

AMSI 2016

Annual
Report

AMSI's mission

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.

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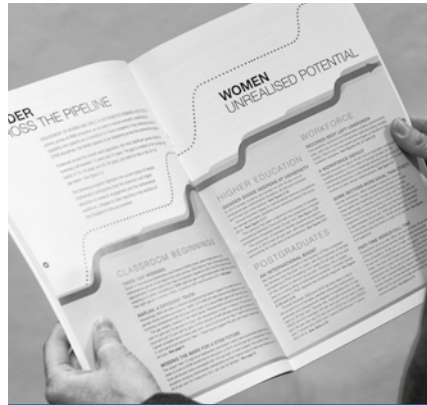
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POLICY & ADVOCACY



OUTREACH



RESEARCH



HIGHER EDUCATION



AMSI INTERN



SCHOOLS



SCHOOLS - CHOOSE MATHS



GOVERNANCE

From the Chair



AMSI had another highly successful year in 2016 under the leadership of Professor Geoff Prince. I can't emphasise enough how critical AMSI's dedicated and professional staff have been to this success.

Increasingly there is a realisation in the community that innovation is vital to Australia's future well-being and that the mathematical sciences have a crucial role to play in underpinning innovation. Thus I see the role of AMSI through its expanding member base as being about securing Australia's future.

And there are gratifying signs. The BHP Billiton Foundation's investment of more than \$20 million in Choose Maths, focused principally on girls, is a very important signal that enlightened industry players are seeing just how important the study of maths is to their evolving business needs. The project is being enthusiastically rolled out across Australia. A particular highlight of 2016 was undoubtedly the launch of the Choose Maths Awards for students and teachers. The ceremony was full of highlights but the winning senior students' video, from Danebank School for Girls in Sydney, is a delight and can be viewed on the AMSI website along with many other worthy entries.

AMSI Research and Higher Education has had its \$2 million funding renewed. This excellent program facilitates AMSI's distributed research program. I had the pleasure of delivering the opening address for this year's AMSI Summer School at the University of Sydney to a record number of attendees. These events are a real partnership and we are very grateful for the investment of time, excellent people and money that our members contribute to ensuring their success. This new government investment will facilitate the addition of an exciting new strand,

As part of its electoral package, the Australian Government announced a \$28.2 million funding commitment to expand AMSI Intern so it can make a real difference in effective industry engagement, not just in the mathematical sciences but across other STEM disciplines as well. This is an enormous vote of confidence in AMSI and its members.

Optimise, to the portfolio of activities.

There were also exciting developments during 2016 in the work of the Industry Advisory Committee's Industry Mathematical Sciences Engagement (IMSE) Task Force. Members of the task force are forging a number of strong engagements with leading companies and their senior executives who recognise the critical role the mathematical sciences must play in their industries.

2016 was also a time of great sadness for the Australian mathematical sciences community with the passing, far too early, of two of its brightest stars, Professors Peter Hall and Jon Borwein. AMSI salutes them both for their exceptional contributions to Australian mathematics and to AMSI.

We have been very fortunate that Professor Terry Speed has agreed to take on the position of Chair of our Scientific Advisory Committee following Jon's passing.

It is always a great pleasure to welcome new members to the AMSI community. I was very gratified to hear that the Statistical Society of Australia has become a member, along with Edith Cowan University and Murdoch University, which have both signed up as Associate members.

The AMSI Board has a very active and supportive membership. I'm personally delighted that Dr Adelle Howse has agreed to take on the role of Deputy Chair. The Board has strategic oversight of an unprecedented expansion of AMSI and I am proud to say it takes its stewardship role very seriously.

A handwritten signature in dark ink, reading "Ron Sandland". The signature is written in a cursive, flowing style.

**Dr Ron Sandland AM FTSE
Chair**

From the Director



In an eventful 2016, we lost two giants of the discipline, expanded our membership base, won unprecedented program funding and partnered in a decadal plan. The international report cards from *PISA* and *TIMMS* highlighted Australia's desperate need of a more thoroughly trained teacher workforce.

AMSI played a key role in developing the Academy of Science's *Decadal Plan for the Mathematical Sciences*.

I joined Peter Hall and Nalini Joshi on the executive committee, with engagement extending to discipline stakeholders across seven sub-committees. The plan's core recommendations include introduction of universal mathematics prerequisites for university study, professional development for the large number of out-of-field teachers of mathematics and the establishment of a national research centre delivering distributed programs.

Endorsed by AMSI, these measures closely align with our long-time advocacy priorities. Our refreshed core policy document, *Securing Australia's Mathematical Workforce*, drew strong media and stakeholder attention along with our annual *Discipline Profile of the Mathematical Sciences*.

Reconfirming the critical need for reform, data released in 2016 is a reminder that we cannot wait to strengthen Australian numeracy and literacy outcomes. In particular AMSI and external reporting highlights the deep structural challenges ahead for the discipline pipeline.

AMSI and its university members were closely engaged with the Government's 2015 *ACOLA Review of Research Training*. In response to these findings, the Australian Government's recent electoral package included funding to expand AMSI's

all-sector, all-discipline internship program, AMSI Intern. A key priority under the National Innovation and Science Agenda, this will support delivery of 1400 PhD industry research internships by 2020. With sign-off projected for mid-2017, this represents AMSI's largest project to date and will transform research training and industry-university collaboration.

Led by Mark Lawrence, the Industry Advisory Committee's establishment of an Industry/Mathematical Sciences Engagement (IMSE) Task Force has deepened our industry engagement. This task force comprises equal numbers of senior industry figures and academics is targeting measures to the grow Australia's mathematical workforce at a time when our skills are in high and increasing public and private sector demand.

In a significant milestone for the Research and Higher Education program, the Commonwealth has renewed research training funding to 2020.

The impact of this partnership on program growth cannot be underestimated with hundreds of students and early career researchers benefiting annually. Significantly, this renewal has paved the way for the launch of AMSI Optimise in 2017. This event provides a platform to strengthen private and public sector industry engagement with the postgraduates and university research community in an area of national significance.

With 18 workshops bringing 88 international colleagues to Australia in 2016, our Scientific Workshop Program has also continued its growth trajectory. In a significant strengthening of the Institute's collaboration with the Australian Mathematical Society, the launch of Maths Fest t drew over 300 participants to Canberra, including around 70 internationals. Launched in 2016, the AMSI Research Report captures the Institute's extensive research and research training activities. We farewelled long-time, Research and Higher Education Program Manager, Simi Henderson in 2016. I thank her for her outstanding steerage of this program during a period of immense growth. Simi was held in very high regard by our members,

as well as the Department of Education and Training, and we wish her well.

AMSI felt the loss of two towering figures in the mathematical sciences, Peter Hall and Jonathan Borwein. Both were respected for their research impact and policy and advocacy work. Peter was the inaugural chair of our Scientific Advisory Committee and Jon his successor. We could not have wished for greater supporters of our research programs and national leadership.

Funded by the BHP Billiton Foundation, our Choose Maths project is progressing national delivery of initiatives to strengthen teacher training and development, careers awareness and female participation in mathematics. Successfully launched in 2016, the Choose Maths Awards are set to grow in 2017.

Adding to AMSI's reach and impact, 2016 outreach, marketing and media highlights included over 100 national media appearances, the launch of Maths Adds digital, two new issues of the *Update* and delivery of an expanded suite of publications, including the research report.

In an expansion of our membership base, the Statistical Society of Australia formalised our long standing relationship and the Edith Cowan and Murdoch Universities joined as Associate Members.

Finally, I extend my thanks to Ron Sandland, the AMSI Board and our members for their encouragement and support, and to the AMSI staff, our greatest asset. Their excellence in pursuit of AMSI's mission and vision is largely responsible for our reputation and influence.

A handwritten signature in black ink that reads "G Prince". The signature is written in a cursive, slightly stylized font.

**Professor Geoff Prince FAustMS
Director**

AMSI Members

FULL MEMBERS



ASSOCIATE MEMBERS



GOVERNMENT AGENCIES



SOCIETIES



List of members as of December 2016

Key Achievements

Choose Maths Awards launched
attracting over **660**
school student entries &
30 teacher nominations

More than **500** school
visits and over **100**
professional development
days for teachers

AMSI sponsors
18
research workshops

More than
1300 researchers
attend AMSI R&HE events in 2016

Launch of **MathsFest**
– a multi-event including two
international workshops together with
the annual meeting of the AustMS

More than **40%**
of attendees at AMSI
higher education
events were **women**

103 media articles
in 2016 – a **106%**
increase in media
coverage over 2015

34
Internships
completed through
AMSI Intern

428
Research students &
ECRs attended AMSI
training events in 2016

Approaching
3500
Facebook likes

MathsAdds
website launched
to provide expanded digital version of
popular Maths Adds careers guide

Policy & Advocacy

As the central voice for Australia's mathematical sciences, AMSI plays an active role in the development of national research policy and frameworks to help shape future innovation. Our policy and advocacy agenda is intended to deliver critical reform across the mathematics pipeline from school-based and higher education, research training and funding to industry collaboration and innovation.

The Australian Mathematical Sciences in 2016

The fifth edition of the *Discipline Profile of the Mathematical Sciences* revealed the current status of Australian mathematics and statistics at all stages of the pipeline from school and higher education, research and research training, to graduate careers. This data is supported by key priorities outlined for government and peak body intervention and action in AMSI's 2016 core policy document, *Securing Australia's Mathematical Workforce*.



The Australian Academy of Science has estimated the annual worth of the mathematical and physical sciences at \$145 billion—or

11.2 per cent of the economy. Despite this profound economic impact, Australia continues to run a mathematical deficit, with the growing disparity between demand and supply threatening future prosperity. This is attributable to a number of factors, including a lack of university mathematics prerequisites, poor student and career engagement, qualified teacher shortages and a falling supply of mathematically prepared graduates. In particular, Year 12 high-level maths participation continues to fall, declining 20 per cent between 2000 and 2015, and by 32 per cent since 1995. This has resulted in a drought of mathematically prepared graduates. Additionally, due to a range of cultural and social factors the number of females participating in mathematical sciences and STEM remains critically low. The number of Year 12 girls taking advanced maths is about half that of boys with only 30 per cent of undergraduate and graduate mathematics students female.

An ageing population is also having a critical impact on the gender divide and the skills deficit. Currently over 30 per cent of the

2016 POLICY SUBMISSIONS

2016 National Research Infrastructure Roadmap Capability Issues Paper—Response

ARC Research Engagement and Impact Consultation—Response

These are available online:
amsi.org.au/publications_category/publications/submissions/

mathematical workforce is aged over 55 with an unsustainably low postgraduate supply.

The Australian mathematical sciences continues to maintain a strong rate of ARC Discovery grant success compared to other science fields, despite an overall reduction in funding by the ARC across all sciences in 2015. Australia's mathematical sciences performance was also highly ranked in the 2015 Excellence in Research Australia evaluation—more so than in 2012 and 2010.

“A lack of university prerequisites continues to send a strong message to our classrooms that maths is not valued. As a result students are entering university ill equipped for tertiary STEM studies at a time when Australia's future depends on a growing supply of these skills.”

Professor Geoff Prince, AMSI Director

Policy & Advocacy

Our Vision for the Mathematical Sciences

AMSI is calling for decisive measures to improve classroom engagement and foster Australia's future mathematical skills supply. STEM skills are essential to 75 per cent of Australia's growth employment areas. If Australia is to have an innovation future, more needs to be done to address key issues such as out-of-field teachers (more than 30 per cent of teachers are currently not fully qualified to teach mathematics) and restore university prerequisites (only 14 per cent of universities required intermediate maths to start a science degree in 2016).

It is essential to ensure Australia has the mathematical and statistical skills to remain internationally competitive and protect national security, population health and climate stability into the future. Future mathematical literacy requires decisive policy action and reform today.

Infrastructure

AMSI's response to 2016's *National Research Infrastructure Roadmap Capabilities Issues Paper* outlined the case for a national research centre for the Mathematical Sciences.

AMSI's submission identifies the indispensable collaborative role that mathematics and statistics play in technological developments from cryptography to Wi-Fi to internet search engines. Infrastructure to support these collaborations must be provided to ensure Australia does not become a follower in the digital revolution.

AMSI recommends the establishment of a centre to mobilise Australia's mathematical scientists through the technical support of their collaborations with end users from government agencies,

KEY AMSI POLICY RECOMMENDATIONS:

PRIORITY A: OUR CHILDREN

Train the unqualified teachers of school mathematics and secure the future supply of properly trained maths teachers

PRIORITY B: CULTURE CHANGE

Restore university maths prerequisites from their historic low and turn around declining school mathematics enrolments

PRIORITY C: SECURE THE FUTURE

Increase the rates of graduation in the mathematical sciences, especially amongst women, to grow and refresh the quantitative professions

PRIORITY D: WORLD CLASS

Create world quality infrastructure on a national scale in the mathematical sciences and increase our international research engagement

PRIORITY E: INNOVATION

Boost the engagement of Australian business with mathematical sciences research

universities and private sector on topics such as climate change to advanced manufacturing and national security.

Measurement of Research Engagement and Impact in the Mathematical Sciences

In 2015 the Australian Government announced the development of a national framework for the assessment of the engagement and impact of university research, to be administered by the ARC alongside the *Excellence in Research Australia* assessment.

AMSI, AustMS and ACEMS held a collaborative workshop in September 2016 to consider the mathematical sciences research community's response to the assessment of its engagement and impact activities under this framework. The workshop

outcomes formed the basis of a submission by AMSI, AustMS and ACEMS to the ARC consultation on the proposed measurement of research engagement and impact.

Key points in the submission include a recommendation for national level discipline impact assessment as well as university-by-university. This will better capture the collaborative nature of the mathematical sciences and other disciplines that undertake multi-university and industry collaborations.

These assessments will then be able to directly influence strategic planning at a national level to help turn around Australia's poor collaboration rate between universities and industry and the low uptake of research-trained graduates by the private sector.

Advocacy

AMSI represents the mathematical sciences adding its voice to the following advisory panels and task forces:

- National Committee for the Mathematical Sciences
- Bid Committee for ICME.15 in 2024
- Australian Mathematical Society (AustMS) Steering Committee
- AustMS Council
- Decadal Plan for the Mathematical Sciences Executive Committee
- ACOLA Research Training Review Implementation Working Group
- Board member of Science Technology Australia

- Board membership of Australian Technology Network of Universities IDTC Board

The Director of AMSI attended the following external events:

- ATN Conference Industry Session and dinner
- Maths Challenge at MAV
- Launch of the Decadal Plan for the Mathematical Sciences at Parliament House
- Government Advisory Committee on Mathematical Sciences
- Maths by Inquiry Reference Group
- Knowledge Nation

- Public hearing—Inquiry into innovation and creativity: workforce for the new economy
- MATRIX launch
- STEMS: Putting Statistics into STEM in the age of data
- 2016 National Research Infrastructure Roadmap hearing
- AMSI IAC Task Force dinner
- Data61 Goods Shed Docklands Opening
- Science Meets Business
- STA AGM and Board meeting
- Magna Carta Lecture
- Universities Australia Deputy Vice Chancellors Research meeting
- BHP Billiton Board annual reception
- B/HERT dinner



Outreach

AMSI's outreach initiatives strengthen awareness and understanding of the mathematical sciences while fostering collaboration and engagement at all stages of the mathematical pipeline.

Further building the discipline's public profile, community engagement included a series of public events, as well as media, flagship publications and online platforms. Focusing on AMSI's key policy priorities, outreach activities highlighted key challenges facing Australian mathematics and STEM capability for the future.

Outreach

Supporting Women in Mathematics

Women and girls are under-represented in mathematics. This makes redefining traditional mathematical career narratives and championing the participation of women and girls at all stages of the discipline pipeline essential.

As a key facilitator of the Australian Mathematical Society (AustMS) Women in Mathematics Special Interest Group (WIMSIG), AMSI is actively working with the mathematical and general communities to address this issue. In particular through a series of public *Women in Mathematics* events embedded in each flagship-training program. Raising awareness of gender challenges within the discipline, these events are helping create a national support network.

In addition to these events, AMSI is tackling the gender divide through its national Choose Maths project (pg 24). Funded by the BHP Billiton Foundation, this is delivering a range of initiatives to strengthen teacher training and development, female participation in mathematics and careers awareness. Its targeted awards component—the Choose Maths Awards—is fostering a culture of mathematical excellence in the classroom acknowledging outstanding upper primary and secondary maths students and high performing mathematical educators, in particular those who have encouraged and supported girls in maths.

The Choose Maths Travel Grants support the attendance of early career female mathematicians at AMSI's flagship training events through travel funding for accompanying family members as well as childcare/babysitting and respite expenses incurred as a result of participation.

The fourth component of the Choose Maths project—the Women in Maths Network—will begin development in 2017.

Career Advice

Now in its 19th edition, AMSI's popular *Maths Adds* careers guide is now online. Illustrating more than 100 examples of job ads and careers illustrating mathematical and statistical career pathways The site is part of the Institute's growing resources

to empower Australians to pursue mathematics. mathsadds.amsi.org.au

Connecting with Industry

At two to three per cent, Australia has one of the lowest rates of industry-research engagement in the OECD. AMSI sees this challenge as a call to action and an opportunity for reform to support Australia's elevation on the global innovation stage.

Under the leadership of Dr Mark Lawrence, AMSI's Industry Advisory Committee partnered with Australian industry to establish the Industry/Mathematical Sciences Engagement (IMSE) Task Force in 2015. The Task Force's findings indicate a shortage of industry-ready maths graduates in Australia, leading businesses across a wide range of sectors to seek these skills overseas.

Comprising eight industry leaders and eight senior mathematical scientists from AMSI member universities, the IMSE Task Force is leading urgent action to address the following:

- Careers awareness in schools and the community — maths 'opens doors' to a wide range of exciting and challenging careers
- Industry engagement with the mathematical sciences
- Supply of industry-ready mathematical science graduates

Further deepening the Institute's industry engagement, the 2017 launch of *AMSI Optimise* will expand the Institute's research and higher education event program, as delivered under our Commonwealth co-funded project *Securing Australia's Mathematical Workforce*. This annual one-week meeting meets the need for a platform to foster industry, government and research community collaboration, including researchers and postgraduate students from AMSI member universities. Engagement will focus on research innovation and industry optimisation challenges fundamental to the economy and the built and natural environment. One key goal is building graduations strategically by growing the scale of industry engagement with AMSI departments and agencies. Linkages to AMSI Intern will deliver optimisation internships with the industry partners.

Public Events

AMSI continues to incorporate public lectures and panel discussions into its flagship training and research event programs. Appealing to broader audiences, these events provide real-life context to bring an often complex discipline to life. Additionally, AMSI's *Women in Mathematics* events provide a critical setting to challenge the current narrative for women and girls in mathematics. As we seek to foster engagement with the discipline, these events encourage networking to seed collaboration and provide opportunity for existing leaders to mentor new talent.

AMSI's public events program covered a range of topics in 2016 including the role of mathematical modelling in nature conservation, the geometry of curved surfaces, and randomness and probability in real life. Running during flagship training and research programs including AMSI Summer School, AMSI BioInfoSummer, and AMSI Winter School, as well as through the AMSI-SSA lecture tour, these lectures illustrate the cross-disciplinary impact of the mathematical sciences.

KEY PUBLIC EVENTS 2016

Corals, carbon and the cosmos: the story of hyperbolic space

Margaret Wertheim, presented by the AMSI Summer School

Is science any use for saving species and habitat?

Professor Hugh Possingham, presented by the AMSI Winter School

From lotteries to polls to Monte Carlo

Professor Jeffrey Rosenthal, AMSI-SSA Lecturer public lecture series

Journeys through mathematics & life

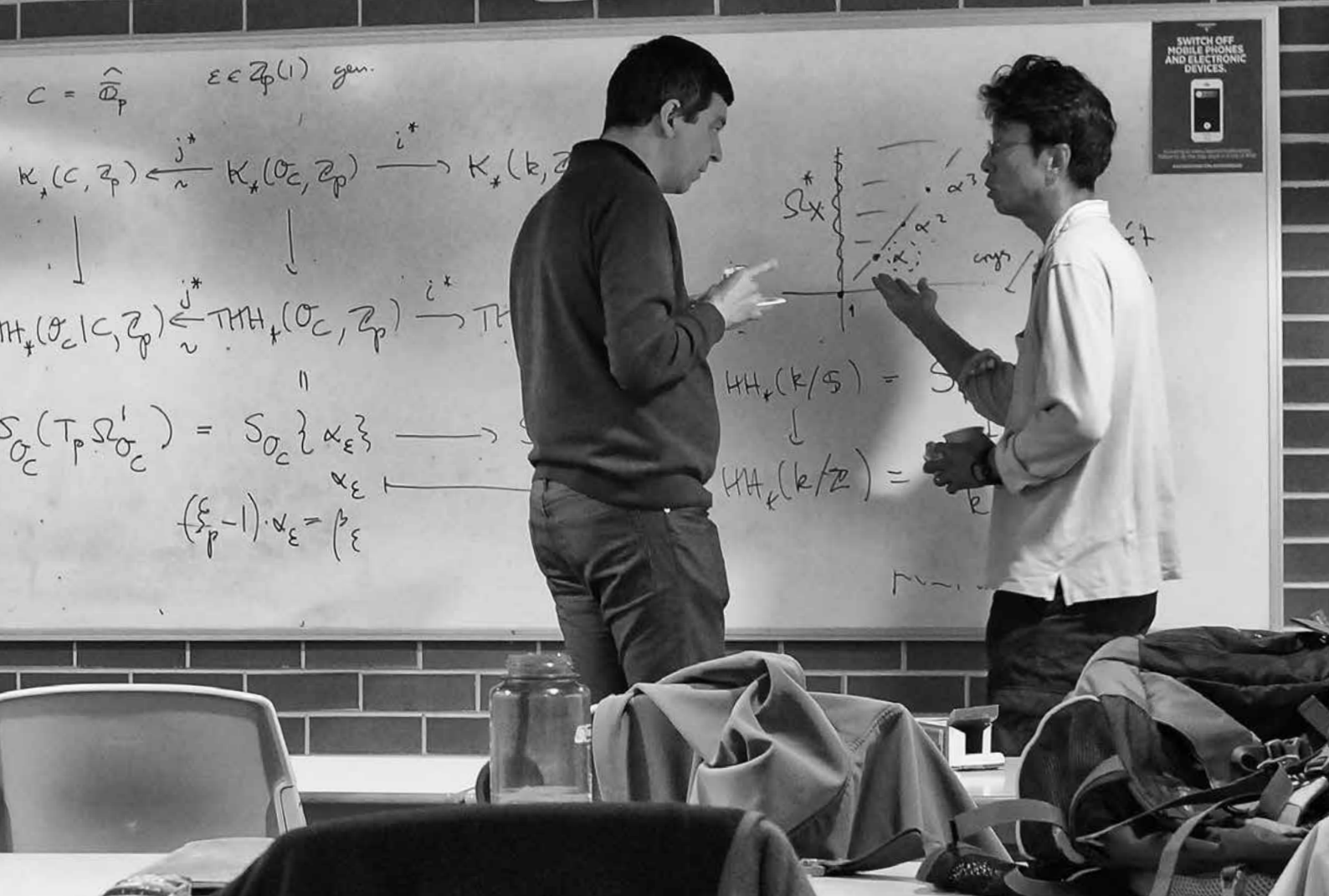
Professor Nalini Joshi and Cassandra Portelli, jointly presented at the Guttman 2015 workshop and ANZAMP conference

Details on these events are available at amsi.org.au/past-events-list/

Opposite Margaret Wertheim, interviewed at the AMSI Summer School held at RMIT University

Research

10:53:53



895

Participants

88

Sponsored
international speakers

42

Travel grants

18

Sponsored
Workshops

Participation for 2016

56% Oceania

17% Asia

17% Europe

10% Americas

Research

AMSI Research supports mathematical discovery and collaboration through its internationally recognised sustained scientific workshop program. In 2016, the Institute sponsored 18 workshops and conferences nationally, with the interdisciplinary impact of the mathematical sciences attracting participants from academia, industry and government.

Launched in 2016

It has been an outstanding year for AMSI Research with workshops reporting a significant increase in international participation and collaborative research outcomes.

Strengthening AMSI's partnership with the Australian Mathematical Society (AustMS), the launch of Maths Fest was a major highlight in 2016. The three-week multi-event featured a panel of high-level national and international keynote speakers, and the added drawcard of two international workshops. Showcasing the best of Australian mathematical sciences, the event successfully increased international presence at AustMS 2016.

Workshop Program

In 2016, AMSI's Scientific Workshop Program funded workshops covered a broad range of topics from number theory to K-theory and topology to ergodic theory. With 18 events, the program provided a platform to strengthen Australia's knowledge base through international research engagement.

In October 2016, Professor Terry Speed FAA, FRS was appointed Chair of AMSI's Scientific Advisory Committee following the passing of Professor Jon Borwein FRSC, FAAAS, FAA. A world leader in statistics and bioinformatics, Terry is a senior researcher in the bioinformatics division at the Walter and Eliza Hall Institute of Medical Research. He is affiliated with the Department of Statistics

at the University of California, Berkeley, and an associate of the University of Melbourne's School of Mathematics and Statistics.

Reporting to the AMSI Board, the Scientific Advisory Committee (SAC) provides scientific advice for AMSI Research activities and reviews, as well as evaluating applications for the AMSI Scientific Workshop Program. The second funding round for 2016 drew a record 16 applications, exceeding 2015's Round Two workshop sponsorship applications of 14. With a number of workshops already committed for next year and a high number of applications received we anticipate another strong year in 2017.

The Scientific Workshop Program supported 88 international expert visits to Australia. AMSI also awarded 42 travel grants to our members to cover staff and student attendance at our workshops, meetings and courses through the AMSI online application platform.

AMSI's support of the Mathematics in Industry Study Group (MISG) provides students with valuable collaboration experience through team-based challenges tackling a range of interesting and relevant industrial problems. More than 80 delegates attended MISG2016 at the University of South Australia's City West campus in early February. Working in groups, participants solved real-world industrial problems from the DST Group, Schneider Electric, SA Water and Ergon Energy.

Linking to the World

As 2016 AMSI-SSA Lecturer, Canadian statistician and Professor of Statistics at the University of Toronto, Professor Jeffrey Rosenthal toured Australia from late November to mid-December. Jeffrey delivered public lectures (*From Lotteries to Polls to Monte Carlo*) and specialist talks (*The Mathematics of Markov Chain Monte Carlo*) at universities in Sydney, Melbourne, Adelaide, and Brisbane, including a plenary talk at the SSA conference. These events were well attended with 200 at both the Adelaide and Melbourne public lectures. They also received substantial media interest including a live interview on ABC Breakfast TV, two radio interviews and articles in most major city dailies.

AMSI thanks the Chairs of the Research and Higher Education Committee and Scientific Advisory Committee respectively together with all the committee members for their support and advice throughout 2016.

AMSI Research Report

The AMSI Research Report 2015–16 is a comprehensive record of the Institute's research activities for the year ending in June 2016. This is available for download at amsi.org.au/publications/research-reports-2015-16/

Opposite Professor Shuji Saito and Professor Lars Hesselholt at the International Conference in K-Theory

“AMSI's scientific workshops provide an important platform to strengthen international engagement and foster interdisciplinary ties. The exchange of ideas and potential for collaboration is critical for the continued growth of the mathematical sciences in Australia.”

Professor Terry Speed, AMSI Scientific Advisory Committee Chair

Research Events

Advanced Collaborative Environment (ACE) Network Research Seminars

In addition to running the ACE Honours program (see pg 18), AMSI advertised access to 27 research seminars broadcast by universities around Australia using their ACE facilities.

In May, AMSI partnered with the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS) to host a discussion forum on ARC Industry Linkage Projects through the ACE network. The network also supported the broadcast

of a workshop on Measuring Research Engagement and Impact in September.

Heidelberg Laureate Forum 2016

AMSI and AustMS provided funds for four young Australian researchers to attend the 2016 Heidelberg Laureate Forum in Germany. This global annual event brings winners of the most prestigious scientific awards in Mathematics and Computer Science together with a select group of highly talented young researchers.

This year's travel grant recipients were Mark Bugden (ANU), Bao Ho (La Trobe), David Khoury (UNSW) and Tian Sang (RMIT).

Early Career Workshops

During 2016, AMSI supported both the Australia and New Zealand Industrial and Applied Mathematics (ANZIAM) and the Australian Mathematical Society (AustMS) *Early Career Workshops*. These were held directly before both annual conferences in February and December respectively.

AMSI Sponsored Scientific Workshop Program 2016

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 attending AMSI-sponsored events
- Bringing leading international researchers to Australia for scientific collaboration and public outreach

Details of each workshop including invited speakers and outcomes may be found in the *AMSI Research Report 2015–2016* (for workshops held in January – June 2016) and in the forthcoming *AMSI Research Report 2016–2017* (for workshops held from July – December 2016).

Gromov Witten Theory, Gauge Theory and Dualities

6–16 January, The Australian National University. **Attendees 39**

Capital Number Theory

8–9 April, The Australian National University. **Attendees 41**

Computational Science Workshop

7–9 June, Geoscience Australia. **Attendees 50+**

Probabilistic and Extremal Combinatorics Downunder

13–17 June, Monash University. **Attendees 65**

Ergodic Theory and its Applications

18–22 July, School of Mathematics and Statistics, The University of Sydney. **Attendees 35**

MATHSFEST 2016

In partnership with AustMS, AMSI launched Maths Fest in 2016. This bookended the AustMS Annual Meeting with the following international workshops run at The Australian National University.

Advances in Ergodic Theory, Hyperbolic Dynamics, and Statistical Laws

28 November–2 December, The Australian National University. **Attendees 50+**

Nonlinear and Geometric Partial Differential Equations

9–13 December, The Australian National University. **Attendees 50+**

Mathematical Optimisation Down Under 2016 (MODU2016)

18–22 July, RMIT University. **Attendees 49**

Winter of Disconnectedness

25 July–5 August, The University of Newcastle. **Attendees 21**

International Conference in K-Theory

1–5 August, Western Sydney University. **Attendees 40**

Geometry at ANU

15–26 August, The Australian National University. **Attendees 66**

Animal, Vegetal, Mineral? Emergence and Function of Complex Shapes in Self-Assembly and Biological Cells

18–23 September, The Australian National University, held at Cave House Hotel WA **Attendees 76**

Number Theory Down Under 4

23–26 September, The University of Newcastle. **Attendees 45**

Topological Matter, Strings, K-Theory and Related Areas

26–30 September, The University of Adelaide. **Attendees 32**

Workshop on Low-Dimensional Topology and Quantum Algebra

31 October–4 November, Mathematical Sciences Institute, The Australian National University. **Attendees 31**

Mathematical Methods for Applications: ANZIAM-ZAMA Joint Meeting

11–14 November, La Trobe University; held in Hangzhou, China. **Attendees 90**

International Conference on Nonlinear Partial Differential Equations

21–25 November, The University of Sydney; held at the University of New England, School of Science and Technology (Armidale). **Attendees 46**

Interactions Between Topological Recursion, Modularity, Quantum Invariants and Low-Dimensional Topology

28 November–23 December, The University of Melbourne; held at MATRIX (Creswick). **Attendees 51**

Tributes to Peter Hall and Jon Borwein

It is with great sadness that we mark the passing of two mathematical leaders with strong ties to AMSI during 2016.

Professor Peter Hall FRS, FAA, AO

As one of the discipline's most iconic and respected leaders, Peter will be remembered through his rich legacy of outstanding leadership and contribution to the Australian and global mathematical sciences.

Peter's field of expertise was in probability theory and mathematical statistics, with applications across diverse fields including economics, engineering, physical science and biological science. He published over

Peter was universally respected and admired by all those he worked with and he will be remembered as a giant of the mathematical sciences who was as much a part of the fabric of Australian statistics as it was of him.

600 journal articles, reviews, book chapters and more, including four books over the course of his career.

After receiving his doctorate from the University of Oxford he returned to Australia to establish his career at The University of Melbourne and then the Australian National University. The last decade of his career saw him back at The University of Melbourne, with a joint appointment at the University of California, Davis.

The inaugural chair of AMSI's Scientific Advisory Committee, the workshop program flourished under his stewardship invigorating the Australian

mathematical community. Featuring high profile international speakers, the events strengthened ties between the Australian and global mathematics communities.

Peter's leadership of this program contributed to a sense of national identity amongst Australian mathematical scientists, students and AMSI's member institutions.

In recognition of his contribution to the Institute and mathematical sciences, Peter was one of the inaugural recipients of the AMSI Distinguished Service Medal in 2012. He was made an Officer of the Order of Australia in 2013 for his contributions to and leadership within the mathematical sciences.



Professor Jonathon Borwein FRSC, FAA, FAAAS, FAMS

A mathematician of astonishing range and versatility and a leader in every way, Jon will be long remembered for his contribution to the Institute as a passionate and inspiring leader and voice for research.

A highly respected ambassador for the Australian Mathematical Sciences, he held a range of leadership roles including President of the Canadian Mathematical Society and Editor in Chief of the Journal of the Australian Mathematical Society. An ISI highly cited scientist, his work in mathematics and computing, including optimisation, computational number theory and classical functional analysis, was widely published.

Jon's interests spanned pure mathematics (analysis), applied mathematics (optimisation), computational mathematics (numerical and computational analysis),

and high performance computing. He also had a long-running interest in the number pi and its computation, and was considered one of the world's experts on the irrational number.

In 2008, he moved to Australia to take up a position as Laureate Professor in the University of Newcastle's School of Mathematical and Physical Sciences and Director of CARMA, the Priority Research Centre in Computer Assisted Research Mathematics and its Applications. Two years later he became the chair of AMSI's Scientific Advisory Committee, going on to hold roles as a member of AMSI's Research and Higher Education Committee and as an observer on AMSI's Board. His deep international leadership experience, coupled with his great generosity

of spirit, has been of extraordinary value to the mathematical sciences in Australia and to AMSI in particular.

Widely published, Jon authored over a dozen books (most recently several on Experimental Mathematics and a monograph on convex functions), and over 400 refereed articles. In 1995 he co-founded a software company, Math Resources, consulting and producing interactive software primarily for school and university mathematics. He also mentored 30 graduate students and 42 post-doctoral scholars.

Jon's legacy to mathematics, both in Australia and internationally, is considerable. The world has lost a remarkable mathematician and AMSI one of its greatest champions.



Higher Education



- ▶ Introduced by Bernštejn, Gelfand and Pon
- ▶ Gives a constructive approach

428

participants attended
the four Higher
Education Flagship
Events in 2016

2016 attendees:

42%
female

2016 Participants:

3% ACT
14% NSW
13% QLD
40% SA
1% TAS
23% VIC
3% WA
3% INTERNATIONAL

Higher Education

AMSI's Higher Education program enhances the undergraduate and postgraduate experience for students in the mathematical sciences and related disciplines. Our flagship events bring Australian students together to develop their talents. Featuring training schools, graduate courses and scholarships, they set the standard for research training infrastructure.

Exposure to cutting-edge methodologies and field areas not routinely covered in academic courses, prepares graduates for the challenges of cross-disciplinary research and industry innovation.

In April 2016, AMSI received a \$2 million grant from the Department of Education and Training under the *Securing Australia's Mathematical Workforce 2016–2020* project to strengthen Australia's mathematical capability through delivery of research and higher education programs. This aligns with the *National Innovation and Science Agenda's* aims to improve outcomes for higher education students in science, technology, engineering and mathematics. Importantly, strengthening research training for graduates in Australia will foster a highly skilled mathematical workforce. Building on the success of current flagship events and scholarship programs, this funding will allow AMSI to expand the program through new initiatives, such as AMSI Optimise and deliver opportunities for real-world research experience. Hosted by The University of Queensland, the 2016 AMSI Winter School was the first event to take place under this funding arrangement.

Developing World-Class Talent

In 2016, the AMSI Higher Education flagship program strengthened its engagement with the mathematical sciences community. Total annual attendance of students and early career researchers for 2016 of 428 reflected a small increase over the 2015 attendance level. More than 50 national and international experts participated in a teaching capacity at these events, giving their time, passion and research expertise with emerging researchers. We expect 2017 attendance levels to easily exceed this.

Featuring specialist talks, one-off courses and cutting-edge research, this year's program fostered learning outcomes beyond the scope of traditional academic programs. With an estimated 75 per cent of jobs in our high growth industries requiring STEM-skilled workers, equipping students for a 21st century workforce is critical to future productivity.

Increasing Gender Equity

Currently women account for fewer than 30 per cent of undergraduate and postgraduate enrolments in the mathematical sciences. Recent measures to support female participation in our programs have been successful with an increase in female participation across most of our flagship events. In particular, female attendance at Winter School increased to 42 per cent of participants and more than 50 per cent at BioInfoSummer. The strong overall attendance at BioInfoSummer assisted in the Higher Education program exceeding a 40 per cent proportion of females for the first time in 2016. This achievement continues the strong trend of female participation growth over the past five years.

Looking Outwards

AMSI Higher Education's embedded outreach program connects school students and the general public to the exciting world of the mathematical sciences. Accessible cutting-edge research is shared across a range of outreach initiatives such as public lectures, panel discussions, media campaigns, blog posts, speaker and student interviews, opinion pieces and social media.

Each of our 2016 flagship training events featured a significant number of program extras and outreach activities, including the following:

- Opening Ceremony (with keynote speaker)
- Women in the Mathematical Sciences / STEM event
- Careers Session or Panel
- Public Lecture
- Event dinner
- Other events including Lunchtime Lectures, Poster Sessions, Coding Competitions and student social events.

These extras have generally been very well supported by flagship event attendees, host university staff, and the general public.

New in 2017: AMSI Optimise

Launching in June 2017, AMSI Optimise will model the success of AMSI's popular BioInfoSummer symposium. The annual research-training event will focus on strengthening mathematical optimisation research engagement and its applications across industry. Providing a platform for AMSI Intern, this program will further increase research-industry engagement.



Opposite Ainsley Pullen from The University of Queensland presenting her work at the Big Day In Conference

Higher Education Events

AMSI Flagship Programs

AMSI Summer School 2016

4–29 January, RMIT University

Attended by 127 honours and postgraduate students, the 14th Annual AMSI Summer School delivered an intensive four-week program. Students gathered at RMIT University to tackle one or two of eight intensive, honours level mathematics and statistics subjects on offer with many students taking one subject for credit.

Under the supervision of Australian research leaders, academic work was complemented by enrichment lectures, as well as social events, a public lecture and a careers afternoon. The Public Lecture was very successful, with over 200 members of the general public attending Margaret Wertheim's talk on *Corals, Carbon and the Cosmos: The Story of Hyperbolic Space*, which also attracted some focused media attention.

AMSI Vacation Research Scholarships 2015–2016

December 2015 – February 2016

Vacation Research Scholarship participants completed real-world mathematical research projects under the supervision of academics from their home university. This model is effective in inspiring students to continue with further research in the future. Scholarships were awarded to 50 of the 76 student applications in 2015–16.

At the end of the six weeks, recipients came together to present their findings to their peers and supervisors at the AMSI hosted Big Day In Conference (9–11 February at International House, at the University of Melbourne). AMSI provides these monetary scholarships to give students a taste of life as a researcher.

AMSI Winter School 2016 on Biological and Environmental Modelling

4–15 July, The University of Queensland

Hosted by The University of Queensland over two weeks in July, this year's Winter School attracted 45 graduate students and postdoctoral fellows of whom 42 per cent were female and one identified as ATSI. This year's attendees explored the theme of Biological and Environmental Modelling. This theme attracted a variety of participants from a broad range of scientific disciplines.

Hosted in conjunction with BrisScience, Professor Hugh Possingham's Winter School public lecture was extremely successful with over 350 attendees. Tickets sold out within a week of registrations opening. The media release for this public lecture attracted national attention with an article in *The Guardian*, and strong social media activity on Twitter and Facebook.

AMSI BioInfoSummer 2016

28 November – 2 December, The University of Adelaide

More than two hundred students and public and private sector researchers gathered at the University of Adelaide for a showcase of cutting-edge developments in bioinformatics. This event received strong local support, with three Adelaide universities accounting for over 70 per cent of the total attendance. For the second year in a row, more than 50 per cent of BioInfoSummer attendees were female.

Acting Chief Executive Officer of the Australian Research Council, Ms Leanne Harvey, opened the event with an interesting and inspiring address encouraging delegate networking. This year's event featured prominent international and domestic speakers from a variety of disciplines, as well as statistics, software, and wet lab training to up-skill and inspire attendees. There was a good overall balance between talks, workshops and networking. The outreach events were well attended with more than 150 people attending the public lecture and around 100 at the Women in STEM event.

AMSI thanks the following people for their leadership in 2016, Summer School Director Professor Andrew Eberhard (RMIT University), BioInfoSummer Director Associate Professor Gary Glonek (The University of Adelaide), and Winter School Director Dr Phil Isaac (The University of Queensland). We also acknowledge the contributions of the speakers, Vacation Research Scholar supervisors and support staff, and their generosity in giving their time to ensure the success of these events.

Other Events/Programs

Choose Maths Grants 2016

Launched in 2015 as a component of the AMSI Schools' Choose Maths project, these Grants provide full or partial support to Australian female mathematical sciences students and early career researchers attending AMSI Flagship programs. These grants help remove financial barriers such as travel, accommodation and family caring expenses to enable women to extend their skills and professional networks.

Recipients are selected by the Choose Maths Grant Committee on a competitive basis—with 17 grants awarded in 2016:

- AMSI Summer School 2016 – 3 awards
- AMSI Winter School 2016 – 5 awards
- AMSI BioInfoSummer 2016 – 9 awards

The Choose Maths project is funded by the BHP Billiton Foundation.

Advanced Collaborative Environment Network Honours & Masters Courses

The Advanced Collaborative Environment (ACE) Network is now in full operation following the substantial 2015 upgrade. The new, sophisticated software platform has enhanced functionality and connectivity, facilitating greater collaboration between the mathematical sciences community within Australia and internationally. This broadens the student research experience beyond existing academic programs and supports our smaller member universities to full honours programs.

As well as running the ACE Research Seminars (see pg 14), six Honours courses were delivered through the network in semesters one and two enabling simultaneous student participation in Honours subjects across a number of universities.

SPONSORS

Australian Government – Department of Education and Training

BHP Billiton Foundation • RMIT University

The University of Queensland

The University of Adelaide • AustMS

ANZIAM • ACEMS • BrisScience • QCIF

The Simulation Group • ABACBS

EMBL Australia • COMBINE • Illumina

University of South Australia

Flinders University

Research Collaboration



English Broom — a Weed of National Significance

AMSI continues to provide statistical support to Parks Victoria's environmental monitoring, evaluation and reporting processes through the partnership program established in 2010. This year, AMSI statistician, Dr Kally Yuen, worked with Science and Management Effectiveness Branch staff on data analysis and development of monitoring protocols and data management system for a number of projects.

Control of English Broom in Alpine National Park

Introduced in the nineteenth century, English broom is now widespread in Victoria's eastern alps, including Alpine National Park. It is a weed of national significance due to its invasiveness, potential for spread and severe impacts on Australia's environment and primary industry. In 2004, Parks Victoria launched an adaptive experimental management program to evaluate the effectiveness of a number of herbicide treatments to control the weed. The results indicated that all treatments were able to reduce broom cover to a low levels by the seventh year.

A second phase of the program was launched in 2013 to investigate the best approach to maintain the low level achieved previously. This second phase indicated that active treatment targeted at residual broom plants and new growth is necessary, and the use of spot spraying on a biennial basis is sufficient to prevent the increase of broom level and preserve other plant species. However, annual treatment with spot spraying is not recommended as it tends to reduce the number of native plant species in the area treated.

Weed Monitoring in the Dandenong Ranges

At the 6th Biennial Weed Society Victorian Conference in June 2016, Dr Marie Keatley, environmental scientist at Parks Victoria, presented the results of weed mapping undertaken in Dandenong Ranges National Park. In addition to publication of the work in the Conference proceeding, it was selected for publication in the peer-reviewed journal Plant Protection Quarterly.

This work identified Sweet Pittosporum as the most persistent weed in Dandenong Ranges National Park. Results have assisted planning for weed control in the region and enabled the community weed action group StopPitt to obtain funding for weed control. It has also led to collaboration between Parks Victoria and a PhD student from Monash University to investigate how long it would take plant communities to recover once Sweet Pittosporum is removed.

AMSI Intern Program

Parks Victoria is a long-term AMSI Intern industry partner, providing opportunities for postgraduate students to gain industry experience and apply their research in the context of real-world projects. In May 2016, Deakin University postgraduate student, Yongqing Jiang, gave a presentation of his intern project to a group of engaging staff at Parks Victoria. Yongqing has created an efficient database system to capture data collected by remote cameras used to monitor fauna in parks.

As a result of this successful collaboration, Yongqing was selected to embark on a new AMSI intern project to develop an automated system to detect whether an image has fauna in it or whether it is the result of a false trigger. Now completed, Yongqing successfully presented his work to Parks Victoria staff in mid-December 2016.

AMSI acknowledges Parks Victoria for their continuing support of this important research collaboration.

AMSI Intern



34 interns from 5 disciplines placed with 21 industry partners across 9 industry sectors generating \$666,500 funding for universities

“We owe it to our STEM PhD graduates to prepare them for industry careers, not just because the opportunities in academia are limited but because the paths in industry can be extremely rewarding.”

Dr Alan Finkel, Chief Scientist of Australia

AMSI Intern

AMSI Intern provides PhD students from all disciplines opportunities to apply their research to complex real-world industry challenges. As Australia seeks to strengthen its STEM and innovation capability, our aspiration is to see these short-term industry engagements become a vital and routine part of the Australian postgraduate experience.

In 2016 the Australian Government committed \$28.2 million to expand AMSI Intern from 2017 as a national-scale industry engaged program. With innovation policy a core focus, this will address Watt and ACOLA report recommendations to strengthen Australia's capacity to translate publicly funded research into commercial outcomes. Our tight focus on industry led research outcomes informed by PhD projects makes AMSI Intern an effective vehicle for translation.

Growth and Consolidation

In 2016, an increase in intern program placements and strong repeat business rate confirmed the ongoing value proposition of the program. Consolidation of key industry partnerships strengthened engagement across core innovation sectors. This demonstrates capacity for placement of multiple internships within large organisations.

Co-investment by eight Victorian and New South Wales partner universities in 2015 has led to a renewed focus on building program capacity and strengthening of long-term government and business partnerships.

University-embedded, our AMSI Intern Business Development Officers continue to drive critical engagement to expand university and industry networks and build linkages critical to future innovation.

This expansion provides a strong foundation for further growth following the announcement of the Australian Government's planned \$28.2 million investment over four years. This would provide placements for 1400 PhD researchers across all disciplines nationally.

Performance Summary

Punctuating placements, maturation of industry partnerships saw a 43 per cent repeat business rate in 2016. Key growth sectors include telecommunications, banking and defence industries. Totalling 34, placements in 2016 represent an increase of 55 per cent over 2015's 22 placements. At 32 per cent compared to 27 per cent in 2015 female placements are increasing. Female placements over the life of the program currently sits at 35 per cent, in line with AMSI's core focus.

Victoria and New South Wales have represented a majority of placements (91 per cent), reflecting their higher level of business development activity due to the co-investment partnerships brokered in 2015. The location of a business development officer focused on growing the program in Sydney is now bearing fruit, with 12 placements in 2016. Interns were also placed in South Australia and Western Australia.

Placements with SMEs were a healthy 24 per cent of internships in 2016, with large enterprises and government agencies at 44 per cent and 26 per cent respectively. Just under 70 per cent of placements were fully funded by the industry partner, and these were almost exclusively made up of large enterprises and government agencies. A partnership with DST Group which offers funding for industry operating within the defence sector was very successful, accounting for 18 per cent of 2016 placements.

Customer satisfaction

The satisfaction rate for the AMSI Intern program remains at a high 96 per cent and 83 per cent of survey respondents rated the support from AMSI Intern as "Excellent" or "Very good". All survey respondents would recommend the program to others.

For 77 per cent of the interns who responded, this internship was their first industry experience with 89 per cent rating the experience as important in preparation for future employment.

The program also has flow-on academic research benefits through strengthening industry engagement. Of the academic mentors who responded to the survey, 62 per cent intend to collaborate with the industry partner beyond the internship. A strong 65 per cent of industry partners

reported implementing the outcomes of the project with 20 per cent employing the intern following the internship.

Finally, 89 per cent of industry partners and 99 per cent of academic mentors indicated they intended to re-engage with the program.

Strategic Partnerships

In a confirmation of the effectiveness of AMSI's corporate engagement, AMSI Intern has developed strategic partnerships with a number of high-level Australian organisations:

- The **Defence Science Institute** partnership secured five internships in its second year. Partnership discussions continue with **DST Group**
- AMSI Intern secured three **BHP Billiton** internships — a mathematics-focused project commenced in December 2016 with a further two projects in development. Based in WA these build on AMSI's *Choose Maths* partnership
- A three-year agreement negotiated with the **Australian Bureau of Statistics** will deliver 11 internships
- In a strengthening of the program's partnership with **ANZ**, another three placements will commence from January 2017 focusing on data science/analytics. A second round will be recruited in March/April 2017
- The **Parks Victoria** partnership has now placed six students over the past eight years
- A successful **Telstra** partnership delivered four internships in 2016
- **Canon Information Systems Research Australia** accepted their fourth intern, with placements planned for 2017
- **Meat and Livestock Australia** are planning at least two intern placements in 2017; a strong foundation for the annual placement of multiple interns nationally

Other major organisations who engaged with AMSI Intern program in 2016 include CBA, CSR and the Bureau of Meteorology (two internships in 2016). The strong resonance of AMSI Intern's value proposition with leading and respected Australian companies acts as a beacon to smaller SMEs — a critical focus for AMSI and the intern program.

Opposite Professor Liuping Wang (Academic Mentor) RMIT University, Dr Xi Chen (Intern) RMIT University and Jeff Thomas (Industry Partner), BAE Systems



Schools

Choose Maths Project

AMSI Schools has conducted
527 school visit days at
120 schools across Australia
116 professional
development days, with
1673 teachers attending

High Demand for AMSI Schools Teaching Resources

67% of traffic to AMSI websites is for TIMES
Teacher Modules*, **26%** is for SAM Middle
Years Teacher & Student Content Modules and
6% is for SAM Senior Years Modules

(Google analytics 24 November 2016)

* Developed by AMSI Schools in 2010

Schools

The AMSI Schools team is known for its commitment to working with and for teachers to enhance educational deliveries. Using a tailored approach, we take time to understand the needs of teachers and students, and design programs that engage and inspire future generations of mathematicians and statisticians. Public engagement is increasingly part of our work. We recognise the need for information to assist parents and members of the public to understand the possibilities that exist through mathematics.

Strategic Partnerships

2016 has been an exciting year for AMSI Schools. The BHP Billiton Foundation-funded initiative Choose Maths project is in full swing with all four components progressing well.

Continuing its engagement with AMSI Schools, Boeing Australia has sponsored a series of four videos exemplifying concepts from the Year 11 and Year 12 curriculum. These will be available on the AMSI Schools Teacher resource portal, Calculate (calculate.org.au) from early 2017.

The completion of work with twelve Geelong schools in June 2016 marked the end of a three year, \$407 000 collaboration with The William Buckland Foundation. Schools staff reported enhanced outcomes for their students, and an increased enthusiasm for mathematics in the school community.

Careers

Now in its 19th edition, *Maths Adds* was distributed to every Australian school in 2016 with the assistance of the Australian Association of Mathematics Teachers (AAMT) and Careers Education Association of Victoria (CEAV). This coincided with the launch of a new companion website, mathsadds.amsi.org.au featuring over 100 examples from recent job ads illustrating mathematical and statistical career pathways. The *Maths Adds* website aims to assist students making decisions about subjects going into Year 11 and Year 12, as well as giving them some direction about higher education study options.

Opposite Professor Geoff Prince presenting awards for Best Senior Video at the Choose Maths Awards ceremony

The Education Challenge

The release of AMSI's *Participation in Year 12 Mathematics 2006–2015* report served as a reminder of the considerable work remaining to strengthen mathematics education. Worryingly, the report revealed a continued decline in Year 12 advanced mathematics participation, particularly amongst girls.



“We need young people who are innovative, resilient, problem solvers and critical thinkers. Investment in mathematics education is critical to provide students, particularly girls, with the foundational skills and confidence to drive industry and innovation into the future. Skilled educators make this possible by creating engaging learning environments.”

Laura Tyler, BHP Billiton Chief of Staff, Head of Geoscience

Choose Maths

A student's decision and motivation to choose maths is supported by access to sufficient information about its need and value. Resources about the types of work open to mathematicians and statisticians and the knowledge that any effort made to complete a secondary school mathematics subject will have benefits. As things stand, both information and motivation are in short supply, especially for girls and young women—with too few taking mathematics in senior secondary school and in the undergraduate years of university.

It was a busy second year for the Choose Maths project in 2016. Funded by the BHP Billiton Foundation 2015–2019, the project has four aims:

- Increased engagement, enthusiasm and confidence in mathematics demonstrated by girls
- Enhanced teacher knowledge and confidence in mathematics and commitment to the implementation of strategies known to engage and inspire girls in Choose Maths schools
- Enhanced understanding of the importance of mathematics in stakeholder base beyond Choose Maths schools
- Decrease in the tightly held public perception of the gender stereotype in mathematics

Teacher Professional Development

During 2016 the Choose Maths Outreach Officers conducted:

- 527 school visit days across 120 schools
- 116 professional development days
- Engagement with 1673 teachers

Outreach Officers used the visits to showcase model lessons, observe current teaching practices and provide feedback. Additionally they responded to requests for topic-specific resources such as modules and support materials and delivered special mathematics events such as family nights and school career days.

Career Awareness Campaign

On target for delivery in 2017, a national public-awareness campaign will help students, teachers, parents, and the public understand the professional value of maths as a rewarding and interesting career pathway. The campaign will feature a series of posters, brochures, social media campaigns, web-based resources and national events.

Women in Mathematics Initiative

A dedicated project officer drives this important component of Choose Maths creating opportunities for women—secondary students to undergraduates, academic and industry professionals—studying and working in mathematics and related fields. Working with AMSI members, the program includes webinars, dinner events and mentor relationships with undergraduate, academic and professional industry leaders. STEM industry and business leaders will act as role models, inspiring young women through their stories and field experience. The Maths and Biology initiative will highlight the cross-disciplinary connection increasingly present in the workplace and industry narrative.

Choose Maths Grants

Many factors contribute to the under-representation of women in Australian mathematics. Choose Maths grants address some of the pipeline blockages. In 2016, 17 women received support to attend AMSI events through the Choose Maths Grants, including Summer School (three), Winter School (five) and BioInfoSummer 2016 (nine).

Choose Maths Awards

Presented in August, the inaugural Choose Maths Awards drew a very strong response from teachers and students. As well as over 30 teacher nominations, more than 660 student teams entered videos in the student awards. The ceremony was attended by teachers and students representing regional and metropolitan schools around Australia, and was hosted by AMSI Director Professor Geoff Prince and BHP Billiton's Chief of Staff Laura Tyler, at Leonda by the Yarra in Melbourne.

The Awards have delivered benefits for the winners, with significant media coverage and new opportunities for awardees.

Research

Ongoing national research activities with schools will inform and evaluate the Choose Maths project.

In Term One the Australian Centre for Educational Research (ACER) designed the independent survey instruments for teachers and principals.

In the second half of 2016 AMSI Schools team members undertook research activities as a baseline for AMSI's research, which will inform Choose Maths in 2017 and beyond.

Schools

Choose Maths Awards

Student awards 2016: *Maths is more than just numbers*

Working in teams, students were asked to create videos reflecting the theme. The Choose Maths Awards team received more than 660 videos for consideration, of which 35 were shortlisted for consideration by the judging panel.

Best Senior Video

Danebank Anglican School for Girls (NSW) – *Everything Around Us*

Best Junior Video

Toorak College (Vic) – *Geometry Around the World*

Awards for Excellence

Australian Islamic College (WA) – *A Doctor's Dream*

Beaconhills College (Vic) – *Maths is More Than Just Numbers*

Huntingtower School (Vic) – *Gauss' Remarkable Theorem*

John Monash Science School (Vic) – *Graph Theory in Pathfinding*

Distinction Awards

Armidale High School (NSW) – *Percentages in Real Life*

Burwood Girls High School (NSW) – *World of Mathematics*

George's River, Hurstville Boys Campus (NSW) – *Maths is the World*

Methodist Ladies' College (Vic) – *The Wonderful World of Triangles*



Teacher Awards

In 2016 we received more than 30 Teacher Award nominations and applications for consideration by the judging panel.

Mentoring Girls in Mathematics Awards

Peter Chandler – Penrhos College, Como (WA)

Peter's leadership, passion and creativity have made an indelible impact on the Penrhos school community. For over 12 years he has engaged, challenged, and mentored girls to help them reach their full mathematical potential. Transforming maths at Penrhos, he has spearheaded initiatives such as successful maths extension program, MathsMentorProgram@Penrhos, partnership activities with Harry Perkin's Institute of Medical Research, national and international enrichment linkages, and an annual mathematics celebration. Making the world his classroom, he has demonstrated that maths is truly more than just numbers.



Stacey King – Mabel Park State High School (QLD)

Stacey has developed a mathematics program integrating experiences and competitions to enhance learning and awareness of real world applications. As well as leading the school's National Science and Maths week celebrations, she has established enrichment initiatives such as the Maths Science Academy (MSA) and STEMfare. Held in conjunction with local and neighbouring schools, STEMfare features STEM and Maths activities such as augmented reality 'sandbox', drones, Spiderbots and Lego EV3s demonstrations.

Teacher Excellence Awards

Greg Anderson – St Leonards College, Brighton (Vic)

Lisa Hogan – Mary Mackillop Catholic Regional College, Leongatha (Vic)

Terry Jacka – St Hilda's School, Southport (QLD)

Jacki McMahon – Makybe Rise Primary School, Baldivis (WA)

Norah Parsons – Moura State High School (QLD)

Cassandra Portelli – Hunter School of the Performing Arts, Newcastle (NSW)

Janine Stewart – St Columba Anglican School, Port Macquarie (NSW)

Eddie Woo – Cherrybrook Technology High School (NSW)



Marketing & Media Stats

103 news articles quote
AMSI in 2016—106%
increase from 2015

24 media releases,
up from 18 in 2015

3535 Facebook likes social
media exposure and a 31%
increase from 2015

AMSI email open rate 41%
—average education sector
email open rate 23%

(source: [mailchimp.com/resources/research/
email-marketing-benchmarks/](http://mailchimp.com/resources/research/email-marketing-benchmarks/))

As Australia's national voice for the mathematical sciences, AMSI engages with a broad stakeholder audience including primary, secondary and university students, teachers, parents, researchers, the AMSI membership, government and industry. Our media presence supports policy engagement, advocacy and research training activities.

Strategy & Branding

Success of our customer-centric marketing strategy is evidenced by achieving increased growth, reach and engagement through e-communications, social media and websites. Increased brand awareness has generated leads and strengthened advocacy. This strategy focuses on delivery of market specific, tailored campaigns, including media. Key messages consider tone, timing, channel, design, cost and resourcing with a clear call-to-action.

In 2016, strategic partnerships proved beneficial in furthering reach and impact of our brand and programs, opening new channels to access key audience sectors.

Cross-promotion of programs was also effective in maximising engagement with key audiences. This optimises awareness of the mathematical sciences while highlighting linkages between AMSI programs, and emphasising career pathways available to students studying maths and statistics.

Strong design concepts and messaging across campaigns and publications have played a fundamental role in building AMSI's brand recognition, which has been supported through an increased media presence, outreach focused initiatives such as the Choose Maths project and research training events.

As work continues towards a proposed Government partnership, AMSI Intern is expected to undergo a brand and name change in 2017.

Underpinning engagement capability and reach, enhanced functionality of our customer relationship management and marketing systems has allowed targeted messaging to core markets, increasing overall lead generation.

Publications Review

The 2016 launch of the *AMSI Research Report* expanded our publications roster. This documents the success and impact of AMSI's Research and Higher Education programs as well as research related activities within the discipline, strengthening national and international collaboration through a range of AMSI delivered programs and events. In 2016 two editions were published, covering the years 2014–2015 and 2015–2016, going forward it will be an annual publication.

Released twice yearly, in 2016 the *Update* focussed on research and industry. Both featured contributions from high-profile political, academic, industry and STEM leaders, including the Chief Scientist

Dr Alan Finkel, Director of MISG Associate Professor Peter Pudney, DSI Associate Director Dr Regina Cramer.

The launch of the digital edition of *Maths Adds* underpinned AMSI's careers resources. With many more advertisements than the print version, the online portal is fully searchable using a variety of relevant keywords and industry sector categories. Additionally it showcases mathematics careers through a selection of profiles of people in a variety of careers that utilise maths, and provides information on graduate programs for maths graduates.

With the support of the Australian Association of Mathematics Teachers (AAMT) and the Careers Education Association of Victoria (CEAV), AMSI continues to distribute the print and digital edition of *Maths Adds* across Australian schools. The print edition was also circulated at AMSI member university open days, careers expos and school visits. mathsadds.amsi.org.au

Media Growth—Publicity

The go-to-authority on the state of Australian mathematics, AMSI has grown its media presence this year with a 106 per cent increase in media coverage compared to 2015 and 24 media releases. In line with AMSI's key priorities and *Vision for a Maths Nation* policy, media campaigns included the AMSI Schools Choose Maths Awards, the release of the 19th edition of *Maths Adds* and website, the release of the *2016 Discipline Profile* and accompanying policy document *Securing Australia's Mathematical Workforce* and the release of the *Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment* data.

Highly anticipated in media circles, the Institute's *Year 12 Mathematics Participation in Australia – the Last Ten Years* report (prepared by Dr Frank Barrington and Dr Michael Evans) kept mathematics education in the spotlight, with Choose Maths outreach events gaining regional coverage. Response was also strong to campaigns tied to our flagship research training programs and Professor Jeffrey Rosenthal's national AMSI-SSA Lecture Tour.

Media coverage was not restricted to print outlets in 2016, with a strengthened TV and radio presence, including coverage of the Choose Maths Awards, a public lecture by Margaret Wertheim at the AMSI Summer School and the above-mentioned lecture tour by Professor Jeffrey Rosenthal.

Governance

AMSI is an unincorporated collaborative joint venture of Australia's 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. The University of Melbourne is AMSI's lead agent and since 2002 a further six universities have become full members, including all Group of Eight universities. Our membership is made up of an additional 17 universities, five Government agencies and five mathematical and statistical learned societies.

AMSI's Organisational Structure Proven Effective

AMSI continues to make a significant contribution to the mathematical sciences in Australia. Our initiatives and programs are important parts of an overall strategy to enhance the standing and health of mathematics and statistics across the community.

AMSI is critically dependent upon the support of its member institutions. Without this support—both financial and via active participation in AMSI's enterprise—the Institute would not be able to provide the many services that are of direct benefit to the mathematical sciences.

AMSI's members meet face to face twice a year and the full members meet at least four times annually. In this way AMSI keeps its programs fresh and responsive to its membership.

Management of AMSI

The JVA makes the AMSI Board responsible for the overall direction of the Institute, formulation of policies and management of activities in AMSI's three portfolio areas:

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

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

Activities are detailed in the annual Business Plan and Budget document, authorised annually by the full members and the board. Management of the Institute and its activities is the responsibility of the Executive Committee (listed on page 29).

AMSI Board Composition

The board comprises:

- An independent chair appointed by the full members
- The Institute Director
- The Institute Deputy Director appointed by the full members
- One person representing the lead agent — 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

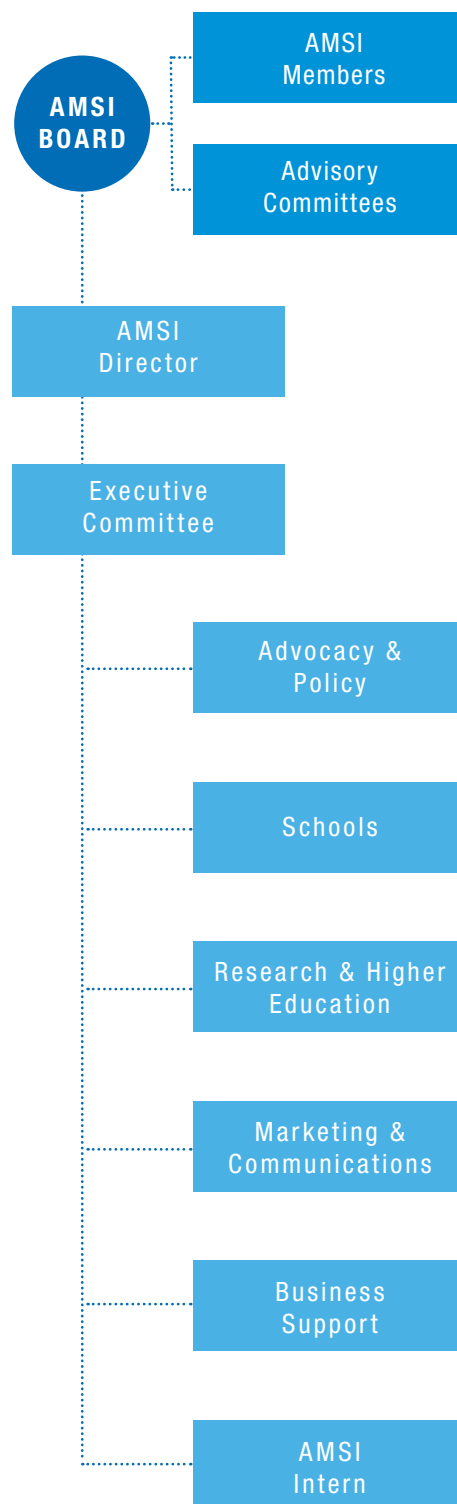
Remuneration of board members is noted in the financial statements on page 32.

Terms of Board Members

The independent members of the board are appointed for terms of one year but are eligible to serve for one or more further terms if reappointed in accordance with clause 19.3 of the JVA. Board representatives for the full members and associate members serve two-year terms.

In 2016 board meetings were held on 19 February, 5 May, 22 July, 10 November and 15 December.

Organisational Structure



Committees & Stakeholders

BOARD MEMBERS

Dr Ron Sandland AM—*Chair*, AMSI
Dr Adelle Howse—*Deputy Chair*, AMSI (from July 2016)
Professor Lynn Batten, Deakin University
Professor Nigel Bean, The University of Adelaide (until July 2016)
Professor Karen Day, The University of Melbourne
Professor Jim Denier, Macquarie University (from July 2016)
Dr Eileen Doyle FAICD, Company Director
Professor Andrew Eberhard, RMIT University (from July 2016)
Professor Gary Froyland, Deputy Director, AMSI (until July 2016)
Professor Joseph Grotowski, The University of Queensland
Professor Markus Hegland, Deputy Director, AMSI (from July 2016)
Dr Mark Lawrence, Mark Lawrence Group
Professor Geoff Prince, Director, AMSI
Lily Serna, Speaker & Presenter
Professor Song-Ping Zhu, University of Wollongong (until July 2016)

BOARD OBSERVERS

Dr Bob Anderssen, Chair, AMSI Education Advisory Committee
Professor Jonathan Borwein, Chair, AMSI Scientific Advisory Committee (until August 2016)
Professor Nalini Joshi, Chair, National Committee for the Mathematical Sciences (until May 2016)
Professor Tim Marchant, President, AustMS (until December 2016)
Professor Kate Smith-Miles, President, AustMS (from December 2016)
Professor Tony Guttman, Director, MASCOS
Professor Terry Speed, Chair, AMSI Scientific Advisory Committee (from October 2016)
Professor Peter Forrester, NCMS Representative (from May 2016)

AMSI RESEARCH & HIGHER EDUCATION COMMITTEE

Professor Gary Froyland—*Chair*, University of New South Wales (until July 2016)
Professor Markus Hegland—*Chair*, The Australian National University (from July 2016)
Professor Jonathan Borwein, The University of Newcastle (until August 2016)
Dr Nicola Armstrong, Murdoch University (from October 2016)
Associate Professor Regina Burachik, University of South Australia (until October 2016)
Dr Peter Caccetta, CSIRO (until October 2016)
Michael Cromer, The Australian National University
Professor Norm Dancer, The University of Sydney (until October 2016)
Professor Jan De Gier, The University of Melbourne (until October 2016)

Professor Andrew Eberhard, RMIT University (until October 2016)
Professor Joseph Grotowski, The University of Queensland (until October 2016)
Professor Anthony Henderson, The University of Sydney (until October 2016)
Simi Henderson, Program Manager, Research & Higher Education, AMSI (until June 2016)
Dr Phillip Isaac, Queensland University of Technology (from October 2016)
Associate Professor Inge Koch, Executive Director, Choose Maths, AMSI
Professor Tim Marchant, Australian Mathematical Society (until December 2016)
Anne Nuguid, Acting Program Manager, Research & Higher Education, AMSI (from June – September 2016)
Professor Geoff Prince, Director, AMSI
Dr Matt Ritchie, Walter & Eliza Hall Institute of Medical Research (until October 2016)
Professor Aidan Sims, University of Wollongong (from October 2016)
Associate Professor Scott Sisson, SSA (from October 2016)
Professor Kate Smith-Miles, President, AustMS (from December 2016)
Professor Terry Speed, Chair, AMSI Scientific Advisory Committee (from October 2016)
Paul Ulrick, Program Manager, Research & Higher Education, AMSI (from September 2016)
Maaike Wienk, ACE Network Coordinator, AMSI

AMSI SCIENTIFIC ADVISORY COMMITTEE

Professor Jonathan Borwein—*Chair*, University of Newcastle (until August 2016)
Professor Terry Speed—*Chair*, Walter & Eliza Hall Institute of Medical Research (from October 2016)
Professor Ben Andrews, The Australian National University
Professor Philip Broadbridge, La Trobe University
Professor Darren Crowdy, Imperial College London
Professor Ezra Getzler, Northwestern University
Associate Professor Frances Kuo, The University of New South Wales
Professor Elizabeth Mansfield, University of Kent
Professor Geoff Prince, Director, AMSI
Professor Kate Smith-Miles, Monash University (until September 2016)
Professor Terry Tao, UCLA; Clay Mathematics Institute
Professor Ole Warnaar, The University of Queensland

AMSI INDUSTRY ADVISORY COMMITTEE

Dr Mark Lawrence—*Chair*, Mark Lawrence Group
Cate Ballard, National Program Manager, AMSI Intern (June to October 2016, on maternity leave from October 2016)
Professor Nigel Bean, University of Adelaide
Dr Eileen Doyle FAICD, Company Director
Joe Forbes, Biarri

Dr Hannah Hartig, Acting National Program Manager, AMSI Intern (until June 2016)
Dr Adelle Howse, Independent
Professor Geoff Prince, Director, AMSI
Bryan Quinn, BHP Billiton
Glen Sheldon, Acting National Program Manager, AMSI Intern (from October 2016)

AMSI EDUCATION ADVISORY COMMITTEE

Dr Bob Anderssen—*Chair*, CSIRO
Dr Amie Albrecht, University of South Australia
Dr Abdulmoed Arayne, Brunswick Secondary College
Dr Frank Barrington, The University of Melbourne
Peter Brown, The University of New South Wales
Dr Mary Coupland, University of Technology Sydney (from February 2016)
Dr Michael Evans, Senior Consultant, AMSI
Janine McIntosh, Program Manager, AMSI Schools; Choose Maths Program Director, AMSI
Professor Geoff Prince, Director, AMSI
Professor Jacqui Ramagge, University of Wollongong
Philip Swedosh, King David School
Tom Lowrie, The University of Canberra (from May 2016)

CHOOSE MATHS COMMITTEE

Professor Kate Smith-Miles—*Chair*, Monash University
Jennifer Dawson, BHP Billiton Manager Communities, BHP Billiton Foundation (until October 2016)
Jessica Simpson, BHP Billiton Manager Community & Social Investment, Sustainability & Public Policy, (from October 2016)
Dr Michael Forbes, Biarri Commercial Mathematics
Associate Professor Inge Koch, Executive Director - Choose Maths, AMSI
Adjunct Professor Gilah Leder, Monash University
Professor Jennifer Graves AO, Distinguished Professor, La Trobe University
Nagla Jebile, NSW Department of Education
Janine McIntosh, Program Manager, AMSI Schools; Choose Maths Program Director, AMSI
Michael O'Connor, Schools Outreach Project Manager, AMSI
Professor Geoff Prince, Director, AMSI
Dr Roslyn Prinsley, National Adviser, Science & Mathematics Education & Industry, Office of the Chief Scientist
Professor Terry Speed, Walter & Eliza Hall Institute of Medical Research

Staff



Professor Geoff Prince,
Director of AMSI

Geoff Prince has been the Director of the Australian Mathematical Sciences Institute (AMSI) since 2009. Geoff's long academic career as a teacher and researcher has included roles at RMIT, the University of New England and La Trobe University where he was Head of Department. He works in differential geometry, differential equations and their application. Geoff holds a BSc honours and a Dip Ed from Monash University and PhD from La Trobe University.



Professor Gary Froyland,
Deputy Director *(until 22 July 2016)*

An ARC Future Fellow and Professor in the School of Mathematics and Statistics at the University of New South Wales (UNSW), Gary's research areas include ergodic theory, dynamical systems and optimisation. While at UNSW he has been awarded three ARC Discovery Projects, an ARC Linkage Project, a Future Fellowship and has been a Chief Investigator in MASCOS. Prior to his appointment at UNSW, he was a Senior Scientist at BHP Billiton Technology, where his work produced three patent applications and he was awarded the BHP Billiton Innovation Prize.



Paul Ulrick, Program Manager,
Research & Higher Education
(from September 2016)

Paul is responsible for the AMSI Research and Higher Education program. Prior to joining AMSI Paul enjoyed a broad and diverse career including management, analytical and consulting roles in service, industrial and consumer markets with Shell, Billiton, Wesfarmers and Spotless. Paul holds a Bachelor of Science (Mathematics and Statistics) from Melbourne University and completed a Graduate Diploma in Applied Statistics in 2016.



Professor Markus Hegland,
Deputy Director *(from 22 July 2016)*

Markus Hegland is a Professor in the Mathematical Sciences Institute of the Australian National University. He is a numerical analyst and has worked in the area of high dimensional approximation, regularisation theory for ill-posed problems and on parallel algorithms and high-performance computing. He has been CI and AI on several ARC Discovery and Linkage grants and ARC funded research centres. In 2010 he received a Hans Fischer Senior Fellowship of the Technical University of Munich (TUM) and has been honoured with a TUM ambassadorship in 2016. Originally from Switzerland, Markus has been at The Australian National University since 1992. Markus chairs AMSI's Research and Higher Education Committee and is a member of the AMSI board and executive.



Associate Professor Inge Koch
Executive Director, Choose Maths

As Executive Director for AMSI and the Choose Maths project, Inge is building on her experience in and passion for engaging girls and young women in her love for mathematics. Prior to joining AMSI in 2015, Inge worked in industry and the CSIRO, and had academic positions at Newcastle University, UNSW and Adelaide University. Her statistics research interests focus on analysis of high-dimensional data with applications in proteomics and cancer research.



Janine McIntosh, Program
Manager, AMSI Schools, Choose
Maths Program Director

Janine McIntosh manages AMSI Schools. Janine leads a professional development and schools visit program for teachers across the country. Through clusters of schools supported by industry and government partners, Janine's aim is to encourage more Australians to enjoy and study mathematics.

Janine is one of the authors of ICE-EM Mathematics, and has developed a suite of online resources and careers materials in her time at AMSI. Janine was one of the writers for the Australian Curriculum: Mathematics F-10. She is an experienced primary teacher, who has worked as a lecturer in mathematics education at the University of Melbourne and serves on the Maths Challenge and AMOC Committees of the Australian Mathematics Trust.



Simi Henderson
Program Manager, Research &
Higher Education *(until June 2016)*

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. Simi graduated in 2002 with a Bachelor of Science in Social Policy from the London School of Economics.



Cate Ballard, National Program Manager, AMSI Intern *(on maternity leave until May 2016 and from October 2016)*

Cate has been the National Program Manager for AMSI Intern since late 2011. Her role is to develop and grow the internship program. 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.



Dr Hannah Hartig, Acting National Program Manager, AMSI Intern *(until 23 June 2016)*

Drawing on her extensive management and university-industry partnerships experience, Hannah has overseen the management of AMSI Intern to foster multi-discipline growth and intern placements across all industry sectors. Her past roles include Research Partnerships Manager of the Faculty of Science and Manager of the School of Earth Sciences, University of Queensland.



Glen Sheldon, Acting National Program Manager, AMSI Intern *(from 10 Oct 2016)*

Glen is the National Program Manager (acting) for AMSI Intern. Glen is responsible for the strategic direction and operational management of the AMSI Intern program. His role provides high-level leadership, strategic development and implementation for the expansion of the AMSI Intern program, whilst driving the number of placements across our member universities.

It is his responsibility to work with the Business Development Managers to drive new business partnerships, leverage funding opportunities and source strategic collaborative arrangements with both public and private enterprises and government.

Prior to his position at AMSI, Glen held a range of senior marketing and publishing roles working with government, industry and the higher education sector.



Mari Ericksen, Marketing & Communications Manager

Mari is responsible for developing the marketing and communications strategies and plans for AMSI and its programs. Before joining AMSI, Mari held senior marketing positions at the 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.



Rod Birch, 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.

HONORARY STAFF

Dr Michael Evans, Senior Consultant
Jan Thomas OAM, Research Fellow

NON-EXECUTIVE STAFF

Kirsten Doert, EA to the Director
Maaikie Wienk, ACE Coordinator/Finance Officer

MARKETING & COMMUNICATIONS

Paul Murphy, Graphic Designer
Michael Shaw, Multimedia Manager
Melissa Trudinger, Publications Officer *(from August 2016)*
Laura Watson, Media & Communications Officer
Simon Villani, Web Developer

AMSI SCHOOLS

Jacinta Blencowe, Outreach Officer
Sarah Blood, Choose Maths Web and Social Media Officer *(from November 2016)*
Helen Booth, Outreach Officer
Sara Borghesi, Outreach Officer *(until January 2016)*
Greg Carroll, Outreach Officer

Julia Collins, Women in Maths Project Officer *(from December 2016)*
Daryn Corish, Outreach Officer
Lauren Draper, Administrative support *(until April 2016)*
Claire Embregts, EA, AMSI Schools Program Manager and Choose Maths Executive Director
Marcus Garrett, Outreach Officer *(until end 2016)*
Dr Susan James, Outreach Officer
Ann Kilpatrick, Outreach Officer *(until January 2016)*
Dr Tania King, Gender Researcher *(until February 2016)*
Ning Li, Gender Researcher *(from July 2016)*
Kristin Marriner, Choose Maths, Marketing & Communications Coordinator
Leanne McMahon, Outreach Officer
Michael O'Connor, Schools Outreach Project Manager
Kerrie Shearer, Outreach Officer *(until October 2016)*
Darla Trejo, Choose Maths, Finance & Admin Officer

AMSI INTERN

Margo Brown, EA, National Program Manager & Admin Assistant
Brad Buller, Admin Assistant

Fiona Druitt, Business Development Officer (Victoria) *(from December 2016)*
Rachel Geddes, Business Development Officer (Victoria)
Robert Mann, Business Development Officer (Victoria) *(until September 2016)*
Anne Nuguid, Project Officer *(seconded to Research and Higher Education Manager from June 2016 – Sept 2016)*
Mark Ovens, Business Development Officer (NSW)

PARKS VIC

Dr Kally Yuen, Statistician

RESEARCH & HIGHER EDUCATION

Lauren Draper, Administration Support *(from September – December 2016)*
Geraldine O'Bryan, Administration Support *(temp)*
Cate Parsons, Project Officer *(from April 2016)*
Elizabeth Phu, Project Officer *(temp)*
Charlotte Watson, Project Officer *(temp)*
Sarah Wilde, Administrative Assistant *(from Dec 2016)*
Liam Williamson, Administration Support *(until November 2016)*

Financials

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 of Melbourne'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. Our operating performance for the year was largely within expectation, having regard to operating conditions we experienced.

Institute Income

Our total income for the year was \$7,159,759 and comprised:

- Member subscriptions (\$970,755),
- The renewal of our Higher Education Grant with the Commonwealth (\$241,217),
- The second year of funding for our Choose Maths Project provided by the BHP Billiton Foundation (\$4,481,131),
- Internship revenues (\$1,137,500),
- Publishing revenue (\$121,543), and
- Other income, including sponsorships and interest (\$207,613).

Institute Expenditure

Our total expenses for the year totalled \$5,825,222, incurred across our key operating areas:

- Directorate activities which includes Governance and Outreach incurred \$820,898,
- Research and Higher Education Programs incurred \$1,237,231,
- Schools Program incorporating Choose Maths incurred \$2,901,645, and
- Internship Program incurred \$865,448.

Major commitments to Choose Maths, the Intern Program and to Research and Higher Education are a feature of our increased expenditure compared to 2015.

The Institute derived a net operating surplus of \$1,334,537 for the reporting period (\$7,159,759 income less \$5,825,222) expenses. The opening cash balance of \$3,431,044 (after allowing for a \$70,000 prior period adjustment) and the operating surplus (\$1,334,537) contributed to our closing cash position of \$4,765,581 as at 31 December 2016.

The total carried forward cash balance of \$4,765,581 comprises:

- \$4,452,483 committed to Choose Maths,
- \$20,712 committed to Investing in Mathematics, and
- \$137,098 committed for expenditure in the Schools Program,
- \$104,000 carried forward within our Intern Program, and
- \$51,288 uncommitted funds within the Directorate.

Certification

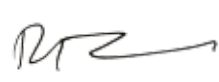
The University of Melbourne undertakes to provide audited financial statements for all contractually funded activities when required by the relevant funding body, but not generally for AMSI as a whole. In the absence of an overall annual audit statement, the following certification is provided.

We hereby certify that funds received by AMSI during the reporting period ended 31 December 2016 and the expenditure incurred during that period were in accordance with all relevant funding agreements, with the AMSI Joint Venture Agreement, and with the approved Business Plan.

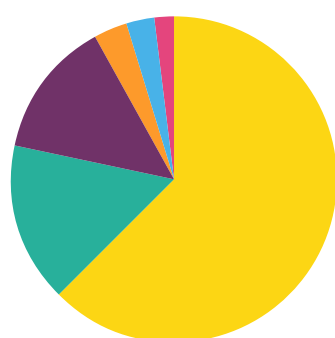
The balance of cash reserves as at 31 December 2016 of \$4,765,581, as detailed in the following financial statements, is consistent with the balance of AMSI funds as represented in the accounting records of the University of Melbourne as at 31 December 2016.









Geoff Prince
Director

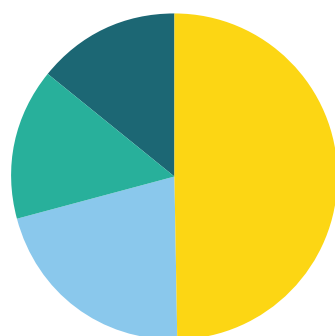


Rod Birch
Business Manager







Institute Income

	Choose Maths - BHP Billiton Foundation	4,481,131
	Investing in Maths - Commonwealth Government Grant	241,217
	Internships	1,137,500
	Publishing Revenue - CUP and copyright revenues	121,543
	Other income - includes consulting, sponsorships and interest income	207,613
	AMSI Membership Subscriptions	970,755
	Total	\$7,159,759



Institute Expenditure

	Directorate - including Governance and Outreach	820,898
	Research and Higher Education	1,237,231
	Schools Education - including the Choose Maths Project	2,901,645
	Internships	865,448
	Total	\$5,825,222

Statement of Financial Performance

	1 January 2016 to 31 December 2016		1 January 2015 to 31 December 2015	
	\$	\$	\$	\$
INCOME				
Membership Income - AMSI Membership Subscriptions		970,755		752,600
Major Grants				
Investing in Maths - Commonwealth Grant for Higher Education		241,217		259,000
Choose Maths - BHP Billiton Foundation		4,481,131		4,247,342
Other Grants - Schools Program		0		216,341
Internships - includes collaboration and placement fees		1,137,500		655,000
Publishing Revenue - CUP and copyright revenues		121,543		185,253
Other income - includes consulting, sponsorships and interest income		207,613		176,942
Total Income		7,159,759		6,492,478
EXPENDITURE BY PROGRAM				
Directorate - including Governance and Outreach		820,898		1,033,997
Research and Higher Education		1,237,231		1,008,383
Schools Education - including the Choose Maths Project		2,901,645		1,586,493
Internships		865,448		778,263
Total Expenditure		5,825,222		4,407,136
Operating Surplus/(Deficit)		1,334,537		2,085,342

Statement of Financial Position

	As at 31 December 2016		As at 31 December 2015	
	\$	\$	\$	\$
ASSETS				
Funds on Hand:				
Project 003058 - AMSI Core	292,386		372,399	
Project 099901 - Choose Maths BHP Billiton Foundation Grant	4,452,483		2,763,151	
Project 080060 - Investing in Mathematics Commonwealth Grant	0		365,494	
Project 003059 - Investing in Mathematics Commonwealth Grant	20,712	4,765,581	0	3,501,044
Net Assets		4,765,581		3,501,044
EQUITY				
Retained income brought forward after prior period adjustment of \$70,000	3,431,044		1,415,702	
Net of income over expenditure	1,334,537	4,765,581	2,085,342	3,501,044
Net Equity		4,765,581		3,501,044

AMSI Publications

AMSI produces a suite of publications, resources and reports to support delivery of its core programs and enhance engagement with the Australian mathematical sciences and broader community. These can be accessed via the links provided below.



AMSI TRACK RECORD

Providing a ‘helicopter’ view of AMSI’s growth and impact since 2002, *AMSI Track Record* documents the evolution and key achievements of each of the Institute’s core programs.
amsi.org.au/publications/2015-track-record



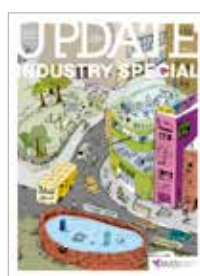
MATHS ADDS

Australia’s leading mathematics career resource, this guide is updated annually to empower students with a full overview of the growing industry opportunities open to those with high-level mathematics.
mathsadds.amsi.org.au



ANNUAL REPORT

This report provides an annual snapshot of AMSI’s key achievements and activities, highlighting successes and growth across all program areas and the Institute’s impact on the mathematical sciences through policy, advocacy and outreach.
amsi.org.au/publications/amsi-annual-report-2015



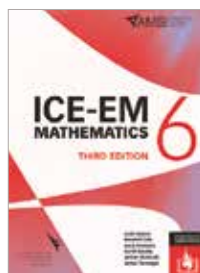
UPDATE

Spanning the mathematical sciences pipeline, this biannual magazine takes an in-depth view of the latest ‘hot topics’, industry successes and research from AMSI and Australia’s mathematical sciences community.
amsi.org.au/the-update-publication



DISCIPLINE PROFILE OF THE MATHEMATICAL SCIENCES

Released annually, the *Discipline Profile of the Mathematical Sciences* is Australia’s most trusted ‘go to’ data resource for media, policy makers and discipline and community stakeholders interested in the state of Australian mathematics.
amsi.org.au/discipline-profile-2016



TEXTBOOKS

Available through Cambridge University Press, the *ICE-EM* series targets Years 5–10 to support transition from primary to secondary school. As well as required curriculum content, the books cover additional topics relevant and essential for a robust understanding of mathematics.
amsi.org.au/publications_category/publications/textbooks



SECURING AUSTRALIA’S MATHEMATICAL WORKFORCE

AMSI’s core policy document, *Securing Australia’s Mathematical Workforce*, sets the Institute’s key priorities for intervention at all stages of the mathematical pipeline as identified in the Discipline Profile.
www.amsi.org.au/mathsworkforce

AMSI WEBSITES



amsi.org.au
amsiintern.org.au
research.amsi.org.au
highered.amsi.org.au
schools.amsi.org.au
choosemaths.org.au
calculate.org.au



RESEARCH REPORT

Illustrating the cross-disciplinary and industry impact of the mathematical sciences, this report documents the success and impact of AMSI’s Research and Higher Education programs and annual research related activities.
amsi.org.au/research-reports

“Mathematicians are problem solvers. And the best solutions are the ones that create new and portable mathematics. Breakthrough innovations flow from this new mathematics: tomography and bioinformatics are striking examples of successful collaborations. Our innovation system ignores this collaborative capability at its peril.”

Professor Geoff Prince, AMSI Director

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AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

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