Annual Report 2005-06

AMSI
AUSTRALIAN MATHEMATICAL
SCIENCES INSTITUTE

National
Collaboration
in the Mathematical
Sciences

Science

Business, Industry & Government

Education

Outreach

Contents

AMSI Major Achievements 2005-06

Facilitating research

- $112,000 sponsorship to 19 scientific workshops

- 40 international academics sponsored to share expertise in Australia

Promoting industry partnerships

- Founding partner in Australian Centre of Excellence for Risk Analysis (ACERA)

- 170 participants from industry, government and academia at AMSI forums promoting use of mathematical sciences in industry

Providing educational opportunities

- 125 schools, 600 teachers and 30,000 students involved in *ICE-EM Mathematics* secondary schools pilot program

- 160 university students attend Summer School and Graduate School

Raising the profile of mathematics

- Strategy initiated to promote careers based on the mathematical sciences

- Strong media interest in reports on school mathematics

Every advanced industrial country knows that falling behind in science and mathematics means falling behind in commerce and prosperity.

Gordon Brown, UK Chancellor of the Exchequer, Budget speech, March 2006

About AMSI

The Australian Mathematical Sciences Institute (AMSI) is a national, collaborative venture supporting the mathematical sciences. It was established in 2002 with initial funding from its member institutions and the Victorian Government's Science, Technology and Innovation Infrastructure grants program.

AMSI's mission is to promote and strengthen understanding and use of the mathematical sciences in Australia's culture, science and economy.

There are three main programs: Science, Education, and Business, Industry and Government. Each program has an Advisory Committee that provides advice to the Institute's Board. Member meetings held twice a year also inform the Board's deliberations.

AMSI manages the International Centre of Excellence for Education in Mathematics (ICE-EM) which is funded by the Australian Government through the Department of Education, Science and Training (DEST). ICE-EM supports a vibrant education program covering school mathematics through to advanced postgraduate courses.

Many activities in AMSI's Science and Business, Industry and Government programs are conducted in collaboration with the Australian Research Council (ARC) Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), of which AMSI is a partner.
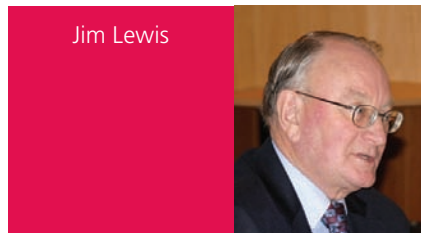
Membership

Full Members

The Australian National University
La Trobe University
Monash University
RMIT University
The University of Melbourne
The University of New South Wales
The University of Queensland
The University of Sydney

Associate Members

Australian Bureau of Statistics
Australian Mathematics Trust
CSIRO
Central Queensland University
Curtin University of Technology
Deakin University
James Cook University
Macquarie University
Queensland University of Technology
Swinburne University of Technology
The University of Adelaide
University of Ballarat
University of Canberra
The University of New England
The University of Newcastle
University of South Australia
University of Southern Queensland
University of Technology Sydney
The University of Western Australia
University of Wollongong
Victoria University

Chairman's review

Jim Lewis

The year has seen AMSI and ICE-EM continue to build on the efforts of previous years. Membership has been steady, staffing stable and many initiatives begun or moved forward, as reported in this document.

It is pleasing to see that collaboration between mathematicians and business and industry has also moved ahead this year. AMSI hosted two all-day Industry Forums during the year which strengthened relationships through discussion of current issues. Projects have begun in a number of fields, and are mentioned later in this report.

"collaboration between mathematicians and business and industry has moved ahead this year"

A major challenge for AMSI is its ongoing funding. The start-up three-year grant from the Victorian Government ended in June 2005 and the only ongoing funding is annual subscriptions from members. A number of grant applications have been made in the entrepreneurial spirit that has been present from AMSI's beginnings. Despite this lesser funding than in previous years, a number of individual projects have been initiated, funded either by businesses seeking data analysis or by the Australian Research Council.

A highlight of the year was establishment of the Australian Centre of Excellence for Risk Analysis (ACERA). AMSI is a partner in ACERA and AMSI's member universities can participate in projects sponsored by it.

Some Board positions rotate at the start of each calendar year. At its meeting in February, Professor Tony Bracken from the University of Queensland took over as representative of AMSI Full Members and Professor Kok Lay Teo from Curtin University of Technology, as representative of Associate Members. Associate Professor Alan Pryde from Monash University, took up a one year term as honorary Deputy Director of the Institute, nominated by the Full Members. I thank the previous incumbents Professor Tony Dooley, Associate Professor David Panton and Professor John Hearne for their contributions during the previous year.

I regret to advise that Dr Tim Littlejohn, an external Board member, has retired due to ill health following a significant accident trauma late last year. His contribution to the Board and industry-related matters came from the perspective of a leading bioinformatician. He had led the Australian Government's Bioinformatics Industry Opportunity Taskforce and founded Biolateral Group among many other roles and achievements. The Board and I thank him greatly for his input. I am working with the Director to find a replacement for Tim.

Another advisor who will be greatly missed is Dr Robert Watts, who stepped down as Chairman of AMSI's Industry Advisory Committee in May after accepting a new role with the Australian Research Council. Bob had been Vice-President Technology and Chief Scientist for BHP Billiton until his retirement and was previously Professor of Chemistry at the University of Melbourne. He continually pricked us with ideas about involvement with business and industry and was instrumental in getting the first industry forum off the ground.

The Scientific Advisory Committee (SAC) has also had some personnel changes recently. Professor Leon Simon of Stanford University (and formerly of Adelaide, Melbourne and the ANU) resigned due to many other commitments and once again we thank him for giving his time to assess applications for workshop sponsorship. He has been replaced by Professor Ezra Getzler of Northwestern University, a mathematical physicist educated at ANU and Harvard. The SAC has been supplemented by the addition of Professor Chris Heyde of ANU, one of Australia's leading statisticians. Chris will be a member of the SAC subcommittee for Risk Analysis which will review all projects coming through ACERA. I congratulate the SAC Chairman, Professor Peter Hall from the ANU on his recently-awarded Federation Fellowship, which recognises his national and international standing and will enable him to do important research in the area of non-parametric statistical methods.

The Education Advisory Committee under Chairman Professor Peter Taylor of the Australian Mathematics Trust has continued to advise on AMSI's education initiatives, which are mostly now under the banner of the International Centre of Excellence for Education in Mathematics (ICE-EM).

The Board thanks all members once again for their support during the year and believes AMSI has made further significant contributions to the mathematical sciences in Australia.

Jim Lewis
Chairman of the Board

AMSI Director's report

Philip Broadbridge

Activities have broadened in a number of significant areas this year. Within Australian mathematical science, the well-being of research, education and industry are inextricably entwined. AMSI has made progress in all three areas.

We are a key partner in the new Australian Centre of Excellence in Risk Analysis (ACERA), funded by the federal Department of Agriculture, Fisheries and Forestry.

Our member institutions may work on ACERA funded projects that have statistical or mathematical content. In this way, they will help maintain Australia's biosecurity and ensure the mathematical sciences' future support for agriculture, aquaculture and silviculture.

AMSI continues to sponsor workshops and conferences in all areas of mathematics, statistics and their applications and is forging more international connections. In July, AMSI and MASCOS signed a joint agreement with Mathematics of Information Technology and Complex Systems (MITACS), the Canadian network. The three organisations, with ICE-EM, are planning a first joint workshop and short course on electricity demand, supply and pricing. In November, AMSI, MASCOS and the Australian Mathematical Society became members of the Pacific Rim Mathematics Association (PRIMA). The PRIMA biennial conference will be hosted by AMSI in 2009.

The 2005-06 AMSI Lecturer, Professor John Dennis of Rice University, Texas, an expert on industrial optimisation, proved to be an excellent lecturer and communicator.

A successful industry forum in July 2005, looking at risk analysis in industry, finance and health was followed by another in March 2006 exploring new ways to use mathematical science in healthcare. Follow-up visits after the March forum were made at the invitation of the Federal Department of Health and the Queensland Chief Scientist. Along with several member institutions, AMSI is still finding ways to exploit the opportunities.

AMSI has been awarded its first ARC Linkage grant, to work with the University of Ballarat and Kann-Finch Group architects on floor plan efficiencies for the commercial building sector (see main report page 9). This is the start of connecting our members to important, non-traditional applications of mathematical sciences. Discussions with other companies are promising. We continue to be aggressive in applying for government grants. AMSI has submitted Round-1 applications to

DEST's Collaboration and Structural Reform Program and Land and Water Australia's Innovation Program. The Carrick Institute for Learning and Teaching in Higher Education has also encouraged AMSI to apply to it for grants.

Our good relations with educational institutions and state member institutions continue at all levels. Site visits have been arranged to member institutions in all states. The fact that AMSI is the first national representative body for both mathematics and statistics has been instrumental in attracting funding for centres of excellence. However, we are also responsible for representing our members when administrative decisions reduce staffing numbers in the mathematical sciences. Our role here is to impress institutions with the critical part mathematics plays in underpinning the sciences, humanities and future options for Australia. We follow this up with public comment in the press when necessary.

We have been closely involved with the ARC Review of Mathematical Sciences, being represented on the working party and advisory committee. This is a very important time for the Mathematical Sciences to identify their strengths and problems and to suggest improvements. Our submission explained the interconnected nature of important current issues in education and research, hence the multilateral interests of AMSI. Our interests in mathematics education are detailed in the ICE-EM report. In particular, the access grid network (see details on page 17) is likely to have a strong influence on mathematics education and be important for AMSI's scientific operations.

"AMSI has been awarded its first ARC Linkage grant"

We continue to cooperate with all of the mathematical science community to better our discipline. One example is the Workshop on Careers and Opportunities held in May, jointly hosted by AMSI, ICE-EM, the Australian Mathematics Society, the Statistics Society of Australia Inc. and the Australian Bureau of Statistics. Out of this workshop, we are planning a national promotional campaign for study and careers in mathematical sciences. We already have a public profile to support such a campaign. The AMSI/ICE-EM Directors and the AMSI Executive Officer have been extensively reported in major newspapers and on ABC Radio.

In short, AMSI continues to make progress on all fronts. I am grateful for the hard work of our expert advisory committees, for the wisdom of our Board, for the support of our members and several non-members around the country, and for the determination of our AMSI staff.

Philip Broadbridge
Director of AMSI

ICE-EM Director's report

Garth Gaudry
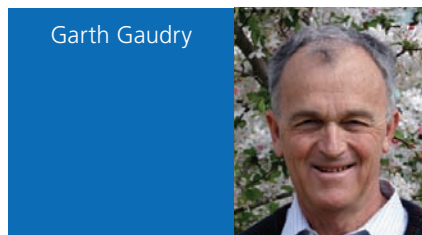
The second full year of operation of ICE-EM has been extremely productive. Building on the thorough planning and intensive work of the previous year, we have been able to fulfil our main objectives, and more. The achievements of the ICE-EM staff during the past year have been remarkable.

The 2006 Summer School, held at RMIT University, continued the tradition of lively, diverse programs for honours and postgraduate students for which AMSI and ICE-EM are now well known. Thanks to the efforts of Dr Nancy Lane, there was a healthy increase in the number of international students taking part. As usual, students seem to have made the most of the opportunity to form new friendships and to enjoy the lively social atmosphere. We are beginning to notice that groups of students who have got to know one another in this way are taking part in subsequent mathematical events organised by ICE-EM, AMSI or the Australian Mathematical Society with a considerable degree of self-assurance.

I am pleased to acknowledge the valuable work of Prof. Kathy Horadam as Director of the 2006 Summer School. ICE-EM owes a special debt of gratitude to Dr Lynne McArthur for the long hours and excellent work she did as Coordinator of the Summer School. I thank her warmly for her contributions.

The first ICE-EM Graduate School at the University of Queensland was an outstanding success. There were over 60 participants. The courses presented by distinguished overseas experts were very well received. Students gave enthusiastic evaluations of the courses and lecturers and appear to have had an enjoyable and rewarding time. Thanks go to University of Queensland staff for their work on the Graduate School, especially Ms Helen Grey. Helen was the mainstay of the event from many perspectives and was greatly admired by the students for the assistance she provided to them.

As its name suggests, ICE-EM seeks to achieve excellence and international involvement and recognition for the best of Australian mathematics. Such worthy aims are achieved only over time, as postgraduate programs become better known, publicity is pursued energetically, and products such as the ICE-EM Mathematics program for schools achieve a high profile and good reputation domestically. As part of our internationalisation program, Nancy Lane and I travelled to a number of key countries, ably assisted by Phil

Broadbridge during his trips to Argentina and Rome. More details about these trips can be found on page 17.

The release of Dr Frank Barrington's report on enrolment trends in Year 12 mathematics throughout Australia over a ten-year period was one of the highlights of the year. Frank's thorough and balanced report built on the results of a data gathering project, commissioned by ICE-EM, undertaken by Dr Helen Forgasz and Ms Nike Prince of Monash University. The report attracted widespread media coverage, including all major newspapers, Radio National *Life Matters*, and many others. This work by ICE-EM, like the preceding Barrington-Brown report on the content of Year 12 mathematics courses across Australia, is vitally important as it is independent and objective and focuses attention on the constructive changes needed nationally to ensure that excellence is achieved.

"The program is meeting a long-felt need"

The ICE-EM Mathematics program for schools is proceeding wonderfully well, thanks to the superb work of Dr Michael Evans, Ms Janine McIntosh and all the other people both at ICE-EM itself and throughout Australia who are contributing. It appears that the pilot books and associated professional development, and the day-to-day help have struck a chord with many schools and teachers. The program is meeting a long-felt need for high quality materials that are accessible and interesting to a wide range of students as well as being clear and helpful to teachers, particularly those without a strong background in the subject. See more information at www.icemaths.org.au.

These are just some highlights of what has been an exceptionally successful year. Details of other activities appear elsewhere in this Report.

I wish to record my sincere thanks to all ICE-EM staff for their enthusiasm and marvellous work throughout the year. A special word of thanks to Geoff Prince who has contributed so much to ICE-EM through his leadership of the Access Grid Program.

Garth Gaudry
Director of ICE-EM

Science Program

$112,000 sponsored for 19 workshops, seminars and other events for research and for bringing the latest scientific developments to mathematicians and statisticians in Australia

AMSI Lecturer John Dennis from Rice University spoke at annual ANZIAM Conference and at nine AMSI member universities in five states and the ACT

Mahler Lecturer, Professor Bruce E. Berndt, Department of Mathematics, University of Illinois at Urbana-Champaign, USA, supported to speak at AMSI institutions

AMSI sponsored 40 distinguished academics to visit Australia and share expertise
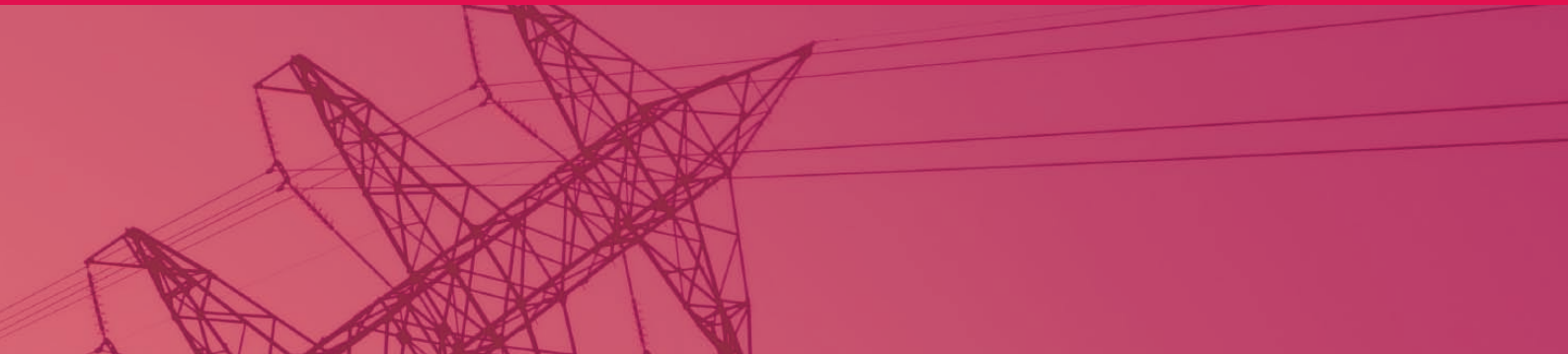
AIMS

- Support scientific research in the mathematical sciences by sponsoring selected workshops, conferences and seminars proposed by member institutions

- Conduct appropriate scientific research in collaboration with MASCOS (ARC Centre of Excellence for Mathematics and Statistics of Complex Systems) and ACERA (Australian Centre of Excellence for Risk Analysis

- Sponsor prestigious international visitors for lecture tours: annual AMSI Lecturer and biennial Mahler Lecturer

ACTIVITIES

Workshops, conferences and seminars

AMSI's scientific program funds meetings and workshops organised by AMSI members. Workshops usually run from two days up to a week, and address a specific field, or even a particular research problem. Special Theme Programs support relatively long periods of research interaction involving both workshop-type activity and collaborative research. This year, the program covered a range of topics from bioinformatics to the environmental sciences, and from stochastic modeling to string theory. These are listed on the next page.

AMSI's funding is usually given as reimbursement for the travel expenses of international and national keynote speakers and the provision of travel grants for students and early career researchers. This year, arrangements were changed for delegate travel, with authority being decentralised to heads of department or heads of discipline to disburse an annual travel budget. The arrangements are described at www.amsi.org.au/pdfs/Travel.pdf.

The Board has endorsed an extended funding model for problem-solving workshops due to a very successful workshop held last year that made progress on several problems in conservation.

AMSI invites proposals for both workshops and Special Theme Programs. Assessment of proposals is not competitive but purely on scientific merit and likely national impact. See www.amsi.org.au/proposals.php. Prof. Peter Hall is chair of the Scientific Advisory Committee.

AMSI Lecturer

Prof. John E. Dennis Jr is Research Professor and Noah Harding Emeritus Professor at the Department of Computational and Applied Mathematics, Rice University, Houston, Texas, USA.

Prof. Dennis's expertise is optimisation algorithms for industrial and computational mathematics, in which he has a long-standing collaboration with Boeing. His work is rated 'highly cited' in the Institute for Scientific Information (ISI) index.

AMSI sponsored his visit to Australia in February. At the annual conference of ANZIAM at Mansfield, Victoria, he spoke on *Optimal Placement of Tsunami Warning Buoys* and was an active participant in discussions on optimisation. He then spoke at nine member universities across Australia. As well as repeating the talk on tsunami buoys, he also presented talks on *Optimisation using Surrogates for Engineering Design and Mesh Adaptive Direct Search Algorithms*.

Mahler Lecturer 2005

The Mahler Lectureship is awarded every two years to a distinguished mathematician who works in an area of mathematics associated with the work of Professor Kurt Mahler. It is co-sponsored by the Australian Mathematical Society and AMSI.

The Mahler Lecturer for 2005 was Professor Bruce E. Berndt, Department of Mathematics, University of Illinois at Urbana-Champaign. Prof. Berndt's research is in the areas of number theory, elliptic functions, *q*-series, continued fractions, character sums, classical analysis and Ramanujan's notebooks. He spoke at the AustMS Annual Conference in September 2005 and at a number of member universities on the subject of *Ramanujan's Lost Notebook*.

ACTIVITIES

AMSI Science Program Workshops

Recent Advances In Biostatistics, Bioinformatics and Markov Chain Monte Carlo
University of NSW,
7-8 July 2005

Categories In Geometry, Algebra and Mathematical Physics
Macquarie University,
11-15 July 2005

Noncommutative Geometry and Index Theory
Australian National University,
22 July - 1 August 2005

Workshop on String Mathematics
University of Melbourne,
29 August - 2 September 2005

Australia-Japan Workshop on Real and Complex Singularities
University of Sydney,
5-8 September 2005

Symposium on Optimisation and Data Analysis
Australian National University,
21-23 September 2005

Workshop on Optimisation, Control and System Identification
AMSI (organised by RMIT University),
24 September 2005

Miniconference on Functional Analysis
University of Western Australia,
24-25 September 2005

Workshop on Groups and Combinatorics (in association with the 2005 Victorian Algebra Conference)
University of Western Australia,
26 September 2005

Recent Advances in Operations Research
AMSI (organised by University of Melbourne),
24 November 2005

Workshop on Lie Theory, Lattices and Dynamics
University of Newcastle,
23-25 November 2005

Statistics '05: Workshops on Research Methods: Modelling and Inference; Experimental Design; Spatial Sampling and Capture-recapture Models for Survey Methods
University of Wollongong,
28-30 November 2005

Manifolds at Melbourne
University of Melbourne,
17-20 January 2006

Workshop on Several Complex Variables and Cauchy-Riemann Geometry
University of New England,
7-10 February 2006

Asymptotic Geometric Analysis, Harmonic Analysis and Related Topics
Australian National University, Canberra,
21-24 February 2006

Workshop on Differential Geometry and Applications
La Trobe University, Melbourne
29 May - 16 June 2006

Joint AMSI & MASCOS workshops

International Workshop On Statistical Mechanics And Combinatorics
Dunk Island, Queensland,
10-15 July 2005

Australian Postgraduate Workshop On Stochastic Processes & Modelling
University of Melbourne,
12-15 February 2006

Mastering The Data Explosion In The Earth And Environmental Sciences
Shine Dome, Australian Academy of Science, Canberra,
19-21 April 2006

ACTIVITIES

Host visitors

AMSI has sponsored the following distinguished academics to visit Australia to present their research.

NORTH AMERICA

NAME	UNIVERSITY	EXPERTISE
A Crans	University of California at Riverside	Quantum algebra and quantum and geometric topology
B Chorny	University of Western Ontario	Homotopy theory, algebraic topology
Buks van Rensburg	York University	Statistical mechanics, combinatorics, bioinformatics
Gerard Thompson	University of Toledo	Mathematical physics, differential equations
Ian Anderson	Utah State University	Differential geometry, global analysis
J Berner	University of Notre Dame	Stochastic modelling and prediction
James Dolan	University of California at Riverside	Category theory
Jonathan Borwein	Dalhousie University, Halifax	Experimental mathematics
Jonathan Rosenberg	University of Maryland	K-theory, homology, homotopy
Neal Madras	University of Toronto	Random walks, statistical mechanics
Nigel Higson	Penn State University	Operator algebra theory
Nigel Kalton	University of Missouri	Functional analysis
Noel Cressie	Ohio State University	Spatial and spatio-temporal stochastic modelling
Stephen Boyd	Stanford University	Convex optimisation applications in control, signal processing and circuit design
Stuart Whittington	University of Toronto	Statistical mechanics of lattice models
Tom Ivey	College of Charleston	Differential geometry, partial differential equations
Tom Mestdag	University of Michigan	Differential geometry

EUROPE

NAME	UNIVERSITY	EXPERTISE
David Balding	Imperial College London	Statistical genetics
David Saunders	The Educational Broadcasting Services Trust (UK)	Differential geometry
Gilles Lancien	University Franche-Comte	Asymptotic geometric analysis
Joachim Cuntz	University of Munster	Noncommutative geometry and operator theory
Mireille Bousquet-Melou	University of Bordeaux	Random walks, permutations, partitions
Michael Mandjes	Centre for Mathematics and Computer Science, Amsterdam	Applied probability and queuing
Mike Crampin	University of Ghent	Differential geometry and dynamics
Demeter Krupka	Olomouc, Czech Republic	Global analysis, differential geometry and mathematical physics
Olga Krupkova	Olomouc, Czech Republic	Global analysis, differential geometry and mathematical physics
Olivier Thas	University of Ghent	Biometrics
Peter Cameron	Queen Mary, University of London	Permutation groups
Rosaria Lombardo	University of Naples	Correspondence analysis
Sue Lewis	University of Southampton	Design and analysis of experiments
Tom Leinster	University of Glasgow	Algebra and category theory
Péter Pálfy	Eötvös Loránd University, Budapest	Algebra and number theory
Xavier Viennot	University of Bordeaux	Combinatorics

ASIA / PACIFIC

NAME	UNIVERSITY	EXPERTISE
Nye John	University of Waikato	Experimental design
Kimio Miyajima	Kagoshima University	Real and complex singularities
Takua Fukuda	Nihon University, Tokyo	Real and complex singularities
Goo Ishikawa	Hokkaido University	Singularities in differential geometry and PDEs
Shyudi Izumiya	Hokkaido University	Singularities in differential geometry and PDEs

Business, Industry & Government Program

The first MASCOS/AMSI Business Breakfast on financial risk

Two AMSI/MASCOS Industry Forums: inaugural forum on *Managing Risk, Resources and Health*; the second on *Mathematical Opportunities in Healthcare*

First project brokered with industry partner

Establishment of Australian Centre of Excellence for Risk Analysis

Two ARC Linkage project proposals submitted for funding

AIMS

- Establish and develop links with industry partners operating in areas likely to benefit from a better use and understanding of mathematics
- Foster a mutual understanding of what is needed and what is possible when using analytical tools
- To showcase to industry and government the benefits of using the mathematical sciences

ACTIVITIES

Industry forums - *showcasing the benefits of using mathematical tools*

Industry Forums showcase the benefits of using mathematical tools to industry and government representatives and foster links and partnerships between practitioners and users. Two Industry Forums were held this year. The first was on *Managing Risk, Resources and Health,* held in Sydney at the Menzies Hotel in July 2005. The second was on *Mathematical Opportunities in Healthcare*, held at the RACV Club, Melbourne in March 2006.

The Hon. Ian MacFarlane, Federal Minister for Industry, Tourism and Resources opened the inaugural Industry Forum in Sydney. The plenary address was given by Prof. Arvind Gupta from MITACS, Canada (photo right). It was preceded by a reception at the Canadian consulate.

Professor Arvind Gupta leading speaker at first Industry Forum

Just over 100 participants listened to presentations that addressed three topical areas of risk, resources and healthcare. It was clear significant opportunities exist to develop partnerships between the providers and users of mathematical skills in these areas in Australia. There were several follow-up meetings with industry and health advisors in Canberra.
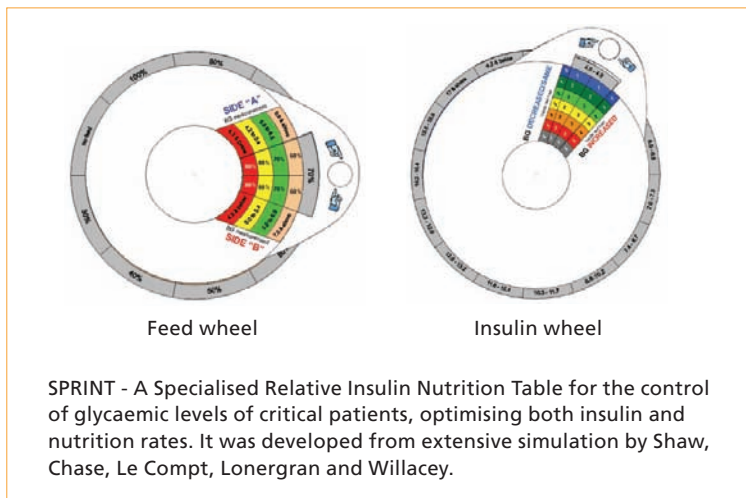
The second forum addressed mathematical opportunities in healthcare. Sessions covered optimising drug delivery, patient flow and healthcare informatics. The keynote speaker was Dr Louisa Jorm, from the NSW Department of Health. Other speakers and delegates were from health-related state and federal government departments and associated organisations.

Presentations revealed the pivotal role the mathematical sciences will have in improving Australia's healthcare system. The take home message was "a greater use of mathematics to identify problems and improve the systems and processes used to manage healthcare services is far more likely to save and improve peoples' lives than a better band-aid".

Infuse-rite drug delivery is managed by encoded algorithms

Feed wheel   Insulin wheel

SPRINT - A Specialised Relative Insulin Nutrition Table for the control of glycaemic levels of critical patients, optimising both insulin and nutrition rates. It was developed from extensive simulation by Shaw, Chase, Le Compt, Lonergran and Willacey.

An example is the Infuse-Rite drug delivery system (above) and the SPRINT system (left) developed by Dr Geoff Shaw and others at Christchurch Hospital and the University of Canterbury, New Zealand. Encoded algorithms optimise delivery of sedatives, reducing risk and more than halving cost while maximising patient care.

Planning is under way for the next industry event on electrical power management to be held in Queensland in April 2007. See current details at www.amsi.org.au/electricity.php.

ACTIVITIES

As well as representing AMSI at Industry networking meetings and arranging one-on-one meetings with potential industry partners, AMSI has hosted three industry outreach events.

MASCOS/AMSI Business Breakfast on financial risk

This year was the first time AMSI held a business breakfast as part of its industry outreach program. The breakfast was held in Melbourne at the Investment Centre Victoria, and opened by the Hon. Matt Viney, Parliamentary Secretary for Innovation and Industry. Speakers addressed management of market, operational and credit risk using a new mathematical tool called Information Gap Theory. The breakfast drew a diverse crowd of analysts and managers from the banking, broking and finance sector. A similar breakfast is scheduled in Sydney.

Lively discussion at the Business Breakfast

First Industry Projects

AMSI completed its first project for an industry partner, involving an analysis of networks. AMSI is in the final stages of negotiations with a major food manufacturer concerning a project that will analyse sensory and marketing data. It has taken AMSI time to gain traction as an organisation able to provide access for industry to experts in its member organisations. AMSI intends to grow the partner program, as it has potential to more than cover costs while providing interesting projects for members willing and able to participate.

Linkage Grants

AMSI was involved in facilitating two ARC Linkage grant applications. The first relates to risk management and the second to architectural design. With Kann Finch Architects and the University of Ballarat, the latter project will develop floor plan efficiencies for commercial buildings. The project will develop algorithms to create best-fit floor plans. It will focus on comparing and optimising building layout and floor plans while considering the use of different spaces. The project will be undertaken by a collaboration between the University of Ballarat, Kann Finch Architects and AMSI.

Paul Bondin, Director of the Kann Finch Group

Benchmarking

At the end of the reporting period, AMSI began a benchmarking study to compare the structure and processes of our Industry Program with those of similar organisations elsewhere such as MITACS (Canada), MATHEON (Germany), the Oxford Centre for Industrial and Applied Mathematics (UK) and the Smith Institute for Industrial Mathematics and System Engineering (UK). The benchmark report will outline issues related to business development, the size and frequency of projects sought, and the expectations and support provided by funding and governing bodies. The exercise will guide AMSI about what does and does not work with regard to industry outreach and project development.

ACTIVITIES

Partnerships with Centres of Excellence

This year AMSI became a founding partner in the Australian Centre of Excellence for Risk Analysis (ACERA). The centre was established with total funding of $6 million (over four years) from the federal Department of Agriculture, Fisheries and Forestry, the University of Melbourne, AMSI and the Australian Centre for Urban Ecology.

The Director of ACERA is Professor Mark Burgman, whose research into the fundamentals of uncertainty in ecology has applied new knowledge to a long-standing problem — how to make conservation decisions. He has published a seminal book on risk assessment for conservation and a broader treatment of uncertainty in environmental management. He is one of the world's leading environmental risk analysts and a member of many government scientific advisory panels.

Prof. Mark Burgman

ACERA will have a Scientific Committee of leading specialists in areas such as mathematics, statistics, biology, physical science, epidemiology, socio-economics, natural resource management, risk management and the psychology and sociology of risk perception.

ACERA will

• Research and develop state-of-the-art risk analysis methods across areas of interest to the Australian community. An early priority for the Centre will be biosecurity risks confronting Australia.

• Engage the range of skills and sciences relevant to the analysis of risk, to ensure that Australia remains at the forefront of practical risk assessment. These skills and sciences relate to communication and perception of and response to risk.

• Document and communicate research findings to ensure governments and others engaged in risk analysis have access to state-of-the-art risk analysis methods and raise the community's understanding of risk.

• Work to promote excellence in risk analysis in Australia.

• Work with the government in influencing international standards in risk analysis.

The Centre was opened on 2 May 2006 by Senator Mitch Fifield (Victoria) standing in for the Federal Minister for Agriculture, Fisheries and Forestry the Hon. Peter McGauran, who had to apologise at short notice.

Senator Fifield at the opening ceremony

Partners, committee membes and representatives from the Department of Agriculture, Fisheries and Forestry

Deputy Vice-Chancellor (Research), University of Melbourne, Prof. John McKenzie with ACERA Business Manager Ms Dolla Boutros

Education Program

2005-06 highlights

Pilot program of *ICE-EM Mathematics* started with 125 schools in all states and territories, 600 teachers and 30,000 students in the first two years of secondary school

Extensive teacher professional development

Promotion of careers in the mathematical sciences using posters, brochures, expos and a national strategy workshop

Access Grid Rooms established in three university mathematics departments and approved in four more

Successful annual Graduate School (60 students) at the University of Queensland and Summer School (100 students) at RMIT University

PROGRAMS

Schools

- Textbooks and online resources for teachers and students
- Teacher professional development
- Careers expos, brochures and posters
- Research into school mathematics

Higher Education

- Student vacation research scholarships
- ICE-EM/AMSI Summer School
- ICE-EM Australian Graduate School in Mathematics
- Access Grid Room network

Industry and Government

- Industry-specific short courses
- Interdisciplinary workshops such as BioInfoSummer
- Careers liaison and support
- Consultation and advice

International Collaboration

- Visiting lecturers
- Student scholarships
- Educational partnerships
- Joint programs

ACTIVITIES

ICE-EM Mathematics

ICE-EM Mathematics is a school mathematics program being developed for Years 5 to 10. It comprises teacher professional development, textbooks, multimedia materials and continuing teacher support. Some of Australia's most recognised writers are working with teachers and mathematicians to produce material for the program that is easy to read, clear, logically structured and mathematically correct.

The pilot program began in January 2006 with the first two years of secondary mathematics. It was trialled in 125 secondary schools around Australia (see map below) by about 600 teachers and 30,000 students.

Ms Janine McIntosh conducts a Professional Development session
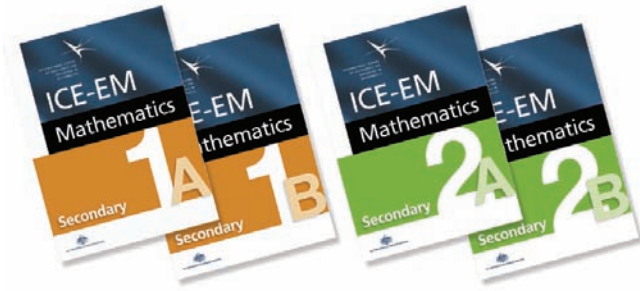
The development team provided three professional development sessions for teachers, and in turn, teachers gave feedback to the development team.

The web site at www.icemaths.org.au offers the latest information for teachers.

Materials for the first two years of secondary will be available commercially in late 2006. Writing is in progress for upper primary and middle secondary pilot materials for release in 2007.

Pilot schools across Australia

Alice Springs

Toowoomba

Caloundra
Brisbane

Perth

Wagga Wagga

Newcastle
Sydney

Albany

Adelaide

Albury

Canberra
Wangaratta

Geelong

Gippsland
Melbourne

Burnie

Launceston
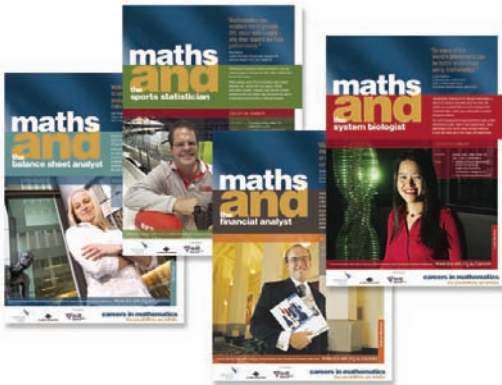
Hobart

70 State Schools
30 Independent Schools
21 Catholic Schools

ACTIVITIES

Promoting wide-ranging careers in the mathematical sciences


Posters

Following the success of the original set of posters, ICE-EM commissioned four new posters suitable for notice boards in schools and university mathematics departments. They depict careers as a sports statistician, system biologist, human rights statistician and balance sheet analyst.

Careers brochure

This year, ICE-EM produced a brochure *Maths and you* aimed at senior school students, showing young people in mathematically-oriented careers. It is designed to be handed out at career expos, open days and other events where careers in mathematics and statistics are being promoted.
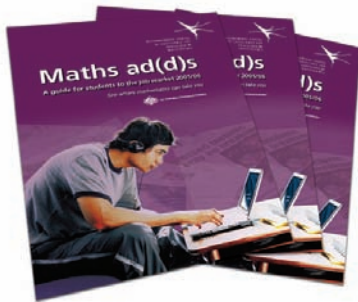
Maths Ad(d)s

This 24-page A4 booklet, updated each year by La Trobe University, contains job advertisements that have appeared in the press or on the internet. The advertisements show that a great number and variety of careers are available to university students after graduation if they include mathematics or statistics in their degrees. Twelve thousand copies were distributed nationally at careers expos and open days.

Expos

ICE-EM again supported a series of mathematics booths at careers fairs in Melbourne, Perth, Adelaide, Brisbane, Sydney and Canberra. AMSI members and, in some states, mathematics teachers associations, provided staffing for the booths.

See www.ice-em.org.au/careers for more details on careers materials, including ordering information

Teachers' Day at the Australian Mathematical Society Annual Conference

About 50 participants registered for the special afternoon sessions designed for teachers on 28 September 2005 at the Australian Mathematical Society (AustMS) Annual Conference in Perth. ICE-EM provided travel support for teachers outside of Perth to attend.

The speakers included Prof. Bruce Berndt from the University of Illinois at Urbana-Champaign, USA; Prof. Jonathan Borwein from Dalhousie University, Canada; Dr Jacqui Ramagge from the University of Newcastle, NSW; and Prof. Philip Broadbridge, Director, AMSI. Their calibre attracted regular conference participants as well.

Assoc. Prof. Ken Harrison of Murdoch University, WA, then chaired a panel discussion on *Outcomes-Based Mathematics Education—Panacea or Poison?* ICE-EM hosted a reception after the sessions. Feedback from teachers, who came from around Western Australia, was very positive.

A similar event is planned for the 50th anniversary AustMS Conference in September 2006.

ACTIVITIES

Research into school mathematics

ICE-EM commissioned a report released on 24 October 2005 that revealed major differences among Year 12 mathematics syllabuses and assessment across Australia. The authors—Dr Frank Barrington of the University of Melbourne and Mr Peter Brown of the University of NSW—described the situation as 'chaotic'. They found that in terms of the syllabus content, WA, SA and Queensland did not require students to study a number of core mathematics sub-topics that are needed for tertiary studies in engineering, science, actuarial studies and other quantitative areas. The authors found some extreme differences in expectations of the exams. They suggest that comprehensive work is needed on the types of questions asked in exams and other assessments and the ways marks are arrived at. The full report is available at www.ice-em.org.au/year12maths.

ICE-EM commissioned a second report released on 6 June 2006 showing a steep decline in the percent of Year 12 students taking higher level mathematics in Australia. The report found a mass movement into elementary mathematics in the past decade at the expense of vitally important advanced and intermediate subjects, posing a serious threat to the nation's capacity to compete internationally.

The report, by Dr Frank Barrington, was built on work done by Dr Helen Forgasz and Ms Nike Prince of Monash University. It found that:

- SA, WA, Queensland and Tasmania now have less than 10% of Year 12 students taking advanced subjects.

- NSW (three unit and four unit Mathematics) and Victoria (Specialist Mathematics) have the strongest enrolments in advanced mathematics — 15% and 12.6% respectively in 2004.

- There has been a steep decline in the percentage of students taking intermediate level mathematics, especially in NSW (two unit mathematics), which dropped from 30% to 20%, and also in WA and SA.

- Intermediate subject enrolments in Queensland were much higher than other states throughout the period.

- Nationally, the percentage of Year 12 students taking higher level (advanced and intermediate) mathematics fell from 41.3% in 1995 to 34.3% in 2004.

> *To reverse this trend, students have to be rewarded in university entrance score calculations for tackling the more difficult subjects. Most universities have softened entrance requirements and dropped prerequisites and are underplaying the level of mathematics essential to complete many degrees successfully.*
>
> Prof. Garth Gaudry, Director of ICE-EM

Vacation research scholarships

Jeanette Palmer (University of Queensland) talking at the *Big Day In* about her project *Network Models for Seismicity.*

ICE-EM provided 44 summer vacation scholarships this year. AMSI members chose their most outstanding undergraduate mathematics or statistics students, who were each given an opportunity to work on a research project with a member of the department's academic staff. Students received an award of $350 a week for up to six weeks, an incentive for them to pursue honours and postgraduate study.

AMSI provided funding for 38 of the students to participate in CSIRO's *Big Day In* where they presented their projects and had opportunities to network with each other and with CSIRO and other scientists. Several universities included a news item about the *Big Day In* on their web site.

See www.ice-em.org.au/students.html#scholarships05 for short reports on the projects.

Rohan Claffey (left), Timur Hassan and Richard Campbell from La Trobe University discuss a mathematical problem at the *Big Day In*

Improving undergraduate teaching

A representative from the Carrick Institute for Learning and Teaching in Higher Education visited AMSI in April 2006. This led to constructive discussions concerning possible projects to improve undergraduate teaching in mathematics and statistics.

ACTIVITIES

ICE-EM Australian Graduate School in Mathematics

The inaugural ICE-EM Australian Graduate School in Mathematics was held from 4-22 July 2005 at the University of Queensland in Brisbane. The courses were aimed at postgraduate students in mathematics and cognate disciplines. Scholarships and cooperative agreements enabled students from Hong Kong and New Zealand to attend.

The School brought leading international experts to present advanced specialist mathematics courses in cutting-edge research. Sixty students attended lectures in one of three themes: Algebraic Structures, Dynamical Systems and Stochastic Processes.

In addition to the lecture courses, participants had the opportunity to present their own research. Each participant presented a one-hour seminar on a topic related to their research interests.

The courses and presenters were:

Stochastic Processes

Random Fields and Geometry	Prof. Robert Adler *(Israel Institute of Technology)*
Statistical Methods in Genetics and Genomics	Prof. Warren Ewens *(University of Pennsylvania)*

Dynamical Systems

Bifurcation Theory	Dr Jeroen Lamb *(Imperial College London)*
Discrete Dynamical Systems and Chaos	Prof. James Meiss *(University of Colorado at Boulder)*

Algebraic Structures

Representation Theory	Dr Stephen Bigelow *(University of California, Santa Barbara)*
Modular Forms	Assistant Prof. Mark Kisin *(University of Chicago)*

For the detailed program, see **http://www.maths.uq.edu.au/IAGSM/IAGSM2005/index_2005.html**
Lectures for Stochastic Processes are webstreamed on the ICE-EM website.

ICE-EM/AMSI Summer School

The fourth annual ICE-EM/AMSI Summer School was hosted by RMIT University from 16 January to 10 February 2006. The School was aimed particularly at incoming mathematics and statistics honours students; however, many postgraduate students also attended. Travel and accommodation subsidies were awarded to students from AMSI member institutions, as well as to students and early career academics from universities in Asia.

Around 100 students attended, including six international students from Indonesia, Hong Kong and Pakistan.

The School offered four two-week and six four-week courses taught by outstanding lecturers from Australia and New Zealand. Three lecture series were videotaped for webstreaming.

Course	Lecturer
Computability and Intractability	Dr Marcel Jackson *(La Trobe University)*
Measure Theory	Dr Marty Ross *(Monash University)*
Finite Element Methods and Related Topics	Dr Thanh Tran *(University of New South Wales)*
Statistical Inference	Prof. Richard Huggins *(University of Melbourne)*
Cryptomathematics	Assoc. Prof. Serdar Boztas *(RMIT University)*
Algebraic Curves	Dr Emma Carberry *(University of Melbourne)* and Dr Nuno Romao *(University of Adelaide)*
Permutation Groups	Dr John Bamberg *(University of Western Australia)*
System Modelling and Simulation	Dr David Green *(University of Adelaide)*
Applied Convex Analysis	Assoc. Prof. Andrew Eberhard *(RMIT University)*
Computational Group Theory & Related Topics	Assoc. Prof. Eamonn O'Brien *(University of Auckland)*

ACTIVITIES

Access Grid Rooms
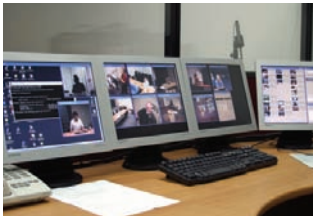
Access Grid Rooms are the next generation of video conferencing facilities. They provide a highly interactive teaching and research experience. ICE-EM has been funded to support installation of these rooms in mathematical science precincts around the country. AGRs have been commissioned at the University of Wollongong, La Trobe University and the University of South Australia, and at least four more have been approved and are in various stages of development. In second semester 2006 a national seminar program and shared honours subjects will be trialled.

Industry courses

ICE-EM was the major sponsor of BioInfoSummer 2005: The ICE-EM Summer Symposium in Bioinformatics. The symposium was held from 28 November to 2 December 2005 at ANU. ICE-EM's funding provided subsidies for 32 students from AMSI member institutions and seven from Asian universities.

ICE-EM international students at BioInfoSummer with organiser Lucia Santoso (right)

The first industry workshop sponsored by ICE-EM was Recent Advances in Stream Ciphers and Hash Functions, held on 26-30 June at the Queensland University of Technology. The first two days were an intensive short course to bring participants new to the field up to speed. The last three days comprised keynote lectures by internationally renowned speakers including Lars Knudsen, Technical University of Denmark; Stefan Lucks, University of Mannheim; Bart Preneel, Catholic University Leuven, Belgium; and Josef Pieprzyk, Macquarie University, Sydney.

Further courses, including one in Financial Mathematics, are scheduled for 2006-07.

International collaboration and promotion

In October 2005, Prof. Garth Gaudry was invited to present an address to the Education Committee of the American Mathematical Society about ICE-EM's projects. Participants showed a great deal of interest in the work and valuable contacts were made.

Dr Nancy Lane with Graduate School participants from Vietnam

Prof. Gaudry visited schools and universities in Thailand in November 2005, promoting ICE-EM events and products. He gave a presentation at the Australian Embassy to invited Thais prominent in secondary and tertiary education. This visit was organised by Australian Education International (AEI). Subsequently Dr Nancy Lane took part in an AEI event organised by DEST in Brisbane, which was attended by many education leaders from countries in the region.

Dr Lane visited Vietnam in June 2006 and established excellent groundwork for cooperation with Vietnamese mathematicians. A number of Vietnamese are expected to attend ICE-EM events in Australia, and the possibility of presenting an intensive postgraduate course in Vietnam is being explored.

ICE-EM events and subsidies are now listed on the PRIMA website, www.primath.org. In return, PRIMA has offered opportunities for Australian students to become involved in its members' activities.

Marketing

ICE-EM distributed about 30,000 copies of the Summer 2006 and Winter 2006 newsletters as inserts in mathematics and mathematics education publications. In addition, an 8-page ICE-EM introductory brochure was launched in April.

A new brochure, *Mathematics Opportunities in Australia,* was first published in October to promote the Summer School, Graduate School and industry workshops. It is updated as new events are scheduled.

The web site www.ice-em.org.au has had 36,000 visitors during the year.
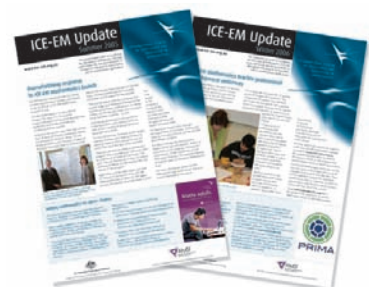
Outreach Program

Major participant in ARC Review of the Mathematical Sciences in Australia

Organised multi-party workshop to develop national strategy to promote careers in the mathematical sciences

Established formal international links with MITACS and PRIMA

Campaigned against cuts to mathematics at member institutions
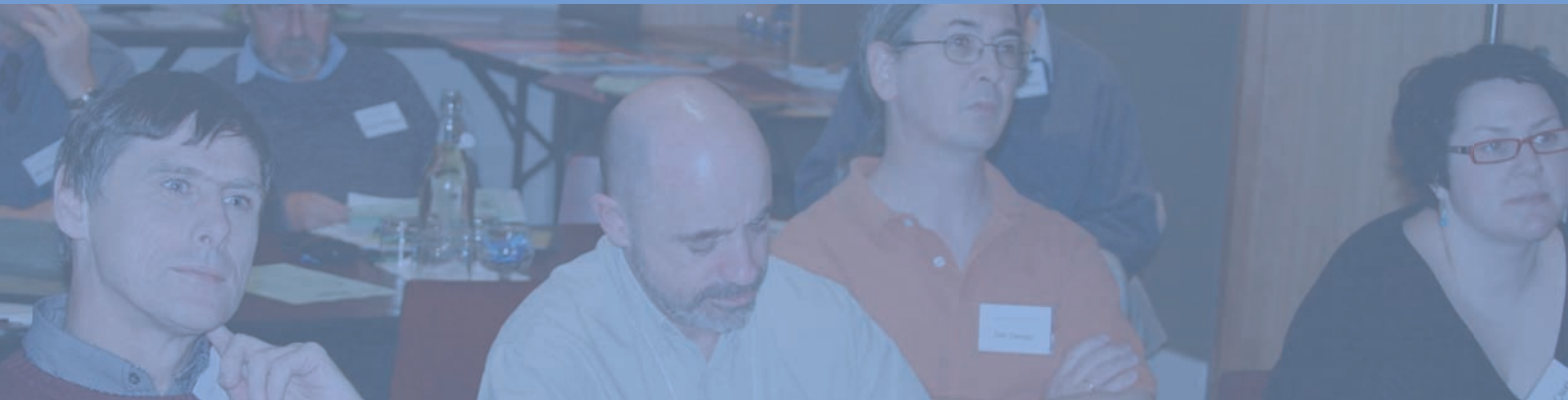
AIMS

- Encourage federal and state governments and universities to give greater support to the mathematical sciences at all levels, including by making submissions to parliamentary and other enquiries and reviews
- Sponsor and participate in research into the state of the mathematical sciences in Australia
- Raise awareness of the mathematical sciences nationally and internationally
- Forge links with other professional associations
- Showcase Australian mathematical sciences at selected international conferences
- Take the lead on selected issues for the mathematical sciences

ACTIVITIES

## Speaking out on behalf of the mathematical sciences

Government

At a public hearing on 18 August 2005, Prof. Garth Gaudry, Ms Jan Thomas and Ms Janine McIntosh appeared before the House of Representatives Standing Committee on Education and Vocational Training in connection with the submission ICE-EM had earlier presented (see **www.aph.gov.au/house/committee/evt/teachereduc/subs/sub058.pdf**) relating to the mathematical content in teacher education. Their presentation was well received and led to a positive and potentially fruitful interchange with members of the Standing Committee from all sides of politics. Prof. Gaudry and Ms Thomas also had a number of meetings with the Department of Education, Science and Training (DEST) and ministerial staff.

AMSI and ICE-EM also made a submission and presentation to the Inquiry into Changes to the Post-compulsory Curriculum in Western Australia by the Education and Health Committee of the Legislative Assembly of Western Australia. AMSI hosted a review team from the Committee in November 2005.

Prof. Gaudry and Ms Thomas attended the annual Science Meets Parliament day and had opportunity to inform members of parliament and ministers' staff about the importance of the mathematical sciences.

Ms Thomas continues interactions with the Federation of Australian Scientific and Technological Societies (FASTS) and was a guest at its 20th anniversary dinner. FASTS is an important conduit in formulating national science policy.
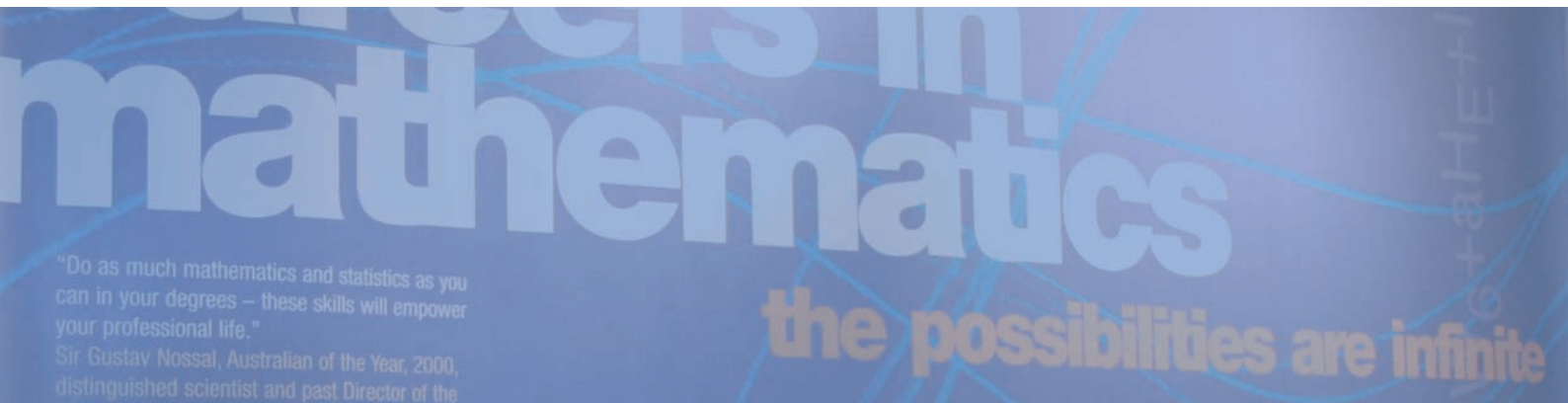
Media coverage

Wolfe Words was engaged to promote the release of the Barrington-Brown report on differences among Year 12 syllabuses in October 2005 and the release of the Barrington report on Year 12 participation in mathemtaics in June 2006 (see details on page 15). Both reports received a great deal of coverage in the mainstream media and the ICE-EM Director had many radio interviews.

Prof. Broadbridge was invited in March 2006 to give a talk on ABC Radio National about mathematical shortcomings in Australian engineering courses. This was followed by exposure in the mainstream press about the issue.

In recent years, many Australian engineering programs have reduced the mathematics requirements in favour of management, communication and marketing courses. The most common program structure now includes only three mathematics courses beyond secondary education. This is certainly not sufficient to enable engineers to successfully model mechanical behaviour of new materials.

Prof. Philip Broadbridge, Director of AMSI, on ABC Radio, 8 March 2006

Down-sizing of mathematics and statistics departments

Prof. Broadbridge communicated concerns to the incoming Vice Chancellor of the University of New England, NSW, about its plans to halve the mathematics staff. Ms Jan Thomas also supplied an article to the *Armidale Independent* on the subject.

Prof. Broadbridge has visited many regional universities where he has spoken with academics, Deans and senior executives about ways to maintain a vibrant program in the mathematical sciences. Prof. Gaudry and Ms Thomas undertook a similar visit to Darwin where they spoke to university, government and education authorities.

ACTIVITIES

Research into the state of the mathematical sciences

AMSI is a sponsor of the National Strategic Review of Mathematical Sciences Research in Australia. The review has been taking place under the auspices of the National Committee for the Mathematical Sciences of the Australian Academy of Science. It commenced in September 2005 and the final report is expected to appear in late 2006. The review follows great changes in the Australian higher education sector in the previous decade, and in the mathematical sciences in particular. In the context of reviewing research, the review is considering teaching, research and practice in the mathematical sciences in universities and beyond. It is also considering the use and anticipated future needs of mathematical sciences in business and in the wider community. Ms Jan Thomas, Executive Officer of AMSI, is a member of the Review's national working party.

Ms Thomas was also a member of the Steering Committee of the Review of Statistics in Australian Universities, conducted by the Statistical Society of Australia. It handed down its final report in December 2005. This review was prompted by the shortfall of statistics graduates to meet the needs of Australian employers. It made recommendations relating to school curriculum design, teacher training, university funding, employer links and improving the profession's image and profile.

ICE-EM carried out two national research studies during the year. The first was a study of Year 12 mathematics syllabuses and assessment which found major disparities across the states. The second was a study of the numbers of Year 12 students taking higher level mathematics, which shows a significant decline over the past decade. More details are given on page 15.

Raise awareness of AMSI and ICE-EM internationally

ICE-EM staff visited several countries during the year. In October 2005, Prof. Garth Gaudry spoke at a meeting of the American Mathematical Society and visited Thailand in November 2005. Dr Nancy Lane visited Vietnam in June 2006. See fuller report on page 17.

Prof. Phil Broadbridge, Director of AMSI, delivered a short course in Rosario, Argentina in November and December 2005 and spoke at the *Trilateral Australia Taiwan Italy Meeting on Analysis* in Rome in January 2006. Also in November 2005, AMSI Executive Officer Ms Jan Thomas presented at the Fifth Southern Hemisphere Symposium on Undergraduate Mathematics and Statistics Teaching and Learning held on Fraser Island.

National strategy for promoting careers in the mathematical sciences

On 23 May 2006, a workshop was held in Melbourne to devise a national strategy to promote mathematical science careers. It aimed to identify what was already being done, identify gaps and devise a national strategy. Key audiences for the materials being considered were students in schools and tertiary institutions as well as their parents.

The event was sponsored by AMSI, ICE-EM, the Australian Mathematical Society, the Statistical Society of Australia and the Australian Bureau of Statistics.

All mathematical science departments were invited, along with DEST, science centres, CSIRO, ABS, professional societies and school education authorities.

The outcome of the day will be a plan with priorities for further action, national in scope. Consultants assisted with the day and will produce a report.

For other activities and material produced by ICE-EM promoting careers in mathematics and statistics, see page 14.

Ms Jan Thomas addressing the careers workshop

Dialogue with AMSI members

The Director of AMSI, Prof. Phil Broadbridge, and the Industry/Marketing Manager, Dr Thomas Montague, have been regularly visiting members to discuss local issues and opportunities for collaboration. This has resulted in projects involving academics from several member universities as reported in other sections of this report. Representatives of the AMSI members also meet with AMSI senior staff and Board directors at a semi-annual Members Meeting.

ACTIVITIES

Links with international mathematical organisations

In July, AMSI and MASCOS signed a joint agreement with the Mathematics of Information Technology and Complex Systems (MITACS), a Canadian network of centres of excellence for the mathematical sciences. The network, established in 1999, initiates and fosters linkages with industrial, governmental, and not-for-profit organisations that require mathematical technologies to deal with problems of strategic importance to Canada. In this, it has parallel aims to AMSI. The agreement envisages a joint workshop per annum, collaborative research and industrial outreach, exchange of research students, graduate internships and a possible joint annual graduate school.

The three organisations, with ICE-EM, are planning a first joint workshop and short course on electricity demand, supply and pricing in 2007.

In November, AMSI, MASCOS and AustMS became members of the Pacific Rim Mathematics Association (PRIMA). PRIMA is an association of mathematical sciences institutes, departments and societies from around the Pacific rim, established in 2005 with the aim of promoting and facilitating the development of the mathematical sciences throughout the region. The PRIMA biennial conference will be hosted by AMSI in 2009.

Professor Arvind Gupta (MITACS) and Professor Garth Gaudry (AMSI) signing the AMSI, MASCOS and MITACS Memorandum of Understanding on 21 July 2005

Links with national mathematical organisations

AMSI is closely associated with the Australian Mathematical Society (AustMS). AMSI supplies a report for each issue of the Society's Gazette. Examples of collaboration this year were the Teachers Day at the AustMS Annual Conference (see page 14 for more details), support of the biennial Mahler Lecturer and co-sponsorship of the careers national strategy event reported on the previous page. AMSI and AustMS worked closely together as key participants in the National Review of the Mathematical Sciences.

Australian and New Zealand Industrial and Applied Mathematics (ANZIAM) is a division of AustMS. AMSI supplied the annual AMSI Lecturer as a plenary speaker to ANZIAM's annual conference in February 2006. A similar arrangement was planned for the Statistical Society of Australia.

The Victorian chapter of the Australian Society for Operations Research has for some time been using the AMSI premises in Carlton for its monthly committee meeting and public lecture. Recently, the Victorian chapter of the Statistical Society of Australia Inc. has begun using the AMSI premises for the same purpose. An offer is open to all such organisations within the mathematical sciences field to explore similar arrangements. AMSI has a seminar room with modern AV equipment suitable for seating up to 35 people.

A Third Stream Funding Forum was hosted at the Australian Academy of Sciences in Canberra, by the Federation of Australian Scientific and Technological Societies (FASTS) on 12 October 2005. Ms Jan Thomas represented AMSI at the Forum. Third Stream Funding is defined as "the generation, use, application and exploitation of knowledge and other university capabilities outside academic environments ... the interaction between universities and the rest of society." The Forum was held to consider whether a type of Third Stream Funding might be useful or applicable in Australia.

Corporate Governance

Structure of AMSI

AMSI is a collaborative unincorporated joint venture involving universities and other bodies related to the mathematical sciences. A Joint Venture Agreement (JVA) was signed by six Full Member universities in 2002, with a further two Full Members joining in 2004. A complete list of AMSI members appears on page iii of this report.

Management of AMSI

The JVA empowers the AMSI Board to be responsible for the overall direction of the Institute, formulation of policies, and management of activities in the areas of science; business, government and industry; and education. External advice is provided by three high profile Advisory Committees.

Activities are detailed in the Business Plan and Budget document as authorised annually by the Board on behalf of the Full Members.

Management of the Institute and its activities as detailed in the Business Plan and Budget document is the responsibility of the Executive Committee authorised to perform such functions by the Board. (Members of the Executive Committee are listed on page 26).

Organisation structure

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┌─────────────────────┐        ┌──────────────────┐        ┌─────────────────────┐
│  Members Meeting    │        │   AMSI Board     │        │  Host Institution   │
└─────────────────────┘        └──────────────────┘        │ University of       │
┌─────────────────────┐                                     │ Melbourne           │
│ Scientific, Industry│                                     └─────────────────────┘
│ and Education       │
│ Advisory Committees │
└─────────────────────┘
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        ┌──────────┐         ┌──────────┐        ┌──────────────────────┐
        │ Director │         │ Director │        │ Advanced Coursework  │
        │ AMSI     │─────────│ ICE-EM   │────────│ Committee            │
        └──────────┘         └──────────┘        └──────────────────────┘
                                                  ┌──────────────────────┐
                                                  │ Summer School Program│
                                                  │ Committee            │
                                                  └──────────────────────┘

                        ┌──────────────┐
                        │  Executive   │
                        │  Committee   │
                        └──────────────┘

   ┌────────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
   │ Business   │  │ IT and       │  │ Project and  │  │ Administrative│
   │ and        │  │ Multimedia   │  │ other staff  │  │ support      │
   │ Industry   │  │              │  │              │  │              │
   └────────────┘  └──────────────┘  └──────────────┘  └──────────────┘
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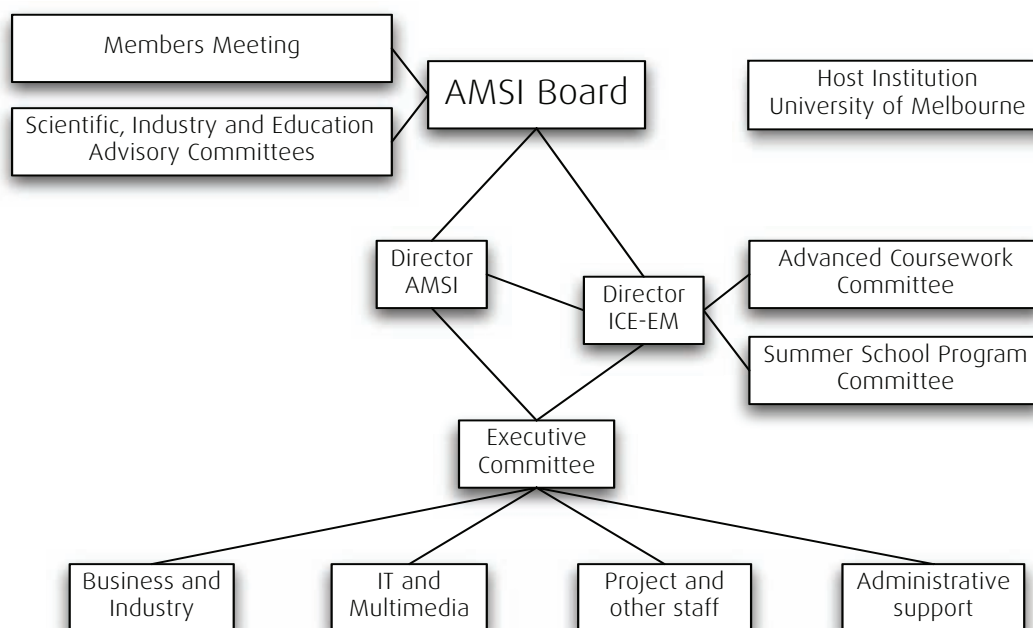

The AMSI Board

Composition

The Board comprises up to nine persons being:

• an independent Chair appointed by the Full Members

• the Institute Director

• the Deputy Director appointed by the Full Members

• one person representing The University of Melbourne

• one person representing the Full Members appointed by mutual agreement of the Full Members

• one person representing the Associate Members appointed by mutual agreement of the Associate Members

• two or three independent members representing business and industry appointed by mutual agreement of the Full Members.

No non-executive members of the Board are remunerated.

Term of Board members

The persons comprising the Board are appointed for terms of 1 year but are eligible to serve for one or more further terms if re-appointed in accordance with clause 18.2 of the Joint Venture Agreement.

The Directors

The Directors for 2005-06 were as follows:

Dr James E. Lewis BE, BA, PhD, FIChemE

Independent member and Chairman

Jim is President of the Parkview Group Pty Ltd and Director of several other companies. He has had a long career in industry and for a significant period was responsible for the research effort of one of Australia's major corporates.

Ms J S Downes BA (Hons), Dip Ed, Grad Dip Acc, FCPA

Independent member

Judith is Chief Financial Officer and Chief Operating Officer, Institutional Division, Australia and New Zealand Banking Group Limited (ANZ). Previously she was Group General Manager Finance of ANZ. She joined ANZ Bank Group in 1996. She is also a member of the Standards Advisory Council of the International Accounting Standards Board and a Director of ING Australia.

Dr Tim Littlejohn BSc (Hons), PhD

Independent member

Tim is director of Biolateral Pty. Ltd., a life sciences information services company he founded in 2001. He is a leading Australian bioinformatician. Previously he was Head of ANGIS, the Australian national bioinformatics facility. He has led the Australian Government's Bioinformatics Industry Opportunity Taskforce, and in 2002 was appointed inaugural National Convenor of AusBiotech's Bioinformatics Special Interest Group.

Prof. John Hearne BSc(Hons), MSc, DSc

Deputy Director to 10 February 2006

John has been Head of the School of Mathematical and Geospatial Sciences at RMIT since its formation in 2004. He is former president of the Resource Modelling Association and the Operations Research Society of South Africa. He has editorial responsibilities with *Ecological Modelling*, *Natural Resource Modelling*, *ORION* and *International Abstracts in Operations Research*.

Assoc. Prof. Alan Pryde MSc, PhD

Deputy Director from 10 February 2006

Alan has been Head of the School of Mathematical Sciences at Monash University since 2003. His research interests are functional analysis, spectral theory and harmonic analysis. He is an Associate Editor of the *Journal of the Australian Mathematical Society*.

Prof. Garth Gaudry BSc (Hons), PhD, Hon Fil Dok

Director of AMSI to 31 July 2005

Garth is Director of the International Centre of Excellence for Education in Mathematics. He was previously foundation Director of AMSI and Professor of Pure Mathematics and Head of School at the University of New South Wales. He is known internationally for his research in harmonic and functional analysis and has been influential nationally in school mathematics education.

Prof. Philip Broadbridge BSc (Hons), Dip Ed PhD

Director of AMSI from 1 August 2006

Prior to joining AMSI, Philip was Chair of the Department of Mathematical Sciences at the University of Delaware, USA (2002-05) and Professor of Applied Mathematics at the University of Wollongong, NSW (1991-2001). His research interests involve applied nonlinear partial differential equations. He is a member of the editorial board of *Journal of Mathematical Analysis and Applications, Mathematical and Computer Modelling, Applicable Analysis* and *Lecture Notes of the Australian Mathematical Society*.

Prof. Peter Taylor BSc (Hons), PhD

Nominee of the University of Melbourne

Peter is Head of the Department of Mathematics and Statistics at the University of Melbourne, which is the host department of AMSI. He is internationally known for his research in applied probability and stochastic modelling. He is Editor-in-Chief of *Stochastic Models* and an associate editor of *Queuing Systems*. He is also the current Chair of the INFORMS Applied Probability Awards Committee whose duty is to select, worldwide, the best young researcher and the best publication in alternate years.

Prof. Anthony Dooley BSc(Hons), PhD

Representative of the Full Members to 10 February 2006

Tony is Professor of Pure Mathematics and President of the Academic Board at the University of New South Wales. He was Head of Pure Mathematics for seven years and Presiding Member of the Faculty of Science for five. He is also a MASCOS Chief Investigator. His research interests are concentrated in harmonic analysis on Lie Groups and measurable dynamics.

Prof. Tony Bracken BSc(Hons), PhD, MAIP, FAustMS

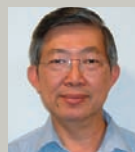Representative of the Full Members from 10 February 2006

Tony is Head of the Discipline of Mathematics in the School of Physical Sciences at the University of Queensland. His research interests are areas of mathematical physics (especially quantum mechanics) and biomathematics.

Assoc. Prof. David Panton BSc (Hons), PhD

Representative of the Associate Members to 10 February 2006

David is Head of the School of Mathematics and Statistics at the University of South Australia. He serves as a member of the Senior Secondary Assessment Board of South Australia, is a member of the Reference Group for the SA Government Strategic Directions in Mathematics and Science Project and is a committee member of the Mathematics Teachers Association of SA. His research interests are in the field of operations research.

Prof. Kok Lay Teo BSc, MASc, PhD, SMIEEE

Representative of the Associate Members from 10 February 2006

Kok Lay is Professor of Applied Mathematics and Head of the Department of Mathematics and Statistics at Curtin University of Technology, WA. Previously, he was Chair Professor of Applied Mathematics and Head of Department of Applied Mathematics at Hong Kong Polytechnic University, Hong Kong. He is Editor-in-Chief of the *Journal of Industrial and Management Optimization*. His main research interests are in the areas of operations research, optimal control, and signal processing in telecommunications engineering.

The Chairs of the three Advisory Committees and Director of MASCOS are also invited to sit on the Board as observers.

Prof. Peter Hall BSc (Hons), MSc, DPhil, DHC, DSc, FAA, FAustMS, FRS, FRSE

Chair of the Scientific Advisory Committee

Peter was Professor of Statistics at the Australian National University, ACT, from 1987 to 2006, moving during that year to the University of Melbourne, Vic. His research interests include theoretical statistics and applications of statistics. During 2006 he was Vice-President, and later President, of the Australian Mathematical Society.

Prof. Peter J. Taylor FACE, CMath, FIMA, FTICA, BSc, PhD

Chair of the Education Advisory Committee

Peter is Executive Director of the Australian Mathematics Trust, Director of its Trustee Company AMTT Limited and is a Professor of Mathematics and Adjunct Professor of Education at the University of Canberra, ACT. He is currently co-Chair of the International Commission on Mathematical Instruction (ICMI) Study 16 *Challenging Mathematics in and outside the Classroom* and Immediate Past President of the World Federation of National Mathematics Competitions, an affiliated study group of ICMI.

Dr Robert O. Watts BSc, PhD, FAA, FTSE, FRACI

Chair of the Industry Advisory Committee to 28 May 2006

Bob was formerly Vice-President Technology and Chief Scientist for BHP Billiton. He was responsible for the company's Technology Development Laboratories in Australia and South Africa. He is a member of the Physical Sciences Panel of the Australian Research Council. His previous appointments include ICI Masson Professor of Chemistry and Head of School at the University of Melbourne, and Chairman of Chemistry at the University of Washington.

Prof. Tony Guttmann MSc, PhD, FAustMS, FAA

Director of MASCOS

Tony was Interim Director of AMSI upon its foundation, and is currently Director of MASCOS, the immediate Past President of the AustMS, and an organiser of the BHP Billiton/University of Melbourne School Mathematics Competition. His research interests are in mathematical models of phase transitions, enumerative combinatorics and critical phenomena in general.

Board meetings

The Board met in person or by teleconference five times in 2005-06. Attendance was as follows.

Dr James E. Lewis	4 of 5
Dr Tim Littlejohn	2 of 5 (on leave due to sickness from October 2005)
Ms Judith Downes	3 of 5
Prof. Peter G. Taylor	4 of 5
Prof. Garth Gaudry (to 31 July 2005)	1 of 1
Prof. Phil Broadbridge (from 1 September 2005)	4 of 4
Prof. John Hearne (to 10 February 2006)	3 of 3
Assoc. Prof. Alan Pryde (from 10 February 2006)	2 of 3
Prof. Tony Dooley (to 10 February 2006)	2 of 3
Prof. Tony Bracken (from 10 February 2006)	3 of 3
Assoc. Prof. David Panton (to 10 February 2006)	3 of 3
Prof. Kok Lay Teo (from 10 February 2006)	1 of 3

Committee Membership

Scientific Advisory Committee

Professor Peter Hall (Australian National University) (Chair)
Professor Phil Broadbridge (Director, ex officio)
Professor Frances Kirwan (University of Oxford)
Professor Leon Simon (Stanford University)
Professor Terry Speed (University of California, Berkeley; Walter and Eliza Hall Institute)
Professor Terry Tao (University of California, Los Angeles, Clay Mathematics Institute)
Professor Neil Trudinger (ANU)
Professor Chris Heyde (ANU) (from May 2006)

Education Advisory Committee

Professor Peter Taylor (Australian Mathematics Trust) (Chair)
Mr Bill Akhurst (Australian Mathematics Trust)
Dr Frank Barrington (University of Melbourne)
Mr Peter Brown (UNSW)
Ms Elizabeth Burns (Loreto Mandeville Hall)
Ms Teresa Dickinson (Australian Bureau of Statistics)
Professor Peter Galbraith (University of Queensland)
Dr Bill Pender (Sydney Grammar School)
Professor Cheryl Praeger (University of Western Australia)
Ms Jan Thomas (AMSI)
Professor Garth Gaudry (ICE-EM Director, *ex officio*)
Dr Nancy Lane (Manager, ICE-EM, *ex officio*)

Industry Advisory Committee

Dr Robert Watts (Chair) (to 28 May 2006)
Professor Bill Appelbe (Victorian Partnership for Advanced Computing)
Dr James E. Lewis (Parkview Group)
Dr Tim Littlejohn (IBM/Biolateral)
Dr Thomas Montague (AMSI and MASCOS)

Executive Committee

Professor Phil Broadbridge (AMSI Director)
Professor Garth Gaudry (ICE-EM Director)
Professor John Hearne (Deputy Director until 10 Feb 2006)
Associate Professor Alan Pryde (Deputy Director from 10 Feb 2006)
Dr Nancy Lane (Manager, ICE-EM)
Associate Professor Geoff Prince (Executive Director to 10 Feb 2006)
Ms Jan Thomas (Executive Officer)
Mr Richard Barker (Business Development/Marketing Manager)
Dr Thomas Montague (Industry/Marketing Manager)

Advanced Coursework Committee

Professor Neil Trudinger (Chair) (ANU)
Professor Michael Eastwood (University of Adelaide)
Professor Garth Gaudry (Director ICE-EM)
Professor Mark Gould (University of Queensland)
Dr Markus Hegland (ANU)
Professor Kathy Horadam (RMIT University)
Professor Nalini Joshi (University of Sydney)
Professor Matt Wand (UNSW)
Dr Nancy Lane (Manager ICE-EM)

Stakeholders

Members

Full Members and Associate Members are listed on page iii. They meet as a group twice a year, normally in February and June or July. In the 2005-06 year, the meetings were:

• 22 July 2005 at the University of Sydney

• 10 February 2006 at the University of Melbourne

• 19 June 2006 at the University of New South Wales.

Member representatives at the June 2006 meeting at the University of New South Wales

Other stakeholders

AMSI was set up through a grant from the Victorian Government and with in-kind input by the University of Melbourne. Funding through this grant ceased on 30 June 2005. However, AMSI still has reporting responsibilities to the Victorian Government until 31 July 2006.

AMSI won a tender from the Department of Education, Science and Training (DEST) for an International Centre of Excellence for Education in Mathematics (ICE-EM) in January 2004 and this project is being funded for four years from July 2004.

Comprehensive progress reports and updated business plans are presented to DEST twice a year in accordance with the Funding Agreement.

Communication with stakeholders

All Full and Associate Members of AMSI have nominated a person to be their representative to communicate with AMSI. In the case of member universities, this is almost always the Head of the Department or School or Discipline of Mathematics and Statistics. These 'member representatives' or their proxies are invited to meet as a group every six months to hear reports of progress on current matters and to raise matters of common interest and concern.

The AMSI and ICE-EM Directors' monthly reports on activities are emailed to Board members, committee members and AMSI member representatives.

The Joint Venture Agreement members do not meet separately as a group. Their interests are catered for through the Deputy Director of AMSI and one other representative on the Board and the AMSI Deputy Director on the Executive Committee.

Employees

Policies and procedures

Staff are employed on fixed term contracts through the University of Melbourne and its policies and procedures are followed.

Senior staff

Director of AMSI, Prof. Philip Broadbridge, and Director of ICE-EM, Prof. Garth Gaudry, have been profiled in the Board section on page 24.

Dr Nancy Lane BA, MSIS, PhD

Manager, ICE-EM

Nancy coordinates a number of ICE-EM educational programs and their promotion nationally and internationally, including the ICE-EM Australian Graduate School in Mathematics, the ICE-EM/AMSI Summer School and various industry workshops. Previously she was Director of Communications for Pacific Resources for Education and Learning in Honolulu, Hawaii, and the Development Officer and Communications Manager at the Australian Academy of Science.

Ms Jan Thomas BSc (Hons), DipEd, BEd (TESOL)
Executive Officer AMSI

As Executive Officer for AMSI, Jan's principal responsibilities are policy analysis and response, promoting careers in the mathematical sciences and supporting the Directors of AMSI and ICE-EM. She is a former teacher, curriculum advisor and teacher educator.

Dr Thomas Montague BSc, MSc, DipEd, DPhil
Industry/Marketing Manager, AMSI and MASCOS

Thomas coordinates the industry outreach program for AMSI and MASCOS. This includes identifying and promoting partnerships between users and providers of the mathematical sciences. His prior experience includes Science Advisor to the Victorian Government, private consultant on environment and resource management, company director, research scientist and academic.

Mr Richard Barker CPA, AMA

Business Development/Marketing Manager AMSI and ICE-EM

Richard's responsibilities include management of AMSI's and ICE-EM's financial activities, preparation of budgets, administration of contracts, and coordination of commercial and marketing activities. He has a background in financial management, domestic and international marketing, and general management, predominantly in the manufacturing and wholesaling sectors, as well as a period of financial consulting.

Financial statements

Financial accounts are kept by the University of Melbourne and audited reports are provided in accordance with the requirements of the JVA and the funding agencies.
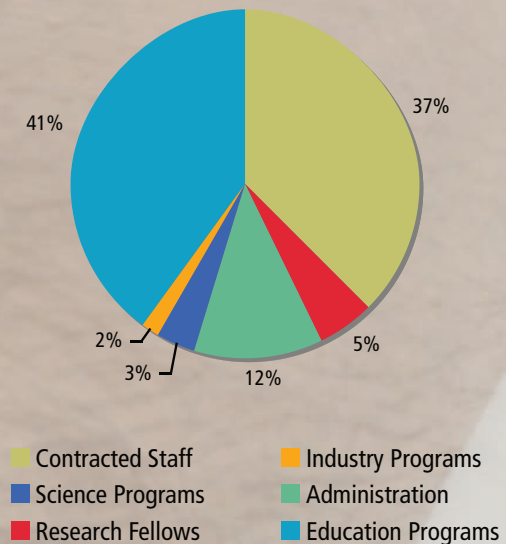
Graph of the 2005-06 income highlights the dependence to date on membership fees and government funds. This dependence is expected to diminish in future years as income generating commercial activities gain momentum.

AMSI Group Income 2005/06

2%
18%
14%
66%

- Membership Fees
- MASCOS Allocations
- DEST Funding
- Earned Income
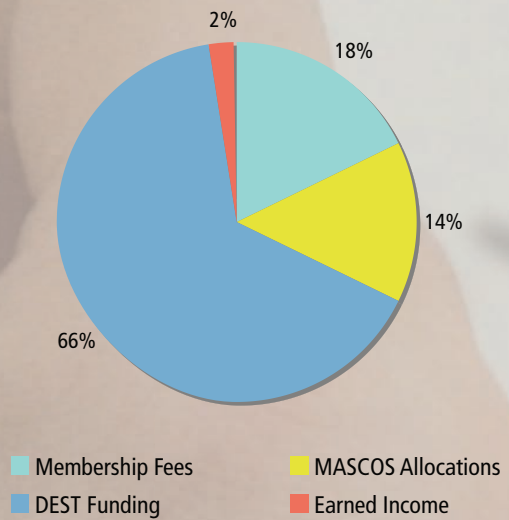
A similar illustration of 2005-06 expenditure reveals a positive direction of funds towards Business Plan activities compared to staff and administration expenditure. Again, this positive emphasis is expected to increase as program activity increases and administration costs remain stable.

AMSI Group Expenditure 2005/06

41%
37%
2%
3%
12%
5%

- Contracted Staff
- Industry Programs
- Science Programs
- Administration
- Research Fellows
- Education Programs

Australian Mathematical Sciences Institute
Statement of Financial Performance

	July 2005 to June 2006		July 2004 to June 2005	
	$	$	$	$
Income				
State of Victoria - STI Grant	0		250,000	
Consortium member contributions	625,000		580,000	
Collaboration partner (MASCOS) contribution	507,520		970,586	
Commercial income	25,078		3,782	
Other income	7,195			
Total Income		1,164,793		1,804,368
Expenditure				
Personnel				
Salaries, permanent and casual	770,567		548,731	
Internal- University of Melbourne (Maths & Stats admin.)	5,242		16,318	
External salary support	-96,009		-78,217	
		679,800		486,832
Materials, Supplies and Services				
Scholarships				
Fellowships	0		16,600	
PhD top-up scholarships	20,000		20,000	
Supplies				
Consumable materials & provisions	19,041		11,320	
Services				
Contracted or professional services	71,494		95,836	
Internal services - University of Melbourne	1,169		15,252	
Utilities	5,342		6,459	
General expenses				
Printing/photocopying/subscriptions	15,414		22,640	
Minor works - re security			3,538	
Freight/cartage	19,900		0	
Public relations & promotion				
Domestic advertising & promotion	21,161		18,963	
Entertainment	13,340		11,387	
Collaboration partner contribution -				
MASCOS	100,000		200,000	
ACERA	28,333		0	
Finance - FBT and payroll tax	2,908		3,822	
		318,102		425,817
Equipment				
Computer software & services	8,960		9,665	
Expensed assets	14,232		16,663	
Hire of equipment			127	
Minor equipment components	1,111		2,481	
		24,303		28,936
Travel & conferences				
Travel & accommodation-domestic	87,356		70,660	
Travel & accommodation-I' national	45,175		35,792	
Conducting/attending seminars, conferences, workshops	111,848		63,315	
Living away from home	1,084		22,956	
		245,463		192,723
Total Expenditure		1,267,668		1,134,308
Net of actual income over expenditure		-102,875		670,060

Expenditure by Program	AMSI	AMSI/ MASCOS	AMSI	AMSI/ MASCOS
Personnel				
Staff salaries, permanent and casual	361,469	134,519	150,680	112,058
Research fellows, less sponsor support		183,813		228,453
Fellowships, PhD top up scholarships		20,000		36,600
	361,469	338,332	150,680	377,111
Administration	204,748	15,792	235,161	31,685
Advisory committee and program projects	138,581	80,413	80,321	59,350
Collaboration contributions				
MASCOS	100,000		200,000	
ACERA	28,333			
	833,131	434,537	666,162	468,146
Total AMSI, AMSI/MASCOS combined		1,267,668		1,134,308

Australian Mathematical Sciences Institute
Statement of Financial Position

	30th June 2006		30th June 2005	
	$	$	$	$
Assets				
Cash AMSI	710,174		889,677	
AMSI/MASCOS Ref. general note (c)	948,219		871,589	
		1,658,393		1,761,266
Property, plant and equipment				
Capitalised expenditure (Note 1)		0		0
Total Assets		1,658,393		1,761,266
Liabilities				
Provisions for employee entitlements (Note 2)		0		0
Equity				
Retained funds brought forward				
AMSI	889,677		722,057	
AMSI/MASCOS	871,589		369,149	
		1,761,266		1,091,206
Net of actual income over expenditure				
AMSI	-179,504		167,620	
AMSI/MASCOS	76,630		502,440	
		-102,874		670,060
Total liabilities and equity		1,658,392		1,761,266

Note 1   The requirement of the University of Melbourne is that Departments treat all assets as having been expensed in the period of purchase.

Note 2   Employee entitlements are deducted from AMSI funds by the University of Melbourne on an accrual basis.

General notes to the accounts
(a)   The financial accounts and payroll records are maintained for AMSI by the University of Melbourne in its role as lead agency for the JV consortium. Expenditure authorisation and income/expense allocations are the responsibility of AMSI personnel using the UoM policies and procedures.

(b)   AMSI directors, the chairman and members of the Board plus members of advisory committees, are reimbursed for travel related costs incurred in attending meetings. No other payments are made to Board or committee members.

(c)   As a party to the Collaboration Agreement that obtained and ARC Centre of Excellence Grant to establish MASCOS, AMSI makes an annual contribution of $100,000 to MASCOS and in turn receives an allocation from MASCOS (2006 $507,520). Use of these monies for research and industry linked activities is administered by an advisory committee.Separate financial records pertaining to the annual allocation from MASCOS are maintained within AMSI under the heading AMSI/MASCOS.

International Centre of Excellence for Education in Mathematics
Statement of Financial Performance

	July 2005 to June 2006 $	July 2004 to June 2005 $
Income		
Government funding		
Department of Education, Science and Training	2,300,000	3,000,000
Non Grant Income		
Course Fees & Charges	13,445	15,969
Sponsorships	32,733	28,835
Commercial income ICE-EM Mathematics	1,440	0
Other Income	3,130	4,178
	50,748	48,982
Total Income	2,350,748	3,048,982
Expenditure		
Personnel		
Salaries, permanent and casual	1,083,347	583,699
External salary support	-22,148	-10,170
	1,061,199	573,529
Materials, Supplies and Services		
Scholarships		
Under Graduate vacation scholarships	81,836	69,300
Supplies		
Consumable materials	10,476	4,661
Services		
Contracted or professional services	188,235	37,864
Internal services	5,733	21,552
Utilities	6,502	1,134
General expenses		
Printing, copying, subscriptions	172,356	31,359
Freight/cartage	62,857	
Grants - AGR's	224,000	
Public relations & promotion		
Domestic marketing & promotion	93,027	45,918
Entertainment	13,786	5,696
Finance - FBT and payroll tax etc	662	1,639
	859,470	219,123
Equipment		
Computer software & services	5,339	4,027
Expensed assets	6,593	46,039
Minor equipment components	306	106
	12,238	50,172
Travel & conference		
Travel & accommodation-domestic	97,719	72,810
Travel & accommodation - students	106,422	0
Travel & accommodation-I' national	11,975	7,959
Conducting/attending seminars, conferences, workshops	304,175	199,929
Living away from home allowance	23,529	10,670
	543,820	291,368
Total Expenditure	2,476,727	1,134,192
Net of actual income over expenditure	-125,979	1,914,790

Expenditure by Program	$	$
Higher Education (Summer School, Access Grid Rooms, student access to researchers)	518,997	286,193
Schools (Teacher PD, promotion of careers in mathematics, schools materials for students and teachers).	704,418	90,878
Research, business & industry (Advanced specialist courses)	220,200	32,527
Internationalisation of the mathematical sciences (Marketing and promotion)	32,102	9,863
Personnel (Permanent staff)	875,538	583,699
Administration	125,472	131,032
	2,476,727	1,134,192

International Centre of Excellence for Education in Mathematics
Statement of Financial Position

	30th June 2006 $	30th June 2005 $
Assets		
Cash	3,223,126	3,349,105
Property, plant and equipment		
Capitalised expenditure (Note 1)	0	0
Total Assets	3,223,126	3,349,105
Liabilities		
Provisions for employee entitlements (Note 2)	0	0
Equity		
Retained funds brought forward	3,349,105	1,434,315
Net of actual income over expenditure	-125,979	1,914,790
Total liabilities and equity	3,223,126	3,349,105

Note 1   The requirement of the University of Melbourne is that Departments treat all assets as having been fully expensed in the period of purchase.

Note 2   Employee entitlement monies are deducted from AMSI funds by the University of Melbourne on an accrual basis.

General note to the accounts

The financial accounts and payroll records are maintained for ICE-EM by the University of Melbourne in its role as lead agency for the JV consortium. Expenditure authorisations and income/expense allocations are the responsibility of ICE-EM personnel using UoM policies and proceedures.

Audit Statements

File Ref. 95/01170
JT /gran28
RN: 2006/085
Attchs.

25 August 2006

The Minister for Innovation
Department of Innovation, Industry and Regional Development
13ᵗʰ Floor, 55 Collins Street
Melbourne 3000

THE UNIVERSITY OF
MELBOURNE

AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

The audit opinion is prepared for the purpose of the Grant Agreement dated 2 November 2002 ("the Agreement") between the Minister for Innovation and The University of Melbourne.

AUDIT SCOPE

We have conducted an independent audit in accordance with Australian Auditing Standards of the attached Financial Statement of Income and Expenditure for the period 1 July 2005 to 30 June 2006 which specifies an amount of $1,267,668.38 of expenditure on the Program, and an amount of $625,000 of contributions by Consortium Members towards the Program ("Member Contributions"), in order to express an opinion on it for the purposes of the Agreement.

Our audit involved an examination, on a test basis, of evidence supporting the amount of expenditure incurred, including all Grant funds, and the amount of income and contributions received. This included an examination of Melbourne University's financial records and receipts, and an evaluation of the policies and procedures used to calculate the expenditure of the Program and Member Contributions. These procedures have been undertaken to form an opinion as to whether the methodology used to calculate the expenditure and Member Contributions is in accordance with the Agreement, and that the figures stated are true and fair.

This audit opinion expressed in this report has been formed on the above basis.
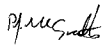
AUDIT OPINION

We confirm that in our opinion:
• Melbourne University has incurred $1,267,668.38 in expenditure on the Program;
• the contributions of Consortium Members to the Program are $625,000 cash (see attached schedule);
in accordance with the terms of the Agreement.

I trust this information is of assistance to you and advise that any queries can be directed to me on (03) 8344-0846.

Yours sincerely,

PJ McGrath
Director, Internal Audit

Internal Audit Office
The University of Melbourne Victoria 3010 Australia.
T: +61 3 8344 0844 F: +61 3 8344 0847
E: internalaudit-queries@unimelb.edu.au

**Financial Statement of Income and Expenditure
for the Period 01/07/2005 - 30/06/2006**

THE UNIVERSITY OF
MELBOURNE

|	
Project Title:	STI Infrastructure Grant to Establish the Australian Mathematical Sciences Institute
Grantor:	State of Victoria - Department of Innovation, Industry and Regional Development
Chief Investigator:	Professor Garth Gaudry
Our Reference:	79949

$

INCOME

State of Victoria - Department of Innovation, Industry and Regional Development	-
Consortium Member Contributions	625,000.00
Collaboration Partner (MASCOS) Contribution	507,520.00
Commercial Enterprise Income	25,078.19
Other Income	7,195.45
Total Income for the reporting period	**1,164,793.64**

EXPENDITURE

Personnel	795,808.96
Materials, Supplies & Services	234,006.11
Equipment	24,303.14
Training	-
Travel	213,550.17
Total Expenditure for the reporting period	**1,267,668.38**
Surplus/(Deficit) for the reporting period	- (102,874.74)
Carryforward Surplus/(Deficit) from 30 June 2005	1,761,266.30
Surplus/(Deficit) Balance as at 30 June 2006	1,658,391.56

I certify that
a) all funds received have been expended for the purposes for which they are provided; and
b) the expenditure shown above has taken place and is correct.

Bryan Rossi
Director - Financial Operations
25-August-2006

Department of Financial Operations
5th Floor Raymond Priestley Building
The University of Melbourne Victoria 3010 Australia
Telephone: +61 3 8344 4265 Fax: +61 3 9347 7463

File Ref. 95/01170
jt /gran29
RN: 2006086
Attch.

14 August 2006

THE UNIVERSITY OF
MELBOURNE

Ms Fiona Buffinton
Chief Executive Officer
Australian Education International
Department of Education, Science and Training
GPO Box 9880
CANBERRA ACT 2601

Dear Fiona,

Establishment of an International Centre of Excellence for Education in Mathematics

I advise that an audit has been conducted of the financial statement for the Establishment of an International Centre of Excellence for Education in Mathematics Project for the period 1 July 2005 to 30 June 2006.

Please find enclosed the financial statement certified by the Deputy Vice-Chancellor (Research) and the Director, Internal Audit in accordance with clauses 12.6 and 12.7 of the agreement between the Department of Education, Science and Training and the University of Melbourne.

Clause 12.6(i) of the agreement requires a statement of the balance of the bank account referred to in clause 4.1. In this regard, the University does not operate separate bank accounts for individual grants, but utilises its main bank account for the purpose of depositing and expending grant funds. The University's General Ledger structure enables the income and expenditure for each grant to be identified separately.

If there are any queries regarding this statement please contact me on (03) 8344-0846 or Fax. (03) 8344 0847.

Yours sincerely,

PJ McGrath
Director, Internal Audit

cc   Professor G Gaudry
      Director - ICEEM

Internal Audit Office
The University of Melbourne Victoria 3010 Australia
T: +61 3 8344 0844 F: +61 3 8344 0847
E: internalaudit-queries@unimelb.edu.au

**Financial Statement of Income and Expenditure
for the Period 01/07/2005 - 30/06/2006**

Project Title:	Establishment of an International Centre of Excellence for Education in Mathematics
Grantor:	Australian Government Department of Education, Science and Training
Chief Investigator:	Professor Garth Gaudry
Our Reference:	79983

$

INCOME

Department of Education, Science and Training	2,300,000.00
Sponsorships	39,514.91
Fees and Services	6,663.64
Commercial Enterprise Income	3,116.25
Professional Services	909.09
Housing & Accomodation Services	544.59
Total Income for the reporting period	**2,350,748.48**

EXPENDITURE

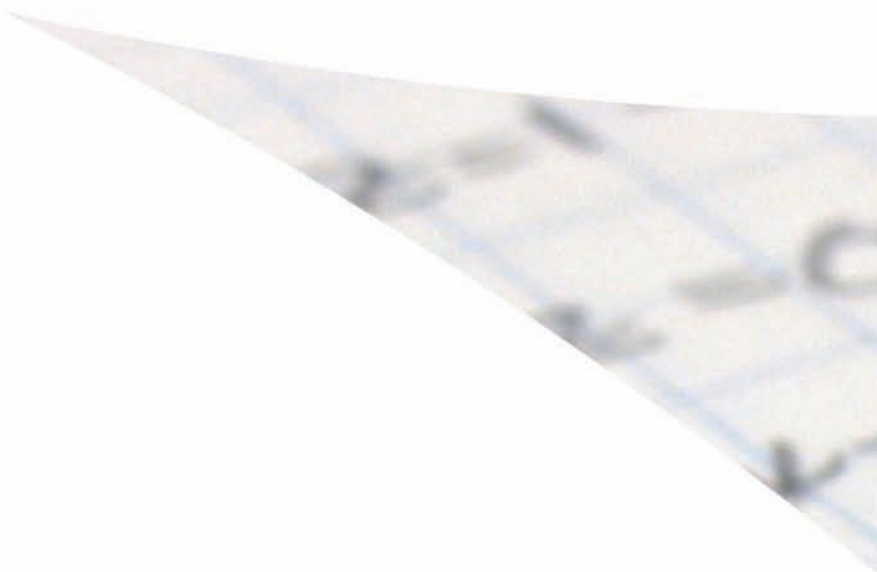|	
Personnel	1,154,683.63
Supplies & Services	772,819.52
Equipment	12,204.16
Training	-
Travel	537,019.88
Total Expenditure for the reporting period	**2,476,727.19**
Surplus/(Deficit) for the reporting period	(125,978.71)
Carryforward Surplus/(Deficit) from previous period	3,349,105.44
Surplus/(Deficit) Balance as at 30 June 2006	3,223,126.73

We certify that:
a) the Financial Statement of Income and Expenditure presents fairly the expenditure for the International Centre of Excellence for Education in Mathematics project, and
b) the funding was expended for the Project and in accordance with the agreement.

Professor J McKenzie
Deputy Vice-Chancellor (Research)
11-August-2006

PJ McGrath
Director, Internal Audit
11-August-2006

Acronyms

ACERA	Australian Centre of Excellence for Risk Analysis
AGR	Access Grid Room
AMSI	Australian Mathematical Sciences Institute
ANU	Australian National University
ARC	Australian Research Council
AustMS	Australian Mathematical Society
CSIRO	Commonwealth Scientific Industrial & Research Organisation
DEST	Department of Education, Science and Training
ICE-EM	International Centre of Excellence for Education in Mathematics
ISI	Institute for Scientific Information
JVA	Joint Venture Agreement
MASCOS	ARC Centre of Excellence for Mathematics and Statistics of Complex Systems
MATHEON	German DFG Research Center: Mathematics for key technologies: Modelling, simulation, and optimisation of real-world processes
MITACS	Mathematics of Information Technology and Complex Systems: a Network of Centres of Excellence for the Mathematical Sciences
PRIMA	Pacific Rim Institute of Mathematics
QUT	Queensland University of Technology
UNSW	University of New South Wales