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**Postal Address**

School of Civil, Mining and Environmental Engineering  
Faculty of Engineering  
University of Wollongong  
Northfields Ave.  
NSW 2522, Australia

Phone: +61 2 4221 4391  
Fax: +61 2 4221 3238  
Web: [http://www.uow.edu](http://www.uow.edu)
We are very proud to host the School of Civil, Mining and Environmental Engineering in the Faculty of Engineering at the University of Wollongong. These disciplines all have a very proud record in teaching and research ever since they were set up amongst the first activities of the University when it was founded in 1951. This year the School includes one of the fastest growing single disciplines in the Faculty, in Mining Engineering, and it has also rapidly expanded its incoming student intake in Civil Engineering each year for the last five consecutive years.

The School contributes vigorously and creatively to the Faculty's teaching and research activities. For example, this year it has led the Faculty in the designing and operation of a new teaching space which provides new multimedia facilities to all our students to assist them in developing team and project work skills, and its staff are major contributors to innovation in many Faculty wide 'core' subjects. In research it has international reputations in several key areas in Civil, Mining and Environmental Engineering, and has received many research awards and accolades as outlined in this report.

I am confident that Graduates from this School receive the highest quality engineering education given by dedicated staff who are themselves highly qualified engineers with international reputations for the quality and creativity of their engineering teaching, research, and industrial consultancy work. The School's graduate employment rates of 100% for the last several years (as measured by the independent ‘Good University’s Guide) demonstrates that Industry also has a very high regard for our graduates. The School is certainly a ‘high achiever’, as shown in this annual report.

Chris Cook
HEAD OF SCHOOL REPORT

This is the inaugural annual report of the recently restructured and rejuvenated School of Civil, Mining and Environmental Engineering (CME) having being transformed from a conventional Department. This report contains important information about the structure of the School and its teaching and research activities, conducted by a high quality academic staff supported by dedicated technical and general staff. The School of CME provides its students with the finest quality education in Civil, Mining and Environmental Engineering. The students in our three undergraduate and coursework Masters degree programs are constantly exposed to cross-disciplinary interactions that make the depth and breadth of the academic experience in the School most unique and rewarding. The School thrives on the quality of its academic and support staff who had won numerous teaching, research and general staff awards, and takes great pride in the quality of the graduates it produces. Dr. Samanthika Liyanapathirana deserves special mentioning as the winner of ASCE’s 2007 Middlebrooks Award for her contribution to the novel design of piles in liquefying soils (shared with Prof. Harry Poulos of Coffey Geotechnics), and Assoc. Prof. Michael Boyd and Dr. N. Bodhinayake receiving the GN Alexander medal from the Institution of Engineers Australia, for their innovation in the methods of flood prediction in a variety of catchments.

The industrial boom particularly in mining and civil infrastructure development has seen a rapid growth in high caliber undergraduate enrolments in these streams. Environmental engineering remains a national priority maintaining a steady number of enrolments, including the ever popular Civil and Environmental combined degree. The revitalization of essential subject strands such as in structural analysis and design, geomechanics, water resources, mine planning and design, and computations and numerical analysis with valuable input and participation from industry colleagues in our teaching programs has generated more challenging and exciting degree programs within the School. Our record in research continues to be strong and vibrant. With the creation of senior academic positions in Structural Design and Water Resources and the appointment of several new academics and full-time research personnel in Civil and Mining streams, the school has continuously enjoyed an exciting and challenging research outlook capturing a wider array of areas including seismic, offshore dynamics, natural disaster mitigation and climate change issues. This builds on the experience and outstanding record in winning competitive research grants and a commendable completion rate of doctoral students.

Greater interaction with industry colleagues in all disciplinary areas has created synergies with the inevitable result of industry-based grants in research through the Australian Research Council (ARC)-Linkage Projects, the Cooperative Research Centre for Railway Engineering and Technologies (CRC-Rail) and the Australian Coal Association Research Program (ACARP). Increased attempts by staff to secure blue sky funding have also been rewarded with success in the ARC-Discovery Projects. The healthy number of research students (enrolments and completions), an impressive rate of peer-reviewed publications, national and international awards for academic staff in teaching and research, significant infrastructure grants for modernization of laboratories, and increased participation of international academics in research activities including two Endeavour Fellows funded by the Department of Education, Science and Training have maintained the reputation of the School as one of the best in the country.
While providing an excellent teaching and research environment within the School, a larger fraction of the academic staff is now involved in major consultancies and contract research, including modern design and performance verification of roads and rail tracks, ground improvement of low-lying coastal zones, structural damage assessment, flood plain development, composite materials testing, steel structural design, dam maintenance, waste water treatment and recycling, landslides risk assessment among others in several states including New South Wales, Queensland and Victoria.

The School of Civil, Mining and Environmental Engineering is geared to meet not only the future educational challenges for producing topmost graduates in the country, but also to face the dramatically changing industrial trends and environmental changes. I profoundly thank all our School’s academic, technical and general staff, the past and present students and the local community for their efforts for making our School for what it is today.

Buddhima Indraratna

A MESSAGE FROM FORMER HEAD OF SCHOOL

It has now been a little over six months ago since I have left the University of Wollongong to take on the helm of the School of Engineering at the University of Western Sydney. It is also just over twelve years ago that I began my academic career within the then Department of Civil and Mining Engineering of the University of Wollongong. The UoW and the School of CME within these dozen or so years has gone from strength to strength. The teaching programs at UoW are at the top of the national rankings as evidenced by the teaching quality rankings of 2005. I have no doubt that such programs such as Introduction to Tertiary Teaching a compulsory unit that academics must complete has had a major impact on these rankings. Furthermore, in this time the University of Wollongong has developed an outstanding reputation for applied and fundamental research which sees it ranked up with the Group of Eight universities of Australia on a per capita basis.

When I returned to the University of Wollongong to take on the role of the Head of the School of CME in 2004, I had the great pleasure to work with the Dean of Engineering, Professor Chris Cook and the staff of the school to help it position itself in the top echelon of schools of it’s type in the country. The school I believe has achieved this, which is best evidenced by it’s ability to maintain a 100% graduate placement for it’s undergraduate students for the last five years as well as maintain an academic staff complement with 100% PhD qualifications. The school through its effective recruitment strategies conducts world class research and has had great success in the ARC Discovery, Linkage and the Australian Coal Association Research Program (ACARP) funding over the last decade. Furthermore, it forms an important node for the national CRC for Railway Engineering and Technologies, which has been so expertly led by Professor Buddhima Indraratna.

In closing, I feel greatly honoured to have been able to lead such a talented group of staff within the school and for being able to work with such a vibrant university executive in achieving the school’s objectives. It is particularly pleasing to see that Professor Buddhima Indraratna has stepped into the fold as the new Head. I wish him and the school the greatest of success in the future and look forward to being able to maintain the links that have been developed over my many years of involvement with the University of Wollongong.

Brian Uy
### 1 Current School Structure

#### School Staff

The management team of the School of Civil, Mining and Environmental Engineering at the University of Wollongong is as follows:

- **Head of School**: Professor Buddhima Indraratna
- **Civil Engineering Discipline Advisor**: Professor Tim McCarthy
- **Mining Engineering Discipline Advisor**: A/Professor Ernest Baafi
- **Environmental Engineering Discipline Advisor**: A/Professor Muttucumaru Sivakumar
- **Postgraduate Research Student Coordinator**: A/Professor Ernest Baafi
- **Senior Administrative Officer**: Ms Lorelle Pollard

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<th>Environmental</th>
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<tr>
<td>Prof Buddhima Indraratna</td>
<td>A/Prof Naj Aziz</td>
<td>A/Prof Michael Boyd</td>
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<td>Prof Tim McCarthy</td>
<td>A/Prof Ernest Baafi</td>
<td>A/Prof Muttucumaru Sivakumar</td>
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<tr>
<td>Prof Brian Uy (until Dec. 2006)</td>
<td>A/Prof Ian Porter</td>
<td>Dr Long Nghiem</td>
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<tr>
<td>A/Prof Muhammad Hadi</td>
<td>Dr Jan Nemcik</td>
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<td>Dr Brett Lemass</td>
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<td>Dr Samanthika Liyanapathirana</td>
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<td>Dr Alex Remennikov</td>
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<td>Dr Hadi Khabbaz</td>
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<td>Dr Neaz Sheikh</td>
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- **Research Academics**
  - Dr Phil Flentje
  - Dr Cholachat Rujikiatkamjorn
  - Dr Alexandra Golab
  - Dr Daniel Palamara
  - Dr Mohamed Shahin
  - Dr Kenneth Agenson
  - Dr Jayan S. Vinod

- **Honorary Professorial Staff**
  - Professor Robin Chowdhury (Civil Engineering)
  - Associate Professor Maxwell Lowrey (Civil Engineering)
  - Associate Professor Denis Montgomery (Civil Engineering)
  - Associate Professor Bill Upfold (Mining Engineering)
2 SCHOOL STAFF

2.1 Academic Staff

**Professor Buddhima Indraratna**
PhD, MSc, DIC, BSc (Hons), FIEAust, FASCE, FGS, CEng, CPEng
Professor of Civil Engineering
Head of School

Office Location: Room 4.133
Email: indra@uow.edu.au
Tel: +61 2 4221 3046
Fax: +61 2 4221 3238

Research Interests: (1) Ground improvement including sub-surface drainage and soft clay stabilisation, (2) Large scale geotechnical testing and process simulation, (3) Railway foundations, (4) Jointed rock engineering, (5) Geoenvironmental engineering including remediation of acid sulphate soils, (6) Flow through porous and jointed media including dam filters, (7) Dams and embankment engineering, (7) Numerical and analytical modelling and (8) Ground instrumentation

**Professor Brian Uy**
BE, PhD, CPEng, CEng, MIEAust, MASCE, MInstCE, MICE
Professor of Structural Engineering
Previous Head of the School (until Dec. 2006)

From Jan. 2007: Head of the School of Engineering at University of Western Sydney
Email: b.uy@uws.edu.au
Tel: +61 2 4736 0228

Research Interests: (1) Composite steel-concrete structures, (2) Steel structures and (3) Structural design and stability

**Professor Tim McCarthy**
BE (Civil) MSc PhD MIEI
Professor of Structural Steel and Design
Civil Engineering Discipline Advisor

Office Location: Room 4.G041
Email: tim_mccarthy@uow.edu.au
Tel: +61 2 4221 4591
Fax: +61 2 4221 3238

Research Interests: (1) Structural steel design, (2) Offshore structures, (3) Deepwater marine riser design, (4) Ecologically sustainable structural design, (5) Structural optimisation using genetic algorithms, (6) Applications of artificial Intelligence in Structural Engineering, (7) Information modelling and management in engineering and (8) Systems thinking in engineering design
Associate Professor (Siva) Muttucumaru Sivakumar  
BSc (Eng) Hons, ME Hons, PhD, MAWA, FIEAust, CPEng  
Environmental Engineering Discipline Advisor  
Office Location: Room 4.125  
Email: siva@uow.edu.au  
Tel: +61 2 4221 3055  
Fax:+61 2 4221 3238  
Research Interests:  
(1) Water quality modelling and management, (2) Sustainable design of water and wastewater treatment processes, (3) Membrane processes for water treatment and recycling, (4) Agricultural waste management and resource recovery, (5) Flow and sediment transport processes in channel junctions and (6) Onsite wastewater treatment and reuse

Associate Professor Ernest Baafi  
BSc, MSc, PhD, ACSM, MAusIMM  
Postgraduate Research Student Coordinator  
Mining Engineering Discipline Advisor  
Office Location: Room 4.134  
Email: ebaafi@uow.edu.au  
Tel: +61 2 4221-3031  
Fax:+61 2 4221-3238  
Research Interests:  
(1) Geostatistics, (2) Mine system simulation and (3) Operations research methodologies to mine evaluation and design

Associate Professor Naj Aziz  
BSc (Eng) Hons, ME Hons, PhD  
Associate Professor  
Office Location: Room 4.G32  
Email: naj_aziz@uow.edu.au  
Tel: +61 2 4221-3449  
Fax:+61 2 4221-3238  
Research Interests:  
(1) Rock mechanics and ground control, (2) Rock bolting, (3) Mine gases and coal/gas outburst control, (4) Mine dust and dust control and (5) Rock cutting technologies

Associate Professor Muhammad Hadi  
BSc, MSc, PhD, CPEng, MASCE, MIEAust  
Associate Professor  
Office Location: Room 4.G38  
Email: mhadi@uow.edu.au  
Tel: +61 2 4221-4762  
Fax:+61 2 4221-3238  
Research Interests:  
(1) Strengthening structures using fibre reinforced polymer, (2) Concrete structures, (3) Optimisation (4) Neural networks and (5) Pavements
**Associate Professor Ian Porter**  
BSc (Eng) Hons, ME Hons, PhD  
Sub-Dean of Engineering  
Office Location: Room 4.131  
Email: ian_porter@uow.edu.au  
Tel: +61 2 4221 3491  
Fax: +61 2 4221 3238  
**Research Interests:** (1) Rock mechanics and ground control in mining and (2) Mine ventilation and the environment

---

**Associate Professor Michael Boyd**  
BE, PhD, CPEng, CEng, MIEng Aust, MASCE, MInstStrucE, MICE  
Associate Professor  
Office Location: Room 4.139  
Email: michael_boyd@uow.edu.au  
Tel: +61 2 4221 3054  
Fax: +61 2 4221 3238  
**Research Interests:** (1) Development of computer program for flood studies (WBNM), (2) Identification of impervious surfaces in urban catchments using remote sensing, (3) Engineering hydrology: flood hydrology, water resources, computer modelling of catchments, (4) Civil engineering hydraulics: hydraulics of culverts, flood detention basins and river hydraulics and (5) Urban stormwater management

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**Dr Brett Lemass**  
BE (Hons), PhD, MIEng Aust, CPEng, NPER  
Senior Lecturer  
Office Location: Room 4.130  
Email: blemass@uow.edu.au  
Tel: +61 2 4221-3039  
Fax: +61 2 4221-3238  
**Research Interests:** (1) Conceptual Design and (2) Management and decision support

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**Dr Alex Remennikov**  
BE (Hon) PhD, MIEng Aust, MIPENZ  
Senior Lecturer  
Office Location: Room 4.137  
Email: alexrem@uow.edu.au  
Tel: +61 2 4221 4221  
Fax: +61 2 4221 3238  
**Research Interests:** (1) Behaviour of structures under extreme loading (impact, shock, blast), (2) finite element modelling of structures under impact and blast loads and (3) dynamics of railway tracks, impulsive loading and response of railway track system and components
Dr Samanthika Liyanapathyana  
BSc Eng, PhD, MASCE

Senior Lecturer

Office Location: Room 4.129  
Email: saml@uow.edu.au  
Tel: +61 2 4221 3035  
Fax:+61 2 4221 3238

Research Interests: (1) Foundation design for seismically active areas, (2) Pile driving dynamics and (3) Numerical modelling

Dr Jan Nemcik  
BSc (Eng) Hons, ME, PhD

Senior Lecturer

Office Location: Room 4.138  
Email: jan_nemcik@uow.edu.au  
Tel: +61 2 4221 4492  
Fax:+61 2 4221 3238

Research Interests: (1) Geotechnical measurements and instrumentation for underground excavations, (2) Stress distribution and rock failure about underground openings, (3) Numerical modelling of underground excavations, (4) Numerical modelling of the longwall powered supports and their influence on strata behaviour at/ahead of the moving coal mining longwall face and (5) Evaluation of the longwall powered supports and their suitability to mine in variable ground

Dr Long Nghiem  
BE (Hons), GC (Bus), PhD

Lecturer

Office Location: Room 4.G37  
Email: longn@uow.edu.au  
Tel: +61 2 4221 4590  
Fax:+61 2 4221 3238

Research Interests:(1) Membrane filtration technology, (2) Membrane extraction and polymer inclusion membranes, (3) Trace contaminants in water recycling, (4) Acid sulfate soil remediation and (5) Monitoring of methane in coal mining
Dr Hadi Khabbaz  
BSc (Hons), MSc, PhD  
Lecturer  
Office Location: Room 4.132  
Email: khabbaz@uow.edu.au  
Tel: +61 2 4221 3385  
Fax:+61 2 4221 3238  

Research Interests: (1) Unsaturated soil mechanics, (2) Numerical methods in geoenviromental engineering, (3) Membrane technology for water and wastewater treatment, (4) Constitutive modeling in geomechanics including mechanical behaviour of coarse granular materials and (5) Ground improvement techniques for problematic soils

---

Dr Neaz Sheikh  
BSc (Eng), MPhil, PhD  
Lecturer  
Office Location: Room 4.G43  
Email: msheikh@uow.edu.au  
Tel: +61 2 4221 3009  
Fax:+61 2 4221 3238

Research Interests: (1) Optimal seismic design, (2) Performance-based seismic design and assessment, (3) Seismic vulnerability modeling, (4) Seismic hazard assessment for low to moderate seismicity regions, and (5) Site response study

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Farewell

Prof. Brian Uy (fifth from right) was the Head of the School until Dec. 2006.

A/Prof. Michael Boyd (middle) retired in Dec. 2006. Ms. Burnham (financial officer) and Prof. Chris Cook (the dean) are also in the picture.
2.2 Research Academics

Dr Phil Flentje
BSc (Eng) Hons, ME Hons, PhD
Senior Research Fellow

Office Location: Room 4.129
Email: phil_flentje@uow.edu.au
Tel: +61 2 4221 3056
Fax:+61 2 4221 3238

Research Interests: (1) Landslides and slope stability, (2) Slope hazard assessment and (3) Geographic Information System (GIS) applications

Dr Cholachat Rujikitakamjorn
BE, PhD (UoW)
Research Fellow

Office Location: Room 4.127
Email: cholacha@uow.edu.au
Tel: +61 2 4221 5852
Fax:+61 2 4221 3238

Research Interests: (1) Ground improvement techniques, (2) Geotechnical aspects of rail tracks, (3) Numerical and Analytical methods in geotechnical engineering; (4) Environmental geomechanics (soil-water interaction)

Dr Alexandra Golab
BSc, MSc, PhD
Research Associate (Until Dec. 2006)

Office Location: Room 4.G38
Email: golab@uow.edu.au
Tel: +61 2 4221 4762
Fax:+61 2 4221 3238

Research Interests: (1) Acid sulphate soil remediation and (2) Permeable reactive barriers

Dr Daniel Palamara
BE (Hons), PhD
Research Associate (Until March 2007)

Office Location: Room 4.130
Email: daniel_palamara@uow.edu.au
Tel: 0431 664 147
Fax:+61 2 4221-3238

Research Interests: (1) Mine planning, (2) GIS applications and (3) Engineering geomorphology
Dr Mohamed Shahin  
BSc MEng, PhD, MIEAust  
Research Fellow (Until Oct. 2006)  
Now at: Curtin University of Technology  
Email: m.shahin@curtin.edu.au  
Tel: +61 8 9266 1822  
Research Interests: (1) Railway Track Geotechnology, (2) Numerical Modelling in Geotechnical Engineering, (3) Ground Improvement and Soil Stabilisation and (4) Artificial Neural Networks

Dr Kenneth Agenson  
BSc MEng, PhD  
Research Fellow (Until Feb. 2007)  
Now at: Carr and Associate Consulting Engineers, Perth, WA  
Research Interests: (1) Membrane technology and (2) Water chemistry and water treatment

Dr Jayan Sylaja Vinod  
BSc MEng, PhD  
Research Fellow  
Office Location: 4.G36  
Email: vinod.js@gmail.com  
Tel: +61 2 4221 4089  
Fax:+61 2 4221 3238  
Research Interests: (1) Soil dynamics, (2) Discrete and finite element methods in geomechanics, (3) Ground improvement (4) Centrifuge modelling (5) Seismic hazard analysis and (6) Shallow and deep foundation design
2.3 Honorary Professorial Staff

Prof Robin Chowdhury  
BSc (Eng) Hons, ME Hons, PhD

Office Location: Room 4.G42  
Email: robin_chowdhury@uow.edu.au  
Tel: +61 2 4221 3037  
Fax:+61 2 4221 3238

Research Interests: (1) Landslides hazard and slope stability risk assessment and (2) Seismic landslide hazard assessment.

Associate Professor Maxwell Lowrey  
BE, PhD

Office Location: Room 4.G39  
Email: max_lowrey@uow.edu.au  
Tel: +61 2 4221 3036  
Fax:+61 2 4221 3238

Research Interests: (1) Dynamic of structures and (2) Design of steel structures.

Associate Professor Denis Montgomery  
BE (Hons), PhD

Office Location: Room 4.128  
Email: denis_montgomery@uow.edu.au  
Tel: +61 2 4221 4186  
Fax:+61 2 4221 3238

Research Interests: (1) Construction materials, (2) Waste material optimisation and (3) Concrete technology.

Associate Professor Bill Upfold  
BSc, MSc, PhD

Office Location: Building 4  
Email: bill_upfold@uow.edu.au  
Fax:+61 2 4221 3238

Research Interests: (1) Mining engineering and (2) Underground mining
2.4 Honorary Fellows

- Dr Hagare Dharmappa (Environmental Engineering, Water and Wastewater Treatment)
- Mr Michael Muston (Environmental Engineering, Natural Reuse Management, Water Reuse)
- A/Prof Jerry Ongerth (Environmental Engineering, Pathogens Detection, Water Treatment)
- Dr Ross Seedsman (Mining Engineering)
- Professor V. S. Vutukuri (Mining Engineering)
- Dr Joe Shonhardt (Mining Engineering)
- Mr Jeffrey Tanner-Jones (Mining Engineering)
- Mr Raymond Tolhurst (Mining Engineering)
- Prof Gour Sen (Mining Engineering, Ground Vibration)

2.5 Professional, Technical and Administrative Staff

The professional, technical and administrative staffs at the Faculty of Engineering (listed below) provide the required services for the School of Civil, Mining and Environmental Engineering.

<table>
<thead>
<tr>
<th>Computer Support Officers</th>
<th>Des Jamieson (IT Officer) <a href="mailto:Des_Jamieson@uow.edu.au">Des_Jamieson@uow.edu.au</a></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leonie McIntyre (IT Officer) <a href="mailto:Leonie_McIntyre@uow.edu.au">Leonie_McIntyre@uow.edu.au</a></td>
</tr>
<tr>
<td></td>
<td>Peter Turner (IT Officer) <a href="mailto:Peter-Turner@uow.edu.au">Peter-Turner@uow.edu.au</a></td>
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<table>
<thead>
<tr>
<th>Technical Staff</th>
<th>Alan Grant (Senior Technical Officer, Geotechnical Engineering Laboratory)</th>
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<tr>
<td></td>
<td>Ian Laird (Senior Technical Officer, Geotechnical Engineering Laboratory)</td>
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<tr>
<td></td>
<td>Joanne George (Senior Technical Officer, Environmental Engineering Laboratory and School Safety Committee Chair)</td>
</tr>
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<td></td>
<td>Norm Gal (Senior Technical Officer, Environmental Engineering Laboratory)</td>
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<tr>
<td></td>
<td>Bob Rowlan (Technical Officer, Geotechnical and Structural Engineering Laboratory)</td>
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<td></td>
<td>Ian Bridge (Technical Officer, Mining and Structural Engineering Laboratory)</td>
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<tr>
<th>Administrative Staff</th>
<th>Lorelle Pollard (Administration Manager) <a href="mailto:Lorelle_pollard@uow.edu.au">Lorelle_pollard@uow.edu.au</a></th>
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<tbody>
<tr>
<td></td>
<td>Pam Burnham (Finance Officer)</td>
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<tr>
<td></td>
<td>Ellen Manning (OH&amp;S Coordinator)</td>
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<tr>
<td></td>
<td>Roma Hamlet (Dean’s Assistant)</td>
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<td></td>
<td>Rhondalee Cambareri (Research Coordinator)</td>
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<tr>
<td></td>
<td>Marina Evans (Faculty Officer)</td>
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<td></td>
<td>Carmelle Scott (Receptionist)</td>
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<tr>
<td></td>
<td>Stacey Smith (Administrative Assistant)</td>
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<td></td>
<td>Christine Walkham (Administrative Assistant)</td>
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<tr>
<td></td>
<td>Coral Byrnes (Administrative Assistant)</td>
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<td></td>
<td>Julie Curcio (Administrative Assistant)</td>
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<td></td>
<td>Joy DeMestre (Administrative Assistant)</td>
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<td></td>
<td>Jade Kennedy (Administrative Assistant) Until June 2007</td>
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3 RESEARCH ACTIVITIES AND CENTRES

3.1 Key Research Areas

2006-2007 marked a significant increase in research strength of the School of Civil Mining and Environmental Engineering. With a strong focus on ground breaking research we have been able to attract more than $2.1 million in funding and the number of full time research students has increased to over 40. A record number of more than 100 peer reviewed publications further highlighted the growth of CME over the last academic year. This includes numerous keynote and landmark papers that earned researchers many prestigious awards. Significant innovations in the use of laboratory space and equipment designed to accommodate the ever growing number of research staff and postgraduate students have also been achieved.

Research at the School of CME, University of Wollongong, focuses on five major clusters:

- Geotechnical Engineering
- Railway engineering
- Structure and Construction Materials
- Mining Engineering
- Water Quality and Treatment, and Sustainability

The multi-disciplinary nature of these foci requires teamwork across all departments within the school, other members of the University community and the region, including the corporate and technology sectors, federal research laboratories, and international collaborators.

3.1.1 Research Centre for Geomechanics and Railway Engineering (GRE)

Australia’s Railway Industry is re-inventing itself to become the major mode of land transport in the 21st century with the main challenge being to create a competitive edge through imaginative ideas, innovative leadership, and the latest technology. Because most Australians live on coastal areas where the marine clays are soft and compressible, advanced construction methods are required for the design and performance of major infrastructure such as transportation systems.

The School of CME is home to a renowned and well established Geomechanics and Railway Engineering (GRE) Research Centre. Extensive collaborative research between the centre and industry bodies such as RailCorp, Snowy Mountains Engineering Corporation, Department of Main Roads (Brisbane), Queensland Rail (QR), Australian Rail Track Corporation (ARTC), Douglas Partners (Wollongong), and Polyfabrics (Australia) have resulted in many modern ground improvement techniques. National and International recognition gained through awards such as the Swedish Geotechnical Society Award for Ground Improvement, plus numerous Keynote addresses in reputable Conferences have brought immense prestige to the research being undertaken in geotechnical and railway engineering. The 2006-2007 academic year was highlighted by a rewarding recognition for the centre and its partners within CRC Railway Engineering and Technologies with the announcement of Commonwealth Funding support of $21 million over the next 7 years.

Given the design, construction, and maintenance challenges associated with dams, roads and rail tracks along terrain characterised by adverse ground conditions, the optimum functioning of this research centre is imperative. The Research Centre for GRE at UoW has been built around several inter-disciplinary research phases (i.e. geotechnical, geological, mining, mechanical, structural and environmental). Existing and proven research by a team
of focused academics, research fellows and high calibre students places the GRE Research Centre at the top of the region in a number of key areas including:

**Rail Track Engineering**
- Ballast-track interaction and the effective use of geosynthetics
- Rail track foundation soil properties and stabilisation
- Dynamic analysis of track and assessment of its capacity
- Improving rail infrastructure by introducing native vegetation and ‘green’ corridors
- Stress-strain and filtration characteristics of sub-ballast under cyclic loads
- Effect of slope movements on rail tracks
- Decision support systems applied to track maintenance scheduling
- Development of novel insulated joints
- On-board wheel-wear and wheel-rail-noise assessment system

Outcome of the School’s cutting-edge research work conducted by Prof. Buddhima Indraratna, his colleagues and research students on ballast and track degradation under high speed heavy haul trains has modernised future track design.

Field trial: Installation of geogrids and geotextiles (left) and LVDT transducers (right) at Bulli site near Wollongong

**Geotechnical Engineering**
- Landslides hazards and risk management
- Chemical stabilisation of problematic soils including erodible, dispersive, collapsible and unstable soils
- Behaviour of granular materials under cyclic loads including particle degradation and cyclic densification
- Stabilising soft clay embankments using prefabricated vertical drains combined with vacuum preloading
- Remediation of acid sulphate soils to prevent corrosion of track components
- Stability assessment of embankments
- Stabilisation of soft and weak foundation soils using native vegetation exploiting root suction
- Use of synthetic materials for improving subsurface drainage
- Role of filtration in eroded soil retention
• Jointed rock engineering with applications to rock excavations including tunnelling and mining
• Deep foundations and pile driving dynamics
• Earthquake effects on foundations
• Computational geomechanics

3.1.2 Advanced Structural Engineering and Construction Materials (ASEAM) Group

Founded in 2005, the Advanced Structural Engineering and Construction Materials (ASEAM) Group couples the existing research strengths of structural engineering and construction materials within the School of CME. The focus of this group is to undertake advanced structural analysis and evaluate the materials used in civil engineering construction. Much of the research undertaken by this group has been funded through the Australian Research Council and associated industry partners. The group consists of six full time academic staff, two visiting members and also includes numerous BE (Hons), Masters and PhD students. The group also has approximately five technical staff associated with its two structural engineering laboratories. The group has a very strong research record with a total of $5 million in funding from National Competitive Grants and have produced over 300 publications and supervised more than 50 theses over the last five years.

Four primary strands of research of the ASEAM group include:

• Advanced analysis and design of structures: This research considers the non-linear analysis of concrete, steel and composite steel-concrete structures and the behaviour of
structures under extreme loading. ASEAM group is also developing novel techniques for optimising structural design

- High performance concrete: This research is associated with the constitutive behaviour and application of high strength concrete, self compacting concrete, fibre reinforced concrete and fibre reinforced polymer (FRP) wrapped concrete members.
- High performance steels: High performance steel research and applications in civil engineering construction is being conducted using high strength steels, stainless steels and titanium based alloys.
- Soil-structure interaction investigating the interaction between foundations with soil under variable loading.

Academics from the School of CME examining the Lawrence Hargrave construction site

**Revolutionising the Design of Railway Sleepers**

Innovative research by engineers at the School of CME is set to change the design of concrete sleepers and possibly save the industry millions of dollars. Dr Alex Remennikov from the School of Civil, Mining and Environmental Engineering and his PhD student, Sakdirat Kaewunruen, are completing their research in collaboration with Queensland University of Technology and have been sponsored by the CRC for Railway Engineering and Technologies.

Sleepers are a major component of railway tracks; they are the cross-tie beam built to distribute the load from the rails to the underlying ballast bed. Although sleepers can be made of timber, steel, or concrete, the current trend is towards concrete because of its high durability and ratio of benefit to cost. Concrete sleepers can last from 50 to over 100 years under extreme environmental conditions. Their high mass also helps stabilise the tracks against the thermal expansion of rails and vibration from rolling stock.

The initiative for this research project came from a widespread notion based on general industry experience that concrete sleepers have reserves of untapped strength. The current design was based on experience, with little or no science or theory to back it up. This has resulted in an over estimation of the strength required and the high cost of their extensive use.
As part of the research a new, high capacity drop-weight impact machine was constructed at UoW, it has a maximum drop of 6m and is currently the largest of its kind in Australia. It can accommodate full size building/structural members such as a concrete sleeper, a steel-concrete composite beam and column, or a pre-cast concrete slab. High technology sensors and devices are used to measure and monitor the behaviour of any test specimen under a variety of dynamic impact loading spectra. An estimate by STEM partnerships (2006) showed that the new design would help the rail industry save over $7 million dollars in the short term.

Dr Alex Remennikov (right) and Sakdirat Kaewunruen (PhD student) are investigating the impact resistance of a prestressed concrete sleeper.

A helically reinforced concrete beam after the test
3.1.3 Mining Research Group

Wollongong has a very strong mining research group. Our laboratories offer students, researchers, and the industry, access to the latest equipment and facilities. A number of government and industry sponsors are currently supporting our on-going research efforts that cover the following categories:

Outburst Control
- Computer modeling and simulation of methane and carbon dioxide drainage
- Permeability and sorption testing equipment
- Gas composition analysis

Rock Mechanics and Ground Control
- Subsidence prediction and control
- Longwall mining
- Characterization of new grouts for ground control
- Bump prediction associated with mines under strong roofs
- Slope stability in open-pit mines
- Multi-seam mine design

Ventilation
- Improved recovery of coal-bed methane
- Design of jet fans
- Ignition of explosions in coal mines

A polymer sheet supporting a tonne of bricks (Brendan Rolls, a mining student)

A/Prof Naj Aziz (2nd from left) and his students visiting Cadia Ridgeway Mine
3.1.4 Sustainable Water and Energy Research Group (SWERG)

Engineers have a special role in the assessment as well as in the design and construction of major and minor development projects that may give rise to profound changes to the environment. As such their contribution to sustainable development is invaluable. SWERG brings together researchers interested in integrated water and energy related environmental problems and in the practical aspects of projects and processes in the civil, environmental and mechanical engineering areas.

The Sustainable Water and Energy Research Group’s (SWERG) vision is to advance high calibre research and training with an interdisciplinary focus using modern environmental and
other engineering and scientific techniques to find solutions that directly contribute to ecologically sustainable development.

Research work at UoW investigating the removal of trace contaminants like pharmaceuticals and hormones by reverse osmosis membranes is providing vital information to evaluate risks associated with the indirect potable water reuse.

The major research areas of SWERG are:

1. Integrated water cycle management
   - Recycling and reuse
   - Catchment, river and lake water quality
   - Microbial risk assessment
   - Social aspects

2. Membrane filtration
   - MF/UF/NF/RO systems and modelling
   - Trace contaminants removal
   - Fouling processes
   - Leachate treatment
   - Electrodialysis
   - Membrane distillation

3. Sustainable water treatment and recycling technologies:
   - Dairyshed waste treatment and recycling
   - Solar electrocoagulation
   - Ballast water treatment
   - Mine water treatment
   - Residuals drying and reuse

4. Decentralised wastewater treatment & reuse:
   - Nutrient removal
   - Greywater treatment
   - Membrane bioreactors (MBRs)

5. Renewable energy technologies
• Vertical axis wind turbines
• Wave power systems
• Bio-energy development from dairy shed wastes

6. Geo-environmental engineering
• Soil contamination modelling
• Permeable reactive barriers
• Solidification of wastes

2006-2007 has been a remarkable year of growth and success for the environmental engineering group in many fronts: research student enrolment, laboratory space and facilities, publication output, awards, research recognition, fundraising and revenues. The group maintained a large number of postgraduate students, focusing on the areas of water quality, water resources, non-potable and indirect potable water reuse, advanced water and wastewater treatments, and ecological engineering.

3.2 Research Students
The list of current research students, their topics and supervisors are given in the following table.

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Research Topic</th>
<th>Supervisor</th>
<th>Cosupervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawad Al-Rifai (PhD)</td>
<td>Characterisation and treatment of Reverse Osmosis concentrates from water recycling applications</td>
<td>William Price</td>
<td>Hadi Khabbaz</td>
</tr>
<tr>
<td>Anass Attya (PhD)</td>
<td>Performance of vertical drains in soft clay under cyclic loads</td>
<td>Buddhima Indraratna</td>
<td>Cholachat Rujikiatjamjorn</td>
</tr>
<tr>
<td>Dennis Black (PhD)</td>
<td>Improving drainage efficiency of coal seam by hydro-fracturing</td>
<td>Naj Aziz</td>
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</tr>
<tr>
<td>Beatrice Bodhinayake (PhD)</td>
<td>Finite element analysis of flexible pavements</td>
<td>Muhammad Hadi</td>
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<tr>
<td>Dieter Bruggemann (ME)</td>
<td>Assessment of field parameters for predicting gas outburst conditions in coal mines</td>
<td>Naj Aziz</td>
<td></td>
</tr>
<tr>
<td>Thidarat Bunsri (PhD)</td>
<td>Completed in 2007 Contaminant transport processes in on-site waste disposal systems</td>
<td>Muttucumaru Sivakumar</td>
<td>Hagare Dharmappa</td>
</tr>
<tr>
<td>Jose Dominguez Davila (PhD)</td>
<td>Behaviour of alkaline permeable reactive barriers</td>
<td>Buddhima Indraratna</td>
<td>Long Nghiem</td>
</tr>
<tr>
<td>Angela Dejong (ME)</td>
<td>Slope stability in mines</td>
<td>Jan Nemcik</td>
<td></td>
</tr>
<tr>
<td>Kalyani Dissanayake (PhD)</td>
<td>Experimental and numerical modeling of flow and sediment characteristics in open channel junctions</td>
<td>Muttucumaru Sivakumar</td>
<td>Ajit Godbole</td>
</tr>
<tr>
<td>Mohammad Mahdi Emamjomeh (PhD)</td>
<td>Completed in 2006 Electro-coagulation technology as a process for defluoridation in water treatment</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
</tr>
<tr>
<td>Behzad Fatahi (PhD)</td>
<td>Numerical and analytical models of soil suction on rail track stability and movement using native vegetation</td>
<td>Buddhima Indraratna</td>
<td>Hadi Khabbaz</td>
</tr>
<tr>
<td>Student Name</td>
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<tr>
<td>Julian Fyfe (PhD)</td>
<td>Dairy shed waste treatment and recycling</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
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<tr>
<td>Ali Garaibeh (PhD)</td>
<td>Mathematical and experimental investigation of drying of water treatment residuals</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
</tr>
<tr>
<td>Ali Ghandeharioon (PhD)</td>
<td>Effect of mandrel penetration on the development of smear zone and the associated pore pressure and deformation of the surrounding soil</td>
<td>Buddhima Indraratna Cholachat Rujikiatkamjorn</td>
<td></td>
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<tr>
<td>Zakir Hossain (PhD)</td>
<td>Constitutive modelling for ballast degradation under cyclic loading</td>
<td>Buddhima Indraratna</td>
<td></td>
</tr>
<tr>
<td>Hossein Jalalifar (PhD)</td>
<td>A new approach in determining the load transfer mechanism in fully grouted bolts</td>
<td>Naj Aziz</td>
<td></td>
</tr>
<tr>
<td>Ali Reza Jalayer (ME)</td>
<td>Waste minimisation and pollution control in regional Australia: The case of a mustard oil and flavour extraction plant</td>
<td>Long Nghiem Muttucumaru Sivakumar</td>
<td></td>
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<tr>
<td>Mohammad Javdan-Mowlaei (ME)</td>
<td>Nutrient removal in aerated wastewater treatment system</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
</tr>
<tr>
<td>Ross Jeffry (PhD)</td>
<td>Enhancing the strength and ductility of reinforced concrete beams by helical reinforcement</td>
<td>Muhammad Hadi</td>
<td></td>
</tr>
<tr>
<td>Shane Jordan (PhD)</td>
<td>Factors controlling the effectiveness of resin encapsulation in ground control</td>
<td>Naj Aziz</td>
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<tr>
<td>Sakdirat Kaewunrueen (PhD)</td>
<td>Dynamic characteristics of railway track and its components</td>
<td>Alex Remennikov</td>
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<tr>
<td>Walter Keilich (PhD)</td>
<td>Numerical modelling of mine subsidence using UDEC</td>
<td>Naj Aziz</td>
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<tr>
<td>Kourosh Kianfar (PhD)</td>
<td>Stabilisation of rail tracks using vertical drains and geosynthetics</td>
<td>Buddhima Indraratna Hadi Khabbaz</td>
<td></td>
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<tr>
<td>Martin Kimber (ME)</td>
<td>Improving operations through online knowledge management of board and pillar mining methods characteristics</td>
<td>Naj Aziz</td>
<td></td>
</tr>
<tr>
<td>Joannn Lackenby (PhD)</td>
<td>Triaxial behaviour of ballast and the role of confining pressure under cyclic loading</td>
<td>Buddhima Indraratna</td>
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<tr>
<td>Tie Ling (PhD)</td>
<td>Anaerobic digestion of dairy shed waste</td>
<td>Muttucumaru Sivakumar</td>
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<tr>
<td>Daniel May (PhD)</td>
<td>Prediction of storm water quality in urban catchments</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
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<tr>
<td>Thevaragavan Muttuvel (PhD)</td>
<td>Behaviour of chemically stabilised erodible and dispersive soils</td>
<td>Buddhima Indraratna Hadi Khabbaz</td>
<td></td>
</tr>
<tr>
<td>Jayanathan Mylvaganam (PhD)</td>
<td>Shear behaviour of normally consolidated and overconsolidated infilled rock joints under undrained triaxial conditions</td>
<td>Buddhima Indraratna</td>
<td></td>
</tr>
<tr>
<td>Student Name</td>
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<tr>
<td>Mathias Nagy (PhD)</td>
<td>Influence of pore pressure in the shear behavior of rock joints</td>
<td>Ian Porter</td>
<td></td>
</tr>
<tr>
<td>David Oliveira (PhD)</td>
<td>Effects of internal pore pressure on the shear behaviour of infilled clay joints</td>
<td>Buddhima Indraratna</td>
<td></td>
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<tr>
<td>Mark Peterson (PhD)</td>
<td>Remediation techniques for acid sulphate soils</td>
<td>Buddhima Indraratna</td>
<td></td>
</tr>
<tr>
<td>Debashis Raha (PhD)</td>
<td>A model for improving wastewater treatment plant performance from ‘command &amp; control’ to managing in compliance with ESD principles</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
</tr>
<tr>
<td>Ashok Kumar Raut (PhD)</td>
<td>Mathematical modelling of granular filters and constriction-based filter design criteria</td>
<td>Buddhima Indraratna</td>
<td>Hadi Khabbaz</td>
</tr>
<tr>
<td>Chihiro Sakata (ME)</td>
<td>Minimisation of fouling rate in reverse osmosis membrane plants</td>
<td>Hadi Khabbaz</td>
<td>Muttucumaru Sivakumar</td>
</tr>
<tr>
<td>Luke Scott (PhD)</td>
<td>Development of low energy water purification for remote communities</td>
<td>Muttucumaru Sivakumar</td>
<td></td>
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<tr>
<td>Nichanan Tedkaew (PhD)</td>
<td>Removal of Trace Organic Contaminants by Membrane Bioreactors</td>
<td>Long Nghiem</td>
<td>Muttucumaru Sivakumar</td>
</tr>
<tr>
<td>Faham Tahmasebinia (ME)</td>
<td>Improving deformation capacity of concrete slabs using shear reinforcement</td>
<td>Alex Remennikov</td>
<td></td>
</tr>
<tr>
<td>Pramod Thakur (PhD)</td>
<td>Cyclic densification of ballast and associated deformation and degradation</td>
<td>Buddhima Indraratna</td>
<td>M. Shahin H. Khabbaz</td>
</tr>
<tr>
<td>Laricar Dominic Trani (PhD)</td>
<td>Application of constriction size based filtration criteria for railway subballast under cyclic conditions</td>
<td>Buddhima Indraratna</td>
<td>Hadi Khabbaz</td>
</tr>
<tr>
<td>Devendra Vyas (PhD)</td>
<td>Factors controlling the effectiveness of resin Encapsulation in Ground Control</td>
<td>Naj Aziz</td>
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</tr>
<tr>
<td>Rhon Walker (PhD)</td>
<td>Analytical solutions for modeling soft soil consolidation by vertical drains</td>
<td>Buddhima Indraratna</td>
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<tr>
<td>Melanie Werner (PhD)</td>
<td>Small water systems sustainability in regional Australia</td>
<td>Greg Hampton</td>
<td>Long Nghiem</td>
</tr>
<tr>
<td>Veysel Yazici (ME)</td>
<td>Strengthening reinforced concrete columns by Fibre Reinforced Polymers</td>
<td>Muhammad Hadi</td>
<td></td>
</tr>
</tbody>
</table>

### 3.3 Selected Strategic Grants

Aziz, N. “Mine Gas Drainage and Outburst Control”. *BHP Billiton - Illawarra Coal Holdings Pty Ltd*, $300,000.


Baafi, E. and Porter, I. “Web Based Roadway Development Information System” *Australian Coal Association Research Program (ACARP)*, $193,000.

Flentje, P. and Baafi, E. “GIS-based Decision Support Systems for Mine Subsidence Management”, *Australian Coal Association Research Program (ACARP)*, $147,000.

Indraratna, B. and Darve, F. “Assessment and Prediction of Particle Breakage under Cyclic Loading”. *ARC-Discovery*, $180,000.


Indraratna, B., Cameron, D. and Khabbaz, H. “Improvement of Rail Corridors using Native Vegetation” (2003-2006). *CRC for Railway Engineering*, with RailCorp (Sydney), ARTC (Adelaide), and QR (Brisbane), $153,000.


Nghiem, L. and Sivakumar, M. “Wastewater Treatment and Reuse at a Vegetable Oil Extraction plant; *Palos Verder and UoW*; $19,000.

Poter, I., Baafi, E., Spinks, J., Nemcik, J. and Lukey, C. “Alternative Polymeric Skin Reinforcement and Confinement System”, BMA, Xstrata, Austar, Rio Tinto, Centennial Anglo Coal, Helensburgh Coal, Oaky Creek Coal, NRE Minerals and UoW URC grant, $150,000.

Remennikov, A. “Dynamics of Railway Tracks and Impact Response of Prestressed Concrete Sleepers”, *CRC for Railway Engineering*, with Rocla and QR, $85,000.

### 3.4 Laboratory Facilities

#### 3.4.1 Geotechnical Engineering

Geotechnical Engineering group has upgraded its soil and rock mechanics laboratories to be most suitable for modern undergraduate teaching and postgraduate novel experimental research.

**Specific Laboratories:**

- Undergraduate Soil Mechanics Laboratory
- Postgraduate GDS Triaxial Laboratory
- Large Scale Triaxial and Consolidation Laboratory
- Railway Track Testing Laboratory
- Unsaturated Soil Laboratory

The GRE Research Centre under the leadership of Prof. Indraratna previously received extensive support from the University, the ARC, the CRC for Railway Engineering and Technologies, rail organisations (e.g. RailCorp, Queensland Rail and Australian Rail Track
Corporation) and several Industry partners. Accordingly, many unique laboratory facilities have been designed and built at the School of CME.

Unique Geotechnical Laboratory Facilities:

- Large scale cylindrical triaxial rig with dynamic actuator (300 mm in diameter)
- Large scale cyclic prismoidal triaxial rig with Unrestrained Sides (600×600×800mm)
- Large scale consolidometer (650 mm in diameter for soft soil testing)
- Constant normal stiffness shear apparatus
- Large scale direct shear box
- Large scale permeability apparatus (500 mm in diameter)
- GDS controlled triaxial apparatus
- Automated Rowe cell consolidometer
- Cracked erosion apparatus
- High pressure filtration apparatus for monotonic loads
- Cyclic filtration apparatus (250 mm in diameter)
- Pressure plate apparatus (for determining soil-water characteristic curves)
- High pressure rock testing apparatus (universal testing machine)
- Soft soil grouting equipment (for lime injection)
- Dynamic rail simulator
- Geosynthetics pull out test rig
### 3.4.2 Structural Engineering

The specific laboratories of structural engineering group are:

- Structural dynamics laboratory
- MTS Compression and Tension Rigs
- Drop hammer machine for impact tests
- Structural Mechanics Laboratory
- Concrete Laboratory
- High Bay Laboratory for Testing Large Scale Model Structures

Large drop hammer machine  
Modal testing to identify the critical dynamic parameters of concrete sleepers

### 3.4.3 Mining Engineering

Mining laboratories at the School of CME are:

- Rock Mechanics Laboratory
- Gas Flow Simulation and Ventilation Laboratory
- Underground Support Testing Laboratory
- Coal Testing Laboratory

### 3.4.4 Environmental Engineering

The special equipment and testing facilities of water and environmental engineering group are:

- Lab Scale Cross-flow Reverse Osmosis Filtration
- Dead-end Stirred Cells for Membrane Testing
- Microfiltration System
- Pilot and lab scale electro-coagulation units
- Lab Scale Electrocoagulation-Ultrafiltration Hybrid System
- TOC/TN Analyser
- HPLC System with UV-V and Fluorescence Detector
- GC/MS System
- Laser Doppler Velocitimeter with a Fibre-optic Probe
- Atomic Adsorption Spectrometer
- Aerobic and Anaerobic Bioreactors
- Onsite Wastewater Treatment Systems
3.5 Selected Doctoral Student Profiles

The School of Civil, Mining and Environmental Engineering offers a wide range of research programs for postgraduate students. Our school offers an excellent environment for students to work in theoretical, numerical, and experimental aspects of research. Under the supervision of academic staff and senior technical officers, postgraduate students have unrestricted access to the well designed and equipped laboratories to further their skills. The School of CME has consistently attracted many high caliber research students and graduates of this School have performed extremely well in their professional life. Selected past PhD student profiles are given in this section.

Dr William Glamore

William received his PhD in the area of Geo-environmental Engineering in 2003. He was then offered a position at the Water Research Laboratory, School of Civil and Environmental Engineering, at the University of New South Wales (UNSW), a leading international hydraulics research and consulting laboratory, to help solve complex water related problems for industry and government for the next 50 years.

As a Senior Research Fellow, William manages over 20 water engineering projects per year with an annual turnover of $300,000. His field of expertise and research includes hydrology, wetland design and creation, tidal restoration, groundwater dynamics, estuarine and coastal processes, hydro-dynamics, and water quality in reservoirs and estuaries.

In 2004 he was awarded the Thesis of the Year award at the University of Wollongong and in 2005 was awarded a prestigious Churchill Fellowship to investigate international wetland restoration practices in 6 countries. In 2006 he was invited to join the American Society of Civil Engineering Committee on Wetland and Sediment Management, which aims to publish a Wetland Engineering Manual. He was also nominated as an “International Expert in the field of Hydrodynamic Processes” by the International Atomic Energy Agency (IAEA). In 2007, William was nominated as an “Expert of International Standing” by the Australian Research Council’s College of Experts. He is also a committee member of Engineers Australia’s NSW Water Panel (2004-present).

Since completing his PhD, William has presented research findings at many international and Australian conferences, published more than 30 Technical Reports to Government and Industry representatives and co-authored 5 international journal papers, including two invited papers. He also reviews several international journal papers, ARC grants and governmental documents.
Dr Joanne Lackenby

Joanne began her studies at the University of Wollongong in 1998 with an undergraduate degree in Environmental Engineering. She received first class honours and a number of awards including top of the class in her first and fourth years. Following successful undergraduate studies, she commenced a PhD in 2002 in the area of Geotechnical Engineering where she focused on the degradation and deformation characteristics of granular materials under cyclic loading. During these studies Joanne published a number of journal and conference papers, including two articles in Géotechnique, a top journal in the geotechnical field. This is a wonderful achievement for a person in their twenties.

Joanne has been working as a consulting Geo-Environmental Engineer at Douglas Partners (DP) since September 2005. DP is a leading geotechnics, environmental, and groundwater consultancy with 13 offices throughout Australia. At present, Joanne is involved in a number of activities including field investigations, design and analysis, and report writing for a vast range of geotechnical and environmental projects.

Dr Ashok Raut

Ashok received his PhD in Civil Engineering in 2006. Even before submitting his thesis, Ashok was offered a position as Senior Water Engineer for the Snowy Mountain Engineering Corporation (SMEC) Australia. SMEC Australia is a leading Australian engineering firm that offers the latest technical solutions to all engineering problems world wide. So far he has been involved in projects such as modelling for the Sydney Catchment Authority to facilitate a more affective management of their water supply system, and a feasibility study to augment the capacity of the Yass Valley water supply system to help cope with the prolonged drought.

Currently, he is working on the development of the GIS-based computer Decision Support System (DSS) tool for the Irrigation Department of Uttar Pradesh state of India. This World Bank scheme focuses on alleviation of socio-economic status of 160 million farmers of the northern Indian state through agriculture diversification and intensification through efficient resource management. Based on his performance and the satisfaction of the client and the World Bank, the SMEC India has nominated Ashok as a full-time team leader position for a similar DSS project in the central Indian state (Madhya Pradesh), scheduled to commence towards the end of this year. In 2007, Ashok was awarded the Australian Geomechanics Society prize (Wollongong award) for the best postgraduate performance in geotechnical research at the University of Wollongong. So far, Ashok has co-authored three technical papers in the Journal of Geotechnical and Geoenvironmental Engineering, ASCE, and several other papers are in the pipeline.
4 TEACHING AND LEARNING PROGRAMS

The University of Wollongong is one of two universities in the top tier of three categories for the Federal Government’s Learning and Teaching Performance Fund for 2007, announced by Education Minister Julie Bishop in December 2006. The University of Wollongong and the Australian National University in Canberra were the only two institutions ranked as Band A1 in the Performance Fund, which rewards higher education providers that best demonstrate excellence in teaching and learning for domestic undergraduate students. This achievement is a tribute to the outstanding quality of teaching staff at the UoW.

4.1 Undergraduate Teaching Programs

Undergraduate students at the School of CME are taught to be critical thinkers, problem solvers, and innovative. They develop skills that will enable them to make competent decisions on their future careers as related to the analysis and design of a wide range of engineering projects, and to understand the delicate balance and sustainability that exists in the environment.

Civil Engineering

Civil Engineering graduates at UoW can apply their knowledge to plan, design, construct, operate, and maintain buildings, bridges, dams, harbors, water supply systems, waste management systems, airports roads, tunnels and railways. The subjects cover engineering design and innovation, geotechnical engineering, hydraulics and hydrology, and structural design.

APPLIED CIVIL ENGINEERING SUBJECTS:

- Mechanics of Solids
- Engineering Materials
- Structures 1, 2 & 3
- Structural Design 1, 2 & 3
- Engineering Computing 1 & 2
- Applied Engineering Computing
- Civil Engineering Design
- Geomechanics 1 & 2
- Applied Geotechnical Engineering
- Advanced Foundation Engineering
- Construction Materials and Construction Techniques
- Hydraulics and Hydrology
- Roads Engineering
- Surveying

Mining Engineering

This degree builds knowledge of mining methods, ventilation, environmental engineering, planning and development, and the environmental impact of mining and rock mechanics; with a focus in later years on mine planning, occupational health and safety, and mining economics.
APPLIED MINING ENGINEERING SUBJECTS:

- Mine Planning & Development
- Special Topics in Mining Engineering
- Mine Water
- Geostatistical Ore Reserve Estimation
- Environmental Impact of Mineral Operations
- Advanced Studies in Mining Engineering
- Simulation of Mining Operations & Problems
- Rock Mechanics
- Environmental Control in Mines
- Mining Engineering Techniques

Environmental Engineering

The Environmental Engineering course is concerned with assessing, planning, and managing the effects of human and other activities on the natural and built environment; through applications such as environmental impact assessment, pollution control and cleaner production, management of hazardous waste, and environmental engineering design.

APPLIED ENVIRONMENTAL ENGINEERING SUBJECTS:

- Engineering Fluid Mechanics
- Water Quality Engineering
- Air and Noise Pollution
- Site Contamination and Remediation Technologies
- Pollution Control and Cleaner Production
- Solid and Hazardous Waste Management
- Water Engineering (Coastal and Groundwater Engineering)
- Environmental Engineering Design 1 & 2
- Membrane Science and Technology
- Sustainable Energy Technologies

The following link can be used for more details on subjects available in the Faculty of Engineering at UoW: [http://www.uow.edu.au/handbook/yr2007](http://www.uow.edu.au/handbook/yr2007)

4.2 Postgraduate Teaching Programs

The School of CME offers PhD and Masters Degrees, and comprehensive teaching and research activities to train postgraduate students. Masters degrees in Civil, Mining, and Environmental Engineering can be conducted either by research or coursework. Two coursework Master degrees program that we offer are:

Master of Engineering (Civil, Mining and Environmental Engineering)

Master of Engineering allows the student to combine specialist post-graduate subjects with project work according to their undergraduate background. This one year program comprises a 24-credit point dissertation and at least 24 credit points of coursework. The dissertation typically requires rigorous research in a specialised area, normally where coursework components are undertaken.
Master of Engineering Practice

Master of Engineering Practice has been designed to meet the needs of leaders of the future. This program allows practicing engineers to build on, update, and acquire additional knowledge in areas not covered by their first degree. This is a one year full-time or part-time equivalent (48 credit point) program. The core program comprises four, 6-credit point subjects. The remaining 24 credit points can be selected from the Postgraduate Engineering subjects.

With approval from the Course Advisor, students can undertake a 12 credit point dissertation as part of the elective subjects. This dissertation is a research project that allows students to pursue a particular area in-depth to develop skills in information retrieval, project planning and organisation analysis, problem solving, and effective communication of the results.

Graduate Diploma in Engineering

The Graduate Diploma in Engineering is intended to provide specialised studies in engineering. It may provide entry to the Masters Research program for students who do not have the necessary entry qualifications, particularly if studying this discipline for first time. Students enroll in one of the following 48 credit point subjects according to their discipline area:

- Civil Engineering CIVL899 Advanced Topics in Engineering
- Mining Engineering MINE899 Advanced Topics in Engineering
- Environmental Engineering ENVE899 Advanced Topics in Engineering
5 AWARDS AND HONOURS

5.1 Students Awards

Every year students, staff, and guests attend the University of Wollongong's Faculty of Engineering Awards Presentation to recognize outstanding and high achieving students and graduates succeeding in the field of engineering. The 2007 Prize winners of the School of Civil, Mining and Environmental Engineering, one of three schools in the Faculty of Engineering, are listed below.

Faculty of Engineering Awards

Engineering Undergraduate Scholarships
- William Alexander
- Ben Dowling
- Mark Pensini

Work Integrated Learning Scholarships
- BlueScope Steel: Amber-Rose Crowley
- NSW RTA: Matthew Adamson, Philip Stolk
- Rural NSW RTA: Benjamin Kresevic, Lindsey Stewart, Brendan Young

Engineers Australia Award, Illawarra/Sutherland Regional Group Prize
- Highest weighted average mark in an Engineering Course: Paul Knight

Women in Engineering Bursaries
- Civil Engineering: Lindsey Stewart
- Environmental Engineering: Kylie White

David Charles Davies Memorial Prize
- The prize is awarded to the group with the highest average mark for the ENGG101 projects which require an innovative and/or ecological approach to engineering: Emelia Fabris, Troy Symons, Carl Zacher

Spruson & Ferguson Intellectual Property Prize
- Highest mark in ENGG461 – Management and Human Factors in Engineering: Tina Eddowes

Faculty Postgraduate Thesis Prize
Best postgraduate thesis award. Vahid Mottaghitalab

**Engineering Alumni Awards**
The selection of the recipient is based on significant improvement and on the interest the recipient has shown in the profession

Civil Engineering Ryan Lindfield
Mining Engineering Dane Traeger
Environmental Engineering Stephen Reynolds

**Civil, Mining and Environmental Engineering Awards**

**Australian Geomechanics Society – Wollongong Award**
Best postgraduate performance in geotechnical research Ashok Raut

**Australian Steel Institute Prize**
Best performance for a structural steel project Edward Crossley

**Coffey Geotechnics Award**
Best performance in geomechanics Adam Clarke

**The Matthew Thomas Biasutti Memorial Prize**
Best performance in CIVL245 - Construction Materials David Sawkins

**Professor Lewis C Schmidt Memorial Prize**
Best performance in CIVL352 - Structures 1 Paul Draper

**Peter Schmidt Memorial Scholarship**
Best performance – Postgraduate Research (Civil Engineering) Anass Attya

**Steel Reinforcement Institute of Australia Prize**
Best performance in CIVL314 - Structural Design 2 Derek Gentile

**Con Martin Memorial Prize**
Highest weighted average mark for mining subjects Alexander Steciuk

**Elizabeth Tague Prize (Shared)**
Best performance in MINE422 - Mine Planning Project Craig Shales Wiebe Wilbers
Ted William Scholarship
Environmental Engineering (Undergraduate)  Liam Pettigew
Poppy Coleman

Civil Engineering Discipline Prizes
Best performance in Year 1  Nathan Casanova
Best performance in Year 2  David Sawkins
Best performance in Year 3  Derek Gentile
Best performance in Year 4  Paul Draper

Mining Engineering Discipline Prizes
Best performance in Year 1  Luke Viglione
Best performance in Year 2  Brendan Rolls
Best performance in Year 3  Marie Boisclair St-Onge
Best performance in Year 4  Thomas Secheny

Environmental Engineering Discipline Prizes
Best performance in Year 1  James Archer
Best performance in Year 2  Xin Guan
Best performance in Year 3  Shanin Neveling
Best performance in Year 4  Andrew Rode

Railway Technical Society of Australasia Young Engineer Award
Behzad Fatahi has been awarded the 2007 Railway Technical Society of Australasia (RTSA) Young Engineer Award for his research and professional achievements. This Award recognises engineers, technologists or associates in Australia and New Zealand under thirty who have reached a demonstrated level of achievement and involvement in railway engineering, exhibited technical competence, good character and integrity, and helped develop or improve public and/or other engineer’s attitudes towards railway engineering. Behzad is supervised by Prof. Buddhima Indraratna and Dr. Hadi Khabbaz, and his research is part of a larger project under the CRC for Railway Engineering and Technologies. Behzad has developed a numerical model for ground conditions close to native vegetation around railway corridors. These findings will result in significant environmental benefits and cost savings for the rail industries.
In September 2006 Behzad was also awarded the first prize at the Young Geotechnical Professional’s Night – a prestigious geomechanics award from the Australian Geomechanics Society and Engineers Australia.

5.2 Staff Awards

OCTAL Teaching and Learning Award 2006

Dr Brett Lemass has won the Engineering section of the Outstanding Contribution to Teaching and Learning (OCTAL) awards for the second time. Dr Lemass is a Senior Lecturer in Engineering and a past OCTAL winner. His practical background in design and project management, applied research and ability to motivate and effectively teach students have made him a valued member of the Engineering staff since 1999.

Between receiving these awards Brett has written two books on design that serve the needs of students inside and outside his classroom, as well as industry professionals. Both books have been warmly received as a necessary contribution to teaching resources by staff at other universities. He has been a driving force in overhauling the management stream and revised Engineering Management subject to provide a framework for engineering education and thus align the attributes of UoW graduates with the formal competency expectations required by international and domestic certifying authorities.

Carrick Australian Award for University Teaching 2006

Dr Lemass was also awarded the 2006 Carrick Australian Award for Outstanding Contribution to Student Learning for “Practical Books on design and management for engineering students and professionals, coupled with low cost work books that combine engineering theory and tutorial exercises”.

Thomas Middlebrooks Award 2007 (American Society of Civil Engineers)

Dr Samanthika Liyanapathirana (School of Civil, Mining and Environmental Engineering), and Professor Harry Poulos (University of Sydney and Coffey Geotechnics) have been selected by the American Society of Civil Engineers to receive the 2007 Thomas A. Middlebrooks award. This award is made to the authors of a paper judged worthy of special commendation for its contribution to the field of Geotechnical Engineering. The title of the paper is: Liyanapathirana, D. S. and Poulos, H. G. (2005). "Pseudostatic approach for seismic analysis of piles in liquefying soil," Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 131 No. 12, pp. 1480-1487. This paper is based on the finite element method and presents a numerical approach to obtain the internal response of pile foundations subjected to earthquake loading, an essential part of the overall seismic design process of structures.

GN Alexander Medal (Engineers Australia)

Associate Professor Michael Boyd and his former PhD student Dr Nanayakkara Bodhinayake were the winners of the prestigious 2006 GN Alexander Medal for their outstanding work on predicting flooding in a wide range of catchments. The GN Alexander Medal for Hydrology and Water Resources was created in 1987 and is dedicated to the memory of Mr Geoffrey Newman Alexander (1908-1975), in recognition of his contribution to Australian hydrology.
The Award takes is an inscribed bronze medal and certificate(s) which are conferred by Engineers Australia on the author(s) of the best paper in hydrology and/or water resources published in Engineers Australia over the period from, and including the previous Hydrology and Water Resources Symposium. Michael and Nanayakkara won the medal for their paper: M.J. Boyd & N.D. Bodhinayake (2006) "WBNM runoff parameters for South and Eastern Australia", Australian Journal of Water Resources, Vol. 10, No. 1, pp. 35-48.

A/Prof. Michael Boyd (right) and his former PhD student Dr Nanayakkara Bodhinayake, winners of the 2006 GN Alexander Medal.

Award-winners Mark Gaykema (front row, 3rd from left), Anass Attya (middle) and Dr Cholochat Rujikiatkamjorn (2nd from right) are pictured with the 2006 Trailblazer competition finalists.

**Trailblazer Award 2006**

A low cost drainage system and a self cleaning water filter were the two innovative research projects that won top honours at the University of Wollongong's Trailblazer competition in July 2006. This competition promotes innovative thinking with the potential to benefit community, industry or business, and generate financial returns.

Dr Cholochat Rujikiatkamjorn, Professor Buddhima Indraratna, and PhD student, Mr Anass Attya from UoW's School of Civil Engineering won the open category, while Engineering PhD student Mark Gaykema and his colleague Mr Joseph Polder, won the student division. Dr Rujikiatkamjorn's efforts have resulted in a low cost drainage system that can significantly improve the stabilisation of soft soils in the construction industry. Mr Gaykema's invention is a self-cleaning water filter that removes debris from water tanks, limits the volume of water lost, and removes potential bacteria developing sediments.

**Marie Lewis Award**

Ms. Joanne George, a senior technical officer, was the recipient of the Marie Lewis Award at the University of Wollongong in 2007. The Marie Lewis Award is in honour of the late Marie Lewis and recognises the achievement of a member of the general staff completing a degree. Selection is based on academic performance and service to the University. Joanne played a major role as the first Environmental Engineering Technical Officer at the School of CME. Her direct contribution and assistance to academic staff in the launch of the Environmental Engineering degree was an imperative, given her enthusiasm, dedication, and sound training (BSc majoring in environmental chemistry and ecology). The Environmental Engineering laboratories began as small units but it soon became clear that more space was needed as the Environmental Engineering degree gained in popularity.
Joanne graduated in 2006 with a Graduate Diploma in Environmental Engineering and immediately began broadening her knowledge and by taking part in complex laboratory practices. She is very keen on professional development and is currently completing an MSc degree in Occupational, Health and Safety. Joanne is the Chair of the School of CME Safety Committee and also a Faculty of Engineering Work Advisory Committee member. She is the engineering representative on the University Bio-safety Committee and also sits on the Hazardous Substances Review Panel. Joanne is also an active member of the University social club and actively contributes to the social life of the School and University.

From Left: Professor Gerard Sutton, the Vice Chancellor, Ms. Joanne George and Emeritus Professor Don Lewis

25 Years Service Award

Mr Des Jamison, a senior technical officer (Information Technology Service), received a 25 Years Service Award at the 2007 University of Wollongong Vice-Chancellor's Awards to formally recognise the outstanding contribution and service of staff members. Most students and staff will always remember Des as a very helpful and dedicated member of the School’s IT team. Des Jamison is pictured with Professor Gerard Sutton, Vice Chancellor of the University of Wollongong.
6 VISITING ACADEMICS AND INTERACTION WITH INDUSTRY

6.1 School Visiting Academics

The School of CME regularly hosts visiting academics that enrich the research culture of the School through interaction and collaboration. Several leading academics from various institutions and universities around the world were invited to our school in 2006-07. They delivered technical presentations, participated in research activities, and promoted joint publications.

Sarah Springman, Professor of Geotechnical Engineering from ETH Zurich (Switzerland) visited UoW in May 2006 (middle row, fourth from right). She delivered a technical presentation on “Geotechnical characteristics of selected Swiss soils” during her visit at UoW.

Following is a selected list of many scholars visited the School recently:

- Prof. Sarah Springman, University of ETH Zurich, Switzerland
- A/Prof. Mohamed Sakr, Tanta University, Egypt
- Prof. Dave Chan, University of Alberta, Canada
- Prof. Berd Bikitewski Technische Universitat Dresden, Germany
- Prof. Gerd Braun, Cologne University of Applied Science, Germany
- Prof. David Nethercot, Imperial College London, UK
- Dr. Ala Aljorany, University of Bagdad, Iraq
- Dr. Retnamony Robinson, Indian Institute of Technology Madras, India
- Prof. Chen Youliang from University of Shanghai, China
A/Prof. Mohamed Sakr (first from left) of Tanta University, Egypt, actively collaborated in the School research projects during his 6-month visit at UoW in 2006.

Prof. Dave Chan, visiting academic, from University of Alberta, Canada (first row, 4th from left) delivered a presentation on “Modeling the moving ground” at UoW in May 2007.

Endeavour Research Fellowships

Dr. Retnamony Robinson

Dr. Retnamony G. Robinson is currently a Visiting fellow in the School of CME under the 2007 Endeavour India Research Fellowship scheme, which is aimed at promoting research in areas with mutual benefits for Australia and India. Dr. Robinson graduated from Madurai Kamaraj University, India with first class Honours in Civil Engineering. He obtained his Masters and Doctoral degrees in the area of Geotechnical Engineering from the Indian Institute of Science, Bangalore, India. He then worked at the National University of Singapore (NUS) for about five years in the area of centrifuge modelling and was involved in some major land reclamation projects. Since 2004 he works as an Assistant Professor at the Indian Institute of Technology in Madras, India. He is an experimentalist with a particular interest in physical modelling, stabilisation of expansive soils and soft clays, and the cyclic behaviour of fine grained soils.

Dr. Ala Aljorany

Dr. Ala N. Aljorany is a Visiting Fellow in the School of Civil, Mining and Environmental Engineering. He is an Assistant Professor in the Department of Civil Engineering at the University of Baghdad, IRAQ and was awarded a 2007 Endeavour Research Fellowship that sponsored by the Australian Government to promote research areas with mutual benefits for Australia and Iraq. He received a BSc. in 1979 and an MSc. in 1987, both in Civil Engineering. He completed his PhD degree (Geotechnical Engineering) in 1996 from the University of Baghdad. His field of interest is the finite element analysis of different geotechnical problems including consolidation and improvement of soft soils, pile foundation, and slope stability. He is currently working with Prof. Indraratna and Dr. Cholachat on the modelling and analysis of prefabricated vertical drains for improving soft soil.
6.2 Industry Links

The School of CME has had a remarkable and successful collaboration with both industry and government sectors in recent years that covers a large number of research and consulting projects. They include the following:

- RailCorp (NSW)
- Queensland Rail (QR)
- Roads and Traffic Authority of New South Wales (RTA)
- Wollongong City Council
- Shoalhaven City Council
- BlueScope Steel
- Snowy Mountains Engineering Corporation (SMEC)
- Queensland Department of Main Roads (QDMA - Brisbane)
- Australian Rail Track Corporation (ARTC)
- Douglas Partners, Wollongong (Geotechnical consulting engineers)
- Polyfabrics Australia Pty Ltd (Geosynthetics manufacturer and distributor)
- Rocla Pty Ltd (Manufacturer of concrete products including concrete sleepers)
- Coffey Partners, Wollongong (Geotechnical consulting engineers)
- Arup Geotechnics (Geotechnical engineering services)
- Chemstab Pty Ltd, Wollongong (Chemical stabilisation of unstable soils)
- Environment Protection Authority (EPA), Wollongong
- Sydney Water Corporation
- Violia Water
- Sydney Catchment Authority
- Department of Climate Change Environment and Water
- Water Quality Research Australia
- Clear Water Technologies
- Energetec Australia (Renewable energy technology development advisor)
- Port Kembla, Port Corporation
- BHP Billiton-Illawarra Coal
- Zenon Environmental
- Geoscience Australia
- Manildra Group, New South Wales
- Austrack, (Concrete railway sleeper manufacturer)
- Australian Geological Survey Organisation (AGSO)
- National Precast Concrete Association Australia (NPCAA)
- Palos Verder
- Helensburgh Coal Pty Ltd
- Gany Gibson and Associates
- Anglo Coal
- Gujarat NRE Minerals
- Oaky Creek Coal Pty Ltd
- Austar Coal Mine Pty Ltd
- Centennial Coal
- Rio Tinto (Coal Australia)
- Minova International (Mining technology)
Appendix A
School Publications (from January 2006 to June 2007)

Books and Book Chapters:


Refereed Journal Papers:


Conference Papers:


MG Grantham, RM Jauberthie and C Lanos, St Malo, Brittany, France. 27-29 June. Paper 17, pp. 131-137.


Uy, B. (2006) “Stability and Ductility of High Performance Steel Sections with Concrete Infill”, International Colloquium on Stability and Ductility of Steel Structures (SDSS’06), Lisbon, Portugal, September 6-8, 2006, pp. 993-1000.


