

## From the Research Director

Welcome to this first issue of ALTIMA for 2007. From the research perspective, the first quarter of 2007 has seen the Centre responding constructively to the strategic challenges identified during its first Annual Workshop in November, 2006, with an emphasis on consolidation of the research portfolio and sharpening of the definition of strategic design targets and research outcomes. In part, this is an exercise in progressively finding the areas of research alignment and complementarity across institutional boundaries, and steadily increasing the degree of effective collaboration, with a natural reduction in number and increase in scale of individual projects. In part, it is an exercise in the Centre coming to terms with the philosophy that it has embraced, which is to measure its progress against strategic design targets and quantitatively defined research goals.

This latter component constitutes an interesting challenge for the Centre, for it requires an acceptance by academic and research staff that their research can be more effectively and more rationally planned than is common in most academic research environments, and thus quite a significant cultural shift. It is no less challenging because this increased focus on design and research targets must not be allowed to constrain the ambition, novelty and scope in projects. Effective targets will be those that challenge the capacity for innovation and the research capabilities and skills of the staff engaged. I am watching this exercise with great interest, trying to ensure that we confront the issues conscientiously without detracting excessively from the research itself. It is pleasing for me to note that the great majority of researchers are accepting the challenge and that the exercise itself is beginning to yield benefits in terms of enhanced collaboration in multi-institutional projects.

As I have noted previously, the Centre has been fortunate to progressively assemble an outstanding research team and this has continued into 2007; a warm welcome to all those who have joined the Centre in the past few months. I am very pleased to highlight, in particular, the return from Germany of Professor Yuri Estrin to a joint appointment with CSIRO Manufacturing and Materials Technology and Monash University. As CSIRO Professorial Fellow, Yuri has a special brief to advance the light metals collaboration between CSIRO and Monash University, and, through Monash, with the Centre more broadly. Equally, it is a pleasure to welcome back to Monash University, Dr Nick Birbilis, who completed a productive research fellowship at Ohio State University in late 2006. Nick will lead the Centre's Research Program in Surface Engineering and manage development of the Victorian Facility for Light Metals Surface Technology.

Efforts to enhance the Centre's international standing continue apace, enhanced by a growing collaboration in China. Under existing agreements with the Aluminum Corporation of China (CHALCO) and Central South University (CSU), the Centre will host two research staff from CHALCO and two students from CSU for periods of 12 months each, commencing mid-2007. The Centre was pleased to host a visit from the CEO of CHALCO, Dr Xiao Yaqing, on 26 March, 2007, during which Dr Xiao signed a Memorandum of Understanding with Monash University Vice Chancellor, Professor Richard Larkins, committing the two parties to explore opportunities for the establishment of a joint research centre of excellence in light alloy design.

In other international news, Dr Astrid Nordmann and I were pleased to visit the National Institute for Materials Science (NIMS) in Tsukuba, Japan in March and to sign a Memorandum of Understanding with the Structural Metals Center within NIMS that will provide a framework for expanded research collaboration with arguably the strongest light metals research facility in Japan. This represents another exciting opportunity for Centre staff and students to interact with Japanese colleagues and access complementary facilities. Equally, it is another pleasing example of the widespread recognition that the Centre is attracting internationally.

**Barry Muddle**



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Centre  
Visitor:  
Professor  
John Jonas

The Centre is pleased to have hosted a visit from **Professor John Jonas** at its Deakin node in Geelong. Professor Jonas is the Henry Birks Professor of Metallurgy Emeritus from McGill University in Montreal, Canada and was based at Deakin University from February to April 2007.

Professor Jonas' group is currently finishing a three-year investigation of the warm hydroforming of magnesium alloys. This work is sponsored by General Motors of Canada and is concerned with developing methods of forming structural parts out of Mg alloy tubes.

As Mg is a hexagonal metal, it is difficult to form at room temperature (limited slip systems). By heating parts up to about 200°C, the components become easier to form (more slip systems). This joint project involves the University of Sherbrooke (in Quebec), who do the finite element simulations of forming, and NRCAN-CANMET in Ottawa, who do the hydroforming.

Professor Jonas's group performs the mechanical testing, microstructural characterisation and textures. The main foci have involved the twinning behaviour, as well as aspects of the fracture and ECAP (equal channel angular pressing) behaviour. Other light metal projects currently underway include: 1) Coarse-grain Superplasticity in Al-Mg Alloys and 2) Sheet Metal Forming of Ti Alloys.

Professor Jonas is married with four children and four grandchildren (so far!). He enjoys skiing in the winter and boating and swimming in the summer.

# Victorian Facility for Light Metals Surface Technology

Funding from the Victorian State Government's Department of Industry, Innovation and Regional Development (DIIRD) is being directed towards a strategic investment in essential capability and infrastructure within the framework of a designated Victorian Facility that will provide national leadership and global competitiveness in Light Metals Surface Technology.

The Victorian Facility for Light Metals Surface Technology has nodes at Monash University in the Monash Science, Technology, Research and Innovation Precinct (STRIP) and at Deakin University in the Geelong Technology Precinct.

The State Government contribution to these elements of the Facility is being matched by Centre of Excellence contributions. Milestones of the Facility for 2006 include:

- Appointment of Dr. Nick Birbilis as Research Program Leader at Monash University for the Victorian Facility for Light Metals Surface Technology.
- Identification and acquisition of dedicated laboratory space at Monash University for characterisation of the physical properties of light metal surfaces.
- Major equipment ordered:
  - EBSD system for FEG-SEM (Monash),
  - High temperature Tribometer (pin-on-disk) system (Deakin),
  - Scanning Probe Microscope (AFM / STM) with full electrochemical functionality (Monash).

The research associated with this Facility includes:

- Sol-gel / silane conversion coating of Al-based alloy systems for enhancing corrosion resistance.
- Investigation into the effect of the effect of specific alloying additions on the corrosion potential of Mg-based alloys.
- Investigation and control of the surface properties Mg alloys with respect to ignition control of magnesium and high temperature oxidation



**Dr. Nick Birbilis,**  
*Program Leader for the Centre's 'Surface Engineering' Program and coordinator of the Victorian Facility for Light Metals Surface Technology.*

# Staff & student profiles

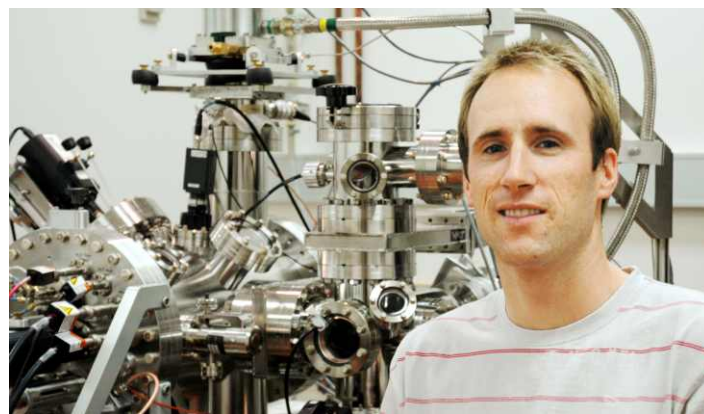
This issue's staff and student profiles are **Dr. Kenong Xia** from the University of Melbourne and **Ross Marceau** from The University of Sydney.

**Dr. Kenong Xia** is based at the University of Melbourne. His research interests include: Design and synthesis of bulk complex materials using particles; nanostructured alloys and composites via severe plastic deformation; high temperature structural intermetallic alloys; high temperature deformation and strengthening; semi-solid processing of light alloys and composites; and solidification processing of metal matrix composites.



Kenong is (married with two daughters and in his spare time enjoys reading, sports (both playing and watching) and spending time with his family.

**Ross Marceau** is from the University of Sydney. His research interests include the design of Al alloys by understanding solute clustering and precipitation processes in the early stages of age hardening. His project involves characterising structure-property relationships using microscopy and microanalytical techniques such as transmission electron microscopy, atom probe tomography (LEAP) and positron annihilation spectroscopy (PALS, CDB). The project is also supported by CSIRO under their flagship program for light alloy development in Australia.



Ross lives on Sydney's northern beaches and on his weekends enjoys spending time outdoors; surfing, road cycling, mountain biking or rockclimbing. He's also an avid snowboarder and is keen to try out the new board that he bought in Vancouver after the 10th International Conference on Aluminum Alloys (ICAA10) in either interior British Columbia, Canada, or the masses of powder that hit the mountains of northern Japan. Hiking is another passion that has taken Ross up and down mountains in places like New Zealand, Japan and Tasmania. In February 2007 he embarked on his first mountaineering trip (ropes, harness, ice axes, crampons - the whole deal) in the Mt Cook region of the south island of New Zealand, near Fox and Franz Josef glaciers.

## Severe Plastic Deformation

The Australian Research Council has recently awarded an International Linkage award to **Dr. Rimma Lapovok** at Monash University on research advancing the structural use of magnesium alloys in the building and transportation industries.

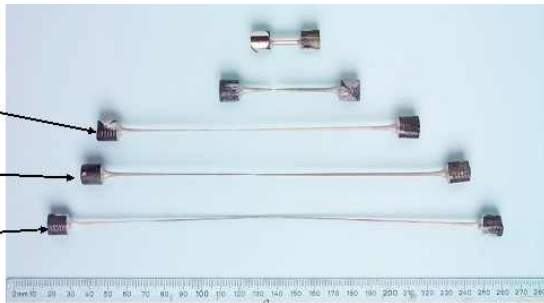
Rimma's work uses severe plastic deformation techniques such as Equal Channel Angular Extrusion (ECAE) to produce magnesium alloys with exceptional elongation-to-failure (over 2000%).

### Elongation

1400%

1700%

2040%



This activity has been carried out with European colleagues, most notably **Professor Yuri Estrin** from Clausthal University in Germany. Rimma's research activity is likely to develop further now that Professor Estrin has joined Monash University as a CSIRO Professorial Fellow. This five-year appointment is jointly funded by CSIRO and Monash University and gives Professor Estrin a special brief to develop the CSIRO-Monash research interface in light metals.

## Travel award for Deakin

**Dr. Ilchat Sabirov** from Deakin University has received a travel grant under the "International Science Linkages Programme - "Scientific Visits to Europe 2007/2008" funded by the Australian Academy of Science.

The travel grant provides funding for a 40 day visit to the Clausthal University of Technology in Germany, one of Europe's finest metallurgy schools. Ilchat will be studying the deformation behavior of ultrafine grained aluminium alloys fabricated by severe plastic deformation. These materials demonstrate unique mechanical properties such as high strength, high ductility, superplasticity. The investigation will focus on the effect of microstructure on the mechanical properties of the ultra-fine grained Al alloys and will combine experimental and theoretical approaches.

## MoU with NIMS

The Centre of Excellence recently signed a Memorandum of Understanding with the National Institute for Materials Science (NIMS) in Tsukuba, Japan. NIMS is Japan's sole Independent Administrative Institution (IAI) specialising in materials science and is home to the Structural Metals Centre. This Centre comprises groups in Physical Metallurgy, Lightweight Alloys, Heat Resistant Design, Welding Metallurgy and Titanium. The MOU between NIMS and the CoE addresses collaboration on the microstructural characterisation of light weight alloys.

## UQ trifecta!

Great news from the University of Queensland node! Firstly, not only has **Arne Dahle** has been promoted to Professor but he has also recently co-authored a paper in *Nature* with **Chris Gourlay**.

In their paper 'Dilatant shear bands in solidifying metals' Arne and Chris have proven for the first time that metallic alloys exhibit deformation behaviour not unlike sand grains on the beach.. Their findings open up new and exciting links between alloy solidification and research areas as diverse as volcano and earthquake science, soil mechanics and the processing of cereal crops ... congratulations Arne and Chris!

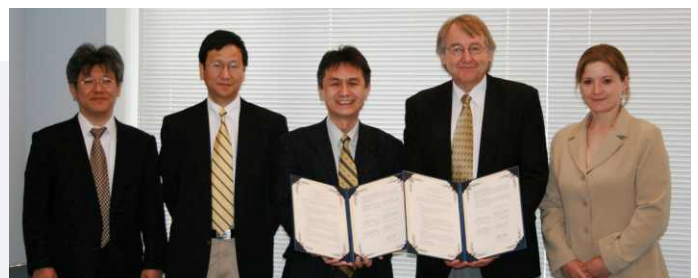
Secondly, **Professor Graham Schaffer** has been appointed to the ARC College of Experts. The ARC engages a College of Experts to provide strategic advice and to play a key role in the identification of research excellence.

Its members are experts of international standing drawn from the Australian research community: from higher education, industry and public sector research organisations. College of Experts members are approved by the Minister for appointment of periods of between one and three years.

The College of Experts members assess and rank ARC grant applications submitted under the National Competitive Grants Program, make funding recommendations to the ARC and provide strategic advice to the ARC on emerging disciplines and cross-disciplinary developments. There are currently 77 members of the College of Experts ... and Graham is now one of them!

Thirdly, the Centre is delighted to announce that **Professor Pat Kelly** has been appointed as an Honorary Professor at the University of Queensland. Pat received his PhD from the University of Cambridge and has a long association with the University of Queensland.

His research interests include the crystallography of phase transformations, both martensitic and diffusion controlled, edge-to-edge matching, the application of electron microscopy and diffraction techniques to the study of materials. Congratulations and welcome Pat!



**Signing of MOU with NIMS (from left):** Dr Toshiji Mukai (Group Leader Lightweight Alloys Group); Professor Kazuhiro Hono (Director-General, Magnetic Materials Centre); Professor Kaneaki Tsuzaki (Managing Director, NIMS); Professor Barry Muddle (Research Director, ARC Centre of Excellence), and Dr. Astrid Nordmann (Chief Operating Officer, ARC Centre of Excellence).

## Upcoming conferences

### 11th World Conference on Titanium (JIMIC-5)

3-7 June 2007, Kyoto, Japan  
[www.appollon.nta.co.jp](http://www.appollon.nta.co.jp)

### GIFA 2007

12-16 June 2007, Dusseldorf, Germany  
[www.messe-duesseldorf.de/gifa](http://www.messe-duesseldorf.de/gifa)

### 10th Aluminium Casthouse Conference

5-8 August 2007, Sydney, NSW  
[www.aluminiumcasthouse.com](http://www.aluminiumcasthouse.com)

### Light Metals 2007

25-30 August 2007, Toronto, Canada  
[www.metsoc.org](http://www.metsoc.org)

### MS&T '07

COBO Centre  
16-20 September 2007, Detroit, Michigan  
[www.matscitech.org/2007](http://www.matscitech.org/2007)

### ICAA11 - International Conference on Aluminium Alloys

22-26 September 2008, Aachen, Germany  
[www.dgm.de/dgm/icaa11](http://www.dgm.de/dgm/icaa11)

### LMT2007 - 3rd International Conference on Light Metals Technology

24-26 September 2007, Saint-Sauveur, Québec, Canada  
[www.lightmetals.org](http://www.lightmetals.org)

### TITANIUM 2007 - 23rd Annual Conference and Exhibition

7-9 October 2007, Florida, USA  
[www.stainless-steel-world.net/calendar/index.aspx](http://www.stainless-steel-world.net/calendar/index.aspx)

### Titanium & China Conference 2007

12-23 October 2007, Beijing, China  
[www.metal-pages.com/conferences](http://www.metal-pages.com/conferences)

### ICAMC 2007 International Conference on Advanced Materials and Composites

NIST, 24-26 October 2007, India  
[w3rrlt.csr.res.in/icamc2007](http://w3rrlt.csr.res.in/icamc2007)

## Congratulations!

Congratulations to the Centre's Executive Officer, Nancy Place and her husband Tim on the arrival of Rebecca Ann-Marie. Rebecca was born at Mitcham Private Hospital on 20th December.



## For the diary ...

The Centre will be holding its Annual Workshop in Sydney on the 27th and 28th of November. Further details will be provided soon.



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## Our partner universities

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Department of Materials Engineering
- **University of Queensland**  
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- **University of New South Wales**  
School of Materials Science and Engineering
- **Deakin University**  
School of Engineering and Technology
- **University of Sydney**  
Australian Key Centre for Microscopy and Microanalysis
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