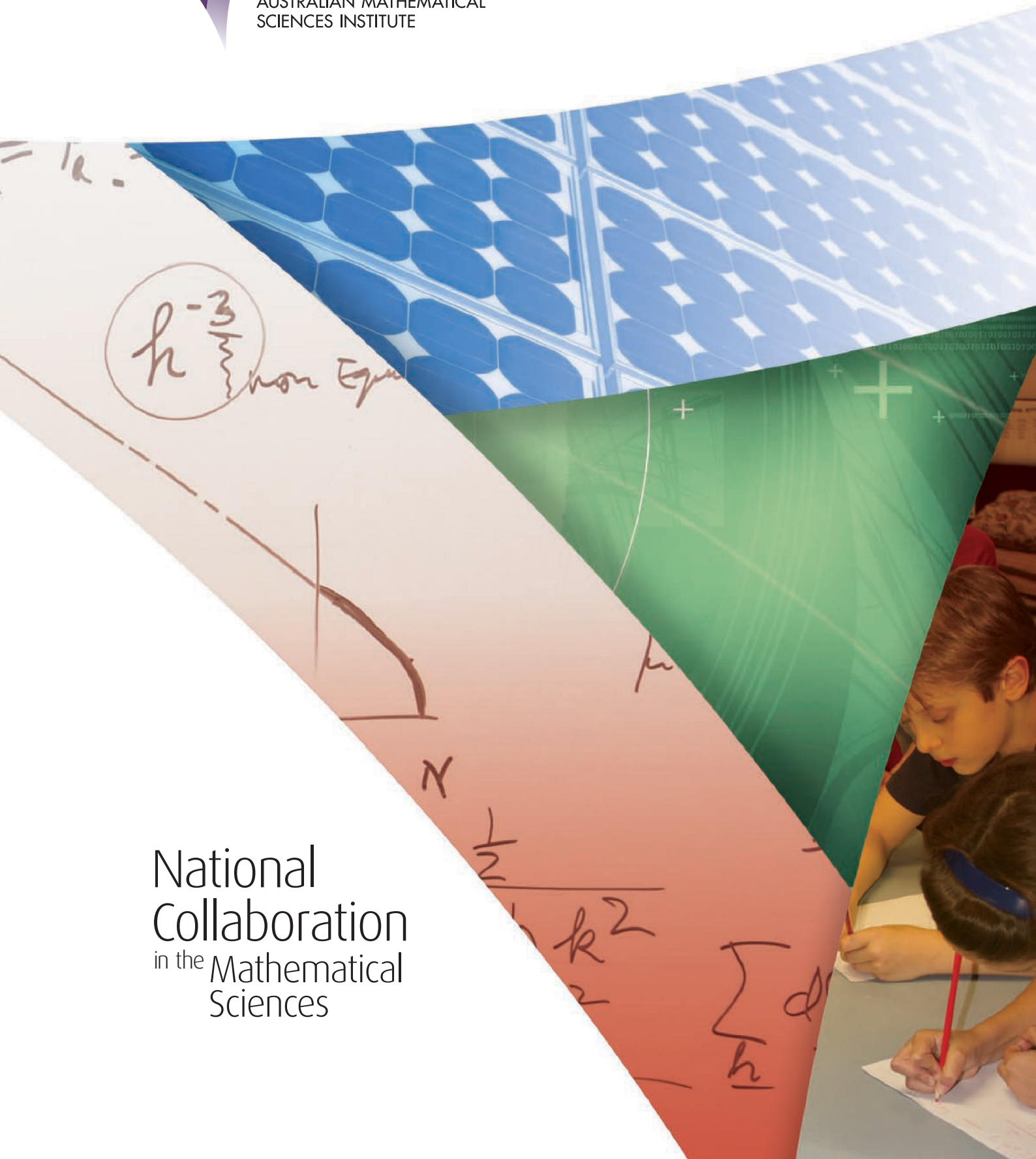
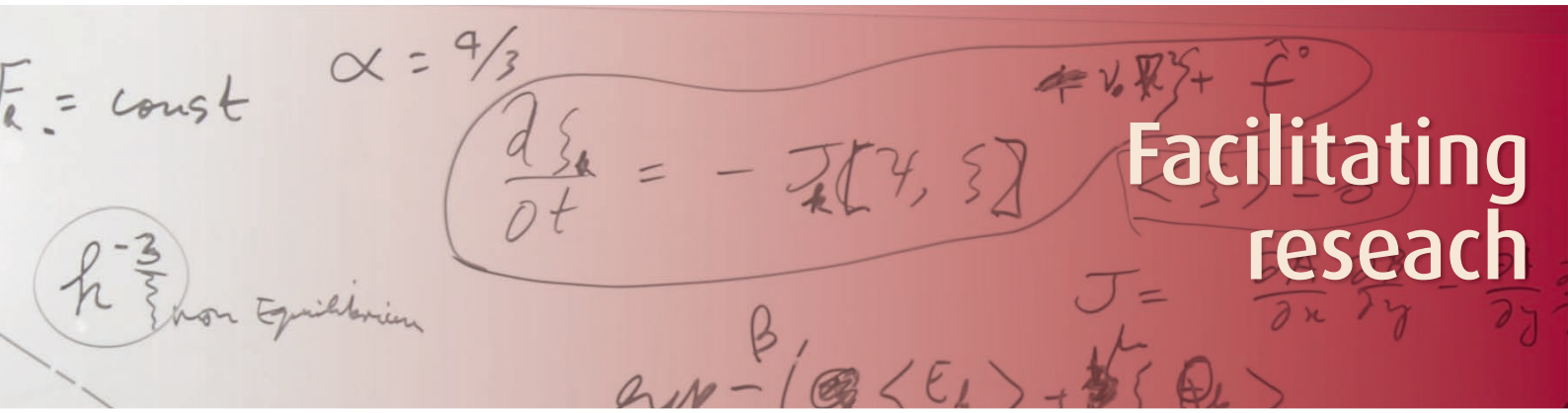
Annual Report 2007/08

AMSI
AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE



National Collaboration in the Mathematical Sciences



Facilitating reseach

Promoting industry partnership

Providing educational opportunities

Raising the profile of mathematics

AMSI major achievements 2007/08

SCIENCE

- Latest advances in mathematical sciences disseminated through support for 48 distinguished international lecturers to visit Australia
- Researchers from many fields connected through AMSI Theme Program *Concepts of Entropy and their Applications*

BUSINESS, INDUSTRY AND GOVERNMENT

- AMSI awarded a three-year grant from the Australian Government to support National Collaboration in the Mathematical Sciences
- Industry internship program launched

EDUCATION

- *ICE-EM Mathematics* text books for Years five to 10 completed
- ICE-EM Access Grid Rooms established and delivering honours courses
- Major report on mathematics education for engineering students completed

OUTREACH

- Australian Council of Heads of Mathematical Sciences (ACHMS) supported
- Publication of *Twisted: The Mathematics of Greenhouse Denial* assisted by AMSI

Contents

About AMSI

The Australian Mathematical Sciences Institute (AMSI) is a national, collaborative venture supporting the mathematical sciences, which are critical to Australia's scientific and economic capacity.

> *"Mathematical skills .... are very important because they appear in every facet of every job nowadays. Finance, research, statistics, money management, presenting information — maths is endemic. The sooner people acquire these skills, the better equiped for life they are."*
>
> Damien Lismore, Chief Financial Officer, Biota
> The Australian Academy of Science, National Strategic Review of Mathematical Sciences Research in Australia

AMSI 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 was funded to May 2008 by the Australian Government through the Department of Education, Science and Training (DEST). A redefined ICE-EM program will be funded as AMSI's educational arm by the Department of Education, Employment and Workplace Relations (DEEWR), commercial generated income and contributions from corporate members.

Many activities in AMSI's Science and Business, Industry and Government programs are collaborative with the Australian Research Council (ARC) Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), of which AMSI is a partner. AMSI's activities are also enhanced though a partnership with Mathematics of Information Technology and Complex Systems (MITACS), a Canadian Network of Centres of Excellence (NCE) for the Mathematical Sciences.

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
Charles Sturt 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 Western Sydney
University of Wollongong
Victoria University

CORPORATE MEMBERS

Gold Membership
BlueScope Steel
Farrell Family Foundation
Silver Membership
Australian Char Pty Ltd

Chairman's Report

Jim Lewis

This past year has been a mixture of real progress and some real disappointments.

First to the achievements. This year AMSI won a grant from the Australian Government under the Collaboration and Structural Reform Fund (CASR), which recognised our ability to deliver co-operative approaches to build Australia's mathematics capability. The three-year grant allows us to continue supporting the advanced mathematics summer school, a reformatted graduate school and introduce a new internship program based on the successful Canadian MITACS program. It has also better enabled us to conduct industry workshops and seminars.

"These private donations are important tangible evidence of support beyond government, from business and organisations who see the value, quality and benefits of the mathematics and statistics programs AMSI and ICE-EM provide"

This year BlueScope Steel put its full support behind the *ICE-EM Mathematics* schools program in selected schools of the Illawarra region, NSW. We sincerely thank BlueScope Steel for its significant financial contribution, which has enabled us to introduce the program to four major high schools and about 20 feeder primary schools. The program has been enthusiastically endorsed by participating schools, teachers and students and we hope to expand it with Bluescope Steel's help in 2008/09.

We also had the benefit of the support of the Farrell Family Foundation through an untied, significant contribution towards the schools project in the broader context. These private donations are important tangible evidence of support beyond government, from business and organisations who see the value, quality and benefits of the mathematics and statistics programs AMSI and ICE-EM provide. We acknowledge the support and contributions of these major sponsors with genuine appreciation.

AMSI played a key role in the National Committee for the Mathematical Sciences of the Australian Academy of Science's 2006 *National Strategic Review of Mathematical Sciences Research in Australia*. We were delighted when the former Australian government acted on the review's first priority and greatly increased funding for teaching mathematics and statistics in universities. In principle this meant that about $25 million in additional funds would be available for mathematical sciences departments.

Another major achievement was completion of the full suite of texts in the *ICE-EM Mathematics* schools project. All 12 texts—two per year for Years five to 10—have been completed and published. This is an outstanding achievement and our thanks and congratulations go to all authors: Dr Michael Evans, Ms Janine McIntosh, Prof. Garth Gaudry, Mr Colin Becker, Mr Peter Brown, Mr Howard Cole, Dr Brian Dorofaeff, Mr Andy Edwards, Assoc. Prof. David Hunt, Mr Robert McLaren, Dr Bill Pender and Mr Brian Woolacott.

The texts have received excellent reviews, including a fulsome endorsement from internationally renowned mathematician Prof. Terry Tao (http://tinyurl.com/terrytao).

Another significant contribution to mathematics teaching was the report by our Director Prof. Phil Broadbridge and Ms Simi Henderson on the teaching of mathematics in engineering degree programs – funded by a grant from the former Carrick Institute of Learning and Teaching.

On the other side of the coin there were some real disappointments.

With many others from the mathematical sciences community here and overseas, we contributed to a campaign to persuade the management of Central Queensland University (CQU) of the wisdom of retaining a viable mathematics faculty. At the end of this financial year things continue to look grim on this front with indications that we have been unsuccessful and that a significant reduction in mathematics staff will occur at CQU. This has serious implications for some other universities. That we have failed despite our endeavours and those of Fields Medallist Prof. Terry Tao in mobilising the international community to push for direct application of additional funding for mathematics and statistics teaching, is very disappointing.

The increased funding for mathematics at universities unfortunately has largely disappeared into university general funds rather than **f** owing to mathematics departments to provide more academics and teaching resources. AMSI, in conjunction especially with Prof. Peter Hall and Prof. Hyam Rubinstein, have made many representations on this matter and will continue to do so in the coming year. The policy was commendable, the execution was lamentable.

This year saw cessation of Australian Government funding under the ICE-EM arrangement. This was both a major blow and a decision that was difficult to understand in policy terms. Four years ago, the government of the day established seven International Centres of Excellence (ICEs) and encouraged them to recruit staff and develop competence to showcase

excellence in Australian education. We and others did that with enthusiasm, prudence and good judgment in terms of staff recruited and programs initiated and commenced. Lamentably a short four years on and with the ICEs established and starting to deliver, the previous government halted funding despite calls from many sectors for increased funding for national education initiatives.

However, thanks to a decision taken by AMSI membership to continue the important support for the valuable *ICE-EM Mathematics* Schools project, ICE-EM will continue as the education arm of AMSI with the project funded at current levels at least until the end of 2009. This allows time for us to put in place corporate support and self generated income to allow the initiative to continue.

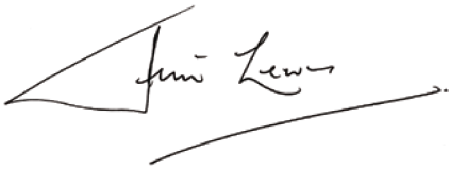
It is early days but we are making strong representations to the Australian government for a significant increase in funding for AMSI this coming year.

The saddest event of the past year has been the sudden illness of the ICE-EM Director Prof. Garth Gaudry. His enforced sick leave prior to his retirement in late June was a heavy blow to AMSI and ICE-EM. AMSI staff and many of his Melbourne colleagues were present at a lunch in his honour on 13 June before he returned to his Sydney home.

AMSI and ICE-EM owe much to Garth and the contribution he has made over the past five years. Garth, with Prof. Tony Guttmann and Ms Jan Thomas, drove the vision and commitment to establish AMSI. He was Foundation Director there for three years before moving to the position of Director of ICE-EM to oversee the major initiative to improve mathematics education, especially in schools. Garth recruited first class staff and team of authors to work with him on producing a remarkable series of texts.

So I wish to record this debt to Garth, and the fraternity's genuine appreciation of his great vision and leadership in moving AMSI and ICE-EM from the "wouldn't it be nice" contemplation, to the reality of the birth and consolidation of the Institute. His legacy is the wonderful ICE-EM programs and texts that have resulted, and the higher standing that the mathematics discipline now commands in Australian academe as a result. On behalf of all in the fraternity I also extend warmest regards and best wishes for Garth's ongoing recovery.

So this past year has been mixed. We have many challenges going forward but also many opportunities. I thank all who have accepted responsibility of being chairs of committees (Prof. Peter Hall - Scientific Committee, Prof. Peter Taylor - Education Committee and Dr John Burgess - Industry committee) and all committee members for their contributions – in the case of both Peters, over the lifetime of the Institute. Their sustained contribution has been tremendous. I also thank our Director Prof. Phil Broadbridge and AMSI staff for their professional and dedicated management of the Institute and its activities during the year. Thank you all for your ongoing support of the Institute and I offer my warm invitation for your continued support in this coming year as we wrestle with the challenges of a new phase in the life of the Institute.



Jim Lewis
Chairman of the Board

AMSI Director's Report

Philip Broadbridge

This year AMSI has undergone significant changes in personnel and support. This has necessitated some organisational restructuring and diversification of funding sources so we can respond well to future challenges. Our founding Director of ICE-EM and previous Director of AMSI, Prof. Garth Gaudry, retired recently. Garth's contributions to mathematics in Australia have been enormous and are elaborated elsewhere. I thank Garth for the wonderful service that he has given to AMSI and I wish him a happy retirement following his period of convalescence.

In 2008, federal government funding for the International Centre of Excellence (ICE) program ceased. However, some Centre activities, such as the annual AMSI/ICE-EM summer school, will be supported until 2010 by the federal government's Collaboration and Structural Reform (CASR) fund. The 2008 Summer School, hosted by Monash University, was an outstanding success, measured by the number of registrants and their course satisfaction. Joint venture partners of AMSI will continue to be the preferred hosts of this event. However, we are fortunate that an associate member, the University of Wollongong, has volunteered to host the 2009 Summer School on a reduced but still sizeable budget.

We are also grateful that The University of Queensland continues to host our highly successful annual AMSI/ICE-EM Graduate School in winter, which will contract to a Graduate Theme School of two lecture courses in 2008/09.

"This united and passionate support for the mathematical sciences by our member institutions makes us the envy of many other disciplines..."

Despite problems in some universities with reduced faculty sizes, our memberships continue to be very healthy. All of last year's 30 member institutions have renewed; we also welcome the University of Western Sydney to AMSI. This united and passionate support for the mathematical sciences by our member institutions makes us the envy of many other disciplines and enhances our credibility in the eyes of our political masters. The 2007 federal budget signalled an annual boost of about $25 million for university mathematics teaching. The 2008 budget announced halving of HECS payments for mathematics and science students, with adequate compensation to universities.

This year we have attracted some valuable corporate sponsorship from Bluescope Steel, The Farrell Family Foundation and Australian Char Pty Ltd. McKinsey and Co have also provided important marketing advice and assistance. Our work to improve mathematics education is receiving widespread acclaim and support in the community. Our advice has been sought by many government inquiries and in the newly-established National Curriculum Board's planning process.

The last volume in our sequence of *ICE-EM Mathematics* textbooks for Years five to 10 was completed in 2008. Book sales for 2007/08 have exceeded budget forecasts. Self-sustainability of our schools program is within sight. This project has received a boost through sponsorship by Bluescope Steel to establish our curriculum materials in several primary and secondary schools in NSW. We continue to provide free professional development in all regions where schools adopt our texts. We continue to develop teacher support materials.

Early in 2008, we released the report, *Mathematics Education for 21st Century Engineering Students*, resulting from a scoping project funded in 2007 by the former Carrick Institute for Learning and Teaching in Higher Education (now the Australian Learning and Teaching Council). The close co-operation of engineering and mathematics educators on that project has helped draw their two disciplines closer together. The report has been well received and as a result, a special issue on mathematics education has been planned for the Australasian Journal of Engineering Education. A UK-based education newsletter has also asked us to contribute an article on our findings.

A significant part of AMSI's income now comes from small industry projects that have sprung from our expanded industry consulting work. Most of this work has been contracted to highly skilled teams drawn from our various member institutions. AMSI is funded to set up an industry internship program. Despite teething difficulties, we have made a solid start, with the program ensuring it benefits all parties.

AMSI officers have been very active in representing the strengths, importance and vital benefits of mathematics and statistics to journalists, university administrators, politicians, public servants and industrialists. Over the past year, we have written several submissions to a myriad of government-backed inquiries and have put forward clear views on the planned national mathematics curriculum.

Thanks to the inventiveness of our members, our scientific program continues to thrive. In 2007/08, we supported scientific workshops on various stimulating themes and topics. AMSI has supported tours by Prof. Ingo Müller, the AMSI-MASCOS Distinguished Lecturer; Prof. Linda Petzold,

the AMSI Distinguished Lecturer and Prof. Mark Kisin, the Mahler Lecturer. All were sponsored to add depth to the intellectual life of the mathematical sciences in Australia.

This year Graham Keen, a long standing member of staff, left to pursue other interests, we wish him well in all his future endeavours.

Once again, I am grateful for the high quality work of all the AMSI staff and for the free service provided by the highly-accomplished members of the AMSI Board, our Scientific Advisory Committee, our Education Advisory Committee and our Industry Advisory Committee.

I am pleased to present our progress in this annual report for 2007/08.

Philip Broadbridge
Director of AMSI

Director's Activities

Prof. Broadbridge continues to work to advance the body of knowledge in his own area of mathematical sciences research, that is applied diffusion problems, hydrology, exact solution methods for partial differential equations and mathematical physics.

In 2007/08 Prof. Broadbridge was invited to speak on his research at:

- Annual Meeting of Soils Science Society of America, New Orleans, November 2007
- Applied Mathematics Seminar, University of Deleware, November 2007
- Applied Mathematics Seminar, The University of New South Wales, December 2007

He gave contributed talks at:

- 8th Biennial Engineering Mathematics and Applications Conference (EMAC2008), Hobart, July 2007
- 6th International Congress of Industrial and Applied Mathematics, Zurich, July 2007
- AMSI Theme Program Concepts of Entropy and their Applications, Melbourne, December 2007
- 51st Annual Meeting of the Australian Mathematical Society, La Trobe University, September 2007
- Annual Australian and New Zealand Industrial and Applied Mathematics Conference (ANZIAM), Katoomba, February 2008

Prof. Broadbridge also sat on the advisory committees for:

- The Centre for Industrial and Applied Mathematics at the University of South Australia
- The Mathematics Discipline Advisory Committee at Victoria University
- The Mathematics and Information Science Disciplines Advisory Committee at the University of Canberra
- The Mathematics and Physics Review Committee at the University of Tasmania

He sits on the editorial boards of:

- Journal of Mathematical Analysis and Applications
- Mathematical and Computer Modelling
- Applicable Analysis
- Australia and New Zealand Industrial and Applied Mathematics Journal
- Lecture Notes of Australian Mathematical Society (book series)
- Entropy

ICE-EM Director's Report


Garth Gaudry

The past year has been a very successful one for ICE-EM. The Centre further developed its position as a leading provider of high quality education in mathematics at all levels, from primary school through secondary school to postgraduate courses and courses for industry.

Further remarkable progress was made during the year on the writing and revision of books in the *ICE-EM Mathematics* schools program. The full suite of books, covering the last two years of primary school and the first four years of secondary, was completed in March. A substantial number of books have been sold in this financial year and sales are expected to increase with the completion of the series. ICE-EM schools receive free professional development and CD-ROMs of teacher support materials.

The ICE-EM schools project received a major boost in 2007 when it obtained funding from BlueScope Steel to assist with introduction of the program in the Illawarra region. The funding has enabled clusters of primary and secondary schools to receive free books and teacher professional development. The Illawarra project has considerable support in the local region, especially from Mr Mike Archer from BlueScope Steel, and the School of Mathematics & Applied Statistics and the Faculty of Education at the University of Wollongong. I thank them for their help with this important project.

Support for the ICE-EM programs was also received from the Farrell Family Foundation and Australian Char Pty Ltd. My sincere thanks to these supporters and to BlueScope Steel.

The extraordinary success of the Schools Program is thanks to the prodigious efforts and leadership of Dr Michael Evans and Ms Janine McIntosh. They have led a team of writers, checkers, typesetters and others and produced a product that was unanimously endorsed by the AMSI members at their February meeting.

The AMSI/ICE-EM Summer School 2008, held at Monash University in Melbourne, was an outstanding success. About 120 attended, including international students. Eight courses covering various topics were offered. Lecturers included Prof. Jerry Kazdan from University of Pennsylvania and Prof. John Stillwell from the University of San Francisco. I am pleased to acknowledge the first-class work by the organisers, especially the Director, Prof. Robert Bartnik, Ms Gertrude Nayak and Dr Burkard Polster and Monash University staff.

ICE-EM's investment in Access Grid Rooms (AGR) which make remote learning possible is now allowing honours students from many AMSI member universities easy access to a broader range of advanced mathematics and statistics courses. The mathematical sciences have led the way in adopting this technology and presenting collaborative course offerings. Enormous potential now exists for seminars, teacher professional development and research collaboration to be realised through the AGR.

The ICE-EM Australian Graduate School in Mathematics 2007 at The University of Queensland was once again a very successful event involving prominent international lecturers. It attracted 59 postgraduate participants including five international delegates. All lecturers were international experts, enabling Graduate School students and researchers to learn about contemporary viewpoints and the latest advances in the selected topic areas.

"ICE-EM's investment in Access Grid Rooms which make remote learning possible...(provide) easy access to a broader range of advanced mathematics and statistics courses."

BioInfoSummer 2007 was again a highlight of the industry program. The BioInfo series, conducted by The Australian National University attracts large numbers of people with varied backgrounds, all working in either mathematical and statistical aspects or biomolecular and genetic aspects of bioinformatics. It is a fine example of interdisciplinary study and collaboration. Over 15 international students took part, sponsored by ICE-EM.

This is my final report as Director of ICE-EM as I retire on 30 June. ICE-EM will continue as AMSI's education arm and provide excellence in mathematics education at all levels across Australia. It has excellent staff who will continue the exceptional work already completed.

In conclusion, I wish to sincerely thank all of the AMSI and ICE-EM staff I have worked with since 2002, initially as Director of AMSI and then as Director of ICE-EM. Special thanks to Dr Jim Lewis who was Chair of the AMSI and ICE-EM boards throughout my time. He was always ready with help and advice. Thanks also to Ms Jan Thomas who was and remains AMSI's Executive Officer. I have been privileged to work with a superb team of people and, thanks to The University of Melbourne, in enviable premises and facilities.

Garth Gaudry
Director of ICE-EM

Science Program

2007/08 highlights

- Three-week Theme Program, *Concepts of Entropy and their Applications*
- 18 research workshops and other events supported
- 48 distinguished researchers supported to visit Australia
- AMSI–MASCOS Lecturer Ingo Müller keynote speaker at *Concepts of Entropy and their Applications* and member universities

The Scientific Advisory Committee

The Scientific Advisory Committee reviews and approves sponsorship by AMSI of a diverse range of symposia, workshops, theme programs and lecture tours. Prof. Peter Hall (The University of Melbourne) is Chair of the Scientific Advisory Committee, which comprises eminent national and international mathematical scientists (see page 33).

AMSI acknowledges Prof. Chris Heyde's contribution to the Scientific Advisory Committee and was saddened by the death of a world-renowned statistician at a member institution.

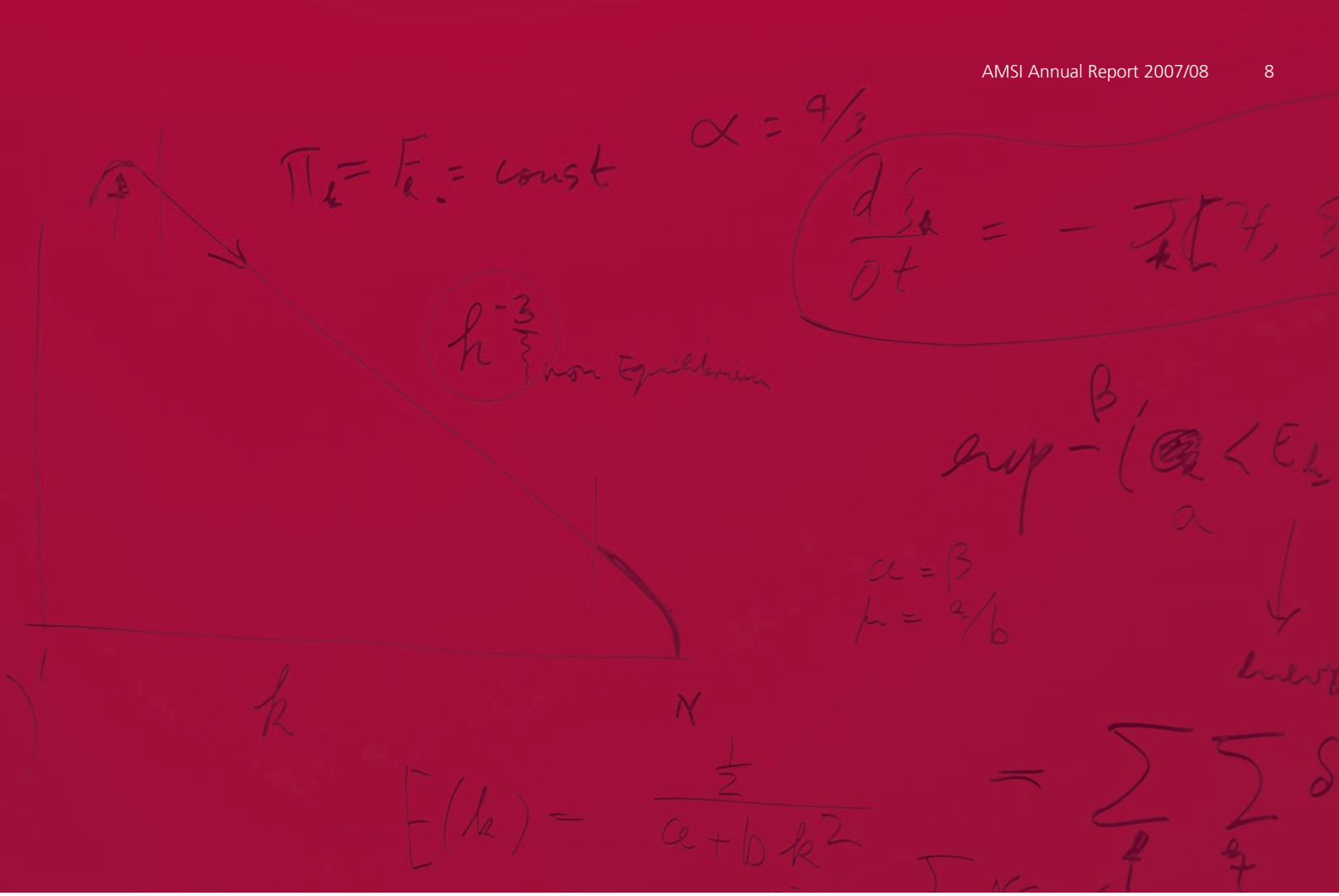
Workshops, conferences and seminars

AMSI continues a very successful scientific program of 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, as well as addressing diverse research topics in theoretical mathematics. These are listed on page 10.

AMSI's funding usually supports reimbursement for the travel expenses of international and national keynote speakers and travel grants for students and early career researchers. Details may be found at www.amsi.org.au/pdfs/Travel.pdf

Proposals for both workshops and Special Theme Programs can be submitted throughout the year. Assessment of proposals is based on scientific merit and likely national impact. Applicants are encouraged to use AMSI premises if practicable as they are well equipped and centrally located. See www.amsi.org.au/proposals.php.

Prof. Peter Taylor speaking at *What Constitutes Good Research in Mathematics and Statistics?* at The University of Melbourne



AMSI Lecturer: Linda Petzold

The AMSI Lecturer for 2008 is Dr Linda Petzold, Professor in the Department of Computer Science (Chair 2003–07) and the Department of Mechanical Engineering, and Director of the Computational Science and Engineering Program at the University of California Santa Barbara.

Dr Petzold is a member of the US National Academy of Engineering. She is a Fellow of the American Society Of Mechanical Engineers (ASME) and of the American Association for the Advancement of Science (AAAS). She was awarded the Wilkinson Prize for Numerical Software in 1991, the Dahlquist Prize in 1999, and the AWM/SIAM Sonia Kovalevski Prize in 2003. She served as Society for Industrial and Applied Mathematics (SIAM) Vice President at Large from 2000–01, as SIAM Vice President for Publications from 1993–98, and as Editor in Chief of the SIAM Journal on Scientific Computing from 1989–93.

Dr Petzold's visit to Australia in February 2008 as plenary speaker at the Australian and New Zealand Industrial and Applied Mathematics annual conference was supported by AMSI. Dr Petzold will again visit Australia in July 2008 as plenary speaker at the 14th Biennial Computational Techniques and Applications Conference (CTAC) and will speak at a number of member institutions.

For details see: www.amsi.org.au/dist_lecturers.php.

AMSI Lecturer Prof. Linda Petzold speaking to staff and students at The University of Melbourne

AMSI–MASCOS Lecturer Prof. Ingo Müller

AMSI–MASCOS Lecturer: Ingo Müller

Em. Prof. Ingo Müller's expertise is in thermodynamics. From 1979 until his retirement in 2005 he was professor of technical thermodynamics at the Technical University Berlin. He developed Extended Thermodynamics, which is essentially a thermodynamic theory of irreversible processes in rarefied gases; the theory is characterised by attractive mathematical properties such as symmetric hyperbolic field equations.

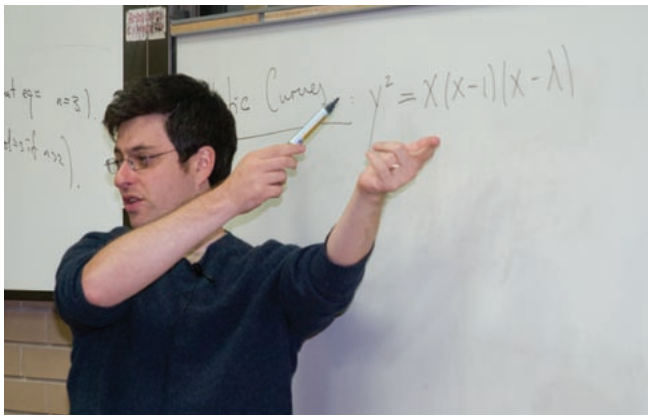
Prof. Müller was awarded the Leibniz Award of the German Science Foundation in 1988 and the International Award for Theoretical Mechanics of the Academy of Sciences of Turin.

AMSI–MASCOS sponsored his visit to Australia in November–December 2007. Prof. Müller was keynote speaker at the AMSI–MASCOS Theme Program *Concepts of Entropy and their Applications*, he then delivered customised lectures at nine universities across Australia.

Mahler Lecturer: Mark Kisin

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

The Mahler Lecturer for 2007 was Prof. Mark Kisin, Department of Mathematics, University of Chicago. Prof. Kisin's research centres on p-adic Hodge theory and its applications to the arithmetic of modular forms and modularity of Galois representations. He spoke at the AustMS Annual Conference in September 2007 and at a number of member universities.



Mahler Lecturer Dr Mark Kisin at the ICE-EM Education Afternoon

Special Theme Program: *Concepts of Entropy and their Applications*

The AMSI–MASCOS joint Theme Program *Concepts of Entropy and their Applications* was held over 11 days from 26 November to 11 December 2007 at AMSI. The program, the first organised by AMSI, was a great success that resulted in a number of high-quality presentations and discussions.

There were over 70 talks presented including 22 one-hour keynote talks. The talks covered a wide range of topics including the historical foundations of thermodynamics, statistical mechanics, dynamical systems, partial differential equations, environmental data modelling, signal processing, information theory and operations research.

The event drew an audience of more than 80 academics and postgraduates from mathematics, statistics, physics, engineering and computer science. International participants came from the UK, Germany, Netherlands, Italy, New Zealand, USA, Israel, France, Russia and Canada.

As a result of the Theme Program AMSI was requested to submit a number of papers to form a special issue of the journal *Entropy,* published by Molecular Diversity Preservation International (MDPI), based in Zurich.

Frank den Hollander (Universiteit Leiden) speaking at the Entropy Theme Program

AMSI Science Program workshops

Joint Australia–China Meeting on Nonlinear Partial Differential Equations and Related Topics	The University of Queensland and The Australian National University 2–6 July 2007
Conference on Geometry and Lie Theory (marking Gus Lehrer's 60th birthday)	The Australian National University 2–6 July 2007 The University of Sydney 9–13 July 2007
18th International Conference on General Relativity and Gravitation	Australasian Society for General Relativity and Gravitation and Australian Consortium for Interferometric Gravitational-wave Astronomy 8–14 July 2007
Quantitative Methods in Investment and Risk Management	AMSI 20 September 2007
Bioinformatics Australia 2007 Conference	AusBiotech and The University of Queensland 23–24 October 2007
Spatial Models for Non-Equilibrium Systems: Bio-Invasions and Climate Change Range Mapping	Australian Centre of Excellence for Risk Analysis 29 October – 2 November 2007
Workshop on Optimal and Predictive Control	RMIT 17 November 2007
Graph Intersection Problems and Related Trades	The University of Queensland 27–30 November 2007
Recent Advances In Asymptotic Probability and Statistics	The University of Sydney 10–12 December 2007
Mathematics in Industry Study Group (MISG)	University of Wollongong 28 January – 1 February 2008
Workshop on Geometry and Integrability	The University of Melbourne 6–12 February 2008
4th Australian Postgraduate Workshop on Stochastic Processes and Modelling	The University of Adelaide 10–13 February 2008
Adelaide Conference on Mathematical Evolutionary Biology	The University of Adelaide and Australian Centre for Ancient DNA 25–30 March 2008
Mathematics Applied to Liquid Crystal Technology	University of Wollongong AGR 8–10 May 2008
What Constitutes Good Research in Mathematics and Statistics?	AMSI 19 June 2008
Computing with R	Statistical Society of Australia 28–29 June 2008

AMSI–MASCOS workshops

8th Asia–Pacific Complex Systems Conference	ARC Centre for Complex Systems and The University of Queensland 2–5 July 2007
AMSI–MASCOS Theme Program, Concepts of Entropy and their Applications	AMSI 26 November – 12 December 2007

Host Visitors

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

Asia / Pacific

NAME	UNIVERSITY	EXPERTISE
Amnon Yekutieli	Ben Gurion University	Algebraic geometry, noncommutative algebra, deformation quantization
Daomin Cao	Academy Sinica	Semilinear elliptic equations
Hua Chen	Wuhan University	Harmonic analysis and Schrödinger operators
Weiyue Ding	Beijing University	Schrödinger f ows
Jiaxing Hong	Fudan University	Differential geometry
Zhou-ping Xin	Chinese University of Hong Kong	Compressible f uid f ow
Xiaoping Yang	Nanjing University	Geometric partial differential equations
Xi-Ping Zhu	Zhongshan University	Topology in R^n
Reuven Rubinstein	Technion - Israel Institute of Technology	Stochastic optimisation in general
Benjamin Weiss	Hebrew University of Jerusalem	Ergodic theory, topological dynamics, probability theory
Rua Murray	University of Waikato	Dynamical systems, ergodic theory, numerical effects in dynamics, approximation theory
Bing-Yi Jing	Hong Kong University of Science and Technology	Probability and statistics
J.D. Harvey	University of Auckland	Nonlinear fibre optics
Tanya Soboleva	Agresearch	Population genetics

North America

NAME	UNIVERSITY	EXPERTISE
Dennis Gaitsgory	Harvard University	The geometric Langlands program
Fred Goodman	University of Iowa	Functional analysis
Jim Carrell	University of British Columbia	Algebraic transformation groups, algebraic geometry and Lie theory
Mathai Varghese	Massachusetts Institute of Technology	Index theory of elliptic operators, spectrum of elliptic operators, and noncommutative geometry
Matt Douglass	University of North Texas	Representation theory of reductive, Lie type groups and related topics
Matthew Dyer	University of Notre Dame	Group and algebra representation theory
Richard Hain	Duke University	Topology of algebraic varieties, Hodge theory, and moduli of curves
Laurent Freidel	Perimeter Institute Theoretical Physics	Integrable systems, topological field theories, quantum gravity
Robert Myers	Perimeter Institute Theoretical Physics	General relativity, string theory
Richard Kleeman	New York University	Climate variability, predictability in dynamical systems, physical oceanography and meteorology
Lajos Horváth	University of Utah	Statistics
Charles Curtis	University of Oregon	Group and algebra representation theory
John Pelesko	University of Deleware	Applied mathematics
Linda Petzold	University of California	Numerical algorithms and software for stiff systems of ordinary differential equations and differential-algebraic equations
Mark Kisin	University of Chicago	P-adic Hodge theory and its applications

Europe

NAME	UNIVERSITY	EXPERTISE
Hanspeter Kraft	Universität Basel	Algebraic groups of transformations, classical invariant theory
Jens Carsten Jantzen	Aarhus University	Algebra, algebraic geometry, group theory and representation theory
Michela Varagnolo	Université de Cergy-Pontoise	Quantum groups
Simon Goodwin	University of Birmingham	Lie theory, especially algebraic groups and finite W-algebras, and their representations
Cedric Villani	SNS, Lyon	Geometric partial differential equations and mathematical physics
Hans Ringström	KTH, Stockholm	Mathematical general relativity, in particular in mathematical cosmology
Renata Loll	Utrecht University	Theoretical physics
Frank den Hollander	Universiteit Leiden	Probability theory, statistical physics, ergodic theory, functional analysis
Tommaso Ruggeri	University of Bologna	Nonlinear wave propagation and hyperbolic systems, non equilibrium thermodynamics
Michael Baake	Universität Bielefeld	Dynamical systems, mathematical physics
Martin Harrison	Loughborough University	Mathematics education in the higher education sector and particularly the mathematical education of non-specialists
Jan Maciejowski	University of Cambridge	System control theory
Jan Pawel Mielniczuk	Polish Academy of Sciences	Time series and stochastic modelling
Jean-Bernard Lasserre	LAAS-CNRS in Toulouse	The application of stochastic methods to optimisation problems
Alain Lascoux	Université Paris-Est	Pure mathematics, in particular in algebraic combinatorics
Noel Frederick Smyth	University of Edinburgh	Nonlinear waves in general
Gaetano Assanto	University of Rome III	Nonlinear effects in optoelectronics
Epifanio Virga	Università di Pavia	Mathematical modelling of soft matter
Ingo Müller	Technical University Berlin	Thermodynamics and continuum mechanics

Business, Industry and Government Program

2007/08 highlights

- Three-year Australian Government grant to support National Collaboration in the Mathematical Sciences: incorporating research, industry and education
- Industry Internship Program established and first intern recruited
- Successful industry workshop—*Quantitative methods in investment and risk management*
- Eight new projects with high-level mathematical content initiated under AMSI–ACERA partnership

The Industry Advisory Committee

New and stronger links with business, industry and government are being established under the guidance of the Industry Advisory Committee. Dr John Burgess (Scena Consulting) chairs the Industry Advisory Committee, which comprises eminent figures in Australian business, and industry (see page 33).

The AMSI program, in association with the Australian Research Council (ARC) Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), seeks to identify industry needs and opportunities that can be addressed using the mathematical sciences. AMSI also shows the relevance of mathematics to industry through industry forums, workshops and short courses on a variety of topics.

Funding for national collaboration in the mathematical sciences

AMSI has received funding from the Department of Education, Employment and Workplace Relations (DEEWR) under the Collaboration and Structural Reform Fund (CASR). This significant grant has enabled AMSI to schedule a number of important events and activities over the period to June 2010. Major topics in the business, industry and government area include: establishment of an Industry Internship Program; Joint Graduate Theme Programs in areas such as Resource Management and Environmental Science; collaborative joint industry short-courses and workshops.

Internship Program

The AMSI Internship Program is a new initiative designed to build links between AMSI members and those in industry, business and government seeking high-end analytical expertise. AMSI offers industry partners the opportunity to use the mathematical and statistical skills of an intern and an academic mentor to address a research problem relevant to the industry partner.

The program:

- promotes closer links with industry
- provides high-end capabilities to industry partners
- enables postgraduate students to benefit through participation in industry research projects

The AMSI Industry Internship Program has been modelled on the highly successful internship program established four years ago by Mathematics of Information Technology and Complex Systems (MITACS) in Canada and a similar program run by the Smith Institute in the UK. This follows on from the Benchmarking Study undertaken by AMSI's Dr Thomas Montague in 2006/07.

The first internship placement was postgraduate student Ms Amie Albrecht from the University of South Australia who worked with Sydney-based TTG Transportation Technology Pty. Ltd. (TTGTT); Prof. Phil Howlett was the academic mentor. Ms Albrecht worked with the TTGTT team developing techniques to estimate the number of seats required to move passengers between pairs of stations and minimise the number of unnecessary train stops on a line. The techniques developed can also be used to design and better manage future rail routes.

For more information on the Internship Program see: www.amsi.org.au/Industry_internships.php.

Amie Albrecht (AMSI Industry Intern) and Phil Howlett (mentor, University of South Australia)

TTG
Transportation Technology

Other DEEWR funded programs

These commence in 2008/09 with both the Joint Graduate Theme Program in Mathematical Sciences and the Industry Event—*The Mathematics of Water Supply and Pricing* occurring in July 2009; the Summer Vacation Scholarships for Undergraduates in December 2008 – January 2009; the first CASR Theme Program in January 2009 and the 2009 AMSI Summer School confirmed for January–Febuary 2009.

AMSI–MASCOS Industry Research Fellow

This year AMSI–MASCOS appointed Dr Dimetre Triadus in the newly created position of Industry Research Fellow. Dimetre successfully completed his PhD in Indentation models for colloid science and nanotechnology at The University of Melbourne in November 2007 and commenced at AMSI in February 2008. Since his appointment Dimetre has played a pivotal role in a number of AMSI industry projects and co-authored a paper with Prof. Philip Broadbridge on integrable solutions in groundwater infiltration theory. His appointment was made with funding and support from the AMSI collaboration with MASCOS.

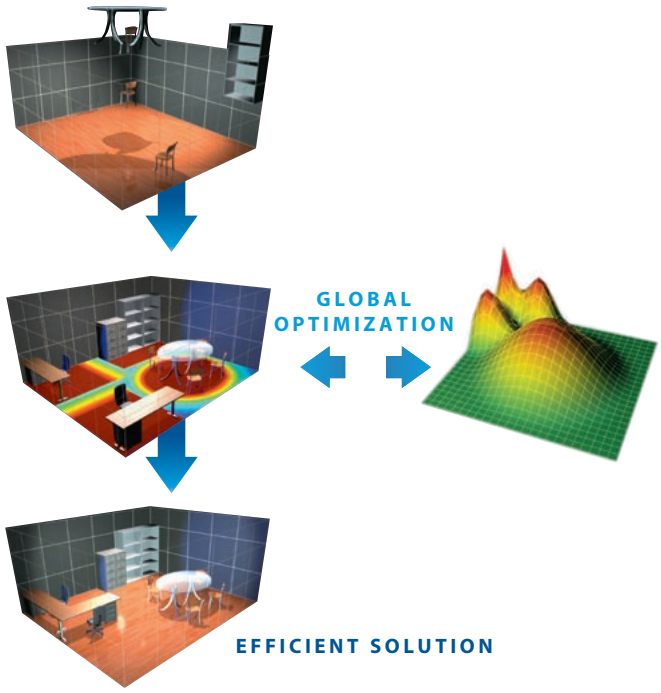
Dr Dimetre Triadis, AMSI–MASCOS Industry Research Fellow

The Kann Finch ARC Linkage Project

This project has just completed the second year of its three-year life. Over the past two years Paul Bondin from Kann Finch and the team from the Centre for Informatics and Applied Optimisation (CIAO) at the University of Ballarat have developed a number of models and software to optimise the layout of a single office. In the final year this model will be generalised to whole buildings to produce better measures of how well f oor space designs will accommodate a particular organisation.

Paul Bondin spoke about the project at the Universities Innovations Showcase in May 2008. Also in May 2008 Dr Musa Mammadov and Dr Fusheng Bai presented some of their findings at the European Mini Conference on Continuous Optimisation and Knowledge-Based Technologies (EurOPT-2008).

Other such innovative work by the Kann Finch Group has resulted in their being short-listed for the 2008 Australian Corporate Interior Design Awards.



How do you best fit furniture into an office? Software developed at CIAO to optimise the layout of a single office.

Consulting projects

This year AMSI has undertaken a number of projects that have drawn on the skills and collaborative efforts of staff at the University of South Australia, The University of New South Wales and The University of Melbourne. The projects have been in the area of financial risk and supply chain optimisation and mining.

Consulting projects promote collaboration in the mathematical sciences and clearly demonstrate the relevance of the mathematical sciences, AMSI and its members to the Australian business community that supports us.

International collaboration

Four students from collaborating Australian Universities were funded to attend the 2008 Pacific Institute for Mathematical Sciences (PIMS) Industrial Problem Solving Workshop (IPSW), and Graduate Industrial Mathematics Modelling Camp (GIMMC) held at the University of Regina, Canada. GIMMC, held in the week preceding IPSW provides preparation for IPSW and is designed to give graduate students in the mathematical sciences an opportunity to learn techniques of mathematical modelling under the supervision and guidance of experts in the field. These techniques are then applied at IPSW to solve problems presented by the industrial partners working in teams with leading specialists from the academic community.

Dr Neville Fowkes, Facilitator for GIMMC, Canada

Industry workshop: *Quantitative methods in investment and risk management*

AMSI hosted a one-day event on financial risk in Melbourne at the Innovation Centre in September 2007. The event highlighted the scope for developing value-adding investment strategies from mathematical and statistical techniques and how they can be applied within the financial world and risk management. The event was targeted at quantitative investment analysts, risk managers, finance academics, mathematicians, statisticians and those wanting an insight into quantitative modelling.

A total of 66 delegates registered for the event, the majority from industry. Speakers included Mr Leo de Bever, Chief Investment Officer, Victorian Funds Management Corporation (VFMC) and Dr Pavel Shevchenko, Principal Research Scientist, Leader, Financial Risk Management, Commonwealth Scientific and Industrial Research Organisation (CSIRO). The event was kindly sponsored by Victorian Funds Management Corporation and run in collaboration with the Melbourne Centre for Financial Studies.

Mr Leo de Bever, Victorian Funds Management Corporation

The Australian Centre of Excellence for Risk Analysis (ACERA)

ACERA continues to thrive and AMSI continues to play an active role in its activities. Assoc. Prof. Geoff Prince sits on the Advisory Board and Prof. Phil Broadbridge and Prof. Peter Hall are members of the Scientific Advisory Committee. The primary focus of the Centre is towards biosecurity risk analysis.

In March 2008 funding for another eight new ACERA research projects was approved. Topics of projects included:

- Strategies for managing invasive species in space: deciding whether to eradicate, contain or control
- Determining necessary survey effort for detecting invasive weeds in native vegetation communities
- Combining GIS and Bayesian Networks in test-action strategies for risk assessment
- Demonstrating risk analysis capabilities
- Biosecurity information sharing and data mining for building a biosecurity intelligence and decision-making framework

Member institutions participating in the above projects were:

- The University of Melbourne
- RMIT University
- The University of Queensland

acera
Australian Centre of Excellence for Risk Analysis


Participants at the ACERA Spatial Models For Non-Equilibrium Systems: Bio-Invasions and Climate Change Range Mapping event

AMSI Industry Planning Meeting

In August 2007 Dr John Burgess, chair of the Industry Advisory Committee, facilitated the first AMSI Industry Strategy planning meeting, 11 eminent figures from industry and government attended. Drawing on their considerable experience and input, the first AMSI Industry Marketing Strategy document was produced.

Education Program

2007/08 highlights

- *ICE-EM Mathematics* textbooks and teacher resource CD-ROMs complete
- Success of the first year of the BlueScope Steel-sponsored *ICE-EM Mathematics* project in the Illawarra region, NSW
- *Mathematics Education for 21st Century Engineering Students* scoping project complete
- ICE-EM AGRs fully operational and delivering honours courses
- Continuing success of AMSI/ICE-EM Summer School and Graduate School

The Education Advisory Committee

The Education Advisory Committee provides general program advice on education-related activities carried out under the auspices of the International Centre of Excellence for Education in Mathematics (ICE-EM), the education division of AMSI. The Committee is chaired by Prof. Peter Taylor (Australian Mathematics Trust) and comprises distinguished mathematics educators (see page 33).

ICE-EM was initially funded by the Australian Government through the Department of Education, Science and Training (DEST), its aim to improve the mathematical sciences base through improved mathematics education in schools, higher education, research and industry. Following cessation of the DEST funding in 2008 a re-defined ICE-EM program will run, funded by the Department of Education, Employment and Workplace Relations (DEEWR); commercial-generated income, and contributions from Corporate Members.

ICE-EM Mathematics—The Schools Mathematics Program for Upper Primary to Secondary Year 10

The pilot stage of the *ICE-EM Mathematics* Program concluded in 2007 with over 140 schools and 35,000 students involved. Teachers from the pilot schools provided valuable feedback and their comments contributed greatly to the commercial versions of the *ICE-EM Mathematics* series. The twelve commercial versions (two per year) have been completed and a substantial number of books sold. At the same time, a number of the pilot schools have chosen to continue using the pilot books rather than purchase commercial versions, due to financial constraints.

Teacher resource CD-ROMs are available for all of the books. The CD-ROMs include additional material to help teachers provide a large range of exercises and thus cope with different levels of ability within the classroom. The team of authors is

to be thanked for their intensive work over the past three years. The books have been well received in schools and they will be inf uential in this time of national curriculum development.

BlueScope–*ICE-EM Mathematics* Project in the Illawarra

In June 2007 BlueScope Steel Ltd announced that its Board had decided to support a Mathematics Project with ICE-EM in the Illawarra region. There are 660 Year 7 students and 1,700 Year 5 and Year 6 students involved in this project.

ICE-EM Mathematics textbooks were provided for each student and teacher in the participating schools and assistance given to teachers by way of professional development. The program was introduced at the start of the 2008 school year and has now been in place for two terms. The program is conducted with the full blessing of the Illawarra and South East Region, New South Wales Department of Education and Training, with further endorsement from the University of Wollongong.

Professional development sessions and conference presentations

Over 100 professional development sessions have been conducted for ICE-EM schools in the past two years. These sessions involve discussion of not only the material in the books, but a broader view of the mathematics involved at this level. Sessions have also been given at state and regional conferences and these sessions have given the opportunity to further promote the *ICE-EM Mathematics* program.

Information tables have been manned in the display halls at both the Victorian and Western Australian Mathematics conferences and the Australian Mathematics Trust displayed our material at the New South Wales conference. Talks were also given for students at a number of venues.

Ms Janine McIntosh speaking to students and their parents at McKinnon Primary School's family mathematics night

Connecting universities and schools—*What's Happening in Mathematics?*

These sessions, hosted by *ICE-EM Mathematics*, introduce researchers working at the forefront of mathematics to audiences of secondary school mathematics teachers. The aim is to provide an interesting update of teacher knowledge of developments in mathematics and to provide ideas to be taken back to schools.

There have been three sessions this year;

The University of Melbourne, 8 August 2007:

Speaker	Topics
Terry Speed	The mathematics and statistics of molecular biology: connecting maths and stats with DNA, RNA, and proteins.
J. Hyam Rubinstein	Soap films, horizons of black holes, networks and mining
Greg Hjorth	How do we count? Counting infinities. Did we miss any?

The University of Western Australia, 2 April 2008:

Speaker	Topics
Adrian Baddeley	The Data Explosion
Kevin Judd	Weather, Climate Change, Chaos and Mathematics
Michael Evans	The ICE-EM Schools Project

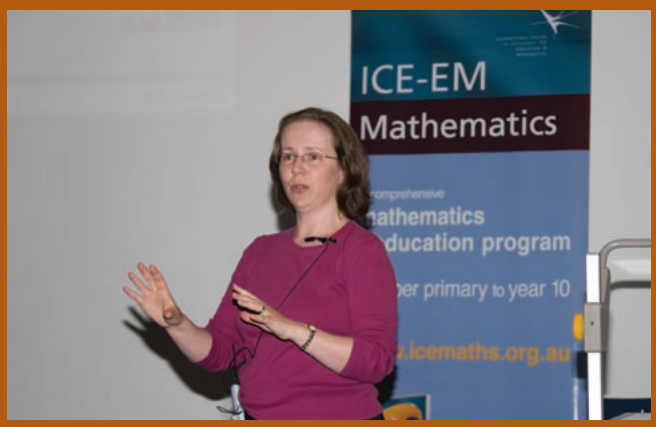
La Trobe University, 15 April 2008:

Speaker	Topics
Luke Prendergast	Some challenges faced when dealing with high dimensional data
Katherine Seaton	It's a small world, what graph theory is telling us about the six-degrees phenomenon
Michael Evans	The ICE-EM Schools Project

A fourth *What's Happening in Mathematics?* session is to be held jointly at Victoria University and the University of Wollongong using the Access Grid Rooms at these institutions. The speakers at this fourth session will be Prof. Jonathan Borwein and Dr Melanie Bahlo.

Prof. Greg Hjorth, Prof. Terry Speed and Prof. J. Hyam Rubinstein at the *What's Happening in Mathematics?* session at The University of Melbourne

Janine McIntosh, Prof. Kevin Judd, Prof. Lyn Beazley, Prof. Adrian Baddeley, Prof Cheryl Praeger, Assoc. Prof. Les Jennings and Dr Michael Evans at the *What's Happening in Mathematics?* session at The University of Western Australia



Dr Katherine Seaton at the *What's Happening in Mathematics?* session at La Trobe University

AMSI/ICE-EM Australian Graduate School in Mathematical Sciences

The 2007 AMSI/ICE-EM Australian Graduate School in Mathematics was the third and final in the series funded by DEST; however, reformatted Graduate Theme Programs are to continue in 2008 and 2009. As in previous years the Graduate School was held at The University of Queensland and the organising committee of Prof. Tony Bracken, Prof. Peter Adams and Ms Lynda Flower continued the exceptionally high standard. Seven distinguished international mathematics researchers presented six courses and, chosen on merit, a record number of 59 predominantly PhD students attended, 54 from Australian universities, five from overseas.

Prof. Tony Bracken, The University of Queensland welcoming students at the opening of the Graduate School

Course	Lecturer
Statistics:	
Likelihood Theory	Anthony Davidson, Ecole Polytechnique Federale de Lausanne, Switzerland
Statistical Analysis of Multivariate Data	Louise Ryan, Harvard School of Public Health, and Longitudinal Data, Boston USA
Lie Theory:	
Methods and Applications of Invariant Theory	Nolan Wallach, University of California, USA
Differential Operators on Homogeneous Spaces	Leticia Barchini & Roger Zierau, Oklahoma State University, USA
Algebra & Combinatorics:	
Designs, Codes and Cryptography	Alexander Pott, Otto-von-Guericke-Universität, Magdeburg, Germany
Topics in Graph Theory	Nick Wormald, University of Waterloo, Waterloo, Canada

AMSI/ICE-EM Summer School 2008

The sixth annual AMSI/ICE-EM Summer School in Mathematics was hosted by Monash University, Clayton Campus, from 14 January to 8 February 2008. The organising committee, Prof. Robert Bartnik (Director), Dr Maria Athanassenas, Ms Gertrude Nayak, Dr Burkard Polster and Ms Amanda Teo presented an excellent program with both lecturers and students indicating a high level of satisfaction with the courses and overall organisation.

The School hosted a total of 116 students including international students from Hong Kong and Bogota, Columbia. The program covered eight honours-level topics in pure and applied mathematics and statistics with 64 students taking courses for credit.

Dr Markus Hegland lecturing at the AMSI/ICE-EM Summer School January–February 2008

Course	Lecturer
Measure Theory	Marty Ross (ex The University of Melbourne)
Partial Differential Equations	Jerry Kazdan (University of Pennsylvania)
Knots and Links	Iain Aitchison (The University of Melbourne)
Approximation Theory	Markus Hegland (The Australian National University)
The Art and Science of Modelling, Analysing and Solving Decision-Making Problems	Moshe Sniedovich (The University of Melbourne)
Advanced Methods for Ordinary Differential Equations	Andrew Bassom (The University of Western Australia)
Lie Groups	John Stillwell (University of San Francisco)
Martingales in Discrete Time	Kais Hamza (Monash University)

The 2009 AMSI/ICE-EM Summer School will be held at the University of Wollongong.

Mathematics Education for 21st Century Engineering Students

The scoping project, *Mathematics Education for 21st Century Engineering Students*, funded by the former Carrick Institute for Learning and Teaching in Higher Education (now the Australian Learning and Teaching Council), was completed in March 2008. The year-long study formed a picture of the rapidly changing field of engineering mathematics education. An extensive questionnaire was sent to representatives from engineering and mathematics at each of the 32 Australian institutions offering engineering degree programs, responses were received from 27. Issues and practices arising from this were further explored with site visits. The project Director Prof. Philip Broadbridge also visited Loughborough University in the United Kingdom to look at the Helping Engineers Learn Maths (HELM) project, and the University of Delaware and Duke University in the United States for Modelling, Experiment and Computation (MEC)
Lab and Laboratory Calculus courses respectively.

Some of the 16 AGR venues participating online in the National Symposium as seen from the host venue RMIT University

As part of the project, a National Symposium, held on 7 December 2007, attracted over 80 participants, both in person and via a network of 16 Access Grid Rooms. The symposium showcased innovative practice in the teaching of mathematics to engineering students. International speakers Dr Martin Harrison (Loughborough University) and Assoc. Prof. John Pelesko (University of Delaware) discussed the success of the HELM project and the MEC Lab.

The project's final report documents the widespread agreement among academics and practising engineers that a good grounding in mathematics is essential for engineers. The widening diversity of the student body, lowering of the mathematics prerequisite for entry to engineering programs and the reduction of teaching modules for mathematics to make way for professional practice subjects have created new challenges for engineering mathematics educators. New techniques must be employed to engage and effectively educate the student body. The report explores methods of teaching and learning trialed in Australia and overseas, finding that it is essential to provide additional mathematics support for students, both to aid the transition from school to university and encourage students to complete extra mathematics practice. Computer aided assessment (both in-house and commercial software) can also provide students with additional mathematics practice that can be easily and quickly monitored by staff. Group learning has been seen to be an effective way to incorporate the teaching and learning of professional practice skills within science subjects.

While there is widespread disagreement about which mathematics topics should be included in the reduced number of mathematics subjects for engineering students and which teaching methods are most effective, this problem is minimised in institutions where the engineering department and the mathematics department have a formal joint committee that communicates openly and decides on a compromise mathematics curriculum. Joint ownership of the curriculum also helps to provide engineering applications that are a strong motivation for the study of mathematics. The study found some institutions that had dramatically improved their students' ratings of mathematics instruction.

The report provides a coherent set of recommendations that build on innovations that were identified around the country to provide strategies to address the challenges identified. The project itself has benefited from an improved level of co-operation between mathematics educators and the engineering profession.

To access the project report, which has already been widely acclaimed by engineering and mathematics academics, see: www.amsi.org.au/carrick.php.

Access Grid Rooms

All AMSI/ICE-EM Access Grid Rooms (AGR) are now fully operational at:

- La Trobe University
- Macquarie University
- Monash University
- RMIT University
- The University of Newcastle
- University of South Australia
- University of Southern Queensland
- The University of Sydney
- University of Technology, Sydney
- University of Wollongong
- Victoria University

AMSI member institutions with AGRs present seminars, lectures, honours and masters courseware, and multimedia resources remotely and interactively, and in return participate in events presented by other AMSI institutions. The AGR network provides the mathematics postgraduate community and professionals with access to international experts who are visiting and lecturing in Australia. It also provides a means of carrying out collaborative research with peers within Australia and internationally.

All AMSI member institutions with AGRs are participating in the giving and receiving of honours courses in 2008. In semester one; eight courses were offered; 10 courses will be offered in semester two. For more information about these courses please see: www.ice-em.org.au/agr.html.

On 7 December 2007, as part of the Carrick Institute of Learning and Teaching funded project *Mathematics for 21st Century Engineering Students*, a one-day workshop was broadcast from RMIT AGR to 16 participating AGRs.

Prof. Jonathan Borwein's *π Day* lecture on 14 March 2008 was the first in the Distinguished Lecturer Seminar Series, broadcast from The University of Newcastle AGR, with six remote AGRs also participating.

As an extension to the AMSI/ICE-EM AGR project, The University of Sydney is allocating funds to AMSI from its successful application to the Federal Government for the project *National Collaboration in Higher-Level Mathematics Instruction using High-Speed High-Bandwidth Internet-Based Communication Technology*. AMSI is filling the Academic Administrator (0.4) position for the AGR Program.

The AGR project is increasingly receiving recognition both nationally and internationally and Assoc. Prof. Bill Blyth, the Academic Administrator, has been invited to share the AMSI experience at a number of conferences in Australia, the United Kingdom and Canada.

Assoc. Prof. Bill Blyth speaking at the opening of the RMIT University Access Grid Room

Assoc. Prof. Pietro Cerone speaking at the opening of the Victoria University Access Grid Room

AMSI–MASCOS Summer Vacation Scholarships

A reduced version of the former ICE-EM Summer Vacation Scholarships program was offered this year, funded by AMSI-MASCOS. Scholarships were awarded on a competitive basis to 10 third-year undergraduates at AMSI member universities who were completing a major in mathematical sciences and intended proceeding to an honours year. The scholarships provided $350 per week for up to six weeks. Students completed a small research project supervised by a member of their home university's academic staff. All participants attended the *Big Day In* organised by CSIRO in February where they each gave a presentation on their project and met their fellow scholars from around Australia.

Seven of the students who attended the annual *Big Day In*

Short reports on the projects can be found at: www.ICE-EM.org.au/students.html

BioInfoSummer 2007: ICE-EM Summer Symposium in Bioinformatics

ICE-EM Director Prof. Garth Gaudry with some of the students from BioInfoSummer 2007

The aim of the symposium is to bring together Australian graduate students (honours, masters and PhD) and early career researchers from the mathematical and biological sciences in order to introduce participants to state-of-the-art bioinformatics research and to develop further applications of mathematics to bioinformatics. The themes were: Introduction to Molecular Biology; Sequence to Structure; Comparative Genomics; Analysis of Gene Expression and Gene Regulatory Networks.

The total number of participants was 116, with 16 from overseas. Of these, 30 Australian students and nine from overseas received travel scholarships provided by ICE-EM.

Research into school mathematics

In May 2007 Dr Frank Barrington and Mr Peter Brown released *Research into School Mathematics: Review of International Baccalaureate Mathematics Course*, the third report in the ICE-EM series concerned with Year 12 mathematics. They compared the International Baccalaureate Organization (IBO) Diploma mathematics programs with those offered in NSW and Victoria. They concluded that the IBO Intermediate and Advanced Mathematics subjects are not significantly difficult in standard, compared with the equivalent offerings in NSW and Victoria.

Dr Frank Barrington also released an update of Year 12 mathematics participation in May 2007. Participation in both the intermediate and advanced levels mathematics has continued to decline.

The reports and updates are available at: www.amsi.org.au/publications.php.

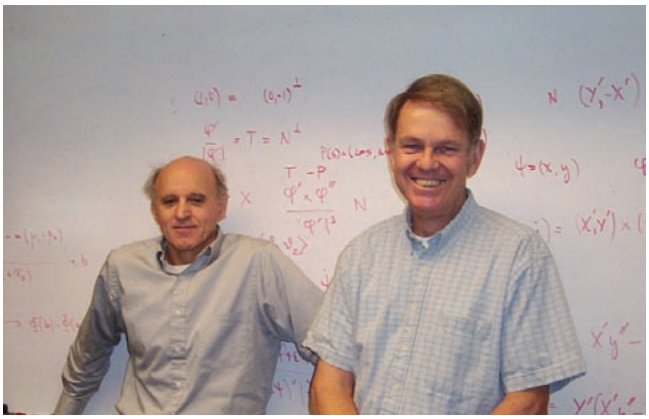
International collaborations

Most industrialised nations and some developing nations have one or more national mathematical sciences institutes. AMSI is part of a supportive international community. We have formal agreements of co-operation with Mathematics of Information Technology and Complex Systems (MITACS) and Atlantic Association for Research in the Mathematical Sciences (AARMS) in Canada and membership of the Pacific Rim Mathematical Association (PRIMA). We have informal contacts with several other overseas institutes. AMSI ran an industry workshop and short course jointly with MITACS in April 2007 and will run another in July 2008.

As reported in the Business, Industry and Government Program section, in June 2008 the 11th Graduate Industrial Mathematics Modelling Camp (GIMMC) and 12th Industrial Problem Solving Workshop (IPSW), held by the Pacific Institute for the Mathematical Sciences (PIMS), took place at the University of Regina, Saskatchewan. As a member of PRIMA, AMSI assisted one student from each of University of Ballarat, University of South Australia, ADFA (The University of New South Wales) and The University of Western Australia, to attend. In addition, PIMS and AMSI sponsored one Australian applied mathematician to attend as a facilitator. PIMS provided free accommodation, meals and registration. The event was an outstanding success and the Australian participation was most beneficial. PIMS and AMSI are currently discussing ways of furthering joint activities. Student visits are two-way, setting up future alliances in the next generation of mathematicians and statisticians. So far, each year we have provided accommodation for several Canadian students at AMSI–MASCOS/MITACS industry short courses, and for several South American and Asia–Pacific students at Summer Schools.

During July 2007, after contributing a paper at the International Congress on Industrial and Applied Mathematics in Zürich, Prof. Philip Broadbridge visited Loughborough University (UK) because that institution is widely regarded as a world leader in teaching mathematics to engineering students. After delivering an invited lecture at the annual meeting of the Soils Science Society of America in November, Prof. Broadbridge also visited Duke University and the University of Delaware (USA), these institutions also are renowned for innovative practice in teaching mathematics to engineering and technology students. Dr Martin Harrison (Loughborough) and Assoc. Prof. John Pelesko (Delaware) visited Melbourne in December to speak at an AMSI workshop on engineering mathematics education.

AMSI improves Australians' exposure to the best mathematical science lecturers from overseas by sponsoring guest lecturers at the annual Graduate School and BioInfoSummer, many invited overseas speakers at AMSI-sponsored conferences, the annual AMSI Distinguished Lecturer, the biennial Mahler Lecturer (jointly with the Australian Mathematical Society) and the biennial AMSI–MASCOS Lecturer (jointly with MASCOS).



Prof. Bill Allard and Assoc. Prof. Lewis Blake, Mathematics Department, Duke University

11th PIMS Graduate Industrial Mathematics Modelling Camp (GIMMC), University of Regina

International marketing

The completion of the books and teacher resource CD-ROMs for the *ICE-EM Mathematics* schools mathematics program for Upper Primary to Secondary Year 10 has opened the way to seriously explore overseas sales opportunities. Significant progress has been made in presenting the materials to the New Zealand market in the up-coming school year and evaluation of content and its suitability is taking place in several other potential markets.

Outreach Program

2007/08 highlights

- Campaign for the restoration of mathematical sciences, following a federal budget increase for tertiary mathematics and statistics
- Publication of *Twisted: The Mathematics of Greenhouse Denial* supported by AMSI
- Education Afternoon at the Australian Mathematical Society Annual Conference

Federal budget increase for mathematics and statistics

The substantial increase in funding for the teaching of mathematics and statistics in the budget of May 2007 was welcomed by the mathematical sciences community. However; by the end of 2007 it was apparent that there was little follow-on to mathematical sciences departments. In conjunction with Prof. Hyam Rubinstein and Prof. Peter Hall, Ms Jan Thomas surveyed universities' mathematical sciences departments and confirmed that in January 2008 they had fewer academics than in January 2007. As Chair (Prof. Rubinstein) and members of the Working Party for the National Committee for the Mathematical Sciences of the Australian Academy of Sciences' *National Strategic Review of Mathematical Sciences Research in Australia* in 2006, the authors conveyed the survey findings to the Prime Minister and a number of other relevant Ministers. See www.amsi.org.au/pdfs/Questionnaire_summary.pdf to view the report.

The May 2008 budget contained little that would begin to address the key performance indicators in the 2006 Review. Some AMSI member universities have seen a reduction in mathematical sciences capability. This appears to be especially the case at the University of Southern Queensland (USQ). Proposed cuts to mathematical sciences at USQ have received considerable media coverage and were the subject of an international and national campaign. Unfortunately USQ is not an isolated case. AMSI will continue to call for a major restoration in the mathematical sciences in all universities.

AMSI-supported publication—*Twisted: The Mathematics of Greenhouse Denial*

AMSI in association with MASCOS supported the publication of *Twisted: The Mathematics of Greenhouse Denial* written by Prof. Ian Enting to highlight the inconsistencies in the arguments of those who deny that global warming exists. Drawing on his extensive experience as a mathematical physicist and a lifetime's work on atmospheric CO_2, the book will appeal to those interested in gathering a better understanding of the issues around greenhouse debate.

Twisted was launched on 23 October 2007 by Prof. David Karoly from the School of Earth Sciences, The University of Melbourne. For more information see www.amsi.org.au/twisted.php.

Prof. David Karoly officially launches *Twisted*

Education Afternoon—Australian Mathematical Society Annual Conference

On 26 September 2007 ICE-EM sponsored and organised an Education Afternoon at the Australian Mathematical Society's 51st Annual Conference at La Trobe University. Two of the conference's plenary speakers, Prof. Stephen Wright (University of Wisconsin, Madison) and Prof. Mark Kisin (University of Chicago), generously gave of their time to present talks. They were joined by locals, Dr Melanie Bahlo from the Walter and Eliza Hall Institute of Medical Research and Dr Peter Milley from The University of Melbourne.

Their talks provided a snapshot of the vibrant, dynamic world of modern mathematics. Topics covered included statistics in medical sciences, a cross-disciplinary area that offers many wonderful career opportunities for young people with an interest in mathematics and medicine. Another medical talk discussed the use of mathematics in improving radiation therapy in the treatment of cancer. A separate lecture discussed geometric objects that cannot be physically constructed or even properly drawn.

A reception was held to close the event, providing teachers and speakers the chance to talk informally.

Prof. Stephen Wright, University of Wisconsin speaks at the AustMS Education Afternoon

Connecting universities and schools—*What's Happening in Mathematics?* *(see page 19)*

These sessions introduce secondary school teachers to mathematics researchers providing updates for teachers on developments in mathematics and ideas to be taken back to the classroom.

Promoting issues, garnering support

AMSI and ICE-EM promote the mathematical sciences through meetings, submissions and attendance at key events.

- On 12 July 2007 Prof. Lyn Beazley, Chief Scientist, Western Australia visited AMSI
- In July 2007 Dr Evans attended the Mathematics Association of Western Australia (MAWA) Conference in Bunbury to promote the ICE-EM Schools Project
- In July 2007 Prof. Broadbridge and Ms Henderson attended the Engineering Mathematics and Applications Conference (EMAC) in Hobart
- In August 2007 Prof. Ah Chung Tsoi, Director of the Davic D. Lam Institute for East–West Studies visited Prof. Gaudry at AMSI
- On 10 September 2007 Prof. Broadbridge attended Kevin Rudd's National Manufacturing Roundtable at Parliament House in Canberra
- On 25 September 2007 AMSI hosted a dinner for Steve Herbert, Member for Eltham and Parliamentary Secretary for Education, in the Victorian Parliament
- In November 2007 Ms Thomas attended the sixth Southern Hemisphere Conference on Undergraduate Mathematics and Statistics Teaching and Learning (Delta 07) in El Calafate, Argentina
- In December 2007 Dr Evans and Ms McIntosh attended the Mathematics Association of Victoria (MAV) Conference in Bundoora to promote the ICE-EM Schools Project
- On 14 March 2008 Prof. Broadbridge and Ms Thomas attended Assoc. Prof. David Panton's retirement function in Adelaide
- On 21 April 2008 Tony McKay, Executive Director of the Melbourne-based Centre for Strategic Education visited AMSI
- In May 2008 Ms McIntosh attended the Mathematics Association of Tasmania (MAT) Conference in Hobart to promote the ICE-EM Schools Project
- In June 2008 Prof. Broadbridge, Ms Thomas and Ms Henderson attended the INFORMA conference *Science and Engineering: Skills for Australia's Future.* Prof. Broadbridge gave an invited presentation, leading to a review of mathematics in Group of Eight Universities.
- In June 2008 Dr Evans attended the Queensland Association of Mathematics Teachers (QAMT) Conference in Brisbane to promote the ICE-EM Schools Project
- In June 2008 Ms Thomas attended the Mathematics Education Research Group Australia (MERGA) conferences in Brisbane
- In June 2008 Ms Thomas spoke at a seminar at RMIT University about Mathematics in Australia
- On 27 June 2008 Prof. Broadbridge, Dr Evans and Dr Barrington attended the National Curriculum Board Forum: *Into the Future, Scoping the Task of Developing a National Curriculum*
- In June–July 2008 Prof. Broadbridge sat on the Mathematics and Physics review committee at University of Tasmania

Supporting the wider mathematical sciences community

Australian Council of Heads of Mathematical Sciences

AMSI provides administrative and other support to the Annual Heads of Department meeting. The meeting has been expanded over time to include other leading figures such as the directors of institutes and presidents of professional societies. At the February 2008 meeting it was decided that a new name was needed to better reflect the current members of the group and the *Australian Council of Heads of Mathematical Sciences* (ACHMS) was chosen.

Prior to the 2008 ACHMS meeting a decision had been made to disband the Australian Mathematical Sciences Council (AMSC). AMSC had been the umbrella organisation of members of the Federation of Australian Scientific and Technological Societies (FASTS) and had been responsible for selecting the FASTS Board representatives for the mathematical sciences. The FASTS representative will now be decided in conjunction with the annual ACHMS meeting. Prof. Nigel Bean from The University of Adelaide was elected FASTS representative for 2008. In November, Prof. Peter Adams of The University of Queensland was elected to the FASTS Executive Committee. Nigel and Peter have been actively pursuing the interests of the mathematical community within FASTS and their hard work is much appreciated.

The ACHMS meeting is an important event in the mathematical sciences calendar. It is an opportunity to gauge progress and set policy directions for the future. AMSI is pleased to be able to support it and to take note of major concerns and issues, especially when dealing with issues of policy and in submission writing.

Supporting the wider mathematical sciences community *continued*

Use of AMSI premises for meetings and seminars

The AMSI premises were used for meetings and seminars for the following organisations:

- Australian Society for Operations Research (ASOR)
- Australian Mathematics Trust (AMT)
- Joint Associations Meeting of the Mathematics Education Research Group of Australasia (MERGA), Australian Mathematics Society (AustMS), Australian Association of Mathematics Teachers (AAMT)
- Joomla Melbourne User Group

We invite other mathematical societies or groups to also consider making use of this resource.

ASOR members at their monthly meeting held at AMSI

Promoting careers in the mathematical sciences

AMSI and ICE-EM are committed to providing young people and their parents with well-informed advice on careers in the mathematical sciences. We have two main objectives: that young people appreciate mathematics as a discipline and that they are aware of the career options that emanate from the study of mathematics and statistics.

We continue to seek funding for a major careers program to supplement the resources already produced.

Maths ad(d)s

ICE-EM publishes *Maths ad(d)s* annually in conjunction with La Trobe University. The 24-page booklet contains selected job advertisements from newspapers and the internet that require mathematics or statistics and illustrates the great variety of rewarding careers requiring these skills. We print and distribute 12,000 copies via our members, at careers expos and to secondary school teachers. It is a very successful and popular product.

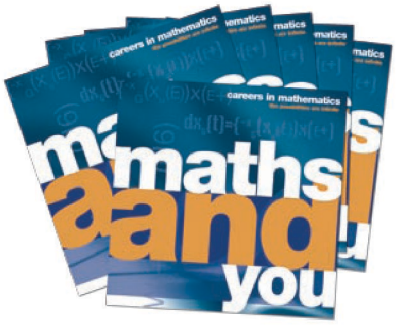
Career expos

ICE-EM continued its program of support for careers expos during 2007/08. In April, Dr Dimetre Triadis and Ms Janine McIntosh provided expert assistance to the thousands of students and parents who attended the Age Careers expo in Melbourne.

Other careers material

ICE-EM also produces a careers brochure *Maths and you* targeted at senior high school students and undergraduates. This encourages students to continue their study of mathematics for the benefit and rewards it brings to their careers. There is also a series of four A3 colour posters suitable for notice boards. See www.ice-em.org.au/careers.html for details.

The careers website with interviews of 10 young mathematicians talking about their careers continues to provide a useful resource encouraging students to continue their study of mathematics for the benefit and rewards it brings to their careers www.mathscareers.org.au.

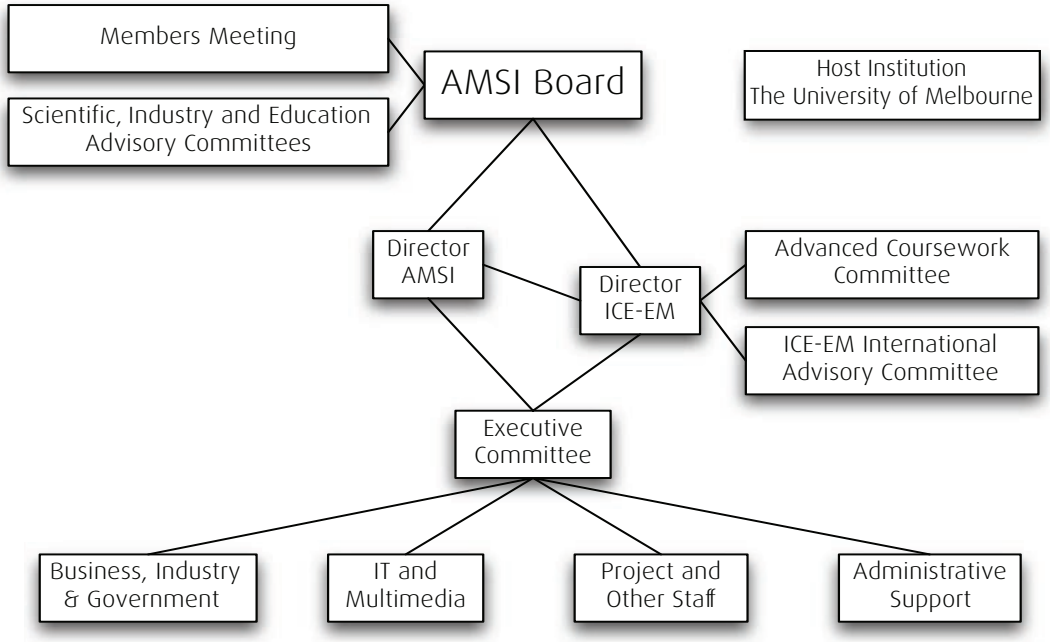


Corporate Governance

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 i of this report.

Organisation structure



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
- 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 33).

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

Non-executive members of the Board are not remunerated.

Term of Board members

The persons comprising the Board are appointed for terms of one 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 2007/08

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.

Assoc. Prof. Grant Cairns BE (Hons), BSc, Doctorat d'Etat

Deputy Director to 14 February 2008

Grant has been Head of the Department of Mathematical and Statistical Sciences at La Trobe University since 2005. He describes himself as a "maths enthusiast" and has research interests in Lie algebras, the dynamics of group actions, differential geometry, combinatorial game theory and elementary number theory.

Prof. Philip Broadbridge BSc (Hons), DipEd, PhD

Director of AMSI

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, ANZIAM Journal, Entropy and Lecture Notes of the Australian Mathematical Society.*

Assoc. Prof. Stephen Roberts, BSc (Hons), PhD

Representative of the Full Members to 14 February 2008

Stephen has been Head of the Department of Mathematics at The Australian National University since 2006. His research interests are computational fluid dynamics and numerical algorithms for high dimensional predictive modelling. From 2004–06 he was the national convenor of the Australian Partnership in Advanced Computing Education, Outreach and Training program.

Ms Judith 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.

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

Deputy Director from 14 February 2008

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*.

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 *Queueing Systems*. He is also a member of the INFORMS Applied Probability Awards Committee whose duty is to select, worldwide, the best young researcher and the best publication in alternate years.

Neville Weber BSc (Hons), PhD

Representative of the Full Members from 14 February 2008

Neville is Professor of Mathematical Statistics in the School of Mathematics and Statistics at The University of Sydney. His research interests are U-statistics and exchangeable arrays, asymptotic approximations in statistics and generalized linear models and Poisson regression. He is a member of the Statistics Research Group.

Prof. Anthony Roberts BMathSci (Hons), PhD

Representative of the Associate Members to 14 February 2008

Anthony is Professor of Applied Mathematics at the University of Southern Queensland. He is a member of the Expert Advisory Committee for Mathematics, Information and Communication Sciences, Australian Research Council. Anthony is the world leader in using and further developing a branch of modern dynamical systems theory, in conjunction with new computer algebra algorithms, to derive mathematical models of multiscale complex systems. He is also the Electronic Editor for the *ANZIAM Journal*.

Assoc. Prof. Jim Denier BSc (Hons), PhD

Representative of the Associate Members from 14 February 2008

Jim is Head of the School of Mathematics at The University of Adelaide. His research interest is f uid mechanics. Jim is the Secretary-General for the International Congress of Theoretical and Applied Mechanics, ICTAM2008 and Co-Chair of the COSNet Workshop on The Complex Dynamics of Rotating Fluids.

Board Observers

The Chairs of the three Advisory Committees and Director of MASCOS are also invited by 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 from 1987 to 2006, moving during that year to The University of Melbourne as a Federation Fellow. 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, BSc, PhD

Chair of the Education Advisory Committee

Peter is Executive Director of the Australian Mathematics Trust, Director of its Trustee Company AMTT Ltd and is a Professor of Mathematics and Adjunct Professor of Education at University of Canberra. He is Immediate Past President of the World Federation of National Mathematics Competitions and Vice President of International Mathematics Tournament of Towns.

Dr John Burgess FTSE, BE, ME, PhD, DEng, CPEng, FIChemE, FIEAust

Chair of the Industry Advisory Committee

Principal, Scena Consulting Pty Ltd. Previously Vice President Safety, Environment and Technology, BHP Ltd. John has wide-ranging experience as a senior executive and research leader in industry, in strategy development and functional leadership, as an academic in chemical engineering and as a member of various advisory boards and committees. In 2003 John was awarded a Centenary Medal.

Prof. Tony Guttmann MSc, PhD, FAustMS, FAA, FTSE

Director of MASCOS

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

Board meetings

Dr James E. Lewis	4 of 4
Ms Judith Downes	2 of 4
Prof. Peter G. Taylor	3 of 4
Prof. Phil Broadbridge	4 of 4
Prof. John Hearne (from 15 February 2008)	1 of 3
Assoc. Prof. Grant Cairns (to 15 February 2008)	1 of 2
Assoc. Prof. Jim Denier (from 15 February 2008)	3 of 3
Dr Stephen Roberts (to 15 February 2008)	1 of 2
Prof. Neville Weber (from 15 February 2008)	3 of 3
Prof. Anthony Roberts (to 15 February 2008)	1 of 2

Committee membership

Scientific Advisory Committee

Prof. Peter Hall (The University of Melbourne) (Chair)
Prof. Phil Broadbridge (Director, *ex officio*)
Prof. Frances Kirwan (University of Oxford)
Prof. Terry Speed (University of California, Berkeley; Walter and Eliza Hall Institute)
Prof. Terence Tao (University of California, Los Angeles)
Prof. Neil Trudinger (The Australian National University)
Prof. Ezra Getzler (Northwestern University, Chicago)

Education Advisory Committee

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

Industry Advisory Committee

Dr John Burgess (Chair)
Prof. Bill Appelbe (Victorian Partnership for Advanced Computing)
Dr James E. Lewis (Parkview Group)
Dr Thomas Montague (AMSI and MASCOS)

Executive Committee

Prof. Phil Broadbridge (AMSI Director)
Prof. Garth Gaudry (ICE-EM Director)
Assoc. Prof. Grant Cairns (Deputy Director to 15 February 2008)
Prof. John Hearne (Deputy Director from 15 February 2008)
Ms Jan Thomas (Executive Officer)
Mr Richard Barker (Business Development/Marketing Manager)
Dr Thomas Montague (Industry/Marketing Manager)

Advanced Coursework Committee

Prof. Neil Trudinger (Chair) (The Australian National University)
Prof. Michael Eastwood (The University of Adelaide)
Prof. Garth Gaudry (ICE-EM Director)
Prof. Mark Gould (The University of Queensland)
Dr Markus Hegland (The Australian National University)
Prof. Kathy Horadam (RMIT University)
Prof. Nalini Joshi (The University of Sydney)
Prof. Matt Wand (The University of New South Wales)

ICE-EM International Advisory Committee

Prof. Hung Hsi Wu, University of California, Berkeley
Prof. Jonathan Borwein, Dalhousie University, Canada
Prof. Yongwimon Lenbury, Mahidol University, Thailand

Stakeholders

Members

Full Members and Associate Members are listed on page i. They meet as a group twice a year, normally in February and June or July. In the 2007/08 year, the meetings were:

- 15 February 2008 at The University of Melbourne
- 20 June 2008 at The University of Melbourne

Other stakeholders

AMSI was established 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 had reporting responsibilities to the Victorian Government until 31 July 2007.

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. This project was funded for four years to May 2008.

Following cessation of DEST funding a redefined ICE-EM program will be funded as the educational arm of AMSI by the Department of Education, Employment and Workplace Relations (DEEWR) under the Collaboration and Structural Reform Fund (CASR), commercial-generated income and contributions from Corporate Members.

Stakeholders *continued*

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, 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, was profiled in the Board section on page 31.

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

Director of ICE-EM

Garth, Director of the International Centre of Excellence for Education in Mathematics, 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 inf uential nationally in school mathematics education.

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.

Dr Michael Evans PhD, DipEd

Schools Project Manager, ICE-EM

Before coming to ICE-EM, Michael was Head of Mathematics at Scotch College, Melbourne, and involved with the Victorian Curriculum and Assessment Authority in various capacities. In 1999 he was awarded an honorary Doctor of Laws by Monash University for his contribution to mathematics education, and in 2001 he received the Bernhard Neumann award for contributions to mathematics enrichment in Australia.

Ms Janine McIntosh DipT

Schools Project Officer, ICE-EM

Janine McIntosh is the ICE-EM Schools Project Officer. Her role is to develop primary school mathematics material and to work with teachers to enhance the mathematics experiences of the children they teach. Janine is an experienced primary teacher who has also worked as curriculum writer for the VCAA, in Mathematics Education at The University of Melbourne and is a member of the Maths Challenge committee of the Australian Mathematics Trust.

Financial statements

Financial records are administered by AMSI staff in conjunction with, and using the facilities of, The University of Melbourne. All financial statements are reconciled to the university's integrated system—Themis—to ensure compliance and to verify the unspent AMSI funds held by the university.

During 2007/08 there were notable changes to the AMSI Group's financial circumstances:

- The four-year period of Federal Government (DEST) funding ($7.8 million) for the International Centre of Excellence for Education in Mathematics (ICE-EM) ended in May 2008 with all funds acquitted. ICE-EM will continue to operate as the education arm of AMSI supported by commercially generated funds
- The one-year period of funding ($110,100) provided by the Carrick Institute for Learning and Teaching in Higher Education to carry out a discipline-based initiative project, *Mathematics for 21st Century Engineering Students*, was completed in March 2008 with all funds acquitted
- The Federal Government's Department of Education, Employment and Workplace Relations (DEEWR), through the Equity and Structural Reform Branch, approved a three-year period of funding ($1,986,000) for National Collaboration in the Mathematical Sciences: Integrating Research, Industry and Education

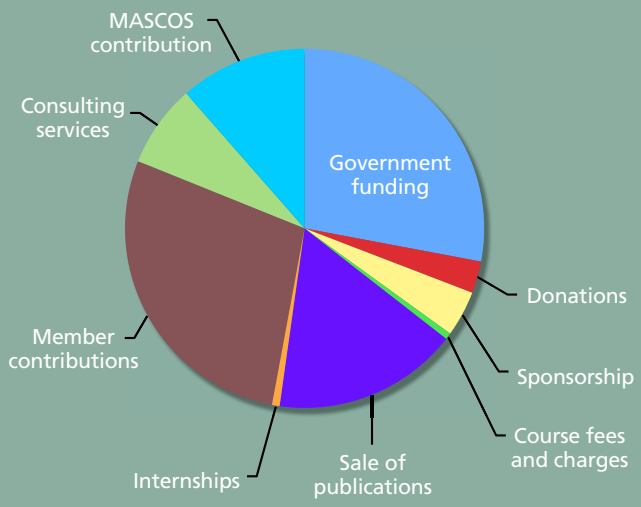
The University of Melbourne undertakes to provide audited financial statements for contractually funded activities but not for the overall AMSI Group. In the absence of such audit statements, the following certification is provided:

We hereby certify that the funds received by the AMSI Group during 2007/08 and the expenditure incurred during that period were in accordance with relevant funding agreements, with the AMSI Joint Venture Agreement, and with approved business plans. The balance of unspent funds as at 30 June 2008 is in agreement with the records of The University of Melbourne.

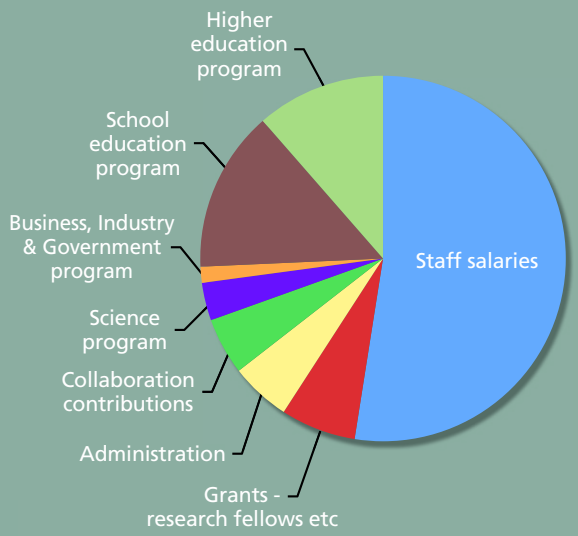
Phil Broadbridge
Director - AMSI

Richard Barker
Business Manager - AMSI

AMSI group income 2007/08



AMSI group expenditure 2007/08



Statement of financial performance

	July 2007 to June 2008		July 2006 to June 2007	
Income	$	$	$	$
Funding				
Dept of Education, Science and Training			1,000,000	
Carrick Institute for Learning and Teaching in Higher Education	110,100			
Equity and Structural Reform Branch (formerly CASR)	500,000			
Donations				
Australian Char Pty Ltd	12,500			
Farrell FamilyFoundation	50,000			
Sponsorship				
BlueScope Steel Limited	75,000			
ICE-Warm – Water Workshop	15,000			
Course fees and charges	12,459		95,793	
Sale of publications	364,089		253,124	
Internships – industry contribution	15,000			
Consortium member contributions	615,000		610,000	
Consulting services	162,348		35,000	
Collaboration partner (MASCOS) contribution	250,000		534,409	
Other income	212		7,191	
Total income		2,181,708		2,535,517
Expenditure				
Personnel				
Salaries, permanent and casual	2,036,655		2,244,626	
Grants – research fellows, top-up scholarships	244,000		53,000	
External salary support	-112,500		-22,746	
		2,168,155		2,274,880
Materials, supplies and services				
Scholarships				
Undergraduate vacation scholarships	16,836		95,200	
Internships	20,000			
Supplies				
Consumable materials	33,780		34,487	
Services				
Contracted, professional services	103,062		199,920	
Internal services – The University of Melbourne	23,434		33,640	
Charges re consultancy by Member institutions	5,615		5,379	
Utilities	12,639		13,799	
Sponsorship				
Workshops, seminars - Member institutions	60,558		141,621	
National Strategic Review	0		32,869	
Careers Forum	0		3,000	
General expenses				
Printing, photocopying, subscriptions 382,614				
less – printing of textbooks in stock 181,642	200,972		377,854	
Freight, cartage	64,045		101,028	
Grants				
Access Grid Rooms – Member institutions	162,485		342,818	
Public relations and promotion				
Domestic advertising & promotion	14,059		17,726	
Entertainment	23,580		33,815	
Collaboration partner contribution				
MASCOS	100,000		100,000	
ACERA	85,000		85,000	
Finance – FBT	4,232		4,983	
Equipment				
Computer software & services	3,976		9,820	
Expenses assets	4,624		6,994	
Travel and conferences				
Travel & accommodation – domestic	135,879		193,940	
Travel & accommodation – international	63,019		55,321	
Conducting/attending seminars, conferences	359,853		559,213	
Living away from home allow.	0		26,381	
		1,497,648		2,474,808
Total expenditure		3,665,803		4,749,688
Net of actual income over expenditure		-1,484,095		-2,214,171

Expenditure by program

Personnel			
Salaries, permanent and casual	2,036,655		
Grants – research fellows, top-up scholarships	244,000		
External salary support	-112,500		
		2,168,155	1,863,449
Administration		195,530	330,665
Collaboration contributions			
MASCOS	100,000		100,000
ACERA	85,000		85,000
		185,000	
Programs			
Science			
Sponsorship of workshops, conferences, seminars; guest lecturers and visiting fellows	122,516		239,211
Business, industry and government			
Intern program, focused workshops, costs re consulting projects	52,049		0
Education			
Schools – teacher PD, promotion of careers, schools materials for students and teachers	373,472		1,072,316
Higher education – summer school, graduate theme program, AGRs, vacation scholars	550,867		1,059,047
Carrick project expenses - Mathematics for 21st Century Engineering Students	18,214		0
		1,117,118	2,434,065
		3,665,803	4,749,688

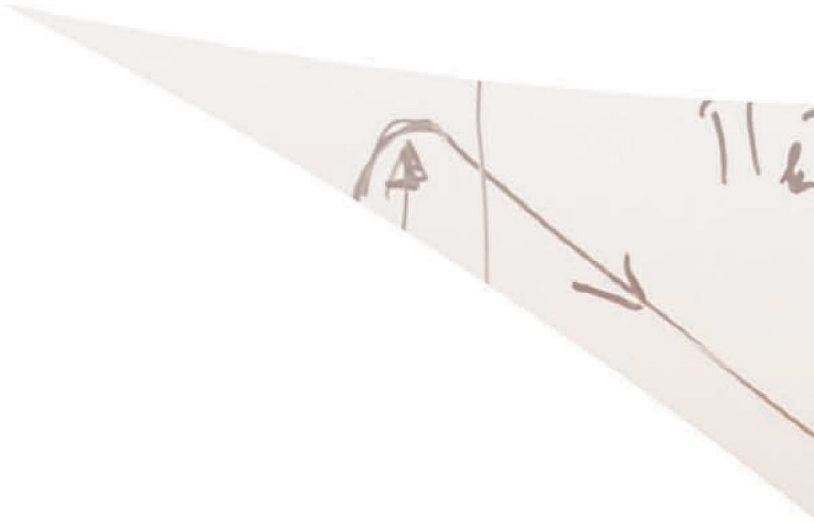
Australian Mathematical Sciences Institute Statement of financial position

	30 June 2008		30 June 2007	
	$	$	$	$
Assets				
Funds on hand				
AMSI, including AMSI–MASCOS	563,481		1,293,492	
Project 80005 - National Collaboration in the Mathematical Sciences: integrating research, industry and education. Funded by DEEWR through the Equity and Structural Reform Branch	320,012		0	
International Centre of Excellence for Education in Mathematics (ICE-EM)	118,119		1,373,855	
		1,001,612		2,667,347
Stock on hand				
ICE-EM Mathematics textbooks	181,642			
		181,642		0
		1,183,254		2,667,347
Equity				
Retained funds brought forward				
AMSI, including AMSI–MASCOS	1,293,492		1,658,393	
International Centre of Excellence for Education in Mathematics (ICE-EM)	1,373,855		3,223,126	
		2,667,347		4,881,519
Net of actual income over expenditure 2007/08				
AMSI, including AMSI–MASCOS	-730,011		-364,901	
Project 80005 - National Collaboration in the Mathematical Sciences: integrating research, industry and education. Funded by DEEWR through the Equity and Structural Reform Branch	320,012		0	
International Centre of Excellence for Education in Mathematics (ICE-EM)	-1,074,094		-1,849,271	
		-1,484,093		-2,214,172
		1,183,254		2,667,347

Acronyms

AAAS	American Association for the Advancement of Science
AAM	Australian Association of Mathematics Teachers
AARMS	Atlantic Association for Research in the Mathematical Sciences
ACERA	Australian Centre of Excellence for Risk Analysis
ACHMS	Australian Council of Heads of Mathematical Sciences
AGR	Access Grid Room
AMSI	Australian Mathematical Sciences Institute
AMT	Australian Mathematics Trust
ARC	Australian Research Council
ASME	American Society Of Mechanical Engineers
ASOR	Australian Society for Operations Research
AustMS	Australian Mathematical Society
AWM	Association for Women in Mathematics
CASR	Collaboration and Structural Reform Fund
CIAO	Centre for Informatics and Applied Optomisation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTAC	Computational Techniques and Applications Conference
DEST	Department of Education, Science and Training
DEEWR	Department of Education, Employment and Workplace Relations
GIMMIC	Graduate Industrial Mathematical Modelling Camp, held by PIMS
ICE-EM	International Centre of Excellence for Education in Mathematics
IPSW	Industrial Problem Solving Workshop, held by PIMS
JVA	Joint Venture Agreement
MASCOS	ARC Centre of Excellence for Mathematics and Statistics of Complex Systems
MDPI	Molecular Diversity Preservation International, Zurich
MERGA	Mathematics Education Research Group of Australasia
MITACS	Mathematics of Information Technology and Complex Systems: a Network of Centres of Excellence for the Mathematical Sciences
NCE	a Canadian Network of Centres of Excellence
PIMS	Pacific Institute for Mathematical Sciences
PRIMA	Pacific Rim Mathematical Association
QUT	Queensland University of Technology
SIAM	Society for Industrial and Applied Mathematics
TTGTT	TTG Transportation Technology
VFMC	Victorian Funds Management Corporation

Cover and layout designed by Michael Shaw



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