, D.K., Gambhir, S., Romeo, T.C., Winther-Jensen, B., Wallace, G.G. Langmuir 2010, 26 (3), 1452-1455. IF=3.898

Nanostructured aligned CNT platforms enhance the controlled release of a neurotrophic protein from polypyrrole, Thompson, B.C., Chen, J., Moulton, S.E., Wallace, G.G. Nanoscale 2010, 2, 499-501. IF in June 2011

Polyterthiophene as an electrostimulated controlled drug release material of therapeutic levels of dexamethasone, Stevenson, G., Moulton, S.E., Innis, P.C., Wallace, G.G. Synthetic Metals 2010, 160, 1107-1114. IF=1.901

Guidance of neurite outgrowth on aligned electrospun polypyrrole/poly(styrene-à-isobutylene-à-styrene) fiber platforms, Liu, X., Chen, J., Gilmore, K.J., Higgins, M.J., Liu, Y., Wallace, G.G. Journal of Biomedical Materials Research: Part A 2010, 94A, 1004-1011. IF=3.318

Wireless aquatic navigator for detection and analysis (WANDA), Fay, C., Lau, K.-T., Beirne, S., Conaire, C., McGuinness, K., Corcoran, B., O'Connor, N.E., Diamond, D., McGovern, S., Coleman, G., Shepherd, R., Alici, G., Spinks, G., Wallace, G. Sensors and Actuators B: Chemical 2010, 150, 425-435. IF=3.083

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