

From the Research Director

In preparation for the mid-term ARC Centre Review later this year, the Centre has just completed a very successful strategic planning workshop on 17-18 June in Melbourne. Attended by the Chief Investigators within the Centre, selected additional nominees from participating institutions, Advisory Board Chair Dr Colin Adam, and Special Advisor on IP and Commercialisation, Dr Malcolm Frost, the workshop addressed Centre progress against both ARC and Centre objectives. It also focused on the development of a framework for a bid to extend the life of the Centre beyond the current five years.

It was immensely pleasing to see the clear evidence emerging that the Centre is now firmly established as a truly inclusive and collaborative national research Centre. Within the short space of little more than two years, the Centre has consolidated the core strengths of the national research community in light alloy design and processing into a foundation research program delivering outcomes at the highest international levels. Elsewhere in this Newsletter, you will find a brief report on the remarkable attention that Centre research is attracting in leading journals such as *Acta Materialia* and *Scripta Materialia* alone.

Beyond this core strength, the Centre has successfully established three new programs in titanium research, in hybrid materials and in surface engineering, with each showing tremendous promise. Workshop participants endorsed these programs with enthusiasm and the challenge for the Centre is to see each adequately resourced to realise the full potential in the medium to long term.

When this research success and potential is coupled with the Centre's powerful global research network, and its developing relationships with both national and international industry, I am confident that we have a very strong mid-term report to take to the ARC.

Indicative of the Centre's increasing recognition internationally, I am pleased to note that the Centre will lead an Australian delegation to the Asian Forum on Light Metals in Korea in November. This second such Forum will attract representation from Korea, Japan, PR China, Taiwan and Australia, and promises to develop into an important meeting for fostering collaboration in the region. The Australian delegation will comprise senior Centre researchers, as well as representation from the CAST CRC and CSIRO.

On a further positive note, the Centre is very pleased to acknowledge the appointment of Dr George Collins as the new CEO of the CAST CRC and to congratulate Dr Collins on his appointment. We look forward to continuing the strong and effective working partnership with CAST under Dr Collins' guidance. I would like to express my warm appreciation to Professor David StJohn, as outgoing CAST CEO, for the support that he has given to the development of that partnership over the past three years. It is pleasing to know that David will not be lost to the light metals research scene, as he continues as Chief Scientist within CAST.



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Extrusion Research wins Best Paper Award

A team of researchers from Rio Tinto Alcan and the University of Queensland won a best paper award at the 9th Aluminium Extrusion Seminar and Exposition in Orlando, USA. Held every four years, this conference is the largest aluminium extrusion industry gathering in the world. The paper was titled "Mechanisms of Streaking on Anodized 6xxx Series Extrusions".

Aluminium extrusions for building and construction are one of the biggest end-uses of aluminium. Streaking is a common problem in extruded aluminium alloys for decorative and architectural applications and involves a localised discolouration of the surface.



Halfway through a three-year collaborative project, funded by an Australian Research Council Linkage grant, the team have analysed a range of extruded products as well as conducting dedicated extrusion trials at Rio Tinto's Pacific Technology Centre in Thomastown. The paper was presented by Dr Xinquan Zhang from Rio Tinto Alcan to a full room at the conference and received a lot of interest from the attendees at the meeting.

"This project has been particularly successful in optimising the synergies between the industry partner and the University researchers", says Adj. Prof Mal Couper from Rio Tinto Alcan. "We can take full advantage of the in-house industrial expertise and experience in Rio Tinto, as well as our extrusion press, and the university researchers provide the detailed metallurgical understanding and analysis", he said. Dr Hanliang Zhu and Prof Arne Dahle at the University of Queensland are utilising cutting-edge facilities to analyse the underlying phenomena behind streaking.



In the next steps of the project, the team aims to improve the understanding of certain die-related streaks and also plan to involve die makers and extruders in the project.

Centre Visitors

The Centre is pleased to have hosted two Visiting Professors at the University of Queensland.



Professor Michel Rappaz from EPFL Lausanne visited the University of Queensland for two weeks in January 2008. During his visit he delivered two seminars on the current research at EPFL. There are many synergies between the research at EPFL and that occurring in UQ's Solidification Group and these were discussed

during Prof Rappaz' visit. In particular, future collaborations will occur in the area of understanding of the fundamentals of solidification, hot tearing and porosity formation. Professor Arne Dahle, Centre Chief Investigator from the University of Queensland, will spend a part of his sabbatical leave at EPFL in the latter half of 2008. Professor Rappaz's visit was very productive and fruitful and also very encouraging for all the researchers in the Solidification Group.



Professor Michel Suery from INP Grenoble visited UQ for two weeks in May 2008. Professor Suery delivered a seminar on the topic of rheology of partially solidified metals. His visit is part of an ongoing collaboration on the understanding of the rheological behaviour of Al and Mg alloys during solidification. It has been

discovered that these alloys are dilatant and behave as compacted granular materials after coherency concentrating deformation in shear bands. Professor Suery has conducted tomography studies of samples from UQ in the synchrotron in Grenoble as well as in lab-scale facilities within CNRS. These results were discussed in detail during his visit. At the end of the year, Professor Dahle will spend two months in Professor Suery's laboratory to further characterise these shear bands.

Both these collaborations will enable the Centre of Excellence to broaden the scope of its solidification related projects.

Welcome to Edna!



Edna Tan joined the Centre on the 9th of June as Executive Assistant and is based at the Centre's administrative offices at Monash University. Edna's role is as personal assistant to the Centre's Research Director, as well as contributing to the overall administration of the Centre. She has previously held similar positions

at Curtin University in Perth and at St. Vincent's Hospital in Melbourne. Please welcome Edna to the Centre!

Strategic Planning Workshop

In anticipation of the ARC Review to be held on September 30 this year, the Centre held a strategic planning workshop in Melbourne on the 17th and 18th of June. The workshop was well-represented by all Centre nodes and provided a platform for discussing the Centre's progress to date, as well as formulating a strategy for the Centre's future research portfolio. It was pleasing to see the progressive increase in collaboration between Centre researchers across a broad range of disciplines, and the Centre will be actively seeking to expand on this collaboration as it moves forward.



Centre staff participating in the Centre's Strategic Planning Workshop in Melbourne.

ARC Linkage

Dr. Nick Birbilis from Monash University was part of a successful Linkage application in the recent round of funding. The ARC Linkage Projects scheme funds collaborative projects that encourage and develop long-term strategic research alliances between universities and other organisations to obtain national economic, social or cultural benefits.

The ARC Linkage project secured ~\$150k of funding with Monash University as the administering organisation, which included two APA(I) awards. The project is entitled 'Improved Management of Australian Port Infrastructure by Development of Predictive Ageing Simulation'. This initiative includes three partner organisations including: Geelong Port, Maunsell Australia P/L, and Sydney Ports.

The project will examine exposure of built infrastructure to corrosive marine conditions causes deterioration and reduced service life. Asset managers lack predictive models of in-service durability. Using data gathered from Australian ports, lifecycle predictions will be developed, simulating durability and incorporating geographical location, structure type, composition, and levels of maintenance. The modelling has not been undertaken on Australian port assets, whereas international models reflect very different infrastructure and exposures and are based on simpler 2D conditions that do not simulate actual deterioration. The three-dimensional (3D) modelling and graphics will be unique worldwide, providing decision support for construction and maintenance.

Student & Staff profiles



Edward Liu is a postgraduate student at the University of Melbourne. His research interests include the phase evolution, thermodynamics, and kinetic characterisation of various binary metallic systems (both miscible and immiscible) consolidated from elemental powders via back pressure equal channel angular processing (BP-ECAP). BP-ECAP is an effective grain refinement and powder consolidation tool capable of inducing high accumulated strain on a single piece of material through repeated pressing. The application of BP-ECAP to initiate solid state alloying between elemental powders to form a bulk, ultrafine grained material with supersaturated/metastable solid solutions is investigated in Edward's project. The mechanical properties and thermal stability of the processed materials are also examined.

Edward is single (if interested, please call!) and is currently living in a big share house with people from five different countries. In his spare time Edward enjoys playing soccer, hanging out with his friends, indulging in computer gaming, reading mystery/science fiction novels, and travelling.



Professor Andrej Atrns is based at the University of Queensland. His research interests include corrosion mechanisms of magnesium alloys, stainless steels and copper alloys; stress corrosion cracking of steels and magnesium alloys; passivity in stainless steels, and atmospheric corrosion and patination of copper. Andrej lives in St Lucia in Brisbane and his interests include gardening, fine food, travelling, music and walking. Andrej's wife Jana is learning to trade FX, and his daughter Inga is a GP who is planning to move to Townsville with her partner. Andrej's son Aleks has made a good start on his PhD on the use of CO₂ as a working fluid in engineered geothermal.

New Advisory Board member



The Centre is pleased to announce the appointment of a new member to its Advisory Board. **Richard Marshall** is Director of Innovation Engineering at GM Holden in Melbourne. He holds a Bachelor of Engineering Degree in Mechanical Engineering from The Royal Melbourne Institute of Technology, and a Post Graduate Diploma in Technology Management from Deakin University.

Richard was appointed Director - Innovation Engineering in September, 2007. Prior to joining Innovation he was Engineering Group Manager for Body Structures and Closures and from 1999 to 2002 he was Manager of Coupe Engineering. Between 1998 and 1999 Marshall was Section Engineer for Body for Asia Pacific Engineering and from 1990 to 1997 he had various assignments in the Advanced Engineering Group. He began his automotive career in 1985 with Kenworth Trucks and joined Holden in 1987 as a project Engineer in Noise and Vibration. With his strong industrial background, Richard is sure to be a welcome addition to the Centre's Advisory Board.

Small Matters: Microscopy and Microanalysis

In 2008, **The Australian Key Centre for Microscopy and Microanalysis**, a node of the Centre of Excellence for Design in Light Metals is celebrating 50 years of research, service and training in the field of Microscopy and Microanalysis. To mark this occasion, a 3-day Symposium will be held at the University of Sydney from 3-5 December 2008. The event will include the official Golden Jubilee Luncheon in the Great Hall of the University of Sydney on 4 December.



www.emu.usyd.edu.au

Australian Key Centre for Microscopy and Microanalysis



The University of Sydney

The symposium will focus on the interdisciplinary topic of microscopy and microanalysis. It will include a combination of contemporary research topics ranging from technical developments in microscopy – for example, in micro- and nano-scale tomography – to applied microscopy in fields as diverse as light alloys, tissue engineering, advanced materials and archaeology. A number of perspective talks will cover the impact and applications of microscopy and microanalysis, past, present and future.

The organisers aim to present a highly stimulating and productive conference. The program will include plenary lectures given by Dr Thomas Kelly (Imago Scientific Instruments) and Professor Wolfgang Baumeister (Max-Planck-Institute for Biochemistry). Also included will be well-balanced technical symposia comprising oral presentations from invited speakers that will cover a range of topics and fields. The list of international speakers includes names such as David Williams, David Cockayne, Paul Midgley, Manfred Ruele, Mike Loretto, Mike Swain and Hans Tanke to name just a few. Poster sessions have also been scheduled with dedicated discussion time and prizes for the top posters.

The Australian Key Centre for Microscopy and Microanalysis would like to invite you to be a part of this important event. Poster contributions are welcome from all participants. More information is available at the following website:

www.emu.usyd.edu.au/golden_jubilee/commemorative_symposium/index.shtml

A detailed program and instructions of how to register will be provided on the website closer to the event.

ARNAM award

In the last round of ARC Australian Research Network for Advanced Materials funding support, **Dr. Nick Birbilis** was awarded funding for Early Career Researcher (ECR) collaborative research to work in the USA on a project investigating the *Influence of severe plastic deformation upon corrosion kinetics*.

The objective of the proposed work is to define a deterministic basis for interpreting the influence of severe plastic deformation (which impacts grain size and grain orientations) on the corrosion kinetics of light alloys. This will exploit a unique capability to characterise material nano/microstructure (at The Ohio State University with Centre Partner Investigator, Professor Hamish Fraser); and to quantitatively interpret the empirical (corrosion and material characterisation) data in the framework of a physically based model.

This will fundamentally and explicitly link the effect of severe plastic deformation on corrosion - and will be carried out at Pennsylvania State University in collaboration with Professor Digby Macdonald. Specifically it will result in:

- a) the necessary theoretical base for interpreting the impact of 'structural' changes induced by severe plastic deformation upon corrosion, and
- b) provide an initial basis to subsequently permit the objective design of materials processed by severe plastic deformation (which can possess very unique and favourable mechanical properties) with corrosion resistance in mind.

Centre Researchers get HOT

For the last quarter of 2007, papers by members of the Centre featured prominently in so-called Hot Papers in both *Scripta* and *Acta Materiala*. Both of the Number 1 downloads for the October-December period involved Centre researchers, while overall three of the top 25 in *Scripta* and two of the top 25 were in *Acta*.

Dr Matt Barnett (Deakin University) featured in four of the papers while **Professor Yuri Estrin** (Monash University) was involved in two. Clearly work related to both Mg and ultrafine/nanostructured metals were the hot areas.

Congratulations to **Dr Ichat Sabirov** for his first Centre paper achieving the number 1 status in *Scripta* (Enhanced tensile ductility of an ultra-fine-grained aluminium alloy).

Further details on the 'Top 25 Hottest Articles' can be found at:

www.top25.sciencedirect.com

Upcoming conferences

4th International Conference on Nanomaterials

18-22 August 2008, Goslar, Germany
www.nanospd4.org

11th International Symposium on Physics of Materials

24-28 August 2008, Prague, Czech Republic
<http://material.karlov.mff.cuni.cz/events/ispma11/ann1.html>

5th International Conference on Advanced Materials and Processing (ICAMP5)

3-6 September 2008, Harbin, China
<http://icamp.hit.edu.cn>

LCF6

6th International Conference on Low Cycle Fatigue

8-12 September 2008, Berlin, Germany
www.dvm-berlin.de

Titanium 2008

21-23 September 2008, Las Vegas, USA
www.titanium.org

ICAA11

11th International Conference on Aluminium Alloys

22-26 September 2008, Aachen, Germany
www.dgm.de/dgm/icaa11

Aluminium 2008

23-25 September 2008, Essen, Germany
www.dgm.de/aluminium

MS&T'08

Materials Science & Technology 2008

5-9 October 2008, Pittsburgh, Pennsylvania, USA

Corrosion and Prevention 2008

16-19 November 2008, Wellington, New Zealand
www.corrosion.com.au

TMS 2009

15-19 February 2009, San Francisco, California, USA
www.tms.org/annualmeeting.html

Titanium 2009

13-15 September 2009, Waikoloa, Hawaii, USA
<http://www.titanium.org>

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Contact the Centre

Dr. Astrid Nordmann
Chief Operating Officer
ARC Centre of Excellence for Design in Light Metals
Monash University
Wellington Road, Clayton, VIC. 3800
Tel: +613 9905 5791
Fax: + 613 9905 4940
Email: astrid.nordmann@eng.monash.edu.au
Website: www.arclightmetals.org.au

Commercialisation Training Scheme Award

Congratulations to postgraduate student **Nasia Shahzad** from Monash University for receiving a Commercialisation Training Scheme (CTS) award. The objective of the CTS 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.

Funding from the Commonwealth Department of Education, Employment and Workplace Relations is provided through annual block grants to participating higher education providers who are responsible for identifying and selecting high quality Australian higher degree by research students. CTS students will receive training in three areas:

- Commercialisation Know-how (a strategic understanding of commercialisation processes);
- Technical Commercialisation Skills (e.g. Intellectual Property Management, Financial Management, Project Management and Market Research); and
- Organisational Behaviour Skills (e.g. Leadership, Teamwork and Presentation skills).

This award allows Nasia to undertake part-time enrolment in the Graduate Certificate in Commercialising Research in 2008. Recipients of this award maintain their higher degree by research candidature and enrol in one unit of the Graduate Certificate in Commercialising Research per semester over two years.

Congratulations on your achievement, Nasia!

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