Vision
An international magnet for research, The Wark advances global knowledge and understanding in interface science and engineering, underpinning Australian industry through breakthrough science and technology transfer.

Mission
As a critical member of an elite international group of colloid and interface science research organisations, The Wark performs outstanding research and attracts sponsors, staff and students from around the globe.

Operating Principles
The activities of The Wark are underpinned by our guiding principles:

- **Strategic Direction.** Invest in areas that build on existing strengths whilst pushing the research boundaries into emerging areas. Demonstrate an unswerving commitment to fundamental research.
- **Partnership.** Undertake intensive collaboration with global industry partners to build research relevance and innovative application.
- **Continuous Improvement.** Practice continuous benchmarking with internationally renowned research organisations.
- **Building Research Capacity.** Attract world-class experienced and early career researchers, as well as PhD students. Support research and analytical skills with high level technical skills.
- **Career Development.** Provide enviable career opportunities, nurture talent, and reward behaviour that supports an open and interactive research culture.
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Ian Wark Research Institute
ARC Special Research Centre for Particle and Material Interfaces

University of South Australia
Mawson Lakes Campus
Mawson Lakes Blvd
Mawson Lakes South Australia 5095
Australia

T +61 8 8302 3694
F +61 8 8302 3683
E iwri.enquiries@unisa.edu.au
W www.unisa.edu.au/iwri

CRICOS provider number 00121B

Photography: Sam Noonan
The Advisory Board commends the fifteenth Annual Report of the Ian Wark Research Institute (The Wark™) to the Council of the University of South Australia.

Replacement and refreshment of the leadership group is well underway, with new professorial appointments and internal promotions.

The sixth biennial review of the Institute by the Research and Technology Advisory Committee noted that most of their major recommendations had been implemented. Other matters of detail to which they draw attention are being addressed.

Industry funding decreased from 43.7% (2008) to 34.3% (2009); however our support from other funding sources increased, resulting in a small gain in total revenue. Industry funding is still under pressure from the global financial difficulties, continuing industry amalgamation, and new uncertainties regarding mining taxes. It is encouraging to note that South Australia is on the verge of becoming a major mineral supplier, and that is already having a positive impact on Institute revenue.

Application of The Wark’s research to other industries is proceeding well and must continue to be emphasized; and our extensive national and international research collaborations are increasingly productive.

Our warmest congratulations go to the recipient of the Ian Wark Research Institute Medal for 2009, Dr Nasrin Ghouchi Eskandar, a graduate of Tabriz University of Medical Sciences, Iran.

Max Richards AM FTSE
Chairman
June 2010
It is with great pleasure that I present my Director's Report for 2009. During the year, The Wark has made great progress in the recruitment of key high level staff, we have continued to publish strongly in high impact journals, developed a number of commercialisation initiatives, as well as key scientific breakthroughs, established new facilities, recruited fine PhD students and developed a swathe of new research initiatives.

Over 80% of our publications appear in ARC categorised A and A* journals. These publications also reflect the extensive national and international research collaborations of The Wark. Our publications are highly cited which gives me great confidence that the Institute will fare very well in the Excellence in Research for Australia (ERA) initiative. The latter has been initiated by the Federal Government and managed by the Australian Research Council.

The Wark has a Strategic Plan, “Wark 2016”, which has received enormous support from our Advisory Board and the University. As one outcome, we embarked upon the recruitment of staff at professorial level and made an extensive search during 2009.

There was intense interest in our professorial posts. From an excellent field we have appointed two outstanding scientists to new positions in The Wark. The first appointment is Professor Dayang Wang, who was a Group Leader, Max Planck Institute for Colloids and Interfaces, and the second is Professor Thomas Nann, who was the Chair in Nanosciences, University of East Anglia, United Kingdom. Both of these appointees will commence with us during the first half of 2010. Internally, Jonas Addai-Mensah and Bill Skinner were appointed to full Professor. Jonas is Professor of Chemical and Interfacial Engineering, whilst Bill occupies the position of Professor of Interface Analysis and Synchrotron Science. Naba Dutta was also promoted to Associate Professor in Polymer Interfaces. Mihail Popescu and Benjamin Thierry were promoted to Senior Research Fellow, whilst Craig Priest and Vera Lockett are now Research Fellows. Phil Souter, one of the lynch pins of our Workshop, was promoted to Higher Education Officer Level 6. All of these promotions were richly deserved and have strengthened The Wark tremendously.

New research staff include Akira Otsuki from Waseda University, Japan. Luke Parkinson and Zofia Swierczek, along with Simon Doe joined our Scientific Services team. Liz Blackmore occupies the role of Research Degrees/Project Officer, whilst Teresa Duncan is providing welcome support to our busy Minerals team.

In the departure lounge, Tim Barnes was appointed to a lecturing position in the Sansom Institute, whilst Renate Fetzer is now employed by Karlsruhe Institut für Technologie as a Staff Scientist. Roger Horn left The Wark after a magnificent 17 years as a Senior Professor and Deputy Director. He is now at Deakin University, where he is Director, Research Training. Roger still comes back to visit us regularly but we miss him greatly on both scientific and personal levels. Ivan Kempson is now Associate Professor at the Institute of Physics at the National Synchrotron Radiation Research Center in Taiwan. Nicola Sleep has left us for an extended European holiday, whilst Su Nee Tan has joined CSIRO Process Science and Engineering as a Research Scientist. Whilst we are sad that these and other staff have departed, there is also much joy in seeing them play important roles in other institutions.

I commend to you our research highlights section of this report. We have now made very significant advances in developing new liquid membranes for fuel cell applications in showing that dewetting dynamics can be controlled by contact line pinning and for the first time, showing how partly soluble drugs can be delivered using microcapsules.

Our funding from the Australian Research Council Discovery and Linkage Grant schemes, NHMRC and kindred granting agencies continues to be very strong. Catherine Whitby was awarded a Future Fellowship in the first round of this years grant awards through the Australian Research Council, whilst Benjamin
Thierry is supported by the NHMRC on a Career Development Fellowship. Spomenka Simovic is the recipient of the Hypatia Postdoctoral Fellowship. These awards recognize the breadth and depth of the capabilities of our younger research staff. Craig Priest was one of Australia’s Fresh Scientists and the only South Australian.

Our commercialisation activities are proceeding extremely well. As an example, our LipoCeramic™ technology is receiving wide international interest.

During 2009, we installed and commissioned approximately AU$5 million worth of new equipment in surface characterization and nanofabrication.

The Materials and Minerals Science Learning and Research Hub has now been planned in detail and “M²” will commence early in 2010, with completion by November 2011.

Our PhD student recruitment continues to attract a wide range of students from Australia, Asia, Europe, South Africa and South America. It is an enormous pleasure to have these splendid individuals with us and the mix of different cultures in The Wark provides a very enriching environment.

In 2009 we commenced a major new project with CSIRO under the Minerals Down Under initiative. This deals specifically with the agglomeration of nickel laterites.

Excellent progress has been made and a number of breakthrough, potentially transformational, technologies have been identified which will enable the industry to make substantial changes to current practice. As a result, there should be substantial reductions in energy and water usage, as well as capital expenditure. The Institute has also identified a number of new research areas in energy and nanobiotechnology where major market applications are feasible. I expect to report on the success of these initiatives in my 2010 Report.

Despite the global financial crisis impinging upon The Wark, we have made up for any funding shortfalls by our increased success from other funding bodies. As the “GFC” subsides, we expect to see a substantial increase in industry funding.

Our Advisory Board has a number of new members, and, along with our Research and Technology Advisory Committee, in conjunction with the wise counsel of the Vice Chancellor and Deputy Vice Chancellor: Research & Innovation, has provided outstanding support for The Wark in 2009. My sincere thanks are extended to all of our sponsors, the University and all members of The Wark family for their marvellous contributions in 2009.

John Ralston AO FAA FTSE
Director
June 2010
The University of South Australia has created the Materials and Minerals Science Learning and Research Hub at the Mawson Lakes campus. Bringing together UniSA’s flagship Ian Wark Research Institute (The Wark™) and the Mawson Institute, along with the School of Mathematics and Statistics, the hub is intended to be a nexus for innovative learning, teaching and high quality research as well as engaging industry and the broader community in its activities.

At the heart of the hub is the new $50 million M² Building; a 5600m², 3-storey building, housing teaching and research laboratories, undergraduate study areas and an industry enclave. The building will facilitate the engagement between undergraduate and postgraduate coursework science and engineering students, higher degree research students, leading researchers and industry stakeholders in a flexible, open and creative space aimed at stimulating innovation.

M², in keeping with the University’s stated environmental commitment, is designed to be an eco-friendly building that will achieve a minimum 5-star Green Star rating from the Green Building Council of Australia. It is designed to be ‘transparent’, to allow the community to see in and help demystify the teaching and research activities and will effectively re-orient the campus to engage more directly with the Mawson Lakes community.

Industry partners are invited to fully engage in the teaching and research by the provision of office and ancillary spaces in a dedicated technology transfer node. Breaking down these traditional barriers will enhance the learning experience of students, allowing them exposure to potential employers and to benefit from the ‘real world’ perspectives of industry partners. It will also serve to revolutionise the university-industry research relationship, allowing them to work side-by-side in an active partnership instead of the more traditional periodic reporting relationship.

The building will contain 10 state-of-the-art teaching and research laboratories ranging from micro computer aided tomography, to minerals research, nano- and biotechnology and through to cell therapy – totalling approximately 1000m². It will house a unique, technology rich lecture theatre, with fully immersive audio-visual systems in a challenging, yet engaging, discussion forum. These facilities will be wired to ‘export’ the activities to other areas within the building or elsewhere in the world.

The new facilities will allow The Wark to further its long standing partnerships with the giants of the global resources world - names like BHP-Billiton, Rio Tinto and Anglo Platinum - to develop new and highly innovative mineral recovery technologies. These new systems include nano-scale mineral separation and recovery using microfluidics - lab on a chip - systems as well as continuing to refine and advance traditional recovery methodologies.

The building is scheduled for completion in November 2011.
Management Structure

University of South Australia Council

Office of the Deputy Vice-Chancellor (Research and Innovation)

Advisory Board

Research and Technology Advisory Committee

Director Laureate Professor John Ralston

Corporate Services

Executive Policy and Planning Committee

Scientific Services

Bio and Polymer Interfaces Sector Co-ordinator Prof Clive Prestidge

Colloids and Nanostructures Sector Co-ordinator A/Prof Daniel Fornasiero

Mineral Processing Sector Co-ordinator Prof Stephen Grano
Advisory Board

The Advisory Board convened on two occasions during 2009. Members were:

Dr Max Richards (Chair)  Chair, School of Botany Foundation, University of Melbourne
Dr Matthew Cuthbertson (Deputy Chair)  Chief Executive Officer, CRC for Advanced Automotive Technology Ltd
Prof Calum Drummond  Chief, CSIRO Materials Science and Engineering
Dr Chris Goodes  General Manager Innovation - Recovery, Rio Tinto Technology & Innovation
Dr Rachel Lucas  Director, RLC Pty Ltd
Dr Jim May  Former Chief Executive, AMIRA Ltd
Prof Caroline McMillen  Deputy Vice Chancellor and Vice President - Research and Innovation, University of South Australia
Ms Ann Nelson  Deputy CEO/Director Bioscience Infrastructure, BioInnovation SA
Mr Joe Pease  Chief Executive, Xstrata Technology
Dr Neville Plint  Head, Research & Development, Anglo Platinum Ltd
Laureate Prof John Ralston  Director, Ian Wark Research Institute, University of South Australia
Dr Leanna Read  Managing Director and CEO, TGR BioSciences Pty Ltd
Dr Andrew Shook  Chief Technology & Information Management Officer, Uranium Customer Sector Group, BHP Billiton
Mr Antony Simpson  Past Chair, Mason & Cox Pty Ltd
Mr Keith Smith  Managing Director, Oncaidia Pty Ltd
Ms Madelene Pierce (Executive Officer)  Ian Wark Research Institute, University of South Australia

Research and Technology Advisory Committee

The Research and Technology Advisory Committee, which convenes biennially, visited the Institute from 25-29 May 2009. The visit included several days of intensive discussions with staff and students, followed by a presentation and written report to the Advisory Board. Members were:

Prof Brian Vincent (Chair)  Leverhulme Professor of Physical Chemistry and Director, Bristol Colloid Centre, University of Bristol, United Kingdom
Dr Terry Blake  Surface Science Kodak (retired), United Kingdom
Dr Matthew Cuthbertson  Chief Executive Officer, CRC for Advanced Automotive Technology Ltd, Australia
Prof Cyril O’Connor  Director, Centre for Minerals Research, University of Cape Town, South Africa
Prof Marcus Textor  Laboratory for Surface Science and Technology, ETH Zurich, Switzerland
Ms Madelene Pierce (Executive Officer)  Ian Wark Research Institute

Executive Policy and Planning Committee

The Executive Policy and Planning Committee met on a monthly basis and comprised:

Laureate Prof John Ralston (Chair)  Director
A/Prof Jonas Addai-Mensah  Dean, Research Education
Dr David Beattie  Academic Staff Representative
A/Prof Daniel Fornasiero  Sector Coordinator: Colloids and Nanostructures
Prof Stephen Grano  Sector Coordinator: Mineral Processing
Prof Hans Griesser  Deputy Director (Industry)
Mr Craig Hackney  Facilities & Information Systems Manager
Ms Wendy Harrington  Postgraduate Student Representative
Prof Roger Horn  Deputy Director (Academic)
Mr Paul Luppino  Professional Staff Representative
Mr Philip Moore  Manager: Scientific Services
Prof Clive Prestidge  Sector Coordinator: Bio and Polymer Interfaces
Ms Sandra Ray  Operations Manager
A/Prof Bill Skinner  Academic Staff Representative
Dr Terry Wilks  Institute Manager
Mrs Liz Blackmore (Executive Officer)
Staff

Director
Laureate Professor John Ralston, AO FAA FTSE FRACI BSc(Hons) MSc DipEd PhD Melbourne DIC London, UK Dr.h.c Abo Akademi, Finland

Deputy Directors
Professor Hans Griesser, DipChem SciTeachingCert PhD ETH Zurich, Switzerland
Professor Roger Horn, BSc(Hons) Monash PhD Cambridge, UK

Institute Manager
Terry Wilks, BSc(Hons) MSc PhD Newcastle, UK

Research Professors
Stephen Grano, BMetEng(Hons) Queensland MAppSc SAIT PhD UniSA
Clive Prestidge, BSc(Hons) Loughborough, UK PhD Bristol, UK
Namita Roy Choudhury, BSc(Hons) BTech MTech(Hons) Calcutta, India PhD Kharagpur, India

Associate Research Professors
Jonas Addai-Mensah, BEng(Hons) USIT, Ghana MSc TIIT, Israel PhD Queensland
Daniel Fornasiero, Maitre es Science Grenoble, France PhD Adelaide
Sunil Kumar, BSc(Hons) MSc(Hons) GNDU, India PhD IIT, Delhi, India
William Skinner, BSc Melbourne BAppSc PhD RMIT

Senior Research Fellows
David Beattie, BSc(Hons) PhD Edinburgh, UK
Jason Connor, BAppSc(Hons) Central Queensland PhD UniSA
Naba Dutta, BSc(Hons) BTech Calcutta, India PhD Kharagpur, India
Dusan Losic, BSc Novi Sad, Serbia PhD Flinders
Hamid Manouchehri, BSc MSc(Hons) Tehran, Iran PhD Lulea, Sweden
Satomi Onishi, BSc Tokyo University of Science, Japan MSc Ibaraki, Japan PhD Saitama, Japan
Rossen Sedev, MSc University of Sofia, Bulgaria PhD Bulgarian Academy of Sciences, Bulgaria

Research Fellows
Igor Ametov, BSc PhD Moscow State, Russia BEng Adelaide
Timothy Barnes, BAppSc(Hons) UniSA GradDipEd Adelaide PhD UniSA
Rick Fabretto, BSc(Hons) Flinders BEd PhD UniSA
Saeed Farrokhpay, BSc MSc Amir Kabir, Iran PhD UniSA
Sabina Gredelj, BEng(Hons) PhD UniSA
Colin Hall, BAppSc(Hons) UniSA
Sarah Harmer, BAppSc(Hons) PhD UniSA
Ivan Kempson, BAppSc(Hons) PhD UniSA
Akira Otsuki, BEng MEng Akita, Japan PhD University of Tokyo, Japan
Mihail Popescu, MSc Bucharest, Romania PhD Emory, USA
Spomenka Simovic, BSc MSc Belgrade, Yugoslavia PhD UniSA
Benjamin Thierry, BEng INP Grenoble, France MSc Montreal, Canada PhD McGill, Canada
Catherine Whitby, BSc(Hons) UNSW PhD Melbourne
Massimiliano Zanin, BEng Trieste, Italy PhD Cagliari, Italy

Research Associates
Artem Borysenko, MSc Kharkiv State, Ukraine PhD National Academy of Sciences, Ukraine
Venkata Ramana Chimala, BEng Sardar Vallabhbhai National Institute of Technology, India PhD Indian Institute of Science Bangalore, India
Renate Fetzer, Dip Physics Ulm, Germany PhD Saarland, Germany
Tatiana Khmelova, MEing Ural Polytechnic, Russia PhD UniSA
Marta Krasowska, MSc Maria Curie Sklodowska University, Poland PhD Polish Academy of Sciences, Poland
Mahaveer Kurkuri, BSc Karnatak University, India MSc Mysore University, India PhD Karnatak University, India
Vera Lockett, MSc Ural State, Russia PhD Russian Academy of Science, Russia
Sundar Mayavan, BTech Central Electrochemical Research Institute, India MSc Anna, India
Agnieszka Mierczynska-Vasilev, MSc PhD Lodz, Poland
Chi Ndi, BSc Buea, Cameroon MSc Leiden, The Netherlands PhD UniSA
Craig Priest, BAppSci(Hons) PhD UniSA
Surya Subianto, BAppSci(Hons) PhD QUT
Hui Tan, BEng Hunan, PR China DipChemEng
MSc Stellenbosch, South Africa PhD Melbourne
Su Nee Tan, BSc Tulane, USA MSc Minnesota, USA PhD UniSA
Jingfang Zhou, BSc(Hons) Xiamen, PR China MSc Henan, PR China PhD UniSA

Scientific Services
Scott Abbott, BA(BAppSci(Hons)) PhD UniSA
Chris Bassell, BA(BAppSci) BEng UniSA
John Denman, BA(BTech BSc(Hons)) Flinders PhD UniSA
Liping Ding, BEng(Hons) MEng Northeastern, PR China, PhD Queensland
Simon Doe, BEng Nottingham, UK DipWeldingEng TWI, UK GradCertTechComm Melbourne
Aleksandt Kaplun, BSc Kiev State, Ukraine
Philip Moore, Advanced Chem Plant Operation Poole Tech College, UK DipOH&S Management NSC, Adelaide
Ray Newell, BSc MSc UNSW PhD UniSA
Dennis Palms, MSc PhD Johannes-Gutenberg, Germany
Luke Parkinson, BSc Adelaide, BSc(Hons) Queensland
Maria Provatas, BSc Flinders BAppSc UniSA
Keith Quast, BAppSc MApplSc SAIT
Andrew Robinson, BAppSci SAIT DipOHS&W TAFE Cert IV Workplace Training & Assessment TAFE
Zofia Swierczek, MSc AGH University of Science and Technology, Poland
Eric Tavenner, BSc Missouri-Rolla, USA MSc Southwest Missouri State, USA PhD Queensland

Research and Technology Support
Michael Bottroff, Cert IV Info Tech TAFE
Louie Del Castillo, BSc Unciano Medical College, Philippines
Darren Faulkner, Fitting & Machining App, Adv Cert Engineering TAFE
Simon Field, Cert III Mech Eng TAFE Adv Dip Engineering TAFE GradCertBusAdmin UniSA
Peter Gray, Post Trade Cert Kilkenny Elect College
Craig Hackney, SciTechCert SAIT BBus UniSA
Marek Jasieniak, BSc(Hons) Cracow, Poland
Czeslaw Poprawski, DipMechEng TUW, Poland SciTechCert SAIT
Rada Pushkarova, BEng Kiev, Ukraine PhD UniSA
Nicola Sleep, BTech BSc(Hons) Flinders
Phil Souter, Post-trade Certificate TAFE

Administration
Liz Blackmore, DipBusMgmt Business SA
Paul Byrne, BA (Hons) Adelaide
Teresa Duncan, Cert III Business (Admin) TAFE
Julie Freytag
Kim Gauci
Tracy Greeneklee, Cert IV Business (Admin) TAFE
Cert IV Info Tech TAFE DipBusAdmin TAFE
Christina Koutlakis
Paul Luppinno, AssDipAcc TAFE
Madeleine Pierce, BA(Hons) Flinders
Kathryn Prohaska
Sandra Ray, GradDipMgmt MBA UniSA
Baden Smith, AssDipAdvGraphicDes TAFE
Maureen Terry
Paul Wotley, BSc(Hons) Adelaide
Kerry Zweck, Cert IV Business (Admin) Jobs Statewide
Adjunct Research Professors
Dr Terry Blake, Visiting Professor, University of Mons-Hainaut, Belgium and Past Head, Surface Science Kodak, United Kingdom
Dr M Iko Burgar, CSIRO Materials Science and Engineering, Victoria, Australia
Dr Bart Follink, Chief of Division, CSIRO Process Science and Engineering, Victoria, Australia
Prof Takehiko Kitamori, Department of Applied Chemistry, University of Tokyo, Japan
Prof Ron Martin, Department of Chemistry, University of Western Ontario, Canada
Prof Wayne Nesbitt, Department of Earth Sciences, University of Western Ontario, Canada
Prof Jordan Petrov, Institute of Biophysics, Bulgarian Academy of Sciences, Sofia, Bulgaria
Dr Allan Pring, South Australian Museum, Adelaide, Australia
Prof Jarl Rosenholm, Physical Chemistry, Abo Akademi, Turku, Finland

Adjunct Research Associate Professor
Dr Nataliya Mishchuk, Institute of Colloid and Water Chemistry, National Academy of Sciences, Kiev, Ukraine

Adjunct Senior Research Fellows
Mr George Levay, Levay & Co Environmental Services, Adelaide, Australia
Dr Ray Shaw (retired), Rio Tinto Group, Victoria, Australia
Dr Robert Sumner, BHP Billiton, Adelaide, Australia
Dr Marek Zbik, Queensland University of Technology, Queensland, Australia

Adjunct Research Fellows
Dr Joan Thomas, Jefferson Lab (The College of William and Mary), Virginia, USA
Dr Gunhild von Oertzen, Consultant in Numerical Modeling and Energy Distribution, Namibia

Left to right: PhD student Mr Daniel Chipfunhu, Dr Igor Ametov and Dr Jason Connor.
**Postgraduate Students**

**Degrees Awarded**
Nasrin Ghouchi Eskandar, PhD in Applied Science
Mingzhao He, PhD in Applied Science

**PhD Students**
Nick Absalom BSc(Hons) Flinders
Robert Acres BSc Nanotechnology (Hons) Flinders
 Furqan Ahmed MBBS MCPS Sindh Medical College & Jinnah Post-graduate Medical Centre Karachi, Pakistan MPhil University of Karachi, Pakistan
Yamini Akkamsetty BPharm St Peters Institute of Pharmaceutical Sciences, India MSc Flinders
Trent Albrecht BSc(Hons) UniSA
Moom Sinn Aw BChemEng(Hons) Adelaide
Audrey Beaussart MEng European School of Materials Science and Engineering, Nancy, France
Xun Bian BEng MEng Wuhan University of Technology, PR China
Susana Brito E Abreu BEng Licenciado Instituto Superior de Engenharia de Lisboa, Portugal
Chiu Ping Chan BSc(Hons) UniSA
Joseph Chan BSc(Hons) Flinders
Daniel Chipfunhu BSc(Hons) MSc University of Zimbabwe
Martin Cole BSc(Hons) Flinders
Jessica Cook BSc (Hons) UniSA
Lorena Del Castillo BSc MSc University of the Philippines
Terry Dermis BSc(Hons) UniSA
Ivan Djordjevic BAppSc BSc(Hons) UniSA
Yusuf Ferdosi BSc(Hons) Aligarh Muslim University, India MSc University of Allahabad, India MPhil Bangladesh University of Engineering & Technology, Bangladesh
Mariya Foundas BProcessEng(Hons) Moscow State Institute of Food, Russia
Jairo Garnica Rodriguez BEng Universidad Nacional de Colombia, MEng MPhil Queensland
Carlos Gontijo Eng de Ninas Universidade Federal do Minas Gerais, Brazil
Aravind Govindaraj Kannan BTech Central Electrochemical Research Institute, India
Colin Hall BAppSc(Hons) UniSA
Wendy Harrington BSc(Hons) UniSA
Allister Henderson BSc(Hons) Adelaide
Lachlan Hyde BSc (Hons) Flinders
Karyn Jarvis BAppSc BSc(Hons) UniSA
Li Jiang BSc Ludong, PR China MSc Tianjin, PR China
Yogesh Kalegowda BSc MSc Kuvempu University, India
Jessica Kinal BEng(Hons) Curtin
Hua Li BPhil/BA MPhil Tianjin, PR China
Sundar Mayavan BTech Central Electrochemical Research Institute, India MSc Anna, India
Regis Mejard MEng Ecole Centrale de Lille, France MEng Universite des Sciences et Technologies de Lille, France
Mayur Mistry BAppSc BSc(Hons) UniSA
Solomon Muganda BSc(Hons) MPhil University of Zimbabwe
Ataollah Nosrati BSc Petroleum University of Technology, Iran MSc Tarbiat Modarres University, Iran
Muireann O’Loughlin BSc(Hons) National University of Ireland, Galway
Mani Paneru MTech IIT Bombay, India
Srinivas Parimi BSc Andhra, India MSc Griffith
Jin Sung Park BEng Yeungnam University, Korea MEng Ajou University, Korea
Luke Parkinson BSc Adelaide BSc(Hons) Queensland
Anuttam Patra BSc(Hons) Calcutta, India MSc IISc Bangalore, India
Thiru Ponnusamy Meenakshisundaram BEng(Hons) Regional Engineering College Trichy, India, MAAppSc UniSA
Lee San Puah BEng(Hons) University of Science, Malaysia
Gujie Qian BEng Tongji University, PR China MEng East China University of Science & Technology, PR China
Melanie Ramiasa DEUG Lycee Saint Louis, France Dip d’Ing ENSC Rennes, France
Andry (Laza) Randriamanjatoosa BEng Polytechnic University of Antananarivo, Madagascar MSc Tuebingen, Germany
Santanu Ray BSc MSc Jadavpur, India
Evgueni Resnianski BSc MSc Novosibirsk State, Russia
Ilana Sedeva MSc Sofia, Bulgaria Grad DipEd Adelaide
Yunyu Shi BChemEng East China University of Science and Technology, PR China, MChemEng Adelaide
Maria Sinche Gonzalez BEng San Agustin National University, Peru MMInRes Madrid Polytechnic University, Spain
Bogale Tadesse BEd Bahir Dar University, Ethiopia MSc Addis Ababa University, Ethiopia
Sin Ying Tan BEng(Hons) Curtin
Sandra Thompson BAppSc(Hons) UniSA
Diana Tran BChemEng(Hons) Adelaide
My Yung Truong BEng Adelaide
Valentin Vancea DipEng Transilvania University of Brasov, Romania
Moharaj Vellore Janarthanan BPharm JSS College of Pharmacy, India MPharm Curtin
Feng Wang BMed Guangxi College of TC Medicine, PR China MSc Waikato, New Zealand
Wenbo Wang BMinProc Southern Institute of Metallurgy, PR China MSc University of Science and Technology Beijing, PR China
Danfeng Xu BSc Northeastern, PR China MSc Tianjin, PR China
Die Yang BEng Anhui University, PR China MSc University of Science & Technology, PR China
Xiangfei Ye BEng Tianjin, PR China MSc Nanyang, Singapore Technical University of Munich, Germany
Kai Ying Yeap BChemEng(Hons) Adelaide
Hardi Ys BSc Syiah Kuala, Indonesia MSc Andalas, Indonesia
Yang Yu BSc Nankai University, PR China MSc Tianjin, PR China
Lin Zhou BChemEng Daqing Petroleum Institute, PR China MSc Tianjin, PR China

MEng Student
Djoko Jullianto BEng Institute of Technology Bandung, Indonesia
Major Research Sponsors and Donors

Major Research Sponsors

The Wark's sponsors include the Australian Federal and State Governments, as well as major national and international companies from the minerals and materials processing, chemical, pharmaceutical, biotechnology, specialty manufacturing and related industries.

AMIRA International Ltd
AngloGold Ashanti Limited
Anglo Platinum Ltd
AREVA
Australia-India Strategic Research Fund - Australian Government
Australian Research Council - Australian Government
BHP Billiton Ltd
Boliden Minerals AB
COREM
CP Kelco Oy
CRC for Advanced Automotive Technology
CRC for Polymers
CSIRO Flagship Collaboration Fund
CSIRO Process Science and Engineering
Department of Primary Industries & Resources - South Australian Government
Energy Exploration Ltd
Freeport-McMoRan Mining Company
ITEK Pty Ltd
Lundin Mining Corporation (Somincor)
Magotteaux Australia Pty Ltd
MMG Century
Mount Sylvia Diatomite Pty Ltd
National Collaborative Research Infrastructure Strategy - Australian Government
National Health and Medical Research Council - Australian Government
Newcrest Resources Inc
Ok Tedi Mining Ltd
Orica Australia Pty Ltd
Outotec
OZ Minerals Ltd
Penfold Australia Ltd
Premier's Science & Research Fund - South Australian Government
Prostate Cancer Foundation of Australia
pSivida Ltd
Rio Tinto Kenecott Utah Copper
Rio Tinto Ltd
RMS Foundation
Silver City Mining Company Ltd
SMR Automotive Australia Pty Limited
Teck Ltd
Tiwest Joint Venture
Vale Inco Ltd
Xstrata Qld Ltd
Xstrata Technology
ZBB Technologies Ltd

Donors

The Wark also receives generous donations from individuals and organisations through The Wark Fund. The fund was established in 2008 to help underpin the activities of The Wark. Donated funds may be used to support postgraduate scholarships, postdoctoral fellowships, the acquisition of major equipment, academic research or other special projects.

We thank all donors for their continuing interest and practical support by investing in our future.

For further information on The Wark Fund, please visit www.unisa.edu.au/giving/fundingpriorities/Wark.asp
Research Funding

Funding Division - 2009

- Federal/State Government: 35.6%
- Industry: 34.3%
- University of South Australia: 29.2%

Operating Revenue for the Period 2000 - 2009
International Collaboration

The Wark has formal partnerships and agreements with institutions in 12 countries to promote international cooperation in research and research education. During 2009, our collaborative activities focused on the following highly prestigious institutions.

**Indian Institute of Science, Bangalore, India**

*Collaborative activities in the area of physical chemistry, surface engineering, nanotribology.*

The Wark and the Indian Institute of Science (IISc) in Bangalore together hold an international collaborative grant ‘Fluid Flow and Lubrication at the Nanometre Scale’ under the Australia-India Strategic Research Fund. This bilateral fund is co-sponsored by the Australian Government through the Department of Innovation, Industry, Science and Research and the Indian Government through its Department of Science and Technology.

One of the activities sponsored under this grant is a series of workshops held jointly between the two institutions, allowing the researchers with an interest in the project to meet and discuss research directions and results.

*Dr Souvik Math from the Indian Institute of Science, Bangalore, showing their surface force apparatus.*
*Photo by Rossen Sedev*
During 2009, the 2nd Indo-Australian Workshop was held in Bangalore from 23-25 November. The Wark delegation consisted of Laureate Prof John Ralston, Dr Rossen Sedev, Dr Craig Priest, Dr Satomi Onishi, Dr Catherine Whitby and Dr Jason Connor. The Wark presentations included a wide range of topics including Dynamic Wetting, Electrowetting, Microfluidic Extraction, Film Stability, Particle Attachment and Corrosion. From the IISc, speakers included Prof Sanjay Biswas, Prof K Ganapathy Ayappa, Dr Rashi Ranjan Sahoo, Mr Foram Thakkar and Dr Raghuraman M Govardhan. They covered topics ranging from Lubrication and Tribology of Suspensions to Structure and Dynamics of Confined Water, Polymer Grafted Membranes and Flow over Textured Surfaces. The workshop was well-attended and generated significant discussion on future plans for the Indo-Australian collaborative project.

A number of visits were undertaken to coincide with the Workshop:

- Several weeks prior, Dr Satomi Onishi visited the Department of Mechanical Engineering at the IISc. She worked closely with Prof Sanjay Biswas, Dr Souvik Math and a PhD student, Mr Deepak Kumar. Atomic force microscopy was used to study experimentally the frictional properties of model surfaces under various humidity conditions.

- On 25 November, The Wark delegation visited the Interdisciplinary Centre for Nanoelectronics and Nanoengineering at the IISc. Professors Bhat and Pratap gave an overview of the facility, major aims, key programs and recent developments (including their new building and equipment acquisitions). The ensuing discussion focused on common research, technical and management problems.

Graduate School of Engineering, University of Tokyo, Japan

Collaborative activities in the area of physical chemistry and interfacial physics. Professor Takehiko Kitamori is an Adjunct Research Professor at The Wark, and Laureate Prof John Ralston is a Fellow of the Graduate School of Engineering.

The Wark and the Graduate School of Engineering at the University of Tokyo have a long-standing collaboration on the fundamental physical chemistry and interfacial physics of liquids in micro- and nano-fluidic devices. The successful operation of micro- and nano-fluidic devices relies heavily on interfacial phenomena that can be manipulated by chemical and physical modification of channel walls. This collaboration brings The Wark’s expertise in interfacial science together with the University of Tokyo’s outstanding track record in micro- and nano-fluidics research to create new knowledge in this interdisciplinary area.

This collaboration was strengthened in 2009 by a short-term visit by Mr Ryo Ishibashi (University of Tokyo) to The Wark for an experimental study of the wettability of microstructured surfaces, hosted by Dr Craig Priest. The visit (13 July – 2 August) successfully laid a platform for ongoing research in the field of structuring channels for microfluidic applications.

The Wark hosted a joint Micro and Nanofluidics Workshop from 14-15 December. Eight participants from the University of Tokyo (Prof Takehiko Kitamori, Prof Yasuhiro Sugii, Dr Kazuma Mawatari, Dr Xu Yan, Mr Katsuyoshi Takahashi, Mr Kyojiro Morikawa, Mr Ryo Ishibashi, and Mr Takuya Murao), Dr Takehiko Tsukahara from the Tokyo Institute of Technology, and seven participants from The Wark (Laureate Prof John Ralston, Dr Rossen Sedev, Dr Catherine Whitby, Dr Craig Priest, Dr Mahaveer Kurkuri, Dr Jingfang Zhou, and Ms Melanie Ramiasa) presented their latest research. Seminars were followed by detailed discussions on scientific developments and future collaboration between the University of Tokyo and The Wark.

The Australian Research Council awarded a Discovery Grant for a joint research project titled ‘Energy dissipation and nanoscale processes at moving contact lines’. The Chief Investigators are Laureate Prof John Ralston, Prof Siegfried Dietrich (MPI-MR), Prof Takehiko Kitamori (University of Tokyo), Dr Rossen Sedev and Dr Mihail Popescu.

Max Planck Institute for Metals Research, Stuttgart, Germany

Collaborative activities in the area of physical and interfacial chemistry, in particular the wetting of structured surfaces and solid-liquid interfaces. The Wark’s collaboration with the Max Planck Institute for Metals Research (MPI-MR) continued during 2009. As indicated above, Prof Siegfried Dietrich from the MPI-MR is a Chief Investigator on a new, collaborative research project in the area of wetting phenomena.

Additional research activities revolved around two primary areas:

- Chemically active colloids, involving Dr Mihail Popescu and Laureate Prof John Ralston (from The Wark) and Prof Siegfried Dietrich and Dr Mykola Taskinkevych (from the MPI-MR). Dr Popescu visited the MPI-MR on three occasions - one week each time, in January, August and November. Outcomes included the publication of a joint paper ‘Phoretic motion of spheroidal particles due to self-
generated solute gradients’ in The European Physical Journal E, as well as the preparation of two research proposals for submission in 2010.

• Ionic liquids, structure and properties, involving Laureate Prof John Ralston, Dr Rossen Sedev and Dr Vera Lockett (from The Wark) and Dr Markus Bier (from the MPI-MR). Dr Bier visited The Wark in May to combine experimental results from The Wark with simulation results from the MPI-MR. The outcomes were promising and further work is planned.

Materials Research Center, Swiss Federal Institute of Technology, ETH Zurich, Switzerland

Collaborative activities in the area of biomaterials. A proposal for collaborative research on novel antibacterial coatings for biomedical materials and implants was developed jointly between researchers at the ETH, the University of Basel, the EPF Lausanne, The Wark, and three companies. The proposal is based on novel antibacterial chemicals identified in Australian plants. A key aim is to develop efficient coating technologies for application to a range of biomedical devices and implants. Another key aim is to elucidate the biomolecular mechanism of action of these compounds. The application was submitted to the Swiss CCMX Scheme and has been awarded funding.

Prof Marcus Textor from the Laboratory for Surface Science and Technology is also a significant contributor to The Wark through membership of our Research and Technology Advisory Committee.
ITEK, the commercialisation arm of the University of South Australia, is working closely with The Wark in relation to commercialisation opportunities. The accompanying table lists technologies/patents which are in various stages of development. The following are discussed by way of example:

**LipoCeramic™ Drug Delivery Technologies**

Based on hybrid materials composed of lipids and nanoparticles, this innovative drug delivery technology developed by Prof Clive Prestidge and team enables “difficult” drugs to be administered to patients with greater absorption and via unique mechanisms. Proof of concept has been established for improved oral delivery of both poorly soluble drugs and proteins by using LipoCeramic™ microcapsules, and also improved dermal delivery for cosmetic and pharmaceutical actives ingredients.

Considerable commercial opportunities exist through the re-engineering of pharmaceutical products with better performance, e.g. efficacy/toxicity and stability.

ITEK has assisted the research team in establishing patent protection via four patent ‘families’ and taking the technology from concept to a viable commercial opportunity. The focus is now on implementing the commercialisation strategy by extending commercial partnerships and enabling human clinical trials.

**Microfluidic Mineral Separation**

Led by Laureate Prof John Ralston, The Wark has been funded, under the National Collaborative Research Infrastructure Strategy (NCRIS), as the South Australian node of the Australian National Fabrication Facility (ANFF) and has established a new facility unique to Australia, specializing in the design, fabrication and development of microchips and nanostructures for micro and nanofluidics.

Additional ANFF funding was announced in the 2009 Federal budget, via the Education Investment Fund (EIF), which will see micro- and nano-tomography (miniature ‘cat scans’), and a range of quality assurance tools added to the existing ANFF-SA facility at The Wark. This brings the total capital investment to over $12 million.

An example of the application of such technology is microfluidic solvent extraction,
which is traditionally employed in high-value, low-volume separations for analytical applications. Microfluidics, however, is equally suited to intensify industrial processes, such as mineral processing where larger samples must be processed at high rates and with maximal product yields. Microfluidic solvent extraction is advantageous as it offers a smaller footprint, a closed system with no moving parts contacting the fluids, the possibility to use smaller volumes of solvents, negligible evaporation, better control over aggressive or hazardous substances, and easier recycling.

ITEK has been involved in the ongoing development of the patent strategy, and commercial and industry validation.

**Antimicrobial Coatings**

A platform technology based on antimicrobial coatings has been developed by researchers from The Wark (Prof Hans Griesser) and the Sansom Institute (Dr Susan Semple). The significance of this project relates to the enormous medical problems and costs that bacterial infections associated with implants and biomedical devices cause. A solution to the problem will bring quality-of-life benefits to patients, cost benefits to the health system, and commercial benefits to the manufacturer(s) of antibacterial coated biomedical devices. This technology platform hinges on novel antibacterial compounds that have been recently extracted and identified from Australian plants of the genus *Eremophila*. These compounds are being coated, by staff employed under an NHMRC Development Grant, as thin layers onto model materials used for biomedical device fabrication and evaluated for their ability to deter colonization by several biofilm-forming human pathogenic bacteria. Tests have shown that such coatings can prevent bacterial colonisation of coated surfaces from suspension and subsequent biofilm formation by the human pathogen bacterium *Staphylococcus epidermidis*. Pre-clinical safety testing with mouse fibroblast cells has shown encouraging compatibility; the work now needs to advance to more sophisticated bacteriological tests prior to application onto real-life biomedical products. An international collaboration has been initiated to elucidate the antibacterial mechanism of action of these novel antibiotics.

ITEK has assisted the team to raise funds via an NHMRC Development grant, and a Commercial Development Initiative grant from BioInnovationSA, and has conducted extensive market research in the area and supported patent protection of the technology, which is currently in PCT phase. Legal support was also provided to Prof Griesser who secured additional funding from, and a license to, an orthopaedics company. ITEK expects to engage in further industry development and validation once the current research milestones are complete.

| Patents List |
|------------------|------------------|
| **Patent Title** | **Status**       |
| A Process and Device for Effecting Selective Separation of Particles | Patent pending |
| Active Polymeric Films | Patent pending |
| Agents and Methods for Photodynamic and/or Photothermal Therapy | Patent pending |
| Antimicrobial Surfaces | Patent pending |
| Bioactive Coating of Biomedical Implants | Patent pending |
| Bubble Generation Apparatus | Patent pending |
| Capsule Formation by Nanoparticles | Patent pending |
| Dried Formulations of Nanoparticle-Coated Capsules | Patent pending |
| Drug Release from Nanoparticle-Coated Capsules | Patent pending |
| Extraction Apparatus and Processes | Patent pending |
| Fabrication of Nanoparticles on Solid Surfaces | Patent pending |
| Formation of Nanoporous Materials | Patent pending |
| Nanoparticle-coated Capsule Formulation for Dermal Drug Delivery | Patent pending |
| Nanoparticle-coated Capsule Formulation for Treatment of Inflammation | Patent pending |
| Photoresponsive Surfaces | Granted |
Research Highlights

Facilities

**ANFF-SA Open for Business**

Australia now has a world-class micro and nanofabrication facility dedicated to research and development of microfluidic chips. The South Australian node of the Australian National Fabrication Facility (ANFF-SA), established at The Wark, opened a Class 1000 and Class 100 clean room facility in April 2009. The facility boasts a photolithography suite with SussMicroTec and EVGroup fabrication tools, including a mask aligner with nano-imprint lithography capabilities and substrate bonder capable of hot embossing glass (650°C, 60 kN). Complementary fabrication equipment includes a deep reactive ion etcher (ULVAC NLD570) for oxide etching and a Kira micromachining tool for generating precise structures from the nm to mm scale. The facility is already making an impact on research projects across the country from the eastern states to Western Australia, with growing interest.

**Powerful Mass Spectrometry Tool Commissioned**

The Wark has even greater capability in surface analysis with the addition of the PHI TRIFT V nanoToF. This powerful mass spectrometry instrument was commissioned at The Wark in 2009, as an integral part of the Australian Microscopy and Microanalysis Research Facility (AMMRF). This Time-of-Flight Secondary Ion Mass Spectrometer (ToF-SIMS) is unique in its ability to combine surface sensitivity, spatial resolution and chemical specificity with parallel detection of atomic and molecular species, both organic and inorganic in nature. The instrument combines TRIFT analyser performance, revolutionary versatile sample handling and four high performance ion gun options to enable analysis of a wide range of samples with unprecedented sensitivity. This analytical support will enable progress in a wide range of areas and represents a research capability unique in Australia.

New Projects and Funding

**Shape Controlled Electro catalyst for Clean Energy**

Naba Dutta, Namita Roy Choudhury, Steven Holdcroft (Simon Fraser University, Canada), Christopher Elvin (CSIRO Livestock Industries, Brisbane), Anita Hill (CSIRO Materials Science and Engineering, Clayton), Shape Controlled Nanostructured Electro catalyst for Clean Energy Generation (ARC Discovery Grant).

The development of alternative clean energy technology is critical to reduce carbon emissions and global warming. This project will bring significant benefits to the Australian community and economy by developing highly efficient supported catalyst, with a focus on the cost and efficiency of clean electrochemical energy conversion devices. An increase in the catalyst efficiency would translate to a significant cost saving and deliver to the nation a strong intellectual property (IP) position in this frontier technology. The fundamental understanding will also underpin the growth in other catalysis areas including sensors, environment pollution and efficient chemical production.
Nano-Ratchets for Biomolecule Separation

Dusan Losic, Lee White (Mathematics and Statistics, UniSA), Wanlin Guo (Nanjing University of Aeronautics and Astronautics, PR China), Periodic Nano-Ratchets: A New Paradigm for Biomolecule Separation (ARC Discovery Grant).

Nanoscience and nanotechnology is recognized as the key strategy to improve conventional, and develop new, devices and technologies for molecular separation. This project proposes the theoretical and experimental study of a new separation concept based on molecular rectification using specially designed nanopore and nanotube structures that consist of periodic and asymmetrical ratchets with nano-scale dimensions. The platform technologies developed from this research will reveal new insights into fundamental phenomena of molecular separation processes underpinning development of a new generation of separation devices to be applied to proteomics, forensic and a range of medical, biotechnological and analytical applications.

A Nanoscopic View of Dynamic Wetting

John Ralston, Siegfried Dietrich (MPI for Metals Research, Germany), Takehiko Kitamori (University of Tokyo, Japan), Rossen Sedev, Mihail Popescu, Energy Dissipation and Nanoscale Processes at Mowing Contact Lines (ARC Discovery Grant).

Understanding how liquids spread and wet flat surfaces, capillaries, open channels and particles requires the determination of energy dissipation at the moving liquid front, or contact line, and the nanoscale processes that take place. Without this knowledge many natural processes will remain a mystery and technologies undeveloped. The project will use novel techniques to design interfaces, control solid-liquid interactions and interrogate the nanoscale processes at moving contact lines. As outcomes, robust models of dynamic wetting will be developed that will change the research field substantially, transform coarse particle flotation in the minerals industry and underpin micro and nanofluidics in the emergent field of process intensification.

Silver Nanoparticles for Infection Prevention

Hans Griesser, Krasimir Vasilev (Mawson Institute, UniSA), Howard Morris (SA Health), Tim Kuchel (IMVS), Simon Pearce (Advanced Scientific Communications), Chi Ndi, Novel Silver Nanoparticle Coatings for the Prevention of Infection of Biomedical Implants and Devices (NHMRC Development Grant).
Prevention of infections associated with a range of implants and biomedical devices is crucial in avoiding medical complications. Novel coatings harnessing nanoparticles with significantly improved antibacterial properties have been developed at The Wark and can be applied generically to a wide range of biomedical implants and devices used in human health care. This project seeks to optimise the technology, verify it in clinical animal studies, and transfer it to a range of biomedical devices and products. The performance of coated products against bacterial colonisation and for compatibility with human cells under a range of conditions will also be evaluated. This project is focused on delivering a new flexible technology to overcome the limitations of current infection prevention technologies.

**Environmentally Benign Flotation Chemicals**

David Beattie, Daniel Fornasiero, Jonas Addai-Mensah, John Ralston, Environmentally Benign Flotation Chemicals (ARC Linkage Grant and AMIRA International Ltd). Replacing hazardous flotation chemicals with those that have lower impact on human health and the environment is a significant challenge. The proposed work will be underpinned by a strong collaboration between surface and colloid chemists, mining companies, and chemical suppliers committed to making mineral processing a safer and more environmentally sustainable industry. It is anticipated that this research will guide the replacement of toxic and environmentally hazardous chemicals used in the mineral processing industry with benign chemicals that are biodegradable and have low toxicity. Replacing these chemicals reduces the risk of workplace injuries and damage to the environment that could be caused by industrial accidents.

**Nanomaterials from Diatomaceous Earth**

Dusan Losic, Jonas Addai-Mensah, Ian Neering (Mount Sylvia Diatomite), Advanced Nanoscale Materials Engineered from Diatomaceous Earth (ARC Linkage Grant and Mount Sylvia Diatomite Pty Ltd). Nature has elegantly solved the problem of building complex 3-D structures with well-defined nanoscale features and multifunctional properties. Diatoms, single cell algae, are the most extraordinary example of these structures. The unique structural, mechanical, optical, and photonic properties of silica material obtained from diatoms, derived from their unique porous micro to nano scale porous architecture, was explored in this project as an attractive and low-cost natural resource for the development of new nanomaterials and devices. Several new nanoscale materials based on diatom silica were developed from natural diatomaceous earth (DE) and the study of their applications for environmental remediation, water purification, catalysis and drug delivery is in the process.

**Biomolecular Cues on Solid Materials Surfaces**

Hans Griesser, Rob Short (Mawson Institute, UniSA), Krasimir Vasilev (Mawson Institute, UniSA), John Hayball (Sansom Institute, UniSA), Michael Brown (RAH), Clive McFarland (UNSW), Chemokine Gradients for Directed Migration of Captured Cells and Guidance of Tissue Engineering (NHMRC Project Grant). Gradients of biomolecules are fundamental to biological systems; numerous physiological processes such as tissue development and diseases are driven by gradients of biological signals. Solid-supported signal gradients will be engineered on the nano-scale to direct and control cell migration and tissue growth. Synthetic gradient-mediated control of cell attachment, activation, and movement will provide bio-assays for migrating cancer stem cells, antigen-specific lymphocytes, and endothelial cells, and will use nano-engineered surface gradients to isolate precursor cell types based on functional potential. Chemokine gradient layers will provide convenient and appropriate two-dimensional model systems to assist in the study of various biological processes where chemokine gradients are thought to play a key role, as a step towards improved understanding of the role of chemokine gradients and how such gradients could be fabricated and applied for medical and diagnostic purposes.

**Publication Highlights**

**New Supported Liquid Membrane for Electrochemical Applications**


A landmark research publication reporting a new type of supported liquid membrane made by combining ionic liquid with Nafion membrane reinforced with nanostructured Polyhedral Oligomeric Silsesquioxanes (POSS) using layer by layer strategy for anhydrous proton exchange membrane (PEM) application. The presence of the conducting nanostructure has enhanced the proton conductivity especially at low humidity due to its confinement in the ionic domains. The work paved the way to a new platform for the synthesis of efficient composite membranes in our other projects on energy storage applications.
Exploring De-wetting

This study investigated the dynamic contact angle for liquid-liquid systems under spontaneous de-wetting conditions. Contact line motion was observed using a high-speed camera for droplets de-wetting spontaneously over a range of chemically modified surfaces. The results were interpreted using both the Molecular Kinetic Theory and the Hydrodynamic Theory. Strong evidence is shown that local pinning of the contact line on chemically heterogeneous surfaces influences the de-wetting dynamics. This is of fundamental importance to a range of technologies where liquids interact with heterogeneous surfaces, including mineral flotation, coatings technologies and microfluidics.

Detecting Dead Tumour Cells with Functional Nanoparticles

Extending the expertise of The Wark in the design of bio-interfaces and the control of biologically non-specific binding events, superparamagnetic nanoparticles have been developed to bind with a very high specificity to intratumoral dead cells. This collaborative study between The Wark and the Royal Adelaide Hospital could lead to the development of advanced MRI nano-probes aimed at more efficient monitoring of patient’s responses to chemotherapy.
Novel Oral Delivery for Poorly Soluble Drugs


The first published report on improving the oral delivery in vivo of a poorly soluble drug using SLH (LipoCeramic™) microcapsules. Improved oral absorption for the non-steroidal anti-inflammatory drug celecoxib was demonstrated in comparison with lipid emulsions and commercial products. Physicochemical stability of celecoxib in a non-crystalline form was also demonstrated after storage. This work led to several new collaborations and international conference invitations.

Novel Biomimetic Nanosprings


This research has demonstrated for the first time that a pH-responsive surface and interface can be derived from the bio-mimetic protein Rec1-resilin. The responsiveness is kinetically fast, robust and completely reversible, and has potential applications in many areas including controlling cell adhesion and migration and creating functional surfaces for biosensors and controlled nanoparticle synthesis. Three PhD students have worked on this project, with two theses already completed and one completion imminent.

Diverse Applications of Multifunction Biomimetic Protein Based Polymer Rec1- Resilin: (i) optically active highly resilient (>90%) crosslinked elastomer; (ii) pH responsive surface/interfaces; (iii) synthesis and directed self-assembly of functional nanoobjects (eg electrocatalytic nanoparticles)
Australian Research Council (ARC) Research Expo

On 26 October, the University of South Australia (UniSA) participated in the ARC Research Expo in Canberra which accompanied the ARC major grants announcements. Twenty five Australian universities attended the event to showcase their research. UniSA’s exhibit focused on the nanofabrication and microfluidics research work of The Wark. This included film footage of the nanofabrication facilities and a display of several microfluidic chips.

After the grant announcements, several hundred guests, including a number of parliamentarians, visited the Expo and exhibits. Senator Kim Carr, in particular, spent a significant amount of time at the UniSA exhibit, discussing nanofabrication and microfluidics with A/Prof Bill Skinner and Mr Philip Moore. Interest in the exhibit also generated several leads for potential collaborations and contract opportunities for The Wark.

2008 Ian Wark Research Institute Medal Presentation

Members of the Research and Technology Advisory Committee recommended that the 2008 Ian Wark Research Institute Medal be awarded to Dr Jingfang Zhou for her thesis titled *Thymine-functionalized Gold Nanoparticles: Synthesis, Surface Structure and Colloid Stability*. The Medal was presented to Jingfang on 29 May by Dr Max Richards (Chair, Advisory Board) and Prof Brian Vincent (Chair, Research and Technology Advisory Committee).
Research Themes

• Bio-interface science
• Functional surfaces and porous surfaces for biomaterial applications
• Functional colloids and nanoparticles for therapeutic delivery and diagnostics

Research Overview

The Bio and Polymer Interfaces Sector continues to develop, increasing its research profile and extending the quality and significance of its scientific outputs. It is encouraging to see the excellent success in national competitive grant proposals (particularly NHMRC) and the large number of new collaborations between The Wark and biomedical researchers from both academic departments and hospital research groups. The nanomedicine field is a clear area of ongoing growth for The Wark.

Staff and students

Dr Tim Barnes left The Wark to commence a teaching and research position in the School of Pharmacy and Medical Sciences at UniSA. Tim will maintain an active research profile and will continue to work collaboratively with The Wark, helping to strengthen the existing links.

New PhD students are Regis Mejard and Yamini Akkamsetty. Regis’ project is ‘Advanced nanostructured biointerfaces for cell capture’, whilst Yamini will work on ‘Hybrid carriers for drug delivery’.

Nasrin Ghouchi Eskandar was awarded a PhD for her thesis titled ‘Physiochemical and biopharmaceutical investigations of nanoparticle-coated submicron emulsions: towards novel dermal delivery systems’, whilst Martin Cole, Ivan Djordjevic and Karyn Jarvis submitted their PhD theses for examination.

The contribution of two of our researchers was recognized with A/Prof Sunil Kumar becoming a Steering Committee Member for IUVSTA (International Union for Vacuum Science, Technique and Applications), on the development of BioInterfaces Division. Prof Clive Prestidge was made a Fellow of the International Union of Pure and Applied Chemistry.

Dr Benjamin Thierry secured a prestigious NHMRC Career Development Award Fellowship to work on ‘Functional nanoparticles: Towards novel advanced cancer diagnostic, prognostic and therapeutic strategies’.

Research outcomes

Major projects that came to an end in 2009 include the ARC Linkage project ‘Investigation of surface properties of biomedical materials and devices cleaned by a new hybrid (ultrasonic-electrolytic) system’ with Soniclean and the AMMRF (Australian Microscopy and Microanalysis Research Facility) TAP grant ‘Cryo-TEM investigation on the evolution of nanostructure of biomimetic protein rec1-resilin’.

2009 was an exciting year for new projects with the Sector being successful in ARC Discovery and Linkage grants, an NHMRC Fellowship and grants, partnership in the newly formed CRC for Wound Healing, and a range of projects directly funded by industry. In total, 8 new projects received funding.

A full international PCT patent application was submitted on the subject of ‘Antimicrobial Surfaces’, covering results from collaborative work between The Wark and the Sansom Institute. Inventors: Hans Griesser, Hardi Ys, Chi Ndi and Susan Semple.

A provisional patent application titled ‘An apparatus and method for cleaning using a combination of electrolysis, ultrasonics and disinfection’, was submitted by Soniclean Pty Ltd to IP Australia on 26 October 2009. Inventors: WahTong Lee, Sunil Kumar and Endre Szili.

Another provisional patent application, titled ‘Active Polymeric Films’, resulted from collaboration between the Mawson Institute and The Wark. Inventors: Krasimir Vasilev and Hans Griesser.
Key publications

More than 30 fully refereed journal articles were published concerning Bio and Polymer Interfaces research. Two of these are listed under Publication Highlights (pages 22-24), but others of significance include:

  
  New insight is provided into the chemical functionalization of nanoparticles to enhance their performance in the body. Specifically, new methods for the effective PEGylation of nanoparticles and nanorods (ie coating with polyethylene(glycol polymers)) have been established that provide good stability against heat, high salt concentrations and extreme pH. Such surface functionalized nanoparticles have application in therapeutic delivery and as diagnostic agents.

  
  It is demonstrated that silica nanoparticle layers can be fabricated around lipid emulsion droplets and that these layers play a significant role in facilitating sustained release of encapsulated molecules and enhanced uptake across the skin when applied topically. Nanoparticle coated lipid droplets can be used for targeted dermal delivery and have potential to be used in new cosmetic or pharmaceutical products.

  
  This review surveyed the emerging field of research on coatings whose properties can be changed in a controlled manner by the application of an external stimulus. The ability to switch interfacial properties is the key for a number of potential applications, particularly in the biomedical devices and biosensing areas. This publication, together with two research papers, has established the Wark’s visibility in this field.

Project of significance

Hans Grieser, Michael Perkins (Flinders University) and Susan Semple (Sansom Institute, UniSA), Development and evaluation of novel antibacterial coatings for the prevention of infection of biomedical implants and devices (NHMRC and ITEK Pty Ltd)

This project investigates a strategy for combating infections at human implants and biomedical devices, such as catheters, and knee and hip implants. The technology is based on novel antibacterial compounds extracted from Australian plants of the genus *Eremophila*. These novel compounds are active against multi-drug resistant strains of *Staphylococcus aureus*, a bacterium that accounts for over 50% of all infections associated with biomedical devices and implants. In addition to this ability to combat “superbugs”, assays with mammalian cell lines have shown a safety window, reducing concerns about possible damage to human host cells and tissue. Two coating methodologies have been developed for applying these compounds onto various biomedical devices, and bacterial testing has shown excellent performance. The technology is the subject of a PCT patent application and has attracted interest from several companies.
Research Themes

- Stability of colloidal particles, including their aggregation, dispersion and adsorption on solid or gas surfaces
- Manipulation of surface chemical and physical nano-heterogeneities to influence the properties of these surfaces with simple and complex fluids

Research Overview

Staff and students

We welcomed two new staff members into Sector projects during 2009. Simon Field, Polymer Device Technologist, commenced in February and Sundar Mayavan, Research Associate in Polymeric Fuel Cell Membranes, commenced in September.

A number of staff departed, including Prof Roger Horn, Deputy Director (Academic) and a founding member of The Wark. Roger maintains an active involvement in a number of research projects and will continue to be a frequent visitor. Other staff who left The Wark during 2009 were Dr Renate Fetzer, Dr Ivan Kempson, Nicola Sleep, Dr Surya Subianto and Dr Su Nee Tan.

Seven new students joined Sector projects, namely Trent Albrecht, Moom Sinn Aw, Muireann O’Loughlin, Melanie Ramiasa, Maria Sinche Gonzalez, Bogale Tadesse and Valentin Vancea.

Mingzhao He was awarded a PhD for his thesis titled ‘The influence of adsorbed polymer on clay and copper mineral particles’ interactions’.

Dr Catherine Whitby secured a prestigious Australian Research Council Future Fellowship to continue her work on Controlling Detachment of Particles at Interfaces.

Research outcomes

2009 saw the completion of AMIRA International and ARC Linkage project P498B, a long running project on ‘Polymers at mineral interfaces’, however this project now continues under the banner of P498C. Also coming to an end was the Tiwest Joint Venture project on ‘Optimisation of pigment coating surface treatments’.

The Sector commenced a number of new challenges in 2009, including two new projects with CSIRO Process Science and Engineering on ‘Ionic liquids’ and the ‘Fundamentals of electocrystallization from aqueous solution’. Also starting was a new ARC Linkage grant with Mount Sylvia Diatomite and an Australia-India Strategic Research Fund grant. ITEK, the commercialisation arm of the University of South Australia, has funded a project looking at solvent extraction using the exciting new field of microfluidics.

Dr Nate Stevens, Prof John Ralston and Dr Rossen Sedev were awarded a provisional patent dealing
with particle wettability. A second provisional patent was awarded for a process and device for effecting selective separation of particles. The inventors are Diana Tran, Prof John Ralston, Dr Daniel Fornasiero, Dr Catherine Whitby and Darren Faulkner.

Key publications
Two of the Sector’s publications are listed under Publication Highlights (pages 22-24), but others of significance include:

  The adsorption of dextrin on talc, molybdenite, and graphite (three naturally hydrophobic minerals) has been compared to gain an insight into the role of adsorbed polymer morphology on the reduction of mineral hydrophobicity, and therefore on the effectiveness of dextrin to depress the flotation of the three minerals.

  This paper describes a new methodology for the measurement of advancing and receding contact angles of particles from capillary pressure measurements in packed beds of particles partially saturated with liquids. This technique was validated with model systems and applied successfully to various real particulate systems.

Project of significance
Daniel Fornasiero, John Ralston, George Levay and Chris Moran (SMI, University of Queensland), *Impact of recycled and low quality process water on sustainable mineral processing practices* (ARC Linkage Grant and AMIRA International Ltd)
Water represents a major component of mineral processing operations and is becoming a critical issue for the minerals industry because the shortage of available water and restriction for the disposal of used water to the environment have resulted in a need for increasing water recycling and reuse. Poor quality process water, including saline waters, can significantly impact on the performance of mineral beneficiation processes and therefore there is a strong economic imperative to identify and understand the factors causing the negative effects of this water on flotation performance and to develop strategies to control or neutralise these negative effects. Use of this water as process water will help achieve economy and sustainability in water usage in the industry and good water management practice. Seven companies around the world are sponsoring this project. The project is a blend of fundamental studies, with three PhD students, and applied studies, with investigations at the plant sites of each sponsor. It commenced in 2008 and will run for a period of three years.

*Polydisperse water droplets resting on a superhydrophobic metal surface. Photo by Jairo Gamica Rodriguez*
Research Themes

- Mineral flotation and agglomeration
- Mineral leaching
- Solvent extraction of minerals

Research Overview

Staff and students

We were joined by Dr Akira Otsuki and Teresa Duncan. Akira joins us as a Research Fellow from Waseda University in Japan and Teresa will be providing administrative support to the Sector. Leaving us in 2009 were Dr Sabina Gredelj, Dr Tatiana Khmeleva and Dr Rada Pushkarova.

Three new students started work on Sector projects in 2009, namely Yusuf Ferdosi, Yogesh Kalegowda and Jin Sung Park, whilst three students submitted their theses for examination; Carlos Gontijo and Diana Tran for a PhD and Djoko Julianto for a Masters degree.

Research outcomes

The sixth phase of one of the nation’s longest running and most successful minerals research projects, AMIRA P260E - Improving Sulphide Mineral Flotation, came to an end in 2009. The sixth iteration took the lifespan of the project past 20 years and independent analysis puts the return on investment for this project at better than 20:1 for every dollar invested. The project now continues on into the future with the renewed P260F.

Also concluding in 2009 were projects with Magotteaux, Xstrata and a number of projects with an industry leader in the international resources sector.

Amongst the new projects to commence was a new study with Magotteaux, looking at the interactive effects of the grinding environment of froth stability. Also commencing was the landmark CSIRO MDU Flagship Collaboration Fund Project, looking into ways to improve the grade and leaching behaviour of nickel laterite ores. This is the beginning of an even closer relationship between The Wark and the CSIRO Process Science and Engineering division.

Key publications


Interfacial chemistry and particle interactions of aqueous muscovite dispersions were investigated in the pH range 2-9. Electrokinetic zeta potential and pulp shear rheology indicated a bifurcation, accompanied by a strong pH-history, solid loading and time dependency. Incongruent leaching and subsequent specific adsorption of hydrolysable Al(III), Si(IV), K⁺ and Fe(III) ions were observed to dominate the interfacial chemistry and rheological behaviour, both of which showed good compliance with DLVO theory.


Molybdenite flotation at Kennecott Utah Copper was studied by means of a combination of plant metallurgical surveys and laboratory mineralogical (QEMSCAN®) and surface (ToF-SIMS) analysis.
It was suggested that the lower flotation recovery of molybdenite compared to the copper sulphide is determined by several factors, including particle morphology, inherent hydrophobicity and formation of slime coatings in the presence of skarn ores. Implications on plant performance were discussed, and solutions presented.

Projects of significance

Stephen Grano, Daniel Fornasiero and Bill Skinner, Improving sulphide mineral flotation (P260E) (ARC Linkage Grant and AMIRA International Ltd)

The main aim of this project was to improve value sulphide mineral particles recovery by flotation. This is exemplified by one of the case studies in which the performance of different concentrators treating porphyry copper ore was investigated, in relation to enhanced molybdenite recovery. In spite of the apparently high natural hydrophobicity of the mineral, molybdenite recovery in flotation is very variable, and is generally lower than the recovery of copper minerals. A combination of plant surveys, flotation testing, and surface analysis and modification methods was applied to investigate the issue for improvement. Consistently, in all the plants investigated, an increase in molybdenite recovery was achieved in the rougher/scavengers, ranging from 1% to more than 10%.

Jonas Addai-Mensah and Bill Skinner, Improving aqueous processing and control of copper leach tails behaviour (ARC Linkage Grant)

This project investigates properties and behaviour of reactive gangue clay – value mineral ores which are pivotal to a number of processes in the minerals industry, including hydrometallurgical extraction of value metals (eg copper, gold and nickel), dewatering and waste minimization. Several important findings which improve our knowledge and understanding of how pulp mineralogy and chemistry-mediated particle interactions arising from incongruent leaching of clay minerals may have a striking impact on mixed oxide-clay mineral particle interactions and temporal rheological behaviour have emerged.

John Ralston, Jonas Addai-Mensah, Daniel Fornasiero, Bill Skinner, Stephen Grano and Hamid Manouchehri, Preconcentration and agglomeration to enhance heap leaching of nickel laterite (CSIRO Flagship Collaboration Fund)

The main thrust of this new 3-year project is to perform strategic basic and applied studies of the key fundamental issues underpinning complex, low-grade nickel laterite milling, beneficiation and particle agglomeration to produce large and robust granules conducive to heap leaching for enhanced nickel recovery. The project involves collaborative research with groups from CSIRO and the Universities of Melbourne, Queensland and British Columbia.
Scientific Services had a remarkable 2009, particularly given the severe impact of the global financial crisis on many of the industry sectors that we service. Scientific Services actually outperformed our 2008 performance and returned a more than 12% increase in the number of projects, with increases in the amount of work from both internal and external clients.

Even more pleasing is the repeat business that we were able to generate with 2009 seeing an average of over 3 projects per client. This upswing in business resulted in a massive 65% increase in revenue, with all of that growth coming from industry clients while revenue from internal sales slipped slightly.

On the staffing front, we welcomed Zofia Swierczek, Simon Doe and Luke Parkinson and bid farewell to one of our Mineral Technologists in Liping Ding. Zofia is a mineralogist and brings a wealth of experience to the Minerals Technology team and will be our main mineralogical analyst working with the QEMSCAN®.

Simon Doe has been recruited to lead the Nanofabrication team in our Microfluidics and Nanofabrication Facility, which is the South Australian Node of ANFF (Australian National Fabrication Facility), where his skills in project management and experience working in industry will help market and focus the activities of the team to deliver a first class service to our clients.

Luke will bring his micro and nanofabrication machining skills, together with his engineering and design experience, to enable us to open new markets with the exciting Kira Micro Mill, a high speed precision mill, which is able to physically machine to nanometre scale tolerances.

These key appointments followed the construction of two clean rooms, a Micro Milling area and the installation of five significant items of equipment, which collectively provide the capability to manufacture microfluidic chips and devices, fabricate micro-engineered structures and surfaces and enhance performance through modification of surface chemistry.

The new nanoTOF was commissioned by mid-year, which is one of two National Flagship instruments operating within the South Australian Node of the AMMRF (Australian Microscopy and Microanalysis Research Facility). This advanced surface analysis equipment, the only one of its type in Australia, started to deliver outcomes for the Australian research community and industry throughout the remaining half of 2009.

Both the nanoTOF and Microfluidics and Nanofabrication Facility (ANFF-SA) were funded from the Federal Government’s NCRIS Scheme (National Collaborative Research Infrastructure Strategy).

Metrics
Mining and Minerals projects were again the dominant source of funding with an increase of 5.6% on the previous year. This result exceeded expectations as staff turnover throughout the year placed additional burdens on the continuing team members.

The experience and knowledge of the 18 staff working within Scientific Services was being utilised to its fullest potential, as over 90% of work performed for clients included some form of value adding. Although basic sample analysis, where data only is reported, was conducted for a number of clients, this represented just 3.8% of the total income for 2009. Another point to note is the increase in our NCRIS supported activities from 2008. The AMMRF component was 1.1% in 2008 and ANFF-SA was in the construction phase.

Future Directions
During 2009, further funding for ANFF-SA was awarded through the Federal Government’s EIF (Education Investment Fund) which will enable capability for quality control of fabricated items, process control and development to be progressively added from 2010 to 2013.
To support the increasing utilisation of the Mini Pilot Plant, a facility for the rapid analysis of minerals samples will be established during 2010. This will include a new laboratory equipped with two fume cupboards specifically designed for acid digestion of samples and an X-ray Fluorescence Spectrometer.

It is also anticipated that X-ray Diffraction equipment will be installed during 2010 under arrangements which are currently being negotiated.
**BIO AND POLYMER INTERFACES**

*A physicochemical approach for optimizing drug delivery from BioSilicon
Research Sponsors: Australian Research Council Linkage Grant and pSivida Ltd
Chief Investigators: C Prestidge, A Evans (Pharmacy and Medical Sciences, UniSA) and P Pendleton (Pharmacy and Medical Sciences, UniSA)*

*Advanced nanostructured biointerfaces for cell capture
Research Sponsor: Australian Research Council Discovery Grant
Chief Investigators: H Griesser, B Thierry, C Prestidge, M Brown (Royal Adelaide Hospital) and M Tabrizian (University of Montreal)*

*Development and evaluation of novel antibacterial coatings for the prevention of infection of biomedical implants and devices
Research Sponsors: National Health and Medical Research Council and ITEK Pty Ltd
Chief Investigators: H Griesser, M Perkins (Flinders University) and S Semple (Sansom Institute, UniSA)*

*Development of novel antibacterial coatings
Research Sponsor: RMS Foundation
Chief Investigators: H Griesser, M Perkins (Flinders University) and S Semple (Sansom Institute, UniSA)*

*Engineered nanotube membranes for molecular separation and biosensing
Research Sponsor: Australian Research Council Fellowship
Chief Investigator: D Losic*
*Surface for tissue engineering  
Research Sponsor: CRC for Polymers  
Chief Investigator: H Griesser

**COLLOIDS AND NANOSTRUCTURES**

*Advanced nanoscale materials engineered from diatomaceous earth*
Research Sponsors: Australian Research Council Linkage Grant and Mount Sylvia Diatomite Pty Ltd  
Chief Investigators: D Losic and J Addai-Mensah

*Anomalous interfacial air bubble dynamics: The importance of electrokinetic effects in thin film drainage*
Research Sponsor: Australian Research Council Discovery Grant  
Chief Investigators: R Horn and S Miklavcic (Mathematics and Statistics, UniSA)

*Development of novel nanostructured electro-optical systems*
Research Sponsors: Australian Research Council Linkage Grant and SMR Automotive Australia Pty Limited  
Chief Investigators: H Griesser, P Murphy (Mawson Institute, UniSA), G Wallace (University of Wollongong), P Innis (University of Wollongong) and S Edwards (SMR Automotive Australia Pty Limited)

*Electrical double layer and electron transfer in ionic liquids*
Research Sponsor: CSIRO Process Science and Engineering  
Chief Investigators: J Ralston, R Sedev and M Horne (CSIRO Process Science and Engineering)

*Enhanced depression and dispersion of minerals in flotation (P498C)  
*Environmentally benign flotation chemicals (P498C)*
Research Sponsors: Australian Research Council Linkage Grant and AMIRA International Ltd  
Chief Investigators: D Beattie, D Fornasiero, J Addai-Mensah and J Ralston

*Fluid flow and lubrication on the nanometre scale*
Research Sponsor: Australia India Strategic Research Fund Grant  
Chief Investigators: R Sedev, J Ralston, C Priest and R Horn

*Fundamentals of electrocrystallization from aqueous solution*
Research Sponsor: CSIRO Process Science and Engineering  
Chief Investigators: J Ralston and J Addai-Mensah

*Gradient index optical coatings by plasma polymerisation*
Research Sponsor: CRC for Advanced Automotive Technology  
Chief Investigators: H Griesser, P Murphy (Mawson Institute, UniSA) and R Short (Mawson Institute, UniSA)

*Impact of recycled and low quality water on sustainable mineral processing practices*
Research Sponsors: Australian Research Council Linkage Grant and AMIRA International Ltd  
Chief Investigators: D Fornasiero, C Moran (University of Queensland) and J Ralston

*Ionic liquids*
Research Sponsor: CSIRO Process Science and Engineering  
Chief Investigators: J Ralston and R Sedev
Microfluidic solvent extraction: Improved fluid flow stability and phase separation
Research Sponsor: ITEK Pty Ltd
Chief Investigator: R Sedev

*Novel nanostructured polymeric membranes for energy storage applications
Research Sponsors: Australian Research Council Linkage Grant and ZBB Technologies Ltd
Chief Investigators: N Roy Choudhury and W Skinner

*Optimisation of pigment coating surface treatments
Research Sponsor: Tiwest Joint Venture
Chief Investigators: W Skinner and J Addai-Mensah

*Particle-bubble interactions
Research Sponsor: CSIRO Process Science and Engineering
Chief Investigators: J Ralston, D Fornasiero and P Koh (CSIRO Process Science and Engineering)

*Particles at interfaces: Controlling detachment
Research Sponsor: Australian Research Council Fellowship
Chief Investigator: C Whitby

*Plastic mirror development
Research Sponsor: CRC for Advanced Automotive Technology
Chief Investigators: H Griesser, P Murphy (Mawson Institute, UniSA) and R Short (Mawson Institute, UniSA)

*Polymers at mineral interfaces (P498B)
Research Sponsors: Australian Research Council Linkage Grant and AMIRA International Ltd
Chief Investigators: D Beattie, D Fornasiero, J Addai-Mensah and J Ralston

**MINERAL PROCESSING**

*Gangue recovery fundamental studies - Flotation
Research Sponsor: Industry Partner
Chief Investigators: J Addai-Mensah and S Grano

*Gangue recovery fundamental studies - Leach and Surface Chemistry
Research Sponsor: Industry Partner
Chief Investigators: J Addai-Mensah and S Grano

*Improving aqueous processing and control of copper leach tails behaviour
Research Sponsors: Australian Research Council Linkage Grant and Industry Partner
Chief Investigators: J Addai-Mensah and W Skinner

*Improving froth performance in the zinc cleaners at Century Mine
Research Sponsor: MMG Century
Chief Investigators: S Farrokhpay and M Zanin

*Improving froth zone performance at Prominent Hill
Research Sponsor: OZ Minerals Ltd
Chief Investigators: M Zanin, I Ametov and S Grano

*Improving sulphide mineral flotation (P260E)
Research Sponsors: Australian Research Council Linkage Grant and AMIRA International Ltd
Chief Investigators: S Grano, D Fornasiero and W Skinner
*Increasing the sulphur grade of the pyrite concentrate at Vaal River
Research Sponsor: AngloGold Ashanti Limited
Chief Investigators: S Gredelj, M Zanin and S Grano

*Matching flotation concentrate composition to downstream processing in copper production
Research Sponsors: Australian Research Council Linkage Grant and Industry Partner
Chief Investigators: S Grano, S Harmer and I Ametov

* Optimising the recovery of fine and coarse particles in mineral flotation
Research Sponsors: Australian Research Council Linkage Grant and AMIRA International Ltd
Chief Investigators: S Grano and D Fornasiero

* Preconcentration and agglomeration to enhance heap leaching of nickel laterite
Research Sponsor: CSIRO Flagship Collaboration Fund
Chief Investigators: J Ralston, H Manouchehri, S Grano, D Fornasiero, J Addai-Mensah and W Skinner

Separation of chalcopyrite and bornite in single mineral mixtures, future ores and current concentrates
Research Sponsor: Industry Partner
Chief Investigator: I Ametov

*Separation of enargite from Frieda River-Nena final concentrate
Research Sponsor: Xstrata Qld Ltd
Chief Investigators: S Grano, P Moore and K Quast

*Separation of minerals in final concentrate
Research Sponsor: Industry Partner
Chief Investigators: S Grano and I Ametov

CORPORATE
*Australian Mineral Science Research Institute
Research Sponsors: AMIRA International Ltd, Australian Research Council Linkage Grant, South Australian Government and UniSA
Chief Investigator: J Ralston

*Fabrication of advanced materials
Research Sponsors: National Collaborative Research Infrastructure Strategy, UniSA and South Australian Government
Chief Investigator: J Ralston

Mechanical properties of coated bioceramics
Research Sponsor: Australian Academy of Science International Travel Grant
Chief Investigator: S Kumar

Microfluidic operations with ionic liquids
Research Sponsor: South Australian Department of Further Education, Employment, Science and Technology
Chief Investigator: R Sedev

*SA Regional facility for microscopy
Research Sponsors: National Collaborative Research Infrastructure Strategy, UniSA and South Australian Government
Chief Investigator: H Griesser
Honours and Awards

A/Prof Jonas Addai-Mensah
Award of Merit, Contribution of Members of Communities from Countries within Africa to the State of South Australia
A reception, hosted by The Hon Mike Rann, Premier of South Australia, was held on 28 February. Jonas was the recipient of this award for his significant contribution and outstanding achievement in “Excellence in education, research, scholarship, leadership, service and community engagement”.

A/Prof Jonas Addai-Mensah
Appointment as External Examiner, Department of Mineral Engineering, University of Mines and Technology, Tarkwa, Ghana
Jonas’ duties will include reviewing examination questions, feedback on examinations and academic standards and reporting to Department and Faculty Boards.

A Memorandum of Understanding between UniSA and the University of Mines and Technology was signed in 2007 to facilitate staff/student exchanges, joint research, training and publications.

Ms Susana Brito E Abreu
Commercialisation Training Scheme Scholarship
The objective of the Commercialisation Training Scheme is to provide high quality research commercialisation training for the next generation of Australian researchers as a means of equipping them with the skills, knowledge and experience necessary to bring research-based ideas, inventions and innovations to market.

PhD students Mr Mani Paneru (left) and Mr Terry Dermis
The CTS scholarships are based on academic merit and the probability of pursuing a career that will use the skills, knowledge and experience gained during CTS training. Susana, whose area of research is mineral processing, was one of seven UniSA students to be awarded a CTS scholarship in 2009.

Mr Terry Dermis and Mr Mani Paneru
Joint Winners - Best Wark Student Seminar
Pulp chemistry and kinetics of an isothermally leached muscovite clay mineral
Terry is in the second year of his PhD and is working in the area of minerals and metallurgical processing. His principal supervisor is A/Prof Bill Skinner.

Contact angle saturation in electrowetting: An overview
Mani is in the third year of his PhD and his research area is electrowetting of ionic liquids in solid-liquid-liquid systems. His principal supervisor is Laureate Prof John Ralston.

Prof Stephen Grano
Excellence in Research Commercialisation, South Australian Science Excellence Awards
This award recognises commercial success and acceptance achieved through creating an innovative product, process or service. Stephen was acknowledged for his success in forging a range of industry partnerships on a national and international scale in the area of minerals processing. Stephen noted that the award was recognition of many years of hard work and will facilitate the advancement of his research initiatives through greater interaction with industry.

Prof Hans Griesser
CSIRO Medal for Research Excellence
CSIRO awarded their 2009 Medal for Research Excellence to the ophthalmic biomaterials team, which Hans co-founded and has since been very much involved in defining research directions that have lead to patents and commercial products. Thus he was a named key member of the team that received the medal (each member received a medal) on 14 October.

Ms Kara Holloway
Playford Trust Honours Scholarship
The $1000 prize is awarded to the highest calibre Honours students in South Australia undertaking research projects in the priority areas of Horticulture and Aquaculture, Water, Energy and Climate Change, Advanced Manufacturing and New Technologies or Mining and Resources Development.
Ms Christine Lim
Best Poster Prize, Australasian Pharmaceutical Science Association Conference
Christine, a Wark Honours student, was the recipient of the best poster prize at the APSA Conference held in Hobart, Australia, 9-11 December. Christine’s poster, titled “Mechanical investigation of silica-lipid hybrid microcapsules for improved delivery of poorly soluble drugs” was chosen from amongst 150 posters presented by predominately postgraduate students at the conference.

Dr Craig Priest
Fresh Science Award
Dr Craig Priest was selected as one of only 16 scientists nationally – the only one from South Australia – to participate in Fresh Science 2009. Fresh Science is a national competition that helps promote young scientists in the media. Applicants are assessed on their ability to communicate their research to the general public, and the winners attend an intensive media training course in Melbourne, Australia. The program included a series of school talks in country Victoria and the Melbourne Museum and interviews with TV, print, and radio journalists. Craig’s work on microfluidic solvent extraction was featured in the Adelaide Advertiser, SA Mines and Energy Magazine, and a number of web-based media outlets.

Laureate Prof John Ralston
Australian Academy of Technological Sciences and Engineering Clunies Ross Award
John was the recipient of the prestigious ATSE Clunies Ross Award for Lifetime Contribution, one of the highest awards in Australia, acknowledging not only fundamental research but its application in making real differences in the world. The ATSE Clunies Ross Award is awarded for the application of science and technology for the economic, social or environmental benefit of Australia and this award recognises John’s distinguished career in particle physics and colloid science and its application to the mining and mineral production industries.

This Award has developed successfully over the years into one of the pre-eminent awards for scientists, technologists and innovators across Australia and has recognised the achievements of many special people. A further aim of the Award is to raise the profile of science and technology in the community through promotion of the Awardees and their contributions to Australia.

Laureate Prof John Ralston
Sir Willis Connolly Memorial Medal
John was the recipient of the Medal for 2009 which is awarded to a person who, through their ability to communicate, had advanced the professionalism, industry or management of science, engineering or technology. This award is presented jointly between The AusIMM and the Barbarians – a group established by persons associated with brown coal in Victoria who have close ties to the industry in Germany.

Prof Jarl Rosenholm (Adjunct Research Professor)
Honorary Doctorate, UniSA
The University of South Australia awards the Honorary Doctorate Degree to a person of eminence who has made a distinguished contribution to the public services or a field of academic endeavour. At the graduation ceremony held on 30 March, Prof Rosenholm was awarded the Degree in recognition of his contribution to UniSA and his distinguished career as a scientist, researcher and entrepreneur.

Prof Rosenholm has been an Adjunct Research Professor with The Wark, UniSA since 1999. Throughout this time, he has been a strong advocate for The Wark and has worked to establish strategic partnerships between the University of South Australia and Abo Akademi University, Finland.
Dr Catherine Whitby
Australian Research Council (ARC) Future Fellowship
Catherine was one of three UniSA researchers awarded a prestigious Future Fellowship by the ARC. These Fellowships aim to retain and attract Australia’s brightest and best researchers. The Fellowship provides funding of approximately $700,000 over a period of four years.

Catherine’s research project is titled Particles at Interfaces - Controlling Detachment. Small, solid particles affect the processes used by the Australian mining industry to recover precious metals and valuable minerals in ways that remain poorly understood. The outcomes of this project will make significant contributions to the fundamental understanding of the role of particles in emulsions and foams. The results will also ultimately transfer to, and have a substantial impact on, the pharmaceutical industry, which is poised to use nanotechnology to revolutionise drug delivery.
Ms Kai Ying Yeap
2009 Graeme Jameson Award, CHMECA Conference
The Graeme Jameson Award is offered by the Australasian Particle Technology Society for the best paper by a postgraduate student in the area of particle technology based on originality, clarity of written presentation, quality of science and potential practical value of the finding. Kai Ying’s paper was titled, “The influence of polyethylene oxide (PEO) and orthokinetic flocculation on dewatering behavior of talc suspensions”.

Fellow Wark student, Mr Ataollah Nosrati, was a runner-up for the Graeme Jameson prize for his paper, “The role of pulp chemistry and particle interaction forces in aqueous muscovite dispersions”, deserving a ‘highly commended’ certificate. The Awards were presented during the CHMECA Conference held in Perth, Australia, 27-30 September.

The award is named in honour of the Society’s founding president Graeme Jameson, Professor of Chemical Engineering at the University of Newcastle, Australia.

Dr Nasrin Ghouchi Eskandar
2009 Ian Wark Research Institute Medal
Dr Nasrin Ghouchi Eskandar was awarded the Ian Wark Research Institute Medal for 2009. Nasrin’s thesis was entitled, “Physiochemical and biopharmaceutical investigations of nanoparticle-coated submicron emulsions: Towards novel dermal delivery systems” and her principal supervisor was Prof Clive Prestidge.

The Ian Wark Research Institute Medal is awarded annually to the graduate or graduand from the Ian Wark Research Institute with the most outstanding PhD thesis.

The Medal is based on the creativity and originality of the research, the student’s comprehension of the field, the significance and utility of the research as a contribution to, or as an application of, knowledge and the impact of the thesis through the number and level of international publications.

Wark Student Travel Grants
Each year travel grants of up to $1,000 are made available to HDR students enrolled at The Wark, with a maximum of $3,000 overall being available each half year. The grants are for the purpose of attending conferences held at locations either in Australia or internationally. In 2009, the following students were recipients of Travel Grants:
Ms Candace Chan
Mr Ataollah Nosrati
Mr Mohanraj Vellore Janarthanan
Ms Sin Ying Tan
Mr Wenbo Wang
Ms Danfeng Xu
Nasrin Ghouchi Eskandar
BSc(Hons) Tabriz University of Medical Sciences, Iran PhD UniSA
Principal Supervisor: Prof Clive Prestidge
Thesis Title: Physiochemical and biopharmaceutical investigations of nanoparticle-coated submicron emulsions: towards novel dermal delivery systems
New processes have been developed for coating submicron emulsion droplets with silica nanoparticles. Scientific insight into the synergy of nanoparticles and emulsifiers in stabilizing oil-in-water emulsions is presented and pharmaceutical applications explored. Novel drug delivery systems have been developed for Vitamin A with improved physical stability, enhanced chemical stability and shelf-life. Controlled and targeted delivery into the skin has been demonstrated and this forms the basis for new cosmetic and pharmaceutical products.
Graduate Position: Research Associate, Ian Wark Research Institute, University of South Australia

Mingzhao He
MSc Northeastern University, PR China LICEng Lulea, Sweden PhD UniSA
Principal Supervisor: A/Prof Jonas Addai-Mensah
Thesis Title: The influence of adsorbed polymer on clay and copper mineral particles’ interactions
Comprehensive, fundamental studies including zeta potential measurement, polymer adsorption, particle deposition, rheology and atomic force microscopy imaging indicated that hetero-aggregation between sericite and chalcocite was ascribed to unexpected particle attractions due to chalcocite oxidation and leaching. Anionic polymers were found effective in mitigating hetero-aggregation by establishing electrostatic and/or electrosteric repulsions.
Graduate Position: Research Fellow, Julius Kruttschnitt Mineral Research Centre (JKMRC), University of Queensland
Seminar Program

**Visiting Speakers**

**Dr Rob Atkin**  
Faculty of Science and Information Technology, University of Newcastle, Australia  
*Bulk and interfacial nanostructure in ionic liquids*

**Prof Juergen Backhaus**  
Mannheim University of Applied Sciences, Germany  
*Infrared spectroscopy in clinical diagnostics*

**Dr Steven Carnie**  
Department of Mathematics and Statistics, University of Melbourne, Australia  
*From mercury drops to bubbles*

**Prof Kevin Galvin**  
Centre for Advanced Particle Processing, University of Newcastle, Australia  
*How to elutriate particles according to their density*

**Prof Murray Gray**  
Department of Chemical and Materials Engineering, University of Alberta, Canada  
*Technology for sustainable development of Alberta Oil Sands*

**Dr Richard Greene**  
The Fenner School of Environment and Society, Australian National University, Canberra  
*Colloidal properties of clays: Their role in environmental processes*

**Mr Greg Lance**  
Hysitron Inc, USA  
*Nanoindentation and Atomic Force Microscopy for biological materials*

**A/Prof Desmond Lun**  
School of Mathematics and Statistics, UniSA  
*Model-based engineering of microorganisms*

**Prof Kazimierz Malysa**  
Polish Academy of Sciences, Poland  
*Velocity of rising bubbles as a simple method for monitoring organic contaminants in water reservoirs*

**Dr David Robinson**  
CSIRO Process Science and Engineering, Australia  
*Processing nickel laterites – problems and opportunities for the new CSIRO MDU Flagship Cluster*

**Prof John Vickerman**  
School of Chemical Engineering and Analytical Science, Manchester University, United Kingdom  
*Polyatomic primary ion beams - a new SIMS paradigm!*

**Dr Gleb Yakubov**  
Unilever Corporate Research, United Kingdom  
*Surface architecture, lubrication and nanorheological properties of mucins and mucosal bio fluids*

**Staff Seminars**

**A/Prof Jonas Addai-Mensah**  
*Challenges in high level nuclear waste processing*

**Dr Tim Barnes**  
*Can we identify denatured proteins from their adsorption behaviour at an interface?*

**Dr David Beattie**  
*Musings on polymer depression*

**Dr Artem Borysenko**  
*Monitoring of fluid saturation and distribution in clay-rich rocks using NMR and dielectric spectroscopy*
Dr Jason Connor (co-author Dr David Druskovich)
Two disks are better than one? A new device for studying flow accelerated corrosion

Dr Naba Dutta
Rec1 resilin: A novel biomimetic polymer with adaptive properties

Dr Rick Fabretto
Conducting polymers: Fundamental science makes business sense

Dr Renate Fetzer
Contact angle relaxation in various systems

A/Prof Daniel Fornasiero
Stability of boehmite particle dispersions

Prof Stephen Grano
Successful technology transfer from the P260 project - Case studies on plant implementation of generic flotation research

Dr Sabina Gredelj
Evidence of surface cleaning of sulphide minerals by attritioning in stirred mills

Prof Hans Griesser
Some recent adventures at bio-interfaces

Prof Roger Horn
The complexities of bubble interactions

Dr Marta Krasowska
Probing the interaction between bubble and particle

A/Prof Sunil Kumar
Plasma enhanced chemical vapour deposition for complete three-dimensional chemical modification of robocast alumina scaffolds

Dr Vera Lockett
Interfaces with ionic liquids

Dr Dusan Losic
Engineered nanopores: Fabrication, concepts, applications and perspective

Dr Hamid Manouchehri
Triboelectric charge and electrical separation of industrial minerals

Dr Satomi Onishi
Bubble films on water: Influences of trace impurities and evaporation on film stability

Dr Mihail Popescu
Phoretic motion of catalyst decorated colloidal particles via self-generated composition gradients

Dr Craig Priest
Microfluidics: Extracting value from complex solutions

Prof John Ralston
Nanobubbles and mysteries

Prof Namita Roy Choudhury
Temperature resolved scattering study of proton-conducting polymer membranes

Dr Rossen Sedev
Electrowetting in solid-liquid-liquid systems

Dr Spomenka Simovic
Recent drug delivery investigations- An overview

Dr Hui Tan
Investigation of chlorite leaching

Dr Catherine Whitby
The effect of anionic surfactant in silica particle-stabilised emulsions
Visitors to the Institute

The Vice Chancellor of the University of Mines and Technology (UMaT) Ghana, Prof Daniel Mireku-Gyimah, paid an official visit to UniSA in mid June 2009. The main objective of his visit centred around HDR student training and education, staff and student exchanges and reciprocal visits and collaborative research issues of mutual interest to both universities. These initiatives form part of a UniSA-UMaT Memorandum of Understanding signed in 2007. During Prof Mireku-Gyimah's 4-day visit, he held discussions with Prof Peter Hoj (VC), Prof Caroline McMillen (DVCRI), Dr Anna Ciccarelli (PVCID), Laureate Prof John Ralston (Director) and a number of senior Wark staff including A/Prof Jonas Addai-Mensah who assisted in organising the Ghanaian VC’s visit.

Extended Visits

Dr Steven Carnie
Department of Mathematics and Statistics, University of Melbourne, Australia

Mr Kristian Gunnelius
Department of Physical Chemistry, Abo Akademi, Finland

Dr Marisa Monte
Centre for Mineral Technology (CETEM), Rio de Janeiro, Brazil

Dr Emamali Sabzi
Department of Chemistry, Urmia University, Iran

Short Term Visits

Dr Rob Atkin
Faculty of Science and Information Technology, University of Newcastle, Australia

Prof Juergen Backhaus
Mannheim University of Applied Sciences, Germany

Dr Mike Beresford
Rohm & Haas Paint Quality Institute, Camberwell, Australia

Dr Markus Bier
Max Planck Institute for Metals Research, Stuttgart, Germany

Mr Allen Bolaffi
Hains Norton, Adelaide, Australia

Dr Mark Bonnar
CSIRO Commercialisation, Sydney, Australia

Prof Michal Borkovec
Department of Inorganic, Analytical and Applied Chemistry, University of Geneva, Switzerland

Mr Michael Breu
Swiss National Public Television, Zurich, Switzerland

Mr Joe Cucuzza, Dr Paul Greenhill and Dr Doug Magoon
AMIRA International, Melbourne, Australia

Mr Dieter Engelhardt
Newcrest Mining Ltd, Cadia, Australia

Prof Gerard Fleer
Laboratory for Physical Chemistry and Colloid Science, Wageningen University, The Netherlands

Left to right: A/Prof Jonas Addai-Mensah, Prof Daniel Mireku-Gyimah and Laureate Prof John Ralston
Prof Takeshi Yamauchi, Mr Satoshi Takahashi and Miss Miki Saito
Graduate School of Science and Technology, Niigata University, Japan

Overseas Student Visits

Mr Jussi-Petteri Autere
Tampere University of Technology, Finland

Ms Jessica Avendano Juarez
Instituto de Estudios Superiores de Tamaulipas, Mexico

Ms Marina Ceconello Correa, Mr Ricardo Ferreira Massabki and Mr Manoel Nogueira de Abreu Filho
University of São Paulo, Brazil

Mr Holger Fielder
Freiberg Technical College, Germany

Ms Franziska Elisabeth Fischer
Dresden University of Technology, Germany

Ms Manoela Gaetti Franco
Universidade Estadual de Maringá, Brazil

Mr Roman Pascal Germann
University of Applied Sciences Wädenswil, Switzerland

Ms Carmen Gomez Gimenez
University of Zaragoza, Spain

Ms Margarita Gonzalez-Ferraz
National University of St Augustin of Arequipa, Peru

Ms Yulia Ievskaya
Rheinisch-Westfälische Technische Hochschule Aachen, Germany

Mr Krishna Kant, Mr Dhiraj Kumar and Mr Vasu Sah
Amity University, India

Mr Albert Daniel Komlos
Budapest University of Technology and Economics, Hungary

Ms Eunji Lee
Hongik University, Korea

Ms Caroline Marlot and Mr Matthieu Oberdorff
École Supérieure d’Ingénieurs de Recherche en Matériaux de Dijon, France

Ms Amanda Martin
University of Western Ontario, Canada

Ms Zlata Palkovicova
Instituto Superior Técnico, Czech Republic

Mr Michael Joshua Pastoll
University of Reading, United Kingdom

Mr Zihan Poh
International Student from Flinders University, originally from Singapore

Mr Johannes Quintero
University of Applied Sciences, Austria

Mr Robert Roskamp
Max Planck Institute for Polymer Research, Germany

Ms Vittoria Roiati
Politecnico di Milano, Italy

Ms Anke Schimmer
Mannheim University of Applied Sciences, Germany

Mr Gurvinder Singh
Aarhus University, Denmark

Ms Jinxia Sun
École Nationale Supérieure de Chimie de Montpellier, France

Ms Roya Talari
Isfahan University of Medical Sciences and Health Services, Iran

Ms Klaudia Wilk
Politechnika Rzeszowska, Lukasiewicz, Poland
Conferece Attendance and Invited Lectures
*Oral / *Poster

A/Prof Jonas Addai-Mensah
SME Annual Meeting and Exhibit and CMA
111th National Western Mining Conference,
Denver, USA, 22-25 February 2009

A/Prof Jonas Addai-Mensah
Paydirt's 2009 Uranium Conference, Adelaide,
Australia, 16-17 March 2009

A/Prof Jonas Addai-Mensah
Alta Copper Uranium Conference, Perth,
Australia, 27-30 May 2009

A/Prof Jonas Addai-Mensah
9th International Conference on Agglomeration,
Sheffield, UK, 23-30 June 2009

A/Prof Jonas Addai-Mensah (invited speaker)
Australian Nickel Conference, Perth, Australia,
14-15 October 2009

A/Prof Jonas Addai-Mensah, *Dr Tim Barnes,
Dr David Beattie, *Ms Candace Chan, *Mr Terry
dermis, *Dr Satomi Onishi, *Dr Dennis Palms,
**Dr Mihail Popescu, *Prof Clive Prestidge, **Dr
craig priest, Ms lee san Puah, Dr rossen sedev,
*Ms Sin Ying Tan, Dr Su Nee Tan, *Ms Diana Tran,
*Dr Catherine Whitby and Ms Kai Ying Yeap
4th Biennial Australian Colloid and Interface
Science Symposium (ACIS), Adelaide, Australia,
1-5 February 2009

A/Prof Jonas Addai-Mensah, **Mr Terry Dermis,
Ms Wendy Harrington, Mr Ataollah Nosrati, *Dr
Akira Otsuki, **Mr Keith Quast, Mr Yunyu Shi, Dr
Hui Tan, *Ms Sin Ying Tan, Mr Wenbo Wang, Ms
Danfeng Xu, Ms Kai Ying Yeap, *Mr Yang Yu and
Mr Lin Zhou
CHEMECA 2009, Perth, Australia, 27-30
September 2009

Ms Moom-Sim Aw and Prof Clive Prestidge
The Australian and New Zealand Chapters of the
Controlled Release Society, Brisbane, Australia,
30 November - 1 December 2009

*Dr Tim Barnes, Ms Kara Holloway, Ms Christine
Lim, *Prof Clive Prestidge, *Dr Spomenka Simovic
and Mr Mohanraj Vellore Janarthanan
Australasian Pharmaceutical Science Association
(APSA) Conference, Hobart, Australia, 9-11
December 2009

Dr David Beattie
5th International Conference on Advanced
Vibrational Spectroscopy (incorporating the
8th Australian Conference on Vibrational
Spectroscopy), Melbourne, Australia, 12-17 July
2009

Dr David Beattie, *Dr Sarah Harmer-Bassell, *Prof
Roger Horn, Dr Agnieszka Mierczynska-Vasilev,
*Dr Satomi Onishi, *Dr Mihail Popescu and *Ms
Diana Tran
13th IACIS International Conference on Surface
and Colloid Science & 3rd ACS Colloid and
Surface Science Symposium, New York, USA,
14-19 June 2009

Dr David Beattie, Dr Sabina Gredelj and Dr
Agnieszka Mierczynska-Vasilev
Flotation 09, Cape Town, South Africa,
9-12 November 2009

*Ms Candace Chan
The International Conference and Exhibition on
Materials and AustCeram 2009, Gold Coast,
Australia, 1-3 July 2009

*Ms Candace Chan and Mr Gurvinder Singh
1st Nano Today Conference 2009, Singapore,
2-5 August 2009

Dr Jason Connor, *Dr Satomi Onishi, Dr Craig
Priest, Laureate Prof John Ralston, Dr Rossen
Sedev and Dr Catherine Whitby
The 2nd Indo-Australian Workshop, IISc,
Bangalore, India, 23-25 November 2009
Dr John Denman, Prof Hans Griesser and Mr Philip Moore
3rd Australian Microscopy & Microanalysis Research Facility (AMMRF) Strategic Planning Workshop, Fremantle, Australia, 10-11 June 2009

*A/Prof Naba Dutta, *Mr Colin Hall, *Mr Lachlan Hyde, *Prof Namita Roy Choudhury and *Ms My-Yung Truong
The 11th Pacific Polymer Conference, Cairns, Australia, 6-11 December 2009

Dr Rick Fabretto and Dr Dennis Palms
Bio-Systems & Electronics Workshop, Wollongong, Australia, 2-5 December 2009

*Dr Saeed Farrokhpay
49th SCAA Annual Conference, Glenelg, Australia, August 2009

*Dr Renate Fetzer, Dr Marta Krasowska, Dr Rossen Sedev and *Dr Catherine Whitby
International Workshop on Bubble and Drop Interfaces, Thessaloniki, Greece, 23-25 September 2009

A/Prof Daniel Fornasiero (invited lecture)
Australian-Chile Mining Workshop, University of Adelaide, Australia, 11 November 2009

Prof Stephen Grano and Mr Ray Newell
10th Mill Operators Conference, Adelaide, Australia, 12-14 October 2009

Dr Sabina Gredelj
Crushing and Grinding Conference, Brisbane, Australia, 29-30 April 2009

Prof Hans Griesser
ICMAT and IUMRS-ICA 2009 Conference, Singapore, 28 June - 3 July 2009

Prof Hans Griesser
22nd European Conference on Biomaterials, Lausanne, Switzerland, 7-11 September 2009

Mr Colin Hall
ACES 2009 Electromaterials Symposium for Nanostructured Electromaterials, Wollongong, Australia, 4-6 February 2009

Dr Sarah Harmer and Dr Eric Tavenner
AMAS X – The Tenth Biennial Symposium, Adelaide, Australia, 11-13 February 2009

Mr Lachlan Hyde
AVS 56th International Symposium and Exhibition, San Jose, USA, 8-13 November 2009

Dr Ivan Kempson (invited lecture)
Australian Micro-Analysis Symposium, Adelaide, Australia, 11-13 February 2009

Dr Ivan Kempson (invited lecture)
National Light Source Users Meeting Workshop, Brookhaven National Laboratories, USA, 18 May 2009

Dr Ivan Kempson
Joint International Conference of Biophysics and 14th Annual Conference of the Biophysical Society of ROC, National Cheng Kung University, Tainan, Taiwan, 24-27 June 2009

*Dr Ivan Kempson
Bioavailability of lead in peri-urban environments, CleanUp09, Adelaide, Australia, 24-30 September 2009

+Dr Ivan Kempson
Taiwan Nano Expo, Taipei, Taiwan, 7-9 October 2009

Dr Marta Krasowska, Dr Mihail Popescu, Ms Sin Ying Tan and Ms Die (Daisy) Yang
Advanced Materials for Australia’s Future International Workshop, Melbourne, Australia, 18-19 May 2009

**Dr Sunil Kumar
3rd Indo-Australian Conference on Biomaterials, Implants, Tissue Engineering and Regenerative Medicine, held in conjunction with the 19th Australasian Society for Biomaterials and Tissue Engineering Conference, Sydney, Australia, 21-23 January 2009
*Dr Sunil Kumar
International Conference on Metallurgical Coating and Thin Films, San Diego, USA, 27 April - 1 May 2009

Dr Mahaveer Kurkuri
Nanophotonics Down Under 2009 – Devices and Application, Melbourne, Australia, 21-24 June 2009

Ms Christine Lim, Prof Clive Prestidge, Mr Mohanraj Vellore Janarthanan and Mr Feng (Frank) Wang
Australian Controlled Release Society Peptide Workshop, Brisbane, Australia, 30 November - 1 December 2009

Dr Vera Lockett and Dr Rossen Sedev
3rd Congress on Ionic Liquids, Cairns, Australia, 31 May - 4 June 2009

*Dr Dusan Losic
11th Annual ATN Conference, Brisbane, Australia, 4-6 February 2009

*Dr Dusan Losic and Mr Krishna Kant
International Conference on Nanomaterials and Nanotechnology (ICANN 2009), Guwahati, India, 9-11 December 2009

Dr Satomi Onishi (invited lecture)
Division of Life Sciences, Faculty of Science, Hokkaido University, Hokkaido, Japan, 16 May 2009

*Dr Satomi Onishi
JAST International Tribology Conference, Tokyo, Japan, 20 May 2009

Dr Satomi Onishi (invited lecture)
RIKEN Forum, RIKEN Institute, Saitama, Japan, 22 May 2009

Dr Dennis Palms
The MacDiarmid Institute for Advanced Materials and Nanotechnology (AMN4), Dunedin, New Zealand, 8-12 February 2009

Mr Zihan Poh and *Mr Yang Yu
16th AINSE Conference on Nuclear and Complementary Techniques of Analysis, Sydney, Australia, 25-27 November 2009

Dr Craig Priest
International Nanotechnology Exhibition and Conference, Tokyo, Japan, 18-20 February 2009

*Dr Craig Priest
13th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS 2009), Jeju Island, Korea, 1-5 November 2009

*Prof Clive Prestidge
Pharm Sci Fair Conference, Nice, France, 7-12 June 2009

Prof Clive Prestidge (invited lecture)
School of Pharmacy, University of Aston, UK 6 July 2009

Prof Clive Prestidge (invited lecture)
School of Pharmacy, University of Strathclyde, UK 8 July 2009

*Prof Clive Prestidge and *Dr Benjamin Thierry
Particles 2009 Conference, Berlin, Germany, 9-14 July 2009

*Prof Clive Prestidge and Ms Angel Tan
Controlled Release Society Conference, Copenhagen, Denmark, 18-23 July 2009

Laureate Prof John Ralston (invited lecture)
University of Cape Town and Anglo Platinum, Cape Town, South Africa, 13-30 October 2009

Laureate Prof John Ralston
AUSIMM Award Luncheon, Adelaide, Australia, 2-3 December 2009

Laureate Prof John Ralston
Micro and Nanofluidics Workshop, Adelaide, Australia, 14-15 December 2009

Prof Namita Roy Choudhury (invited speaker)
238th ACS National Meeting and Exposition, Washington, USA, 16-20 August 2009

Dr Massimiliano Zanin
The South Australia Mining Industry and Investment Environment, Adelaide, Australia, 9 November 2009

*Dr Jingfang Zhou
Publications

**Book Chapter**


**Refereed Journal Articles**


Ms María Provatas using QEMSCAN®
QEMSCAN provides new capabilities for rapid characterisation of minerals and non-crystalline phases with distinct elemental composition. The system is able to measure thousands of points on a sample within seconds and display compositional images. The final result is a colour coded mineral map which presents details from about 0.2 µm in size. The mineral map is processed to extract quantitative information such as mineral proportion, particle size and shape, porosity, occurrence and association of the identified phases.


Lillo, M & Losic, D, (2009), ‘Pore opening detection for controlled dissolution of barrier oxide layer and fabrication of nanoporous alumina with through-hole morphology’, Journal of Membrane Science, 327, 11-17, (0376-7388), 2009


Szili, E, Kumar, S, Smart, R & Voelcker, N H, (2009), ‘Generation of a stable surface concentration of amino groups on silica coated onto titanium substrates by the plasma enhanced chemical vapour deposition method’, *Applied Surface Science*, 255, 6846-6850, (0169-4322), 2009


Thierry, B, Ng, J, Krieg, T & Griesser, H, (2009), ‘A robust procedure for the functionalization of gold nanorods and noble metal nanoparticles’, *Chemical Communications*, 13, 1724-1726, (1539-7345), 2009


**Refereed Conference Papers**


International Collaborators

**USA**
- Freeport McMoRan Mining Company
- Lawrence Berkeley National Laboratory, California
- Rio Tinto Kennecott Utah Copper

**Canada**
- COREM
- Simon Fraser University
- Teck Ltd
- University of Montreal
- University of Western Ontario
- Vale Inco Ltd

**Belgium**
- University of Mons-Hainaut

**Brazil**
- Federal University of Rio Grande do Sul
- University of Sao Paulo

**France**
- AREVA
- CPE Lyon

**Portugal**
- Lundin Mining Corporation

**United Kingdom**
- University of Bristol

**South Australia**
- Advanced Scientific Communications
- BHP Billiton (Olympic Dam Corporation) Pty Ltd
- BioInnovation SA
- Department of Further Education, Employment, Science & Technology
- Department of Primary Industries & Resources
- Energy Exploration Ltd
- Flinders University
- Institute of Medical and Veterinary Science
- ITEK Pty Ltd
- Levay & Co Environmental Services
- Premier's Science & Research Fund
- Research Laboratories of Australia
- Royal Adelaide Hospital
- SA Health

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- Vale Inco Ltd

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- University of Bristol

**France**
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- CPE Lyon

**Portugal**
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- Lawrence Berkeley National Laboratory, California
- Newcrest Resources Inc
- Rio Tinto Kennecott Utah Copper

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- University of Western Ontario
- Vale Inco Ltd

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**Brazil**
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- University of Sao Paulo

**South Australia**
- Advanced Scientific Communications
- BHP Billiton (Olympic Dam Corporation) Pty Ltd
- BioInnovation SA
- Department of Further Education, Employment, Science & Technology
- Department of Primary Industries & Resources
- Energy Exploration Ltd
- Flinders University
- Institute of Medical and Veterinary Science
- ITEK Pty Ltd
- Levay & Co Environmental Services
- Premier's Science & Research Fund
- Research Laboratories of Australia
- Royal Adelaide Hospital
- SA Health