Annual Report 2012 – 2013

AMSI

AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

Contents

Membership

FULL MEMBERS

Australian National University
La Trobe University
Monash University
RMIT University
The University of Melbourne
The University of Queensland
University of Adelaide
University of New South Wales
University of Newcastle
University of Sydney
University of Western Australia

ASSOCIATE MEMBERS

Universities

Charles Sturt University
Curtin University of Technology
Deakin University
Federation University
Flinders University
Griffith University
James Cook University
Macquarie University
Queensland University of Technology
Swinburne University of Technology
University of Canberra
University of New England
University of South Australia
University of Southern Queensland
University of Tasmania
University of Technology, Sydney
University of Western Sydney
University of Wollongong
Victoria University

Societies and government agencies

Australian and New Zealand Industrial and Applied Mathematics (ANZIAM)
Australian Bureau of Statistics
Australian Mathematical Society (AustMS)
Australian Mathematics Trust
Bureau of Meteorology
CSIRO
Defence Science and Technology Organisation (DSTO)

Introduction

AMSI is the Australian Mathematical Sciences Institute—a national collaborative venture of Australia's universities, professional societies and government agencies. Since its establishment in 2002, AMSI has become an important central voice for the mathematical sciences in Australia, providing an effective and efficient way of delivering mathematical and statistical capability to research, education and industry. AMSI conducts a wide range of activities including scientific workshops, distinguished visiting lectureships, short courses, industry liaison and professional development for school teachers.

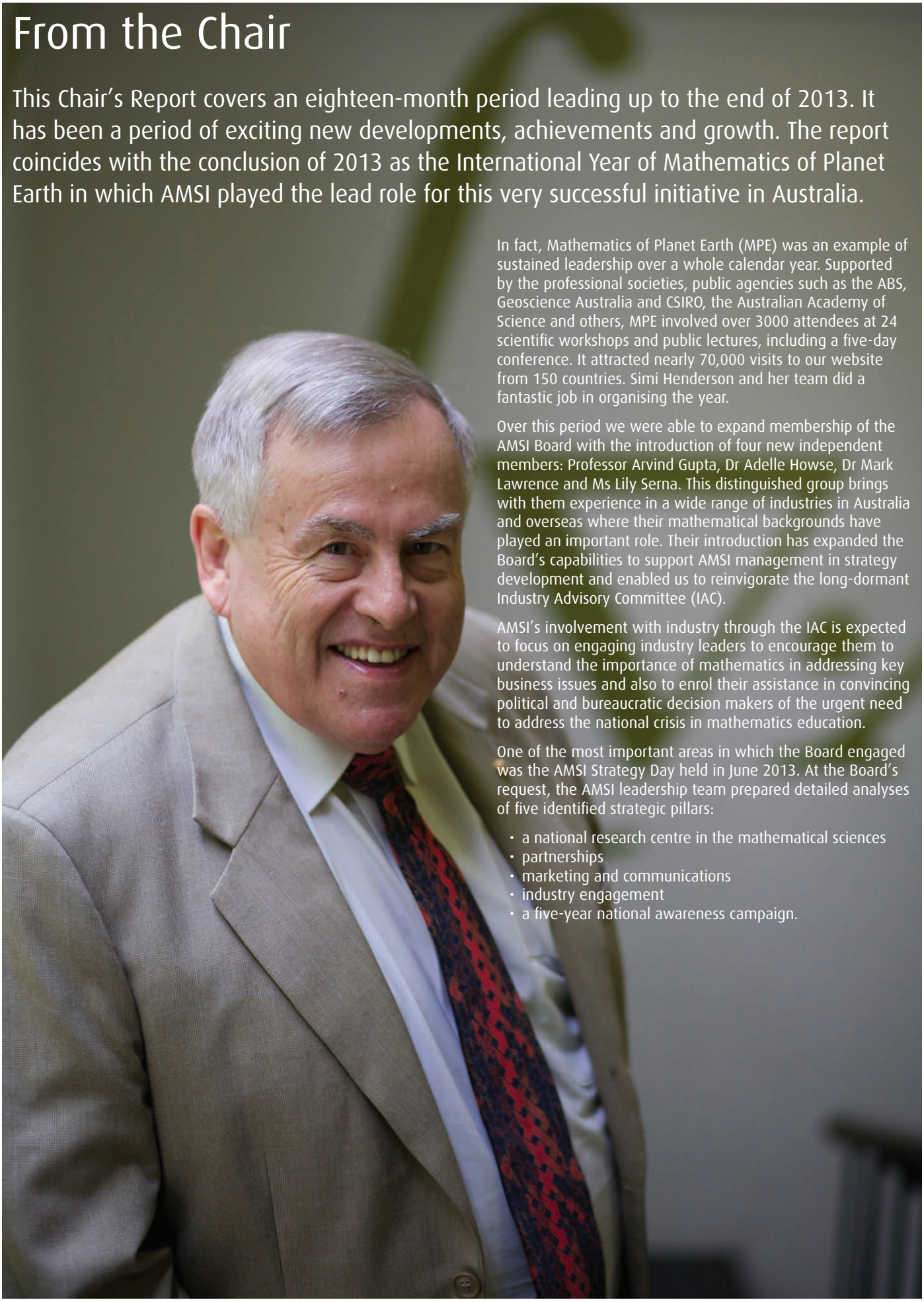
Mission statement

AMSI's mission is the radical improvement of mathematical sciences capacity and capability in the Australian community through:

- The support of high quality mathematics education for all young Australians.
- Improving the supply of mathematically well-prepared students entering tertiary education by direct involvement with schools.
- The support of mathematical sciences research and its applications including cross-disciplinary areas and public and private sectors.
- The enhancement of the undergraduate and postgraduate experience of students in the mathematical sciences and related disciplines.

From the Chair

This Chair's Report covers an eighteen-month period leading up to the end of 2013. It has been a period of exciting new developments, achievements and growth. The report coincides with the conclusion of 2013 as the International Year of Mathematics of Planet Earth in which AMSI played the lead role for this very successful initiative in Australia.



In fact, Mathematics of Planet Earth (MPE) was an example of sustained leadership over a whole calendar year. Supported by the professional societies, public agencies such as the ABS, Geoscience Australia and CSIRO, the Australian Academy of Science and others, MPE involved over 3000 attendees at 24 scientific workshops and public lectures, including a five-day conference. It attracted nearly 70,000 visits to our website from 150 countries. Simi Henderson and her team did a fantastic job in organising the year.

Over this period we were able to expand membership of the AMSI Board with the introduction of four new independent members: Professor Arvind Gupta, Dr Adelle Howse, Dr Mark Lawrence and Ms Lily Serna. This distinguished group brings with them experience in a wide range of industries in Australia and overseas where their mathematical backgrounds have played an important role. Their introduction has expanded the Board's capabilities to support AMSI management in strategy development and enabled us to reinvigorate the long-dormant Industry Advisory Committee (IAC).

AMSI's involvement with industry through the IAC is expected to focus on engaging industry leaders to encourage them to understand the importance of mathematics in addressing key business issues and also to enrol their assistance in convincing political and bureaucratic decision makers of the urgent need to address the national crisis in mathematics education.

One of the most important areas in which the Board engaged was the AMSI Strategy Day held in June 2013. At the Board's request, the AMSI leadership team prepared detailed analyses of five identified strategic pillars:

- a national research centre in the mathematical sciences
- partnerships
- marketing and communications
- industry engagement
- a five-year national awareness campaign.

Their analyses addressed such factors as the background, the evidence base, key challenges, options and key issues on which Board advice was required. These analyses were of high quality and enabled the Board to grapple the strategic questions around AMSI's Mission.

Like all organisations, AMSI has been fortunate to have passionate champions associated with its many successes. Two of them were honoured during the year, and sadly one of them passed away.

AMSI stalwart Jan Thomas was awarded a richly deserved Medal of the Order of Australia in April of 2013. She was awarded the OAM "for service to the mathematical sciences". No one who knows Jan could be in any doubt as to the importance of her contributions to AMSI and to Australian mathematics. Her belief that access to a good mathematics education, together with good communication skills, is fundamental to an equitable and socially just society is part of AMSI's DNA.

Michael Evans came to AMSI after a long reign as Head of Mathematics at Scotch College. He spearheaded AMSI's Schools Education program along with Janine McIntosh. Michael retired from AMSI in 2013 and was awarded AMSI's Distinguished Service Medal at a memorable retirement dinner. Michael's legacy includes the high-quality textbooks produced under the ICE-EM program (with Garth Gaudry, Janine McIntosh and a team of co-authors) and a collection of online teacher and student resources to support the Australian Curriculum.

I must also record, with great sadness, the passing of Professor Garth Gaudry. Garth played a pivotal role in the formation of AMSI. He subsequently became the Institute's first director. Garth gained political support for AMSI, especially through Dr Brendan Nelson, then Minister for Science and Education. This established one of AMSI's most important roles in advocacy and policy development.

In 2003 AMSI was awarded a major grant to establish an International Centre of Excellence for Education in Mathematics (ICE-EM) and Garth became its director. ICE-EM funded many higher-education activities and the establishment of a number of Access Grid Rooms. It also led to major initiatives in school education including the development of quality textbooks. Garth worked tirelessly as Director of ICE-EM until ill health forced his retirement in 2008.

In concluding, I would like to record the Board's unstinting appreciation of the vigour and passion of the leadership of our Director, Professor Geoff Prince, and the outstanding people who make up the AMSI team.

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Dr Ron Sandland AM FTSE

CHAIR

Director's report

This annual report covers the period from July 2012 to December 2013, so there is understandably a lot to present in review. Increased outreach and advocacy along with successful program delivery are the consistent themes. AMSI's brand continues to grow in influence and stature, significantly aided by our leadership of the International Year of Mathematics of Planet Earth 2013 in Australia. No other Australian organisation could have mounted such an ambitious research and outreach program, built on a partnership of 19 societies, agencies, centres and universities and with the Chief Scientist, Professor Ian Chubb AC, as patron. AMSI's members enthusiastically participated and it was a pleasure to have been part of such a significant and extended international event.

2013 was also a significant year for the Australian statistics community. It was the International Year of Statistics, with activities in Australia led by the Australian Bureau of Statistics and the Statistical Society of Australia in partnership with AMSI and the Mathematics of Planet Earth consortium. Professor Terry Speed, a long-time member of AMSI's Scientific Advisory Committee and organiser of BioInfoSummer, was awarded the Prime Minister's Prize for Science in October 2013. And Professor John Croucher of Macquarie University was awarded the Prime Minister's Prize as University Teacher of the Year in November 2013.

This eighteen-month period has seen a growth in other AMSI partnerships. The Defence Science and Technology Organisation (DSTO) and Griffith University have joined AMSI, and the University of Newcastle has become a full member and signatory to the AMSI joint venture agreement. AMSI has also been working closely with the Business / Higher Education Round Table (B-HERT) on the AMSI Intern program, and we have signed a memorandum of understanding with the Mathematical Sciences Institute (MSI) at ANU to extend the reach of MSI's program of special years. AMSI's Schools program has grown through partnerships with Boeing, the William Buckland Foundation, the Regional Universities Network, and the Commonwealth and Victorian governments.

Policy development and advocacy for the mathematical sciences continues to play a principal role in the pursuit of our mission. AMSI's annual *Discipline Profile of the Mathematical Sciences* and accompanying policy brief are frequently cited by government, stakeholders, analysts and the media. Our extensive collection of submissions to public agencies and parliamentary inquiries available through our website, along with many third-party resources, has made AMSI the first point of contact for Australia's media in reporting on issues in school mathematics, such as the 2013 PISA results.

In 2013 I served on the Working Group for the Australian Council of Learned Academies' study *STEM: Country Comparisons.* This project was part of the 'Securing Australia's Future' program undertaken by the Prime Minister's Science, Engineering and Innovation Council through the Office of the Chief Scientist. The report has been influential and it highlights the significant 'out of field' teaching problem in mathematics in Australia. Only around 60 per cent of secondary school mathematics classes are taught by trained maths teachers—the international average being nearly 90 per cent. AMSI has been pursuing this matter with state and federal governments, and we regard it as one of the most important issues facing the discipline and its strategic contribution to Australia's science, economy and intellectual life.

During this reporting period we have successfully delivered on significant contracted programs to government. These include:

- preparation of teacher and student support material for the Australian Curriculum through Education Services Australia
- organisation of AMSI's annual research and higher education flagship events—the Summer and Winter Schools, BioInfoSummer and the Vacation Research scholarships—through our grant with the Commonwealth
- completion of our contracted placement of PhD interns with small to medium enterprises through the Commonwealth's Researcher in Business program.

You will find details of these programs throughout this annual report.

AMSI's PhD intern program continues to attract favourable attention from stakeholders and industry groupings with growing demand and significant return business. We were particularly pleased to have Professor Arvind Gupta, President of Canada's Mitacs and an AMSI Board member, here for our Accelerate Australia event in Canberra in February 2013. The success of Mitacs' own intern program—with over 2000 placements annually—sets an international benchmark which is not lost on Australia's policy makers. With the support of peak industry bodies, the Business / Higher Education Round Table and the Chief Scientist, we continue to pursue opportunities at all levels to grow the scale, and hence the impact, of the AMSI Intern program.

As we head into 2014 there are key items on our agenda. The formation of a philanthropic trust to support AMSI's work in outreach, in school and university education and in research is of critical strategic and financial importance. The establishment of a national, distributed research centre in the mathematical sciences servicing universities, agencies and industry will be led by AMSI and will be a collaboration of the many active players. A network of our research-agency members, along with Geoscience Australia and our university members, is being formed to expose the work of agency mathematical scientists to undergraduate and postgraduate students. And, of course, a close working relationship with the new government will be crucial.

This eighteen-month period has seen a growth in other AMSI partnerships.

It is my pleasure to introduce the new senior staff who joined us in 2012–2013. Ms Mari Ericksen is our Marketing and Communications Manager, and she has already had a major impact on our outreach. Mr Michael O'Connor has joined the schools team as Schools Outreach Manager. Michael travels widely delivering professional development to primary and secondary school teachers and writing online and classroom materials. I am also pleased that AMSI's own Dr Michael Evans, who retired in 2013, is continuing with us as a senior consultant. Michael is one of Australia's most eminent mathematics educators, and his retirement was marked with the award of an AMSI Distinguished Service Medal.

The AMSI management and staff also welcome the Board members who joined us in the reporting period, especially new external members Professor Arvind Gupta, Dr Adelle Howse, Dr Mark Lawrence and Ms Lily Serna. The restructured Board has brought fresh approaches to the delivery of AMSI's mission under Dr Ron Sandland's leadership. AMSI's governance and management is also considerably enhanced by its advisory committees: the Scientific Advisory Committee chaired by Professor Jon Borwein, the Education Advisory Committee chaired by Dr Bob Anderssen, the Research and Higher Education Committee chaired by Professor Mark Gould and the Industry Advisory Committee chaired by Dr Adelle Howse.

I also add to Ron Sandland's my public congratulations to Ms Jan Thomas on her Order of Australia medal. Jan continues with AMSI in an honorary role and we continue to benefit from her astute advice. I also join with Ron in marking the passing of our founding director, Professor Garth Gaudry. Garth was a remarkable individual and it was a privilege to serve as his deputy.

Finally, I want to acknowledge the energy, inspiration and commitment of AMSI's staff. Our program managers, Janine McIntosh, Simi Henderson and Cate Ballard, are the driving forces behind AMSI's success and the support from our Business Manager, Rod Birch, Marketing and Communications Manager, Mari Ericksen and Multimedia Manager, Michael Shaw is indispensable. Michael O'Connor, Joanna Wilson, Kally Yuen, Lauren Draper, Stéphanie Pradier, Maaike Wienk, Uyen Freeman, Edwena Dixon and Daphane Ng all work tirelessly for the Institute, and who knows where we would be without Anne Nuguid.

Professor Geoff Prince

DIRECTOR

Vale Garth Gaudry

It is with deep sadness that all at AMSI mourn the passing of Emeritus Professor Garth Gaudry on 18 October 2012. Garth played a pivotal role in the formation of AMSI, and served as its inaugural director. AMSI itself stands as a tribute to Garth's hard work and foresight. The mathematical sciences owe him a great debt.

Academic strove to lift maths' profile

By Jan Thomas

Published in *The Age (Fairfax Media)*, 30 October 2012.

Garth Ian Gaudry, Mathematician, 16-5-41 – 18-10-12

Emeritus Professor Garth Gaudry, a champion for the mathematical sciences, has died in Sydney after a long illness.

The son of a Queensland primary teacher, he completed his secondary education at Mackay High School, a degree in mathematics at The University of Queensland and a PhD at the Australian National University. His PhD supervisor was Robert Edwards and they later wrote an influential book on harmonic analysis together. The PhD was followed by post-doctoral studies in Paris and England and time at Yale University as a Gibbs instructor, a prestigious appointment for young academics.

In 1971 Gaudry returned to ANU and, in 1972, was appointed professor of mathematics at the newly established Flinders University. He led the Flinders mathematics department until 1992. Fluent in French and Italian, he and his collaborator Alessandro Figa Talamanca established many years of collaboration between the mathematicians of Italy and Australia.

One of the highlights of his time at Flinders was a special student named Terry Tao.

Tao came to him at the age of 12 and, with Gaudry's guidance, entered Princeton University at the age of 17. In 2006 Tao was awarded the Fields medal, considered the Nobel Prize in mathematics. Seeing Tao presented with the Fields medal at the International Congress of Mathematicians in Madrid was undoubtedly a highlight of Gaudry's life.

In 1993 Gaudry moved to the University of New South Wales where he became head of school. His research interests at this time were aligned with Swedish mathematicians, and the University of Gothenburg in Sweden awarded him an honorary doctorate in 1994.

Gaudry had appreciated his excellent teachers in rural Queensland. They enabled him to gain a scholarship to The University of Queensland and to undertake further study within Australia. He became a leader among a group of Australian mathematicians who view with dismay the lack of similar opportunity for an excellent mathematics education, especially in remote and lower socioeconomic schools, for today's young people. They have become active in promoting quality mathematics education across Australia.

Gaudry's involvement in raising the public profile of mathematics and mathematics education began while he was at Flinders. From 1986 to 1990 he was the vice-president and then president of the Australian Mathematical Society (AustMS). He took a leading role in the creation of the Australian Mathematical Sciences Council (AMSC), an umbrella group for the mathematical sciences on the board of the Federation of Australian Scientific and Technological Societies (FASTS). He was the council's first president and, in collaboration with FASTS' executive director, the late David Widdup, achieved considerable prominence for mathematical sciences in the media and political circles.

In 2002 a message went to all heads of mathematics and statistics departments in the universities that there was an opportunity to obtain funding through a Victorian government initiative to establish a mathematical sciences institute at The University of Melbourne. Gaudry immediately saw the benefit to the broader mathematical community and committed the UNSW to full membership. Others followed, the funding proposal was successful, and the Australian Mathematical Sciences Institute came into being. Gaudry then moved to Melbourne in 2003 when he became the institute's inaugural director, a role in which he was instrumental in solidifying what has become a major asset to the mathematical community.

Dr Brendan Nelson, minister for education and science at the time, took a keen interest in AMSI. He found funding within his department's budget for the first summer school, and honours students from around the country were able to attend four weeks of stimulating courses and peer interaction at The University of Melbourne. AMSI will hold its 11th summer school in January.

In 2003 AMSI was awarded a major grant to establish an International Centre of Excellence for Education in Mathematics (ICE-EM). Gaudry chose to relinquish the AMSI director position to become the ICE-EM director. ICE-EM funded many higher-education activities, including the establishment of a network of access grid rooms. These enable someone in Townsville to participate in a lecture given in Perth.

The grant also led to major initiatives in school education. Gaudry arranged several meetings with mathematics teachers and asked them what would assist them most. It was a seminal moment when one of them said: "The textbooks we use are awful." And so the ICE-EM school mathematics materials, consisting of books and support materials, came into being. He worked tirelessly to see this project come to fruition until ill health forced his retirement in 2008.

After he left Melbourne, Gaudry was made an honorary life member of the AustMS, and in June he was presented with an AMSI medal for distinguished service.

He pursued many interests other than mathematics. These included music, the theatre, wine and windsurfing. In later years he became involved in outback travel, birds and photography. He took a keen interest in the work of Australian Wildlife Conservancy.

Friends and colleagues who enjoyed his company and counsel over many years, especially while sharing an excellent red wine, will miss him. His wife Patricia and children Kerry, Rebecca and Peter survive him.

Australia Day honours

Jan Thomas was awarded the Medal of the Order of Australia on 26 January 2013 for service to the mathematical sciences.

Jan has served as President of the Australian Mathematical Sciences Council (AMSC), as Vice-President of the Federation of Australian Scientific and Technological Societies (FASTS, now Science and Technology Australia), and as an Executive Officer of AustMS. Jan was instrumental in the establishment of AMSI. In 2001—with encouragement from Professor Lynn Batten, who was familiar with Canadian mathematical institutes—she saw an opportunity to set up a national centre for the mathematical sciences with a grant from the Victorian Government. In collaboration with Tony Guttmann, Jan co-wrote the successful grant application for $1 million and coordinated the support of AMSI's foundation members.

As the Executive Officer for AMSI until her retirement in 2011, Jan has been deeply involved in almost all aspects of AMSI's activities. Her comprehensive knowledge of the mathematics education landscape, her contributions to reviews and submissions, and her active pursuit of positive change through knowledge of the political landscape has been an asset to the national profile of Australian mathematics. The award of the OAM is well-deserved recognition of Jan's contribution as an advocate for the mathematical sciences.

Professor Simon Levin

Mathematics of Planet Earth

Under the patronage of UNESCO, the International Year of Mathematics of Planet Earth (MPE 2013) brought together over 140 scientific societies, universities and foundations around the world—to promote understanding of the challenges facing our planet and the essential role that mathematics and statistics play in addressing these challenges.

AMSI—supported by 18 partner organisations—led the effort to bring MPE 2013 to Australia, with a major conference, a dedicated website and a variety of activities to engage a wide audience.

Message from the Patron

Our planet faces many challenges with many more yet to come.

Australia's mathematicians and statisticians are playing an integral role in identifying and solving these issues.

Whether it is addressing changes in our environment, minimising health risks for our population, securing adequate, nutritious food supplies, or building and powering infrastructure for this generation and the next, you will always find science and mathematics at the core of the solution.

We must all keep working towards increased literacy around mathematical sciences and the branches of chemistry, physics or biology which use them.

In 2013, we recognised, supported and celebrated our mathematicians and statisticians.

Prof. Ian Chubb AC
Chief Scientist of Australia
Patron, Mathematics of Planet Earth

"Most of the great innovations that have changed the way people live over the past two centuries were enabled by mathematics."

Prof. Ian Chubb AC

Scientific events

AMSI sponsored a comprehensive program of research workshops, conferences and vacation schools. (See the Research and Higher Education section of this report.)

MPE 2013: The conference

The major conference of MPE 2013 was held on 8–12 July at Rydges Hotel, Melbourne. This unique cross-disciplinary conference brought together over 100 delegates from universities, government and industry to discuss the application of mathematics and statistics to global problems. Topics included natural disaster risk, climate modelling and data mining.

Limits to growth: Beyond the point of inflexion

The closing event of MPE 2013 was a symposium on the future of economic growth, hosted by UNSW on 11–12 December 2013. An impressive line-up of keynote speakers included co-author of the notable 1972 book *Limits to Growth*, Professor Jørgen Randers (BI Norwegian Business School). A wide public audience participated in a Q&A session hosted by the ABC's Ticky Fullerton.

"The public, those learning mathematics in schools and universities and those making public policy must be made aware that mathematical scientists are pivotal to innovation."

From the Communiqué by the participants of the MPE 2013 conference

Public outreach

A key focus of MPE 2013 was raising public awareness of the critical importance of mathematics and statistics to society. The theme year provided a platform for engaging Australians with mathematics, providing compelling answers to that perennial question: "What is mathematics good for?"

On the web

The MPE Australia website received nearly 70,000 visits over the year. The site featured a regular blog on which around 100 contributors explained the mathematics and statistics behind their research, with topics as wide ranging as:

- the development of the bionic eye, where optimisation techniques are used to model electrode stimulation in the brain
- predicting the spread of bushfires, where elliptic frontlets (circular patterns) can be used for more accurate warning systems
- how statistics could be key to the development of a cure for cancer.

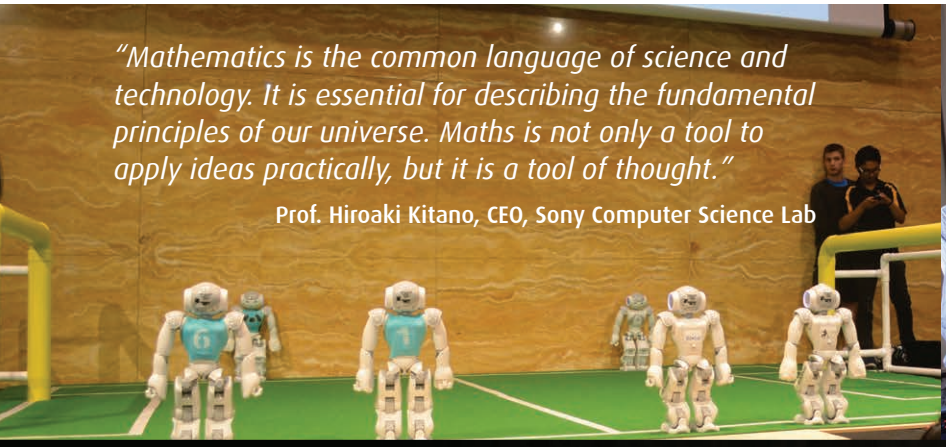
The blog included video interviews with some of the high-profile international experts brought to Australia for MPE's scientific events, and also 57 "coffees" with people from all walks of life (a software engineer, a jewellery designer, a political commentator, ...) talking about what mathematics means to them.

Out and about

AMSI sponsored a series of public lectures around Australia by eminent international and national researchers. The lectures showcased the importance of the mathematical sciences in areas including cancer research, satellite imagery, designing marine sanctuaries and limiting the impact of tsunamis.

Public debate was sparked by several vibrant panel discussions, such as "Can maths save the planet?" at UNSW in Sydney.

MPE Australia attracted national media coverage by *The Australian*, *The Age*, *The Herald Sun* and *ABC Radio*.



"Mathematics is the common language of science and technology. It is essential for describing the fundamental principles of our universe. Maths is not only a tool to apply ideas practically, but it is a tool of thought."

Prof. Hiroaki Kitano, CEO, Sony Computer Science Lab

MPE launch: A red-carpet event for maths and stats

MPE Australia was launched at The University of Melbourne on 29 January by Professor Ian Chubb AC, Chief Scientist of Australia. This was followed by the first in the international series of MPE public lectures sponsored by the Simons Foundation. Professor Simon Levin (Princeton) spoke to a packed lecture hall on *The challenges of sustainability and the promise of mathematics*.

MPE ambassador: From sport to sustainability

Professor Hiroaki Kitano served as an ambassador for MPE Australia. While he is most famous for founding the Robot Soccer World Cup, he is also CEO of Sony Computer Science Lab and President of the Systems Biology Institute Tokyo. Professor Kitano gave public lectures in Melbourne and Sydney on how open energy systems increase the reach and reliability of renewable energy.

Everyone's a winner

Six puzzle challenges throughout the year encouraged people to give their brains a workout over morning coffee and four photography competitions inspired people to get creative in finding and capturing the mathematics in the world around them.

Probability and chance

"The game of softball is nothing but a game of probability and chance."

Is she safe? Elizabeth Romine

Climbing frame geometry. Brooklyn Scott

Geometry

"I chose this photo because it has so many interesting geometrical shapes, lines and angles in it."

Mathematical concepts

"These peacock feathers are a stunning example of fractal geometry in nature."

Peacock fractal geometry. Elizabeth Young

School activities

The MPE theme provided a great opportunity to ignite students' enthusiasm for mathematics. Over 2400 students used AMSI's online classroom resources produced especially for MPE to illustrate the breadth of applications of mathematics. Over 1000 students participated in the MPE celebration for International Pi Day (14 March) held at the Australian Museum and broadcast nationally via videoconferencing. Students in Years 6–9 enjoyed mathematical comedy from host Simon Pampena, hands-on activities, a pi memorisation contest and pies!

What a year!

67,375 visits to our website from 150 countries

3235 people attended events around Australia

24 scientific workshops & public lecture including a 5 day conference with 20 keynote speakers

2400 students have enjoyed our classroom resources

150 photography competition entries received

2731 people receive our MPE Australia newsletter

57 "Coffees With" ordinary people talking about maths

2290 people have joined us on social media

www.mope.org.au

Thank you to our MPE partners!

AMSI Australian Mathematical Sciences Institute

CSIRO

Maths + Stats by Email

Australian Bureau of Statistics

Australian Research Council Centre of Excellence for Mathematics and Statistics of Complex Systems

Australian museum nature culture discover

aamt

IMAS Institute for Marine and Antarctic Studies | UTAS

SSAI Statistical Society of Australia Inc.

Aust MS Australian Mathematical Society

ANZIAM

The Science of Everything COSMOS www.cosmosmagazine.com

CARMA

Australian Academy of Science

Australian Government Geoscience Australia

ARC Centre of Excellence for Climate System Science

Australian Government Bureau of Meteorology

acara Australian Curriculum, Assessment and Reporting Authority

AMSI continues to be a strong public voice for the mathematical sciences. We engage with government and stakeholder groups and are routinely invited to provide submissions and policy advice. Our annual discipline profile and policy documents are influential and widely quoted.

Membership of Science and Technology Australia

In August 2012, AMSI became a member of Science and Technology Australia—formerly the Federation of Australian Scientific and Technological Societies (FASTS)—an organisation with a strong track record in support for science and effective engagement with government. This collaboration will benefit both sides and help AMSI to extend its role as an advocate for mathematics and statistics. Through our membership of STA, we participated in *Science meets Parliament* in September 2012.

Advocacy and Outreach

"Perhaps the chief worry is that one-third of our secondary school classes in maths are taught by teachers untrained or undertrained in the discipline. Many senior science teachers are untrained or teaching the wrong science. Here Australia is unusual."

Prof. Simon Marginson, University of London / The University of Melbourne, lead author of 'STEM: Country Comparisons'

International comparison of STEM strategies

In May 2013, the Australian Council of Learned Academies (ACOLA) published the report *STEM: Country Comparisons*, which compares science, technology, engineering and mathematics (STEM) education on an international level. AMSI's director, Prof. Geoff Prince, served on the Expert Working Group for the project, which was driven by the need to increase Australia's productivity and international competitiveness. The report found that Australia is suffering a serious capacity gap in schools, with teacher shortages—most acute in regional Australia—and a major problem of 'out of field' teachers, particularly in mathematics.

Maximising our investment in schools

AMSI made a detailed submission to the Senate inquiry 'Teaching and learning—maximising our investment in Australian schools'. The submission gave recommendations for addressing two related problems: the shortage of qualified secondary school mathematics teachers and the declining enrolments in higher-level mathematics subjects at Year 12.

Decadal plan for the mathematical sciences

The Australian Academy of Science is working closely with AMSI and other discipline societies in the development of the *Decadal Plan for the Mathematical Sciences* (2015–2025). AMSI's director, Professor Geoff Prince, is a member of the Decadal Plan executive along with Professor Peter Hall (Chair) and Professor Nalini Joshi (NCMS).

AMSI management made submissions to six of the subcommittees for the decadal plan. At the top of AMSI's agenda for the future of the discipline are a national research centre and a five-year public awareness campaign. Planning for the national research centre is currently underway under the auspices of our Research and Higher Education Committee.

AMSI's first member survey

AMSI has conducted its first comprehensive survey of its university members, who provided data on staffing, teaching and student numbers. This data, which contributed to AMSI's 2013 discipline profile, shows broadly that the number of combined teaching-and-research positions in Australian universities continues to be at a low ebb while the number of fixed-term research-only positions has grown strongly.

Census of the Australian mathematical sciences

The second edition of the *Discipline Profile of the Mathematical Sciences*, first published by AMSI in February 2012, was released in March 2013 and accompanied by a set of proposed policy measures to address the challenges apparent from the profile data.

The discipline profiles record the state of the mathematical sciences in Australia, highlighting trends in school education, higher education, research and research training, and career prospects for graduates. The data in the 2013 profile reveals that:

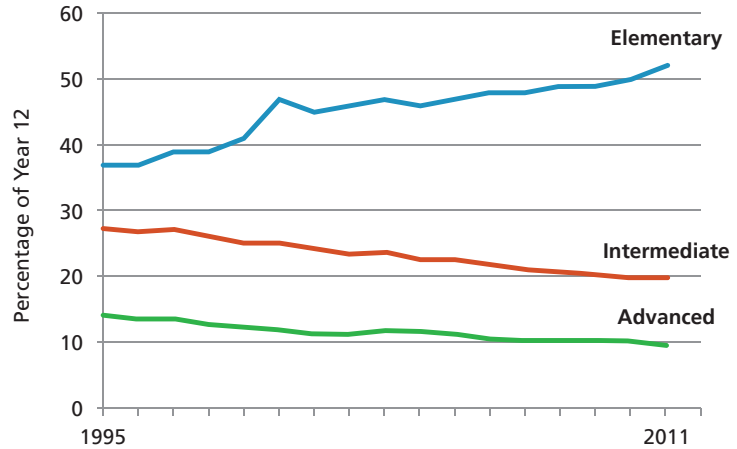
- The demand for mathematical and statistical skills at all levels far outstrips supply.
- The proportion of Year 12 students studying advanced mathematics continues to decline.
- Qualified mathematics teachers are still in short supply in Australia's schools, particularly in regional and low-SES areas.
- Domestic enrolments in higher degrees are languishing, while demand for graduates remains strong.

The challenges

The declining interest in advanced mathematics subjects is a particular challenge for securing Australia's future skills base. While the proportion of Australian Year 12 students studying mathematics has remained at about 80 per cent, the proportion studying intermediate and advanced mathematics has been steadily declining over the past 17 years. In 2011, the proportion of Year 12 students studying advanced mathematics dropped below 10 per cent for the first time since AMSI began monitoring student numbers.

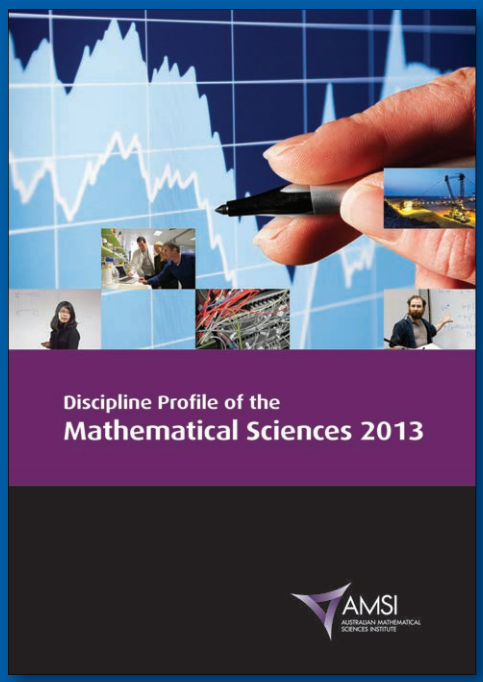
The knock-on effect of this decline is a reduced intake of mathematically qualified graduates into teacher training programs, increased pressure on universities to accommodate mathematically underprepared students, and stagnating interest in science and engineering courses despite high demand for graduates.

Australian Year 12 students: Participation in mathematics



Note: Elementary enrolments estimated.

Source: Frank Barrington, Year 12 Mathematics Participation Rates in Australia, AMSI data collection.



Australian Council of Heads of Mathematical Sciences

The Australian Council of Heads of Mathematical Sciences (ACHMS) is administered through AMSI as a service to the broader mathematical community, and includes representatives from professional societies and other groups outside of the AMSI membership.

ACHMS had its origins in the annual Heads of Mathematical Sciences Departments meeting and has since expanded to provide a broader base for input to policy and discussion on matters of concern to the mathematics and statistics community.

The ACHMS meeting for 2013 was chaired by Professor Neville Weber of the University of Sydney, and held in Melbourne on 29 January. This meeting included a discussion of Excellence in Research for Australia (ERA) led by Professor Peter Taylor, and an overview of the Decadal Plan for the Mathematical Sciences by Professor Peter Hall. Presentations were delivered by Dr Michael Evans on the national senior mathematics curriculum, by Associate Professor Cristina Varsavsky on service teaching, and by Mr Michael Phillips on the International Year of Statistics.

At this meeting, Professor Joseph Grotowski was elected the new ACHMS Chair and Professor Bruce Henry was elected the Deputy Chair, both for two-year terms.

The short supply of qualified mathematics teachers leads to the major problem of mathematics being taught 'out of field' by teachers who are unqualified or underqualified in mathematics. In 2008, the proportion of Year 7–10 mathematics teachers with at most one year of tertiary maths/stats was 36 per cent. In 2010, this had risen to almost 39 per cent. For Years 11–12, the proportion stayed around 20 per cent from 2008 to 2010, but the proportion of teachers with three years of maths/stats slid from 68 per cent to 64 per cent.

Policy measures to address the challenges

Maintaining Australia's international competitiveness, security, health and climate stability requires a mathematically capable workforce. AMSI's policy document, which accompanies the discipline profile, contains a range of concrete policy proposals aimed at reversing teacher shortages and increasing mathematics enrolments. The proposed policy measures include:

- the establishment of a government advisory committee for the mathematical sciences
- a five-year national careers awareness campaign for mathematics and statistics, targeting schools and the higher education sector
- government incentives to study mathematics
- a national program to upgrade the qualifications of 'out of field' mathematics teachers.

As part of the STEM discipline group, the mathematical sciences have a high profile, and this is a first step towards achieving substantive policy measures.

The 2013 discipline profile and proposed policy measures are available from AMSI's website: **www.amsi.org.au**

"[Australia] must replenish the ranks of our mathematics teachers and re-engage students, or we will lose our place in the world as innovators and our economy will suffer."

Prof. Ian Chubb AC, Chief Scientist of Australia

Simi Henderson
Program Manager,
Research and Higher
Education
simi@amsi.org.au

One of AMSI's key missions is to support and build Australia's research base in the mathematical sciences. The Research and Higher Education program facilitates national and international research collaborations and provides training and support to students and early-career researchers.

The period July 2012 to December 2013 saw a big expansion of the program. This expansion was supported by a new $2M four-year funding partnership with the Department of Education (formerly DIISRTE), and boosted by increased scientific activity for the International Year of Mathematics of Planet Earth and the International Year of Statistics.

Research and Higher Education

Higher Education program

The AMSI Higher Education program plays a vital role in enriching the experience of Australian university students in the mathematical sciences. The annual flagship programs provide students with research training from national and international experts and the opportunity to network and build collaborations. The new funding partnership with the Department of Education is allowing AMSI to increase the impact and reach of these programs.

Winter School 2012

Who: 49 graduate students and researchers, 10 expert speakers
When: 2–13 July 2012
Where: The University of Queensland
Sponsors: AMSI, DIISRTE, ANU, UQ, PIMS, BICMR, Biarri, QCIF

The annual Graduate Winter School gives graduate students and early-career researchers the opportunity to learn from world experts. The 7th Winter School—opened by Queensland's Chief Scientist, Dr Geoff Garret AO—centred on **geometric partial differential equations.** Introductory lecture courses in the first week led up to the advanced lectures in the second week. The record number of participants included students and researchers from China, Canada, Korea, Taiwan, USA and Italy. This new expansion of the scope of the Winter School further enhanced the opportunity for Australian students to network and form potential future collaborations.

Thank you to the School Director, Professor Joseph Grotowski, and the Scientific and Organising Committees.

"I've really enjoyed the Winter School. I've met new people and am learning lots of new things—it's so exciting to be able to learn from world-class mathematicians."

Sai Ma, graduate student, ANU

BioInfoSummer 2012

Who: 120 students and researchers
When: 3–7 December 2012
Where: University of Adelaide
Sponsors: AMSI, DIISRTE, EMBL Australia, Bioplatforms Australia, University of Adelaide, Environment Institute, VLSCI

BioInfoSummer is a major annual educational and outreach program aimed at increasing the understanding of bioinformatics among students and early-career researchers. The 2012 program was opened by South Australia's Chief Scientist, Professor Don Bursill AM, and featured an outstanding array of Australian and international keynote speakers. Over 200 people attended a public lecture by Professor Hamish Scott (Centre for Cancer Biology) on genome technologies. An exciting new development in 2012 was the introduction of subsidised internship placements linked to BioInfoSummer and supported by AMSI Intern, EMBL Australia and Bioplatforms Australia.

Many thanks to Professor David Adelson and Associate Professor Gary Glonek and to the Program and Organising Committees.

"BioInfoSummer was a brilliant introduction to the field of bioinformatics, providing an engaging cross-section of current directions and a flavour of things to come. I have left stimulated and excited about my future in the field."

Jake Parker, participant at BioInfoSummer 2012

Vacation Research Scholarships 2012/13

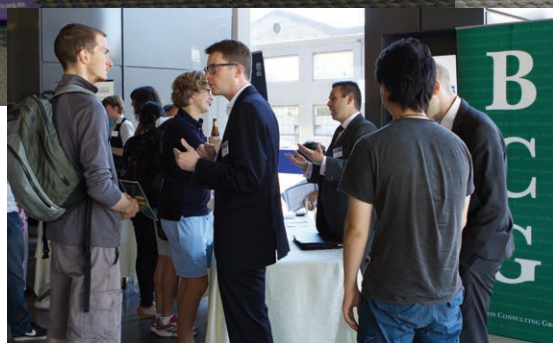
Who: 41 undergraduate students
When: December 2012 – February 2013
Where: 13 Australian universities
Sponsors: AMSI, DIISRTE, CSIRO, MPE 2013

AMSI's annual Vacation Research Scholarship program provides funding for undergraduate students to complete a six-week research project during the summer holidays, under the supervision of academics at their home institution. For most of these students, this is their first experience of research. At the end of summer, the Vacation Scholars travel to CSIRO's *Big Day In* to present their findings.

The number of AMSI Vacation Research Scholarships awarded has almost doubled, with 41 scholarships in 2012/13 compared to 22 the previous summer. Project topics ranged across mathematics and statistics, from modelling the evaporation of a liquid droplet (Joel Alroe, QUT) to studying self-similar actions of groups on graphs (Lachlan MacDonald, Wollongong).

"The Big Day In allowed me to prove to myself that I have the communication skills necessary to pursue an academic pathway. It was also fantastic meeting fellow maths and CSIRO students from around the country and getting different perspectives on study and industry."

Thomas Brown, Vacation Scholar, University of Adelaide



Summer School 2013

Who: 132 students from 22 Australian universities, 10 lecturers
When: 7 January – 1 February 2013
Where: The University of Melbourne
Sponsors: AMSI, DIISRTE, MPE 2013, The University of Melbourne, AustMS, ANZIAM

The 11th Annual AMSI Summer School offered eight honours-level courses in a variety of specialised and core topics in the mathematical sciences. The Summer School provided a lively mathematical environment for the participating students. Networking and social activities included a Careers Afternoon, the School Dinner with guest speaker Professor Keith Devlin from Stanford University (known as the "Math Guy" on U.S. National Public Radio), and a *Letters and Numbers* competition with AMSI board member and media personality Lily Serna.

Thank you to the School Director, Associate Professor Jan De Gier, and the organising team for a great Summer School.

"The enthusiasm for mathematics and statistics and the engagement of students and lecturers in the school generates that special energy rarely seen throughout a regular semester. What better way to spend a summer!"

Assoc. Prof. Jan De Gier, Director of AMSI Summer School 2013

Student profile

Ever since I was in high school I've been interested in how mathematics can be applied to everything we do. A lot of people don't understand that.

I've got a background in financial mathematics; however I decided to use my mathematical skills for work in climate and environmental science rather than in finance.

My masters research project is on statistical modelling of extreme rainfall in southwest Western Australia, where it has been very dry since the 1960s. The use of robust statistical methods for analysis of extreme weather events has grown in importance in order to prevent the significant impact of floods or droughts.

I took Climate Statistics at the AMSI Summer School 2012. This subject helped me with my research. I learnt how to apply my skills in mathematics and statistics to environmental science—an area that was completely new to me.

I had a delightful experience and registered again this year, completing the Complex Networks subject. This looked at understanding how we can characterise and analyse real-world networks, like biological networks (food webs), technological networks and social interaction networks.

The Master of Statistics should lead me into areas such as environmental science, data analytics, epidemiology and actuarial science. Next year I'm hoping to apply to do a PhD, since I think I'd like to become a research scientist.

Mahrita Harahap

University of New South Wales, Master of Statistics student

University of Technology Sydney, Bachelor of Mathematics and Finance (Hons)

"The AMSI Summer School is great as it offers some very niche subjects that most universities can't provide. I really enjoyed being able to meet world famous mathematicians—the lectures were fantastic and it's been great for professional networking."

Dr Rob Vertessy

Winter School 2013

Who: 24 graduate students and researchers, 7 expert speakers
When: 24 June – 5 July 2013
Where: The University of Queensland
Sponsors: AMSI, DIISRTE, UQ, Biarri, QCIF, AMSI Intern

The 8th Winter School—opened by the Honourable Ian Walker, Queensland Minister for Science, Information Technology, Innovation and the Arts—aligned with AMSI's theme year MPE 2013. The broad range of courses on **Mathematics of Planet Earth** provided a valuable learning opportunity for students from the mathematical sciences and also attracted many students from other disciplines, particularly Earth sciences.

Highlights of the program included the advanced course on inverse problems in geomathematics by Professor Volker Michel (University of Siegen, Germany) and the popular public lecture by Dr Rob Vertessy (Director, Australian Bureau of Meteorology) on environmental intelligence.

Many thanks to the School Director, Dr Jon Links, and the organising team for an excellent Winter School.

BioInfoSummer 2013

Who: 190 graduate students and researchers
When: 2–6 December 2013
Where: University of Adelaide
Sponsors: AMSI, DIISRTE, EMBL Australia, Bioplatforms Australia, University of Adelaide, Flinders University

BioInfoSummer 2013 was the biggest ever! The 190 participants included medical researchers, statisticians, biologists and computer scientists. The event was opened by Professor Terry Speed (Walter and Eliza Hall Institute), the recipient of the 2013 Prime Minister's Prize for Science.

World-leading researchers engaged participants with evolutionary biology, systems biology, next generation sequencing, and programming for bioinformatics. The daily computing sessions were especially popular, giving participants the opportunity to consolidate their understanding using real data sets.

Many thanks to Professor David Adelson and Associate Professor Gary Glonek and to the Program and Organising Committees.

"In my opinion, this year was the most successful, not just in the large numbers that came along, but in the reach to different fields of science."

Prof. Terry Speed, Walter and Eliza Hall Institute

Access Grid Room network: Connecting Australia

The Access Grid Room (AGR) network that connects mathematicians and statisticians around Australia was initiated by AMSI through the International Centre of Excellence for Education in Mathematics (ICE-EM). This network—which enables the interactive broadcast of meetings, seminars and lecture courses—plays an important role both in AMSI's Higher Education program and in its Research program.

New grid room at AMSI headquarters

The AMSI grid room was opened in November 2013. This new facility will strengthen the connection between AMSI and its member universities, and has already been used extensively to host seminars and meetings.

New national seminar series

The *AGR National Seminar Series* was launched in February 2013. This is a new Australia-wide seminar series over the AGR network, initiated by AMSI in partnership with the national mathematical organisations AustMS, ANZIAM, SSAI, ANZAMP and ASOR. The series features a range of top-quality seminars presented by eminent Australian and international experts.

AMSI/AustMS	**Leavitt path algebras—Something for everyone: algebra, analysis, graph theory, number theory** Prof. Gene Abrams (University of Colorado, USA), 8 February 2013, University of Western Sydney
AMSI/AustMS	**What do K–12 education, the modern battlefield, the movie Memento, and a 64,000 student Stanford MOOC have in common?** Prof. Keith Devlin (Stanford University, USA), 11 February 2013, University of Wollongong
AMSI/MPE	**The life of Pi: A talk for Pi Day 2013** Prof. Jon Borwein (University of Newcastle), 14 March 2013, University of Newcastle
AMSI/SSAI	**Analysing random events on a network** Prof. Adrian Baddeley (CSIRO / University of Western Australia), 17 May 2013, University of Western Australia
AMSI/ASOR	**Incremental network design** Prof. Martin Savelsbergh (University of Newcastle), 28 May 2013, University of Newcastle
AMSI/ ANZIAM/MPE	**The mathematics of conservation decisions** Prof. Hugh Possingham (The University of Queensland), 21 June 2013, The University of Queensland
AMSI/AustMS	**Fibonacci numbers and linear algebra** Prof. Claus Ringel (University of Bielefeld, Germany), 27 September 2013, University of New South Wales
AMSI/ ANZAMP	**Self-avoiding walks—rigorous and non-rigorous results** Prof. Tony Guttmann (The University of Melbourne), 22 November 2013, AMSI

Short courses

In 2012, AMSI started the targeted facilitation of short-course delivery to utilise further the AGR network during non-teaching periods. So far there have been five very successful specialist short courses for postgraduate students and researchers.

Shared Honours program

This program gives honours students throughout Australia access to a broader curriculum through the collaborative teaching of honours subjects over the AGR network.

Semester 2, 2012	Statistical inference	La Trobe University
	The Banach–Tarski paradox and amenability	University of Sydney
	PDE models in mathematical biology	University of Sydney
	Macroscopic dynamics for complex systems	University of Sydney
	Symbolic dynamics	University of Wollongong
Semester 1, 2013	Statistical consulting	University of Wollongong
	Measure theory and Lebesgue integration	University of Wollongong
	Topology and dynamics	La Trobe University
	PDE models in mathematical biology	University of Sydney
	Geometric mechanics	University of Sydney
	Environmental fluid mechanics and thermodynamics	University of New South Wales
	Discrete optimisation	University of Newcastle
	Topological groups	University of Newcastle
Semester 2, 2013	Theory of statistics	La Trobe University
	Mathematical modelling of infectious diseases	University of Newcastle
	Numerical complex analysis	University of Sydney
	Geometric singular perturbation theory	University of Sydney
	Complex networks	RMIT University
	Nonsmooth analysis and optimisation	RMIT University
	Analysis	Macquarie University

Professor Rick Kenyon

Research program

The AMSI Research program supports Australia's academic community, fostering the critical links between researchers in universities, government agencies and business.

National lecture tours: Inspiring Australia

The national lecture tours co-sponsored by AMSI bring exceptional speakers to Australia to engage students, researchers and the wider community with the state-of-the-art in the mathematical sciences.

AMSI–SSAI Lecturer 2012

Who: Prof. Christian Robert, Université Paris-Dauphine
When: 13 July – 22 August 2012
Where: 10 talks in Adelaide, Sydney, Melbourne, Canberra, Goulburn, Brisbane
Sponsors: AMSI, SSAI

Professor Christian Robert is a distinguished statistician and enthusiastic science communicator. His areas of expertise include Bayesian analysis, numerical probability and computational statistics. Since 2000, he has been Professor in the Department of Applied Mathematics at the Université Paris-Dauphine. He is also a senior member of the Institut Universitaire de France, and the former Head of the Statistics Laboratory of the Centre de Recherche en Économie et Statistique (CREST).

Professor Robert spoke at the 2012 Australian Statistical Conference in Adelaide, and then embarked on a lecture tour around Australia, giving eight seminars and two public lectures. His public lectures showed how computer simulation is used in statistics and gave applications ranging from Sudoku puzzles to the ancestral trees of Pygmy tribes.

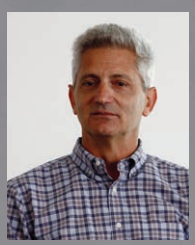
Mahler Lecturer 2013

Who: Prof. Akshay Venkatesh, Stanford University
When: 23 September – 11 October 2013
Where: 16 talks in Brisbane, Perth, Adelaide, Sydney, Newcastle, Canberra, Melbourne, Wollongong
Sponsors: AustMS, AMSI

The Mahler lectures are a biennial event, organised by the Australian Mathematical Society with support from AMSI, in which a prominent mathematician tours Australian universities giving lectures at a variety of levels, including several public lectures.

The 2013 Mahler lecturer, Akshay Venkatesh, is Professor of Mathematics at Stanford University. He received his PhD in 2002 from Princeton University and his undergraduate degree from the University of Western Australia. His research interests lie in number theory and its interactions with other branches of mathematics, such as dynamics and topology. In 2008, he won the *SASTRA Ramanujan Prize* for outstanding contributions to areas of mathematics influenced by the genius Srinivasa Ramanujan.

AMSI–ANZIAM Lecturer 2013



Who: Prof. Stephen Boyd, Stanford University
When: 18 September – 4 October 2013
Where: 7 talks in Brisbane, Adelaide, Melbourne, Newcastle, Sydney
Sponsors: AMSI, ANZIAM

Professor Stephen Boyd toured Australia as the 2013 AMSI–ANZIAM lecturer, giving specialist seminars, public lectures and a plenary talk at the 57th AustMS Meeting in Sydney.

Stephen Boyd is the Samsung Professor of Engineering and Professor in the Information System Laboratory at Stanford University. He is also a member of the Institute for Computational and Mathematical Engineering. His current research focus is on convex optimisation applications in control, signal processing and circuit design.

Professor Akshay Venkatesh

Building industry linkages:

In July 2012, AMSI partnered with ANZIAM to share in the coordination and funding of the Mathematics and Statistics in Industry Study Group (MISG). This annual event gives business access to the high-level problem-solving skills, tools and technologies of Australia's mathematicians and statisticians.

Supporting young researchers:

The annual Early Career Workshop (co-sponsored by AMSI and AustMS) provides a forum for young researchers to build networks and to receive guidance on career success, including grant applications and time-management skills.

Sponsored scientific workshops: July 2012 – December 2013

AMSI's Scientific Workshop program facilitates collaborative mathematical research throughout Australia by:

- sponsoring local and international workshops and conferences
- providing travel support for Australian students and researchers to attend AMSI-sponsored events
- bringing leading international researchers to Australia for scientific collaboration and public outreach.

International Workshop on Operator Theory and its Applications (IWOTA)	
16–20 July 2012 University of New South Wales 110 participants	For 30 years, this conference series has brought together mathematicians with a shared interest in operator theory. The conference was held in Australia for the first time in 2012, with an emphasis on operator algebras, control theory and harmonic analysis of differential operators.
Transport, Flows and Applications	
17 July 2012 Australian National University 25 participants	A one-day research-oriented workshop on the themes of the Graduate Winter School: geometric partial differential equations and particularly harmonic maps, optimal transport and curvature flows.
International Workshop on Set-Oriented Numerics	
3–7 September 2012 University of New South Wales 40 participants	This workshop addressed current developments in the field of set-oriented numerical techniques, bringing together researchers pursuing different set-oriented methodologies and covering a wide range of application areas.
AustMS ECR Workshop	
22–23 September 2012 University of Ballarat 100 participants	The workshop provided early-career researchers with an opportunity for networking and career advice before the 56th Annual Meeting of the Australian Mathematical Society.
16th Biennial Computational Techniques and Applications Conference (CTAC 2012)	
23–26 September 2012 Queensland University of Technology 200 participants	These biennial meetings provide an interactive forum for researchers interested in computational methods applied to problems in engineering, science and technology.
Nonlinear Dynamical Systems	
28–30 September 2012 La Trobe University 50 participants	This workshop brought together mathematicians from two areas of research for cross-fertilisation of ideas: nonlinear systems and integrable dynamics.
Geometry of Supermanifolds	
15–19 October 2012 University of Adelaide 50 participants	A workshop on the geometry of supermanifolds, centred on a lecture series by Prof. Ugo Bruzzo (SISSA, Trieste, Italy) and supplemented by research talks by early career researchers.
Semiparametric Regression Workshop / Bayes on the Beach	
5–8 November 2012 Queensland University of Technology 40 participants	A short course on semiparametric regression, presented by Prof. Matt Wand, preceded the three-day conference Bayes on the Beach, which focused on applications in Bayesian statistics.
Conference and Workshop on Modelling and Computation in Musculoskeletal Engineering	
12–15 November 2012 Queensland University of Technology 60 participants	This inaugural conference showcased the impact of modelling and computation in biomedical engineering and gave participants the opportunity to collaborate on the solution of real-world problems.
Canberra (International) Symposium on Regularization	
19–24 November 2012 ANU/CSIRO 30 participants	This international symposium, part of ANU's Special Year on Inverse Problems, provided an opportunity for students and ECRs to become more involved in the theoretical and practical aspects of regularization.

EViMS: Workshop on the Effective Use of Visualization in the Mathematical Sciences

23–25 November 2012
University of Newcastle
30 participants

This workshop explored how our common objective of maintaining and improving the health of the mathematical sciences can be furthered through better use of visualization.

Trilateral Meeting on Nonlinear Partial Differential Equations

3–7 December 2012
University of Wollongong
55 participants

An Australia–Italy–Taiwan joint meeting centred on partial differential equations and incorporating nonlinear functional analysis, dynamical systems, calculus of variations and various applications.

Hamiltonian Cycle, Traveling Salesman and Related Optimisation Problems

14–15 December 2012
Flinders University
40 participants

This workshop addressed challenges in theoretical, computational and complexity aspects of optimisation problems, in particular the famous Hamiltonian Cycle and Traveling Salesman problems.

Mathematical Models of Tumor-Immune System Dynamics

7–10 January 2013
University of Sydney
40 participants

A forum for applied mathematicians, biologists and experimentalists in cancer immunology to present current research and explore opportunities for collaboration.

Mathematics and Statistics in Industry Study Group (MISG) 2013

29 Jan – 2 Feb 2013
The University of Queensland
120 participants

The annual Mathematics and Statistics in Industry Study Group brings together mathematicians and statisticians to tackle complex technical problems facing Australian businesses and industry.

Young Statisticians Conference

7–8 February 2013
The University of Melbourne

A biennial event hosted by the Statistical Society of Australia (SSAI) aimed at postgraduate students and early-career professionals in statistics and data analysis from Australia and beyond.

South Pacific Optimisation Meeting: SPOM 2013 / Optimisation of Planet Earth Afternoon

9–12 February 2013
Newcastle
49 / 100 participants

This meeting focused on optimisation with applications to ecology, sustainable development, finance and similar fields—bringing together researchers and students from around the world, especially Western Europe and the Pacific Rim.

Graph C*-algebras, Leavitt Path Algebras and Symbolic Dynamics

11–14 February 2013
University of Western Sydney
21 participants

This workshop brought together Australian and international experts to develop the emerging connections between the traditionally disparate fields of abstract algebra, C*-algebras and symbolic dynamics.

Optimisation in Industry

3–5 June 2013
Melbourne
100 participants

A three-day event to bring together graduate students, researchers and industry practitioners with an interest in solving industrial problems using mathematical programming techniques and algorithms.

Charles Pearce Memorial Symposium

17 June 2013
University of Adelaide
60 participants

A symposium to honour the life and work of the Elder Professor of Mathematics, Prof. Charles Pearce. The program consisted of technical talks and personal reflections about Charles.

Mathematics of Transportation Networks

19–21 June 2013
Monash University
40 participants

The design and operation of efficient transportation networks is one of our most urgent practical challenges. This workshop focused on recent developments in the application of mathematics to addressing this challenge.

Sponsored scientific workshops: July 2012 – December 2013

Representation Theory and Operator Algebras

1–5 July 2013
University of Adelaide
35 participants

Representation theory and the theory of operator algebras have long been active research areas, with powerful links between them emerging over recent years. This workshop centred on discovering such links and the resulting applications.

Workshop on Applications of Category Theory

2–5 July 2013
Macquarie University
55 participants

Many of the category-theoretic techniques developed in Australia are now proving essential for applications in actively developing areas of mathematics. This workshop brought these techniques to a wider audience.

Australia New Zealand Applied Probability Workshop

8–11 July 2013
The University of Queensland
70 participants

This workshop brought together researchers from a wide variety of active research areas in applied probability.

MPE 2013: The Conference

8–12 July 2013
Melbourne
200 participants

Mathematicians, statisticians and scientists from the public and private sectors gathered to discuss many of the critical challenges facing our planet.

New Opportunities at the Interface Between Ecology and Statistics

11–12 July 2013
University of New South Wales
150 participants

Ecologists and statisticians have much to gain from working together. World leaders from both fields presented their perspectives on topical issues, and round-table discussions workshopped opportunities for collaboration.

Symposium on Mathematical and Computational Genetics

14–17 July 2013
University of New South Wales
200 participants

A symposium on mathematical and computational genetics held within the annual conference of the Genetics Society of Australasia.

Recycling Rocks: Understanding Sustainability in a Dynamic Earth

15–16 July 2013
The University of Melbourne
50 participants

This workshop focused on how we can best integrate modelling and observation to understand and predict the dynamical processes of the Earth and to devise strategies for the efficient use of our natural resources.

Australian Mathematical Sciences Students' Conference

15–17 July 2013
Australian National University
70 participants

This conference brings together postgraduate and honours students from around Australia, enabling them to communicate their work and encouraging collaboration, all in a friendly and informal atmosphere.

Workshop on General Algebra and its Applications: GAIA 2013

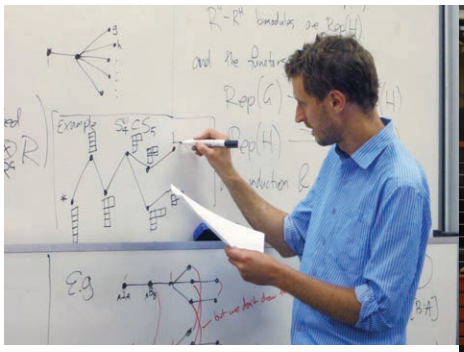
15–19 July 2013
La Trobe University
70 participants

A workshop and conference in celebration of the retirement and 65th birthday of Prof. Brian Davey, and the first major international meeting on universal algebra to be held in Australia.

A Planet at Risk—Bioinvasion and Biosecurity

12–13 September 2013
CSIRO, Canberra
100 participants

Biosecurity is a key priority for Australia. This workshop focused on current biosecurity and bioinvasion issues for which mathematical and statistical modelling has an important role to play in informing decision making.





The Second Australasian Conference of Undergraduate Research

19–20 September 2013
Macquarie University
200 participants

A two-day conference including talks and poster presentations by undergraduate, honours and masters-by-research students from all disciplines and from across Australasia.

Infectious Disease Modelling Workshop

25–27 September 2013
University of Newcastle
60 participants

Mathematical and computational modelling of infectious disease transmission plays a critical role in the development of public-health policy. This international workshop focused on the interface between key methodological areas in infectious disease modelling.

AustMS ECR Workshop

28–29 September 2013
Blue Mountains
100 participants

This annual workshop provides ECRs with an excellent opportunity to think about their career in the mathematical sciences, discuss issues facing early-career mathematicians and statisticians, and meet others from around the country.

Mini-workshop / Conference: Representation Theory in Geometry, Topology, and Combinatorics

28–31 Oct / 4–7 Nov 2013
The University of Melbourne
60 participants

A workshop and conference that brought together international experts in representation theory, emphasising connections with algebraic geometry, algebraic combinatorics and low-dimensional topology.

Lighthouse DELTA 2013

24–29 November 2013
Kiama
130 participants

The 9th Delta Conference on teaching and learning of undergraduate mathematics and statistics. The theme 'Shining through the fog' encapsulated the challenges in building the mathematics and statistics capacity needed for the 21st century.

Recent Developments of Nonlinear Partial Differential Equations

24–30 November 2013
Australian National University
50 participants

A major event in ANU's Special Year on Nonlinear Partial Differential Equations, this conference focused on new developments in several themes of nonlinear PDEs and their applications.

Australia–China Optimisation Workshop

28–30 November 2013
University of Ballarat
40 participants

This workshop series, which started in 2004, brings together experts from Australia and China in the area of optimisation theory, methods and applications.

MODSIM 2013

1–6 December 2013
Adelaide
765 participants

The theme for the 20th International Congress on Modelling and Simulation (MODSIM 2013) was 'Adapting to change: the multiple roles of modelling.'

Complex Analysis and Geometry

2–5 December 2013
University of New England
20 participants

This workshop focused on sharing ideas and discussing recent results in complex analysis and differential geometry with applications in fluid mechanics, meteorology, image recognition and economics.

Limits to Growth: Beyond the Point of Inflexion

11–12 December 2013
University of New South Wales
350 participants

Continued exponential growth is not sustainable, and we are now beyond the point of inflexion: the rate of population growth is slowing. This conference focused on how mathematical models can guide policy makers in this new era.

Mathematical Modelling and Numerical Solutions

12–13 December 2013
Wagga Wagga
30 participants

A workshop to promote collaboration between researchers in mathematical modelling and those in computational methods.

Sponsored international visitors: July 2012 – December 2013

AMERICAS

Jorge Zubelli	Institute of Mathematics	Brazil	Mathematical methods in finance
Andrei Bulatov	Simon Fraser University	Canada	Universal algebra, particularly constraint satisfaction problems
Sarah Otto	University of British Columbia	Canada	Mathematical modelling of population genetics and evolutionary biology
Bill Shipley	Université de Sherbrooke	Canada	Plant ecology
Ross Willard	University of Waterloo	Canada	Universal algebra, including constraint satisfaction problems and natural dualities
Manuel Del Pino	University of Chile	Chile	Variational theory and elliptic PDEs, particularly singular perturbation problems
Gene Abrams	University of Colorado	USA	Leavitt path algebras
Marcelo Aguiar	Texas A&M University	USA	Monoidal categories, Frobenius monoids and bialgebras in the study of combinatorics
David Clark	SUNY New Paltz	USA	Universal algebra, including the use of evolutionary computing
Frank Deutsch	Pennsylvania State University	USA	Applications of functional analysis to best approximation theory in Banach spaces
Trevor Hastie	Stanford University	USA	Applied nonparametric regression and classification
Loek Helminck	North Carolina State University	USA	Geometric quantisation
Nigel Higson	Pennsylvania State University	USA	Operator algebra theory
Tony Ives	University of Wisconsin-Madison	USA	Biostatistics
David Jensen	IBM Research	USA	Optimisation software development, customer engagements, cloud computing
Peter Jipsen	Chapman University	USA	Algebraic logic, algebraic models of computation
Irvin Lustig	ILOG	USA	Mathematical optimisation
Svitlana Mayboroda	University of Minnesota	USA	Analysis and partial differential equations
Ralph McKenzie	Vanderbilt University	USA	Universal algebra, including constraint satisfaction problems and tame congruence theory
Konstantin Mischaikow	Rutgers University	USA	Topological methods for the analysis of dynamical systems; computational topology and dynamics
Sophia Rabe-Hesketh	UC Berkeley	USA	Biostatistics
Terry Rockafellar	University of Washington	USA	Optimisation theory, analysis, mathematical finance and risk
Richard Schoen	Stanford University	USA	Differential geometry, partial differential equations, general relativity, calculus of variations
David Shmoys	Cornell University	USA	Discrete optimisation, approximation algorithms
Michael Shulman	UC San Diego	USA	Abstract homotopy theory, higher category theory, set theory, type theory
Paul Smith	University of Washington	USA	Noncommutative geometry; connections between algebraic and C*-algebraic structures
Edriss Titi	UC Irvine	USA	Partial differential equations arising in fluid mechanics
Valerio Toledano Laredo	Northeastern University	USA	Lie groups, Lie algebras, representation theory
Zhi-Qiang Wang	Utah State / Nankai University	USA	Variational methods and elliptic PDEs
Yinyu Ye	Stanford University	USA	Optimisation, complexity theory, algorithm design and analysis

ASIA

Jin Cheng	Fudan University	China	Inverse problems and regularization theory
Zhouping Xin	Chinese University of Hong Kong	China	PDEs and their applications in fluid mechanics
Xinmin Yang	Chongqing Normal University	China	Optimisation
Kenji Kajiwara	Kyushu University	Japan	Nonlinear dynamical systems, particularly Weyl representations of integrable mappings
Hiroaki Kitano	Systems Biology Institute	Japan	Computer science and systems biology research
Katsuhiro Nishinari	University of Tokyo	Japan	Cellular automata, soliton theory and its applications, network systems
Masahiro Yamamoto	University of Tokyo	Japan	Inverse problems for differential equations, numerical computations
Sergey Foss	Novosibirsk State University	Russia	Queueing theory, asymptotic theory, large deviations, spatial stochastic models
Vladimir Sokolov	Russian Academy of Sciences	Russia	Application of algebraic techniques to dynamical systems
Mikhail Volkov	Ural Federal University	Russia	Semigroup theory, interactions between algebra and computer science
Alex Cook	National University of Singapore	Singapore	Modelling infectious disease phenomena as stochastic processes, inference
Jae-Cheon Joo	POSTECH	South Korea	Several complex variables, differential geometry
Il Bong Jung	Kyungpook National University	South Korea	Functional analysis, classical operator theory
Seick Kim	Yonsei University	South Korea	Elliptic equations
Kang-Tae Kim	POSTECH	South Korea	Several complex variables, differential geometry
Woo Young Lee	Seoul National University	South Korea	Interaction of complex harmonic analysis and operator theory
Chae-Ok Yun	Hanyang University	South Korea	Cancer gene therapy, immunotherapy, angiogenesis, nanomedicine, tumor biology
Chiun-Chuan Chen	Taiwan University	Taiwan	Elliptic and reaction diffusion equations



ASIA *continued*			
Kuo-Chang Chen	Tsing Hua University	Taiwan	Dynamical systems and many-body problems
Chi-Kun Lin	Chiao Tung University	Taiwan	Dispersive wave equations
Dong-Ho Tsai	Tsing Hua University	Taiwan	Geometric analysis and PDEs
Dinh Nho Hào	Vietnam Academy of Science and Technology	Vietnam	PDEs, nonlinear analysis, optimal control theory, numerical analysis
EUROPE			
Libor Barto	Charles University	Czech Republic	Universal algebra, particularly constraint satisfaction problems
Alberto Farina	University of Picardie	France	Qualitative properties of elliptic PDEs
Christian Le Merdy	University of Franche-Comté	France	Functional and harmonic analysis, Banach spaces, non-commutative probability, control theory
Michel Thera	Université de Limoges	France	Convex and nonsmooth analysis, optimisation, variational analysis
Laurent Veron	Université François Rabelais	France	Singular behaviour of elliptic PDEs
Cino Viggiani	Université de Grenoble	France	Theoretical and numerical modelling of the behaviour of geomaterials
Geordie Williamson	Max Planck Institute	Germany	Geometric representation theory
Miklos Maroti	University of Szeged	Hungary	Universal algebra, particularly constraint satisfaction problems
Stefano Bianchini	SISSA, Trieste	Italy	Conservations laws, hyperbolic systems, optimal transportation
Ugo Bruzzo	SISSA, Trieste	Italy	Algebraic and differential geometry; geometric methods in string and quantum field theory
Luigi de Pascale	University of Pisa	Italy	Optimal transport problems
Marcello Delitala	Politecnico di Torino	Italy	Applying mathematical kinetic theory to complex systems of interacting particles
Massimiliano Morini	SISSA, Trieste	Italy	Elliptic and parabolic PDEs
Alessio Porretta	University of Roma	Italy	Elliptic and parabolic PDEs
Aldo Pratelli	University of Pavia	Italy	Optimal transport problems and geometric inequalities
Susanna Terracini	University of Turin	Italy	Elliptic PDEs and many-body problems
Serge Hoogendoorn	Delft University of Technology	Netherlands	Theory, modelling and simulation of traffic and transportation networks
Ferdinand Verhulst	Utrecht University	Netherlands	Chaos of the solution of partial and ordinary differential equations
Arnt-Gunnar Lium	SINTEF	Norway	Optimisation-based decision support
Marcin Kozik	Jagiellonian University	Poland	Universal algebra, particularly constraint satisfaction problems
Igor Dolinka	University of Novi Sad	Serbia	Semigroup theory; interactions between algebra and computer science
Pere Ara	Universitat Autònoma de Barcelona	Spain	Leavitt path algebras and their connections with C*-algebras
Gonzalo Aranda Pino	University of Malaga	Spain	Leavitt path algebras
Xavier Cabre	University of Barcelona	Spain	Semilinear and fully nonlinear elliptic equations
Marco Antonio López Cerdá	Alicante University	Spain	Semi-infinite programming, optimisation, convex analysis, game theory
Lars Elden	Linkoping University	Sweden	Numerical linear algebra and ill-posed problems
Warwick Tucker	Uppsala University	Sweden	Treatment of mathematical problems with set-oriented technologies
Jane Heffernan	York University	UK	Biologically motivated models of infectious diseases, both deterministic and stochastic
Andy Hone	University of Kent	UK	Nonlinear dynamical systems
Matt Keeling	University of Warwick	UK	Mathematical modelling of infectious diseases
Andrei Krokhin	Durham University	UK	Universal algebra, particularly constraint satisfaction problems
Malwina Luczak	University of London	UK	Epidemic and population processes
Andrea Malchiodo	University of Warwick	UK	Topological methods for nonlinear analysis and geometric analysis
Hilary Priestley	University of Oxford	UK	Universal algebra, natural dualities, canonical extensions
Steven Riley	Imperial College London	UK	Transmission of human pathogens by both collecting data and using mathematical models
Dave Wood	University of Southampton	UK	Design and analysis of experiments and Bayesian methods
OCEANIA			
Astrid an Huef	University of Otago	New Zealand	Kumjian-Pask algebras, the analogue of Leavitt path algebras for k-graphs
Marti Anderson	Massey University	New Zealand	Multivariate statistical methods for the analysis of ecological communities
Gib Bogle	University of Auckland	New Zealand	Mathematical biology, including agent-based modelling and image-processing
Bernd Krauskopf	University of Auckland	New Zealand	Geometry of chaos; manifolds of systems with multiple time scales
Rua Murray	University of Canterbury	New Zealand	Low-dimensional dynamics
Iain Raeburn	University of Otago	New Zealand	Graph C*-algebras, Leavitt path algebras and their analogues
Mike Steel	University of Canterbury	New Zealand	Combinatorics and statistics

Schools Education

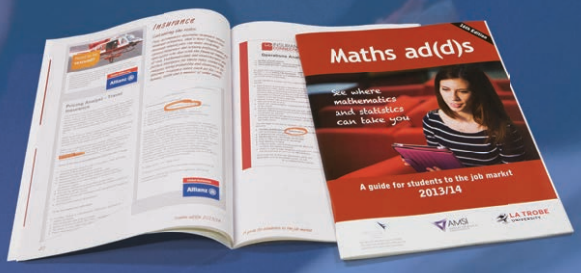
AMSI is committed to improving primary and secondary mathematics education in Australia. AMSI's Schools Education program supports teachers and students by providing professional development for teachers, quality teaching and learning resources and career information.

Janine McIntosh
Program Manager, Schools
janine@amsi.org.au

Growth in Schools Outreach program

AMSI has secured funding to expand its important work in professional development for teachers. We will be working with 48 schools in five areas throughout metropolitan, regional and rural Australia, thanks to the generous support of a range of industry and government partners. AMSI education specialists Janine McIntosh and Michael O'Connor will visit schools to work with teachers to develop their mathematics teaching practices and content knowledge. This support is especially valuable for teachers of mathematics who are working "out of field". Building teacher confidence and preparedness is essential for inspiring students and engaging them with mathematics.

REGION	FUNDING PARTNER
Yarraville/Footscray, Vic	Boeing
Oakey, Qld	Australian Government (RUN/AMSPP)
Warialda, NSW	Australian Government (RUN/AMSPP)
Gippsland, Vic	Victorian Government (DEECD), Schools Connect
Geelong, Vic	The William Buckland Foundation



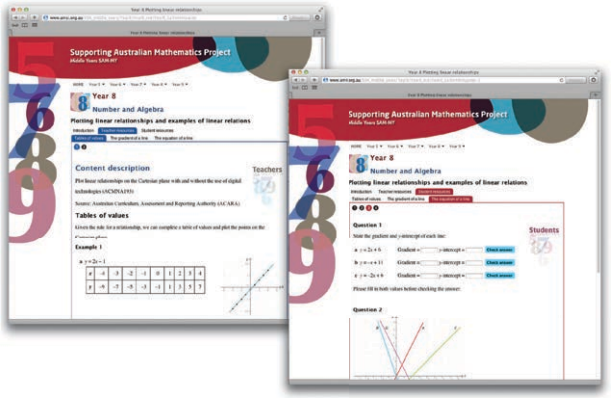
Part of the focus of the Schools Outreach program is to disseminate information on the wide range of careers that involve mathematics. AMSI's careers resources include the *Maths Ad(d)s* booklet (new edition each year) and the *Maths: Make Your Career Count* website, posters, booklet and DVD.

Expansion of online resources

Supporting Australian Mathematics

Supporting Australian Mathematics (SAM) was launched in July 2013. This suite of open-access online resources was developed by AMSI in collaboration with Education Services Australia (ESA). The resources are aligned with the Australian Curriculum and are designed to help both teachers and students deepen their mathematical content knowledge.

- **SAM Middle Years** consists of 45 packages explaining concepts from the mathematics curriculum for Years 5 to 9, including interactive student exercises.
  www.amsi.org.au/SAM-middleyears
- **SAM Senior Years** consists of 25 modules for teachers on topics from the mathematics curriculum for Years 11 and 12, including interactive animations and screencasts.
  www.amsi.org.au/SAM-senioryears



The new SAM resources add to AMSI's existing online Teacher Content Modules for Years F to 10 produced for the TIMES project.
www.amsi.org.au/teachermodules

The entire collection of resources—available through AMSI's website and ESA's *Scootle*—provides teachers with focused and reliable reference material for the Australian Curriculum, equipping them to teach with enthusiasm and engage their students.

Real-life applications: Maths Delivers!

As part of the SAM project, AMSI created four entertaining short videos to expose students to exciting applications of mathematics: gene mapping, cryptography, braking distance and Google PageRank. Professionally produced by Chrissie McIntyre (*Catalyst*, ABC) and narrated by Lily Serna (*Letters and Numbers*, SBS), these four videos are freely accessible through the SAM website. Each video is accompanied by a comprehensive set of notes that explains in more depth the mathematics underlying these real-life applications. **www.amsi.org.au/mathsdelivers**

Formative assessment: The Improve program

Michael Evans and Janine McIntosh worked with ESA on the Improve program. This program provides students, teachers and parents with an online learning environment in which to familiarise themselves with NAPLAN-style questions. The aim is to guide students on their approach to the questions and allow them to gain a deeper understanding of the expectations of NAPLAN.

AMSI resources available through TES Australia

AMSI was invited to share its online teacher resources on the TES Australia website. This site is the Australian division of TES Connect—the world's largest online network for teachers—which boasts almost 2.7 million registered users and the 100-year heritage of the *Times Educational Supplement*. The TES Australia site provides Australian teachers with free access to over 500,000 resources, lesson plans, worksheets and activities. AMSI became a member of TES Australia in August 2013 and in its first five months has shared 100 resources receiving around 5000 views.

"Any Head of Mathematics or mathematics teacher who really values the mathematical education of our children and the future of our economy should be using these resources."

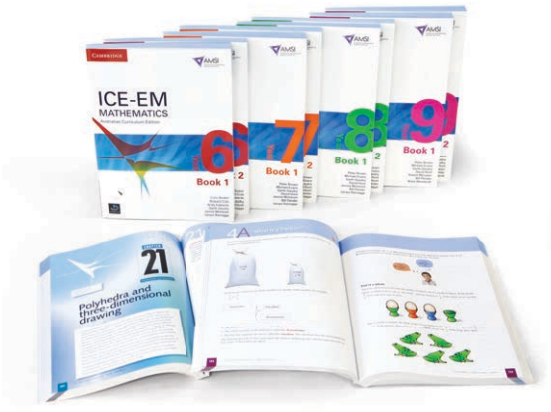
Otieno Ogunah, Southern Highlands Christian School, NSW

Janine McIntosh received the BH Neumann Award from the Australian Mathematics Trust on 23 August 2012. Michael Evans, who was honoured with the award in 2001, received the newly-cast medal at a dinner held in Melbourne.

Sales increase for *ICE-EM Mathematics*

Building a strong foundation in mathematics for every Australian student

The *ICE-EM Mathematics* series of textbooks was created by AMSI to provide a coherent and solid development of mathematical concepts over Years 5 to 10. The current edition of the series, customised for the Australian Curriculum, is published by Cambridge University Press and complemented by the Cambridge HOTmaths digital resources. Sales from the series have grown by 34 per cent over the past financial year, from nearly 30,000 units in 2011/12 to nearly 40,000 in 2012/13.



Collaboration with CSIRO: *Maths and Stats by Email*

Maths and Stats by Email is a fortnightly email newsletter that aims to inspire teachers and students by providing maths news, activities, puzzles and more. With over 20,000 subscribers, this popular newsletter is a joint collaboration between CSIRO, the ABS and AMSI.

Consultation on Year 11–12 curriculum

Michael Evans played a leading role in the development of the Australian Curriculum in Mathematics for Years 11 and 12. Michael worked as a part-time consultant at the Australian Curriculum, Assessment and Reporting Authority (ACARA) during 2012 while the curriculum was being revised based on consultation feedback.

"AMSI is unique in the way it conducts its mathematics outreach. It has taken to heart the idea that mathematicians should be involved in developing curriculum for K–12."

Prof. Arvind Gupta, CEO, Mitacs

Distinguished Service Award for Michael Evans

Dr Michael Evans retired from his full-time position at AMSI in July 2013. In recognition of Michael's immense contribution to the Schools Education program, he was awarded the AMSI Distinguished Service Medal in June 2013.

Michael came to AMSI in 2004 with a distinguished record in mathematics teaching. His reputation as a leader in curriculum development and assessment in Victoria, as an outstanding textbook author and as a major contributor to the Mathematical Olympiad and Australian Mathematics Trust activities, set the standard for AMSI's place in school mathematics in Australia.

Michael acted as managing author for *ICE-EM Mathematics* and, together with Garth Gaudry, Janine McIntosh and an extensive team of authors, produced the successful series of high-quality mathematics textbooks that formed the pillar of AMSI's Schools Education program. More recently, Michael has brought his mathematical and educational expertise to the development of online teacher and student resources, leading a number of major writing projects to support the Australian Curriculum. The Teacher Content Modules are unique in addressing the needs of teachers while maintaining a high standard of mathematical rigour.

Michael's role with ACARA in developing the Australian Curriculum for Foundation to Year 10 and in leading the development for Years 11 and 12 was essential in ensuring that mathematicians and statisticians had input in the process and that the new curriculum had mathematical and statistical integrity.

Michael's contribution to AMSI and to mathematics in Australia has been outstanding. Teachers and students are mathematically richer for the enormous body of work he has developed. Michael continues his valuable contribution to AMSI as a senior consultant.

AMSI Intern

Cate Ballard
National Program Manager, AMSI Intern
cate@amsi.org.au
www.amsiintern.org.au

AMSI Intern is an innovative university and industry collaboration that connects business and other organisations to the vast research expertise in Australian universities. The AMSI Intern program links postgraduate students across all disciplines with industry partners through short-term tightly focused research internships. Each intern receives pre-placement training from AMSI and is supported by an academic mentor from their own university.

AMSI Intern benefits Australia's research-based economy in three ways:

- **Interns** gain transformative research training and valuable workplace experience.
- **Industry partners** obtain flexible and cost-effective access to analytical expertise while building research collaborations with universities.
- **Academic mentors** develop and strengthen research collaborations with industry and government.

Since 2008 AMSI has placed more than 87 interns, as at December 2013, across a wide spectrum of industry and government organisations, including manufacturing, IT, health, transport and resources. The program has a 96 per cent satisfaction rating, with over 45 per cent of industry partners returning for multiple internships and with 94 per cent of academic mentors willing to mentor another student through the program.

AMSIIntern

An Innovative University and Industry Collaboration

"We need to build Australia's human capacity in a range of research areas by attracting and retaining the most promising research students.... The AMSI Intern program shows a great deal of promise as a way to connect researchers in universities with industry to solve problems."

Prof. Aidan Byrne, CEO, Australian Research Council

Business, Industry and Government

Professor Arvind Gupta

"AMSI Intern is an excellent bridge between academics and industry partners. It creates a lot of new insights and some industry collaboration, which might lead to further ARC Linkage Projects."

Academic mentor for AMSI Intern, 2013

"Work-readiness of our PhD students, and the links between industry engagement and national productivity, are critically important.... The AMSI Intern program is one such shining example."

Prof. Ian Chubb AC, Chief Scientist of Australia

New phase for AMSI Intern

AMSI Intern is continuing to grow and develop partnerships with universities, research organisations and peak industry bodies. AMSI Intern has gained the endorsement of the Australian Industry Group (Ai Group) and the Business / Higher Education Round Table (B-HERT).

Large organisations and government agencies now have access to internships through the fully-funded model. The high calibre of the student interns provides significant return on investment and this funding model is increasingly popular, with large organisations (such as NBN Co and CSL) and government agencies (such as DSTO, BoM and Parks Victoria) often requesting multiple internships. Strategic initiatives are in place to grow the program through this model.

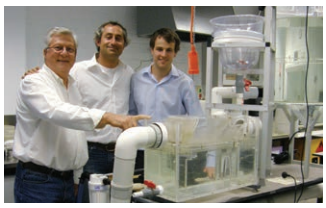
Small to medium enterprises (SMEs) may be eligible for government assistance towards the cost of an internship. In July 2013, AMSI Intern became an approved supplier of the Victorian Government's Business R&D Voucher Program, which provides access to innovation and R&D funding of up to $25,000 for Victorian SMEs.

Accelerate Australia forum

AMSI Intern hosted the event *Accelerate Australia* on 6 February 2013 at the National Convention Centre in Canberra to promote discussion on productivity, industry engagement and the work-readiness of PhD students. The event featured high-level speakers from industry, government and research, as well as interactive demonstrations by PhD interns. The keynote speaker was Professor Arvind Gupta, CEO of Mitacs, who observed that "a key factor in driving innovation in industry is strong engagement with the research community." Mitacs places more than 2000 postgraduate interns into industry in Canada every year.

Innovative success stories

Intern decontaminates the solution



Intern: Scott Manning, University of Sydney

Industry partner: Leo Crasti, Director, Retaw

Academic mentor: Dr Federico Maggi, University of Sydney

Retaw manufactures SDU—a world first storm-water de-contamination unit. When early testing produced some unexpected results, concerning contaminant removal, Retaw needed an expert on a short-term basis—so they contacted AMSI Intern.

Cate Ballard from AMSI Intern knew that the new state-of-the-art Fluids Lab at the University of Sydney would be perfect to further design, test and optimise Retaw SDU's operating parameters. So she matched honours student Scott Manning and his supervisor, Dr Maggi, with Leo Crasti at Retaw to tackle the problem.

Scott constructed a laboratory model—see image above—to simulate the real-world conditions that SDU operates under. The ability to regulate the water flow rates allows different rainfall scenarios to be investigated and then, by varying the concentration and type of contaminants, SDU's efficiency—at removing the contaminants—is tested.

'The outcomes of this project have shown us that there is ample room to conduct further research. And as such we have engaged Cate and her team to find us another stellar intern,' Leo concluded.

Scott's story is one of many that highlights the innovative and sustainable benefits of the program. AMSI Intern allows Australian businesses to tackle their short-term research needs through its unique access to young Australian researchers, and their academic mentors.

> *"The AMSI Intern program facilitated research which would have been difficult to conduct in private enterprise."*
>
> Leo Crasti, Retaw

Greener routes drive profits

Intern: Yi Chen, Federation University

Industry partner: Marcus Denny, Manager, Systems Design Division, VISA Global Logistics

Academic mentor: Prof. David Y. Gao, Federation University

The Travelling Salesman Problem is the classic example of a difficult optimisation problem. VISA Global—one of Australia's largest privately owned global freight-forwarding companies—was faced with such a problem. With their online sales soaring, the logistics company needed to find more efficient ways to deliver goods to reduce costs and their carbon footprint.

VISA Global engaged AMSI intern Yi Chen, a PhD student at Federation University, to look for innovative approaches to improving the efficiency of their transport fleet. According to Marcus Denny at VISA Global: "The results of Yi's work were very impressive and provided VISA with a verifiable approach to solving the problem, with potential gains far in advance of what had been hoped at the outset."

> *"Improvement in efficiency of vehicle movements will result in a direct and significant saving to VISA Global, both in terms of wear and tear on vehicles, as well as fuel consumption, with the simultaneous benefit of lowering VISA Global's carbon footprint."*
>
> Marcus Denny, VISA Global Logistics

Intern sows investment opportunities in regional NSW

Intern: Mark Wright, RMIT University

Industry partner: Derek Robinson, BDM, Agritechnology

Academic mentor: Dr Ingo Karpen, RMIT University

Agritechnology is a well established research and development (R&D) company based in regional NSW. They are at the forefront of their industry—developing biological-based products and fermentation production systems.

Offering innovation to time-honoured farming practices carries a high amount of risk. Knowing this, Argritechnology identified the need to broaden their market research capability. And for this particular project the emphasis was put on determining the viability of potential new markets for their research, and for their products.

They needed someone with marketing research skills who could adapt quickly to a new knowledge domain – agricultural R&D.

"The AMSI internship program provided a ready-made solution for us," said Derek Robinson, BDM Argitechnology.

Over the four month project Mark Wright, AMSI Intern, produced a research report that investigated the market attractiveness of Agritechnology's products.

"We had to make investment decisions, and the report was a significant contributor to that decision making process," Derek said.

> *"Cate and the team at AMSI Intern helped provide the project design and assisted with selecting our intern from the marketing school at RMIT University."*
>
> Derek Robinson, BDM Argitechnology

Partnership with Enterprise Connect

AMSI Intern's successful partnership with Enterprise Connect concluded in March 2013. This partnership involved a three-year Commonwealth Government grant that subsidised the placement of 32 PhD interns across Australia.

AMSIIntern

An Innovative University and Industry Collaboration

Partnership with Parks Victoria

Parks Victoria is responsible for managing a diverse estate that covers more than 4 million hectares (about 17 per cent of Victoria) and includes national parks, urban parks, wilderness areas and 70 per cent of Victoria's coastline. In 2010, AMSI entered into a three-year agreement with Parks Victoria to provide statistical support for their environmental monitoring, evaluation and reporting activities. In 2013, this agreement was extended for an additional three years.

AMSI statistician Kally Yuen has designed the data collection and analysed data for various Parks Victoria monitoring programs, and has provided statistical advice on a range of conservation projects within Victorian national parks.

Impact of feral horses on the Australian Alps

Feral horses in the Australian Alps (left). Assessing the impact of feral horses on a drainage line (right).

The Australian Alps are a place of outstanding natural and cultural significance, and the environmental impacts of feral horses on the region have been of concern for many years. Parks Victoria and the Office of Environment and Heritage (NSW) recently conducted a study to assess the impact of feral horses on treeless drainage lines. Kally analysed the data and presented the results to members of the study team. These results will provide valuable information for horse management across the Australian Alps.

Remote camera monitoring in the Great Otway National Park

Images captured by remote camera in the Great Otway National Park: Red Fox and Long-nosed Bandicoot

The introduced Red Fox is one of the greatest threats to native ground-dwelling mammals, and land-management agencies have invested heavily in trying to control the species. In 2009, Parks Victoria started a remote camera monitoring program in the Great Otway National Park to address the questions:

- Is ongoing fox baiting successful in reducing Red Fox activity?
- Is there a positive response in terms of population growth of prey species in areas subject to fox baiting?

Kally analysed the data and presented the results. As this use of remote camera monitoring is relatively new to Parks Victoria, the data from this study have provided valuable information to rangers from other national parks who wish to conduct similar monitoring programs in the future.

Controlling Coast Wattle in the Anglesea heathland

Monitoring a treatment plot in the Coast Wattle control trial (left). Mechanical mulching to control Coast Wattle (right).

In 2009, Parks Victoria and the Friends of Eastern Otways began a randomised controlled trial to examine the efficiency of five treatments to control the infestation of Coast Wattle at O'Donohue's in the Great Otway National Park. Although Coast Wattle is a native species, it has extended beyond its natural range. The species reduces diversity in the vegetation it invades and may increase fire risk.

The O'Donohue's heathland has a high diversity of native species, many rare and threatened, and so the collateral impact of the treatments was also considered. Kally analysed the data and the results were presented to regional staff from Parks Victoria and volunteers from the Friends of Eastern Otways. It has been shown that the two non-chemical treatments—handweeding and mulching—have outperformed the other treatments in controlling Coast Wattle in the area. As a consequence, these two methods have been adopted for future management.

Many thanks to Dr John Wright, Dr Mark Antos and Dr Marie Keatley from Parks Victoria for their contribution to this section.

Parks VICTORIA

Structure of AMSI

AMSI is a collaborative unincorporated joint venture involving universities and other bodies related to the mathematical sciences. Six universities signed a Joint Venture Agreement (JVA) in 2002 to become the first full members of AMSI. Since then five additional universities have become full members. All Group of Eight universities are full members of AMSI. A complete list of AMSI members appears on page 2 of this report.

Organisational structure

Governance

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 AMSI's three portfolio areas:

- Research and Higher Education
- Primary and Secondary School Education
- Business, Industry and Government

External advice is provided by four high-profile advisory committees.

Activities are detailed in the Business Plan and Budget document, as authorised annually by the full members and the Board. Management of the institute and its activities is the responsibility of the Executive Committee. Members of the Executive Committee are listed on page 44.

The AMSI Board

Board composition

The Board comprises:

- 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
- Two people representing the full members appointed by mutual agreement of the full members
- Two people representing the associate members appointed by mutual agreement of the associate members
- Up to five independent members representing business and industry appointed by mutual agreement of the full members

Remuneration of Board members is noted in the financial statements on page 48 of this report.

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 19.3 of the JVA. Board representatives for the full members and associate members will serve two-year terms.

Board members 2012–13

Dr Ron Sandland BSc (Hons), PhD, FTSE, AM

Independent member and Chair from September 2011

Ron was Deputy Chief Executive of CSIRO from 1999 to 2007 and currently chairs the Steering Committee of the Australian National Data Service and the Advisory Board of the Centre of Excellence for Biosecurity Risk Analysis. He is Pro-Chancellor and a member of the Council of the University of Technology Sydney and also chairs its Commercial Activities Committee. Ron is a Fellow of the Australian Academy of Technological Sciences and Engineering and an Honorary Life Member of the Statistical Society of Australia Incorporated. He was awarded a Centenary Medal in 2001 and was made a member of the Order of Australia in 2007.

Prof. Geoff Prince BSc (Hons), DipEd, PhD, FAustMS

Director of AMSI from September 2009

Prior to joining AMSI again in 2009, Geoff was Head of the Department of Mathematics and Statistics at La Trobe University, sat on the board of the Australian Centre of Excellence for Risk Analysis (2006–2009) as AMSI's representative, and was Vice President of the Australian Mathematical Society (2008–2009). Geoff's involvement with AMSI dates to 2004–2006 when he was Deputy Director, Executive Director, Acting Director, and Access Grid Room coordinator. His research interests are in the field of applications of differential geometry to ordinary and partial differential equations, uncovering results in electrodynamics through to highway design.

Prof. Mark Gould BSc (Hons), PhD

Deputy Director from June 2012

Mark is a Professor in the Department of Mathematics at The University of Queensland, and was Head of Mathematics when UQ became a full member. His research interests include: representation theory of Lie algebras, quantum many-body theory, representation of Kac-Moody algebras and integrable models, Lie superalgebras and supersymmetry in physical systems, structure and application of quantized algebras, knot theory, condensed matter physics, and quasi-Hopf algebras. Mark has published over 160 papers in leading international journals, which have attracted over 1900 citations since 1990. He has been awarded various research grants over his career, the most recent being a $300,000 ARC DP grant with Y. Z. Zhang, 'Mathematical models for disordered critical point theories', for 2011–2013.

Prof. Aleks Owczarek BSc (Hons), PhD

Nominee of The University of Melbourne from February 2011 to February 2013

Aleks is Head of the Department of Mathematics and Statistics at The University of Melbourne. His research interests lie in the general field of statistical mechanics, in particular the area of phase transitions and critical phenomena especially pertaining to model polymer systems. He is part of a Statistical Mechanics and Combinatorics Group working on these topics and is also a Chief Investigator of the ARC Centre of Excellence in the Mathematics and Statistics of Complex Systems.

Dr Eileen Doyle BMath, MMath, PhD, FAICD

Independent member from February 2010

Eileen has more than three decades of diverse business experience at both the executive and the board level. She has held executive roles in the steel industry, the water and wastewater industry and the timber industry. Her non-executive director roles have covered a wide range of industries including research, financial services, business services, building and construction, steel, mining, logistics and export. Eileen is currently Chair of the Hunter Valley Research Foundation and the Hunter Founders Forum and Director of Bradken, CSIRO, Boral and GPT.

Prof. Janet Hergt BSc (Hons), PhD

Nominee of The University of Melbourne from June 2013

Janet completed her PhD at the Australian National University in 1987 and undertook postdoctoral research in the United Kingdom. She returned to Australia and was awarded an ARC QEII Research Fellowship, joining The University of Melbourne in 1994 and establishing state-of-the-art research laboratories. The main focus of her research has been in the application of radiogenic isotope analysis, in combination with other geochemical data, to explore the record of Earth processes preserved in geological materials. Janet has served or currently serves on a number of Editorial Boards and is a member of the National Committee for Earth Sciences. She was the Head of Earth Sciences from 2005 to 2013, and in 2013 served a six-month term as Dean of the Faculty of Science.

Prof. Arvind Gupta PhD

Independent member from October 2012

Arvind is the Scientific Director and CEO of Mitacs. In 2012, he was appointed to the Government of Canada's Science, Technology and Innovation Council (STIC). He sits on a number of boards including the Banff International Research Station, the Canadian Statistical Sciences Institute, the Canadian Mining Innovation Council, Mprime Network and Mitacs, and he also sits on the International Scientific Advisory Board of GRAND-NCE.

Dr Adelle Howse

BSc (Hons), PhD (Mathematics), MBA, AAICD, FFIN

Independent member from October 2012

Adelle has worked at Leighton Holdings for over seven years, and is currently Executive General Manager of Investments, Divestments and Acquisitions and has had previous roles in strategy and infrastructure development. She also holds an honorary position at The University of Queensland's School of Mathematics and Physics, where she completed a PhD in mathematics.

Dr Mark Lawrence BSc (Hons), MA, PhD

Independent member from October 2012

Since 2008 Mark has been Managing Director of a global financial services advisory firm, Mark Lawrence Group, which provides advice to major Australian, Asian and international financial institutions and regulators on risk management and governance, regulation and strategic issues arising from the global financial crisis. Previously, Mark was a Principal at McKinsey & Company. Before this, he was Chief Risk Officer and a member of the Executive Committee at ANZ Banking Group. Earlier, Mark held leadership roles in risk management at various financial institutions in New York, including Merrill Lynch, Bear Stearns & Co. and Société Générale.

Mark completed a Bachelor of Science with Honours at the Australian National University, before gaining a Masters and PhD in mathematics at the University of Wisconsin-Madison.

Ms Lily Serna BA, BMathFin (Hons)

Independent member from October 2012

Lily is an Australian mathematician and television presenter, best known for co-presenting the SBS game show Letters and Numbers and cooking show Destination Flavour. Lily was the National Numeracy Ambassador in 2012, taking part in the launch of the 2012 National Numeracy and Literacy Week. Lily has presented talks to a number of companies on 'Mathematics and work' and 'The magic of mathematics'. In 2009 she completed a Bachelor of Mathematics and Finance and a Bachelor of International Studies at the University of Technology, Sydney, and an Honours year with a thesis in mathematics with applications in biology.

Assoc. Prof. David Easdown BA, PhD

Representative of the full members from July 2011 to June 2013

David has wide interests in mathematics and mathematics education. He has published over 40 research papers and a successful undergraduate textbook, now in its third edition. He is Director of First Year Studies within the School of Mathematics and Statistics at the University of Sydney. He is participating, together with colleagues from The University of Melbourne, the University of Adelaide and Curtin University, in a project funded by the Office of Learning and Teaching entitled *Building leadership capacity in university first year learning and teaching in the mathematical sciences.*

Assoc. Prof. Stephen Roberts MSc, PhD

Representative of the full members from July 2012

Stephen was Head of the Department of Mathematics at the Australian National University from 2006 to 2012. He is heavily involved in the computational science community in Australia. From 2003 to 2006, he was the national coordinator of the Australian Partnership for Advanced Computing (APAC) Education, Outreach and Training program.

Prof. Bruce Henry BSc (Hons), PhD

Representative of the full members from June 2013

Bruce has an international research reputation in nonlinear and statistical science, having published almost 100 scientific articles, including highly cited papers in leading journals, research review book chapters, encyclopedia articles, and pedagogic magazine articles. He has co-organised international conferences in nonlinear dynamics and complex systems and presented specialist invited lectures at workshops and summer schools. He has also engaged with secondary schools as Editor of *Parabola* for ten years and as Chair of the UNSW Annual School Mathematics Competition for five years. He is currently Head of the School of Mathematics and Statistics at UNSW Australia. He is a Fellow of the Australian Institute of Physics and Member of the American Physical Society and the Australian Mathematical Society.

Prof. Stan Miklavcic BSc (Hons), PhD, FAustMS

Representative of the associate members from July 2011 to June 2013

Stan is Director of the Phenomics and Bioinformatics Research Centre in the School of Information Technology and Mathematical Sciences at the University of South Australia and formerly Head of School (2007–2012). He has published over 85 articles on his research in industrial and applied mathematics in international peer-reviewed journals, conference proceedings and book chapters. Stan is a life member of the Swedish Mathematical Society and is a Fellow of the Australian Mathematical Society.

Assoc. Prof. Dann Mallet PhD

Representative of the associate members from July 2012

Dann is an associate professor in mathematical sciences at the Queensland University of Technology, with experience in applied mathematics research and teaching, mathematics education research as well as leadership and management in teaching and learning in the university context. He leads the Australian Mathematical Sciences Learning and Teaching Network—an Australian Government funded discipline learning and teaching network. He is also the Academic Program Director for Mathematical Sciences at QUT, responsible for leadership, management and strategic development in learning, teaching and curriculum matters for mathematics, decision science and statistics.

Assoc. Prof. Sergey Suslov MSc, PhD

Representative of the associate members from June 2013

Sergey received a Master of Science in Applied Mathematics and Physics from the Moscow Institute of Physics and Technology and was subsequently awarded Master of Science and PhD degrees from the University of Notre Dame. Sergey has served as a member of several national professional bodies including the Executive Committees of ANZIAM and its Victorian branch. He has authored and co-authored over 60 refereed journal and conference publications and won several academic awards for excellence in fluid mechanics. His major current research interests are in hydrodynamic stability theory of flows arising in various physical applications.

Board observers

The Chairs of the Advisory Committees, President of the Australian Mathematical Society, Director of MASCOS and Chair of the National Committee for Mathematical Sciences are also invited on to the Board as observers.

Dr Bob Anderssen BSc, MSc, PhD, OAM
Chair of the Education Advisory Committee from July 2011

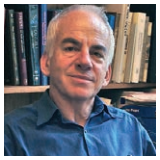
Bob, due to his keen interest in the application of mathematics to real-world and industrial inverse problems, accepted a position in industrial and computational mathematics in the CSIRO Division of Mathematics and Statistics in 1979. He has been directly involved with the mathematics profession in Australia through various positions, including Chair of the Division of Applied Mathematics of the AustMS (now ANZIAM), President of the AustMS, Chair of the NCMS, and more recently as a regular contributor to the Australian Mathematics in Industry Study Group (MISG) and CSIRO's Mathematicians in Schools initiative, and as advisor to the Editor of CSIRO's *Maths and Stats by Email*. Bob was awarded the Order of Australia medal in 2010 for services to the mathematical and information sciences.

Prof. Jonathan Borwein BA (Hons), MSc, PhD, FRSC, FAAAS, FAA
Chair of the Scientific Advisory Committee from 2010

Jon is Laureate Professor of Mathematics at the University of Newcastle and Director of the Centre for Computer-Assisted Research Mathematics and its Applications (CARMA). His research interests span pure mathematics (analysis), applied mathematics (optimisation), computational mathematics (numerical and computational analysis) and high-performance computing. He has also worked at Carnegie-Mellon, Dalhousie, Simon Fraser and Waterloo Universities and has held two Canada Research Chairs. He is a past winner of the Chauvenet Prize (1993) and received an honorary degree from Limoges (1999). Jon is a Fellow of the Royal Society of Canada (1994), the American Association for the Advancement of Science (2002), and the Bulgarian Academy of Sciences (2003). In 2010 he was elected as a Fellow of the Australian Academy of Science.

Prof. Peter Forrester PhD, FAustMS, FAA
President of the Australian Mathematical Society (AMSI Board from September 2012)

Peter received his Doctorate from the Australian National University in 1985, and held a postdoctoral position at Stony Brook before joining La Trobe University as a lecturer in 1987. In 1994 he was awarded a senior research fellowship by the ARC, which he took up at The University of Melbourne. Peter's research interests are broadly in the area of mathematical physics, and more particularly in random matrix theory and related topics in statistical mechanics. This research and its applications motivated the writing of a large monograph *Log-gases and Random Matrices*. His research has been recognised by the award of the Medal of the Australian Mathematical Society in 1993, and election to the Australian Academy of Science in 2004, in addition to several ARC personal fellowships.



Prof. Tony Guttmann MSc, PhD, FAustMS, FAA, FTSE, FSIAM
Director of MASCOS (AMSI Board from 2002)

Tony was Interim Director of AMSI upon its foundation and an organiser of the BHP Billiton / The University of Melbourne School Mathematics Competition. His research interests lie in mathematical models of phase transitions, enumerative combinatorics and critical phenomena in general. He currently holds an ARC Discovery Outstanding Researcher Award.

Prof. Nalini Joshi BSc (Hons), MA, PhD, FAA
Chair of the National Committee for Mathematical Sciences (AMSI Board from May 2012)

Nalini is a Georgina Sweet Australian Laureate Fellow and Chair of Applied Mathematics at the University of Sydney. Her research interests lie in integrable and near-integrable differential equations, difference equations, and extended versions of cellular automata. She was elected Fellow of the Australian Academy of Science in 2008, President of the Australian Mathematical Society from 2008 to 2010 and has held visiting positions around the world.

Prof. Peter G. Taylor BSc (Hons), PhD
Immediate Past-President of the Australian Mathematical Society (AMSI Board from February 2011 to September 2012)

Peter is the immediate Past-President of the Australian Mathematical Society and was previously Head of the Department of Mathematics and Statistics at The University of Melbourne. He is internationally known for his research in applied probability and stochastic modelling. He is Editor-in-Chief of *Stochastic Models*, an associate editor of *Queueing Systems*, and a member of the editorial board of the *Journal of Applied Probability* and *Advances in Applied Probability*. In 2008, Peter became one of the five trustees of the Applied Probability Trust. From February 2006 to February 2008, Peter was Chair of Australian and New Zealand Industrial and Applied Mathematics (ANZIAM). In 2013, Peter was awarded an ARC Laureate Fellowship.

Board meetings

For the period July 2012 to December 2013, Board meetings were held:
8 October 2012, 7 February 2013, 16 April 2013, 28 June 2013 and 15 October 2013.

Dr Ron Sandland 5 of 5
Prof. Geoff Prince 5 of 5
Prof. Mark Gould 4 of 5
Prof. Aleks Owczarek (to February 2013) 1 of 2
Prof. Janet Hergt (from June 2013) 2 of 2
Dr Eileen Doyle 3 of 5
Prof. Arvind Gupta 4 of 5
Dr Adelle Howse 3 of 5
Dr Mark Lawrence 5 of 5
Ms Lily Serna 5 of 5
Assoc. Prof. David Easdown (to June 2013) 3 of 4
Prof. Stephen Roberts 4 of 5
Prof. Bruce Henry (from June 2013) 1 of 2
Prof. Stan Miklavcic (to June 2013) 2 of 5
Assoc. Prof. Dann Mallet 3 of 5
Assoc. Prof. Sergey Suslov (from June 2013) 2 of 2

Committee membership

Scientific Advisory Committee

Prof. Jonathan Borwein (University of Newcastle) (Chair)
Prof. Philip Broadbridge (La Trobe University)
Prof. Darren Crowdy (Imperial College London)
Prof. Ezra Getzler (Northwestern University)
Prof. Nalini Joshi (University of Sydney)
Prof. Frances Kirwan (University of Oxford)
Prof. Geoff Prince (Director, ex officio)
Prof. Terry Speed (University of California, Berkeley; Walter and Eliza Hall Institute)
Prof. Terence Tao (University of California, Los Angeles)
Prof. Neil Trudinger (Australian National University)

Education Advisory Committee

Dr Amie Albrecht (University of South Australia)–from October 2013
Dr Bob Anderssen (CSIRO) (Chair)

Mr Abdulmoeed Arayne (Brunswick Secondary College)
Dr Frank Barrington (The University of Melbourne)
Assoc. Prof. Kim Beswick (President, AAMT)
Mr Peter Brown (University of New South Wales)
Dr Michael Evans (ICE-EM Mathematics Manager)
Ms Janine McIntosh (Program Manager, Schools)
Prof. Jacqui Ramagge (University of Wollongong)
Ms Christine Sergi (Australian Bureau of Statistics)–from October 2012
Dr Philip Swedosh (King David School)
Mr David Treeby (Ivanhoe Girls' Grammar School)
Dr Leigh Wood (Macquarie University) – to October 2013
Mr Frank Yu (Australian Bureau of Statistics) – to October 2012

Research & Higher Education Committee

This new committee convened its first meeting in March 2013.

Prof. Jonathan Borwein (University of Newcastle)
Assoc. Prof. Regina Burachik (University of South Australia) – from July 2013
Prof. Norman Dancer (University of Sydney)
Assoc. Prof. Jan De Gier (The University of Melbourne)
Prof. Andrew Eberhard (RMIT University)
Prof. Peter Forrester (President, Australian Mathematical Society)
Prof. Mark Gould (Deputy Director) (Chair)
Prof. Joseph Grotowski (The University of Queensland)
Ms Simi Henderson (Program Manager, Research & Higher Education)
Dr Richard Jarrett (CSIRO) – from August 2013
Prof. Stan Miklavcic (University of South Australia) – to July 2013
Prof. Geoff Prince (Director)
Dr Matthew Ritchie (Walter and Eliza Hall Institute)

Industry Advisory Committee

Ms Cate Ballard (National Program Manager, AMSI Intern)
Dr Eileen Doyle (Independent)
Mr Joe Forbes (Biarri Commercial Mathematics)
Dr Bronwyn Harch (CSIRO)
Dr Adelle Howse (Leighton Holdings) (Interim Chair)
Dr Mark Lawrence (Mark Lawrence Group)
Prof. Geoff Prince (Director)

AGR Steering Committee

Mr Jason Bell (Central Queensland University)
Prof. Jonathan Borwein (University of Newcastle)
Dr Darren Condon (La Trobe University)
Prof. Andrew Eberhard (RMIT University)
Prof. Andrew Mathas (University of Sydney)
Prof. Geoff Prince (Director)
Assoc. Prof. Martin Wechselberger (University of Sydney)
Dr Maaike Wienk (Access Grid Room Coordinator)

Executive Committee

Prof. Geoff Prince (Director)
Prof. Mark Gould (Deputy Director)
Ms Cate Ballard (National Program Manager, AMSI Intern)
Mr Rod Birch (Business Manager)
Ms Mari Ericksen (Marketing and Communications Manager)
Dr Michael Evans (ICE-EM Mathematics Manager) – to July 2013
Ms Simi Henderson (Program Manager, Research and Higher Education)
Ms Janine McIntosh (Program Manager, Schools)

Stakeholders

Members

Full members and associate members are listed on page 2. They meet as a group twice a year, normally in February and June or July.

Member meetings were held:

- 28 June 2012 at AMSI
- 30 January 2013 at AMSI
- 25 June 2013 at AMSI

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. The following additional funding has been received since inception:

2004: 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). The project was funded for four years until July 2008.

2007: AMSI received funding from the Department of Education, Employment and Workplace Relations (DEEWR) under the Collaboration and Structural Reform Fund (CASR) for the project 'National collaboration in the mathematical sciences: integrating research, industry and education'. The three-year grant funded many of AMSI's flagship programs.

2009: AMSI received further funding from DEEWR for The Improving Mathematics Education in Schools (TIMES) project. The project was funded for one year and extended AMSI's Schools program.

2010: AMSI entered into a three-year partnership with Enterprise Connect, an initiative of the Department of Innovation, Industry, Science and Research which expanded AMSI's Internship program.

2012: AMSI was awarded a $750k contract from Education Services Australia to develop electronic resources to support the Australian Curriculum in mathematics.

2012: AMSI's Research and Higher Education flagship programs boosted with $2M from the Department of Industry, Innovation, Science, Research and Tertiary Education (now the Department of Education), enabling expansion of the Summer and Winter Schools, Vacation Research Scholarships and BioInfoSummer.

2013: AMSI's Schools program boosted with funding from Boeing, the William Buckland Foundation, the Victorian Department of Education and Early Childhood Development and an AMSPP grant in partnership with the Regional Universities Network to deliver professional development to mathematics teachers around Australia.

2013: AMSI Intern approved as a supplier for the Victorian Department of State Development, Business and Innovation (DSDBI) voucher program.

Comprehensive progress reports and updated business plans are presented in accordance with the Funding Agreements.

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 usually the Head of the Department, 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 Director's reports on activities are emailed to Board members, committee members and AMSI member representatives on a monthly basis.

Partners of the JVA meet a minimum of five times per year to provide input on AMSI activities and its business plan.

Policies and procedures

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

Employees

Executive Committee

Prof. Geoff Prince BSc (Hons), DipEd, PhD, FAustMS
Director of AMSI

Profile on page 40.

Ms Cate Ballard BBus (Business & Communications)
National Program Manager (AMSI Intern)

Cate has been the National Program Manager for AMSI Intern since September 2011. Her role is to develop and grow the postgraduate internship program placing students across all disciplines into private enterprise and public agencies for the purpose of research training. Before coming to AMSI, Cate worked at the International College of Management, Sydney in a dual role as an Industry Training / Business Development Manager. She has also held strategic sales and marketing roles with two leading hotel chains in Australia.

Mr Rod Birch BComm
Business Manager

Rod joined AMSI as Business Manager in October 2011. Formerly with the Faculty of Medicine, Dentistry and Health Sciences at The University of Melbourne, his career has spanned work in Government, two major accounting firms and a major bank and has included consulting to the tertiary education sector.

Ms Mari Ericksen BBus (Tourism & Hospitality)
Marketing and Communications Manager

Mari is responsible for developing the marketing and communications strategies and communication plans for AMSI and its programs, including branding and e-communications, positioning, networking and outreach activities. Before joining AMSI, Mari held senior marketing positions at the UK Financial Times (UK) and the Victorian National Parks Association. Mari graduated in 1999 with a Bachelor of Business in Tourism and Hospitality from La Trobe University.

Ms Simi Henderson BSc (Hons)
Research and Higher Education Manager

Simi's role is to facilitate national and international research collaborations and provide research training for AMSI Members. In her time at AMSI, Simi has increased the scale and impact of the Research and Higher Education programs by developing partnerships, implementing a coordinated marketing strategy and securing funding. Annually the programs support 25 national events and provide training to 500 students and early-career researchers. In 2013 she also managed Mathematics of Planet Earth Australia, a major national scientific and outreach program and part of a year-long global initiative under the patronage of UNESCO. Simi graduated in 2002 with a BSc in Social Policy from the London School of Economics.

Ms Janine McIntosh DipT, MEd
Program Manager (Schools)

Janine McIntosh is the Schools Program Manager. Her role is to develop school mathematics material and to work with teachers to enhance the mathematics experiences of the children they teach. Janine is an experienced primary school teacher, curriculum writer for the VCAA and the Australian Curriculum, Assessment and Reporting Authority (ACARA), and mathematics educator at The University of Melbourne. She is also a member of the Maths Challenge committee of the Australian Mathematics Trust.

Non-executive staff

Ms Lauren Draper Dip (Professional Writing & Editing)
Administrative Assistant, Schools program

Lauren graduated from RMIT University with a Diploma of Professional Writing and Editing in 2013, and is currently studying a Bachelor of Arts (Media and Communications) at The University of Melbourne. She provides administrative support to the AMSI Schools program, and works as a freelance editor and journalist in her spare time.

Ms Anne Nuguid BBNSc, GDipMgt
Executive Assistant to the Director

Anne provides executive assistance to the Director and is the primary contact point for the AMSI membership. She coordinates the AMSI Board and board meetings, the biannual meeting of the AMSI members, and the annual meeting of the Australian Council of Heads of Mathematical Sciences (ACHMS). Anne has a Bachelor of Behavioural Neuroscience from Monash University and a Graduate Diploma in Management from The University of Melbourne.

Mr Michael O'Connor BSc, GDipEd, MEd (Studies)
Schools Outreach Manager

Michael's role involves the support of teachers in teaching mathematics, the development of mathematics materials for use in schools and the collection and dissemination of information and advice on careers in mathematics and mathematics in careers. Michael has a Masters of Education (Studies) from Monash University. He is an experienced author of mathematics texts, assessment items and dynamic geometry materials.

Ms Stéphanie Pradier BA BSc (Hons I)
Media and Communications

As AMSI's Media and Communications officer, Stephanie's role is to communicate AMSI's vision and activity to government, members and the public. She writes press releases, looks after the social media and edits AMSI publications. Stephanie has a Bachelor of Arts / Bachelor of Science (Hons. Physics). Stephanie loves to cook and to write—especially about the sciences. She believes that most people are genuinely interested in science, but they find it inaccessible. Science, however, should be accessible. Stephanie relishes explaining scientific and mathematical ideas to people. She believes ideas are good for you: a writer just has to make them taste good.

Mr Michael Shaw BA (Hons), AdvDip (Electronic Design & Interactive Media)
Multimedia Manager

Michael is responsible for providing multimedia design and development services for print and web-based delivery environments. He also provides support to staff relating to the use of multimedia technology for improved communication through web, design and interactive media.

Non-executive staff continued

Dr Maaike Wienk LL.M, PhD, Dip (Accounting)
Access Grid Room Coordinator

Maaike coordinates AMSI's Access Grid Room (AGR) activities, which include the National Seminar Series, Honours Courses, Short Courses and advertising of seminars delivered by AMSI's member universities. Maaike also analyses data collected from the annual survey of the AMSI membership, with results published in the Discipline Profile of the Mathematical Sciences.

Ms Joanna Wilson BA (Hons)
Administrative Assistant (Research & Higher Education)

Jo is the primary contact point for the Research and Higher Education programs. Her responsibilities include the monthly e-news, website content and coordination of the Research and Higher Education Committee. In 2013 she also provided support for Mathematics of Planet Earth Australia (MPE), which included running the MPE website and administration for the major conference and public events run throughout 2013. Jo has a Bachelor of Arts (Hons) from Victoria University of Wellington majoring in Media Studies and Film, and has held administrative roles in both Australia and New Zealand.

Ms Kally Yuen BSc (Hons), MSc, AStat
Statistician (Parks Victoria)

Kally works as a statistical consultant to the research team at Parks Victoria, providing statistical advice on study designs and performing data analysis for Parks Victoria projects. Kally has worked for many years as a biostatistician at the Peter MacCallum Cancer Centre and the Centre for Youth Mental Health at The University of Melbourne. She is an accredited statistician, awarded by the Statistical Society of Australia in 2004.

Honorary staff

Dr Michael Evans BSc (Hons), PhD, DipEd
Senior Consultant

Before coming to ICE-EM, Michael was Head of Mathematics at Scotch College, Melbourne. He has worked with the Victorian Curriculum Assessment Authority (VCAA) in various capacities and over many years. He also has a continuing involvement with the Australian Curriculum. In 1999 he was awarded an honorary Doctor of Laws by Monash University for his contribution to mathematics education. In 2001 he received the Bernhard Neumann award for his contributions to mathematics enrichment in Australia.

Ms Jan Thomas OAM, BSc (Hons), DipEd, BEd (TESOL)
Senior Fellow

Jan was AMSI's Executive Officer until March 2011. She is now a Senior Fellow at The University of Melbourne and has an office at AMSI. Before coming to AMSI, Jan worked as a teacher, as a consultant in schools and as a lecturer in teacher education. Her research interests are concerned with the effect of language and culture on mathematics learning. She believes access to a good mathematics education, along with good communication skills, is fundamental to an equitable and socially just society. Jan was awarded a Medal of the Order of Australia in the Australia Day Honours 2013 for service to the mathematical sciences.

Past staff

Ms Emma Bland BSc (Hons), DipMathSc
Media and Communications Officer

Emma joined AMSI in March 2011 to help communicate the Institute's vision and activity to government, members and the public. She wrote press releases and edited AMSI publications including member bulletins and the annual report. Emma graduated from The University of Melbourne in December 2011 and completed honours with the Space Physics Group at La Trobe University in 2012. She left AMSI in July 2013 and is currently completing her PhD at La Trobe University.

Ms Edwena Dixon BBus (Mktg), AdvDip Bus (Mktg)
AMSI Intern

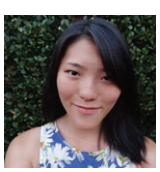
During her eight years at AMSI, Edwena moved between a number of roles, which included general administration, finance and most recently supporting the AMSI Intern program. Edwena left AMSI in July 2013 and has started a financial broking business.

Ms Uyen Freeman
Finance Officer

Uyen was responsible for finance administration, including accounts payable and receivable, internal transfers, employee expense reports and credit card coding. Uyen left AMSI in July 2013.

Ms Susie Lambrianidis MComm (Human Resource Management)
Consultant, AMSI Intern

Susie joined AMSI Intern in September 2013 to assist in growing the internship business of AMSI, which includes recruiting postgraduate students and identifying Industry Partners. Before coming to AMSI, Susie worked as a Talent Acquisition Specialist delivering end-to-end recruitment solutions across a variety of industry sectors. Susie has been fortunate to work with a number of blue-chip companies including ANZ Banking Corporation, GE Capital, Deloitte Australia and TXU (now Energy Australia).



Ms Daphane Ng
Program Support, Research and Higher Education program

Daphane's role was to provide administrative and marketing support for the AMSI Research and Higher Education programs. She was also responsible for social-media posting and data maintenance. Daphane is currently studying a Bachelor of Science at The University of Melbourne and in 2013 founded the popular blog Unimelb Adventures, which now receives on average 1200 visits per day.

Commentary

AMSI's financial records are managed and administered by AMSI staff by utilising the accounting and financial systems of The University of Melbourne.

All financial statements are reconciled to the University's integrated financial system to ensure compliance with relevant policy and to confirm the amount of cash reserves held by The University of Melbourne on behalf of AMSI.

This year we have aligned our financial reporting with calendar years, consistent with the financial reporting of The University of Melbourne. This has required us to prepare financial statements for the period 1 July 2012 to 31 December 2013 (the reporting period).

In overall terms, the Institute incurred a net operating deficit of $35,400 for the reporting period.

Income from memberships remains consistent and accounts for approximately 35 per cent of total funds received. AMSI received grants from a number of sources including the Commonwealth Government, State Government of Victoria, and philanthropic and corporate sources during the reporting period. These grants in total accounted for approximately 32 per cent of total funds received.

AMSI completed a major consulting engagement during the reporting period which contributed significantly to our commercial revenues, as did our publishing revenue through our agreement with Cambridge University Press. Our commercial and other income accounted for approximately 33 per cent of total funds received.

Expenses incurred for the reporting period were largely consistent with expectations.

Given the Commonwealth Government support for the Research and Higher Education Program, our commitment in this area has increased in comparison to prior years. This is in line with expectations. The increase in the Schools Program operating costs was directly referable to incremental costs incurred in regard to a major consulting assignment that concluded during the reporting period, and to additional outreach and engagement activities commenced during the reporting period, and for which there was direct funding support.

The Access Grid Room was commissioned mid 2013 with final costs marginally below budget at $157,709 (Budget per agreed Business Plan $160,000).

Closing cash reserves totalled $924,149 as at 31 December 2013.

Certification

The University of Melbourne undertakes to provide audited financial statements for all contractually funded activities when required by the relevant funding body, but not generally for AMSI as a whole.

In the absence of an overall annual audit statement, the following certification is provided.

We hereby certify that funds received by AMSI during the reporting period ended 31 December 2013 and the expenditure incurred during that period were in accordance with relevant funding agreements, with the AMSI Joint Venture Agreement and with the approved business plan.

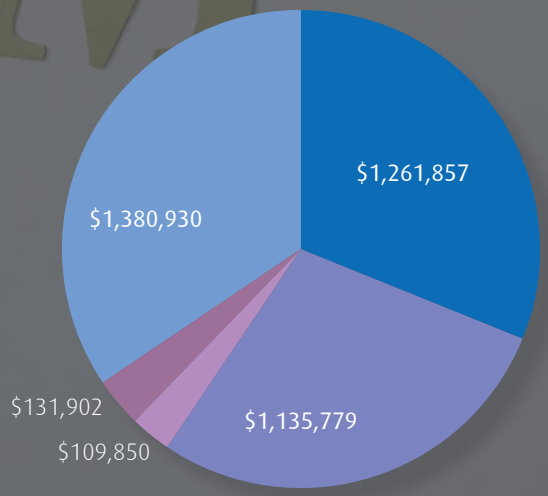
The balance of cash reserves as at 31 December 2013 of $924,149, as detailed in the following financial statements, is entirely consistent with the balance of AMSI funds as represented in the accounting records of The University of Melbourne as at 31 December 2013.

Geoff Prince
Director

Rod Birch
Business Manager

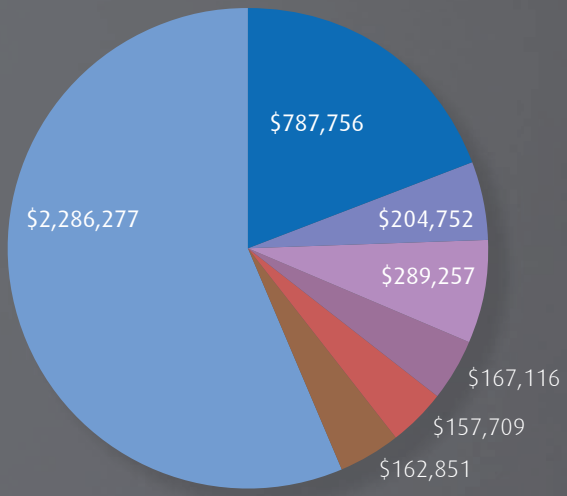
Financial Statements

Group Income



Group Income	$
Grants and Sponsorship	1,261,857
Commercial Income	1,135,779
Internship Program	109,850
Other Income	131,902
AMSI Membership Subscriptions	1,380,930
Total	**4,020,318**

Group Expenditure



Group Expenditure	$
Research and Higher Education	787,756
Business Industry and Governance	204,752
Schools Education	289,257
MPE	167,116
AGR Completion	157,709
Administration	162,851
Staff Salaries and on-costs	2,286,277
Total	**4,055,718**

Financial Performance

	July 2012 to December 2013		July 2011 to June 2012	
	$	$	$	$
INCOME				
Membership income				
AMSI membership subscriptions		1,380,930		920,000
Major grants				
Investing in Maths - Federal Government Grant for Higher Education and Research Program		734,000		-
Other grants - Schools progam related in 2013		425,418		239,014
Consulting income - predominately Schools progam related in 2013		841,854		104,561
Publishing revenue - CUP and copyright revenues		293,925		290,923
Sponsorships		102,439		37,377
Internships - income from placements, industry contributions (2012)		109,850		219,000
Other income - includes salary support, repayments and interest income		131,902		4,480
Total income		4,020,318		1,815,355
Expenditure - Personnel				
Gross salaries, permanent and casual	2,286,277		1,266,532	
less external salary support			39,690	
		2,286,277		1,226,842
Expenditure by program (excluding salaries)				
Research and Higher Education		787,756		379,331
Schools Education		289,257		20,048
Internships		122,829		266,958
Other significant expenditures:				
Outreach and engagement		59,506		
Governance		22,417		
AGR completion		157,709		
MPE events and activity support		167,116		
Administration		162,851		151,810
Total Expenditure		4,055,718		2,044,989
Operating surplus/(deficit)		(-35,400)		(-229,634)

Financial Position

	July 2012 to December 2013		30 June 2012	
	$	$	$	$
Assets				
Funds on hand:				
Project 000020 - AMSI core	812,961		718,983	
Project 080060 - Investing in Mathematics Government Grant	111,188	924,149	240,566	959,549
Net assets		**924,149**		**959,549**
Equity				
Retained income brought forward	959,549		1,189,184	
Net of income over expenditure:				
AMSI core	(-35,400)		(-156,829)	
Projects 80028/30			(-72,806)	
		(-35,400)	0	(-229,635)
Net equity		**924,149**		**959,549**

AMSI
AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

www.amsi.org.au

Australian Mathematical Sciences Institute
Building 161
c/- The University of Melbourne
Victoria 3010 Australia

Tel: +61 3 8344 1777
Fax: +61 3 8344 6324
email: enquiries@amsi.org.au