

AMSI Track Record

2002 – 2017

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

Our Mission

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AMSI INTERN

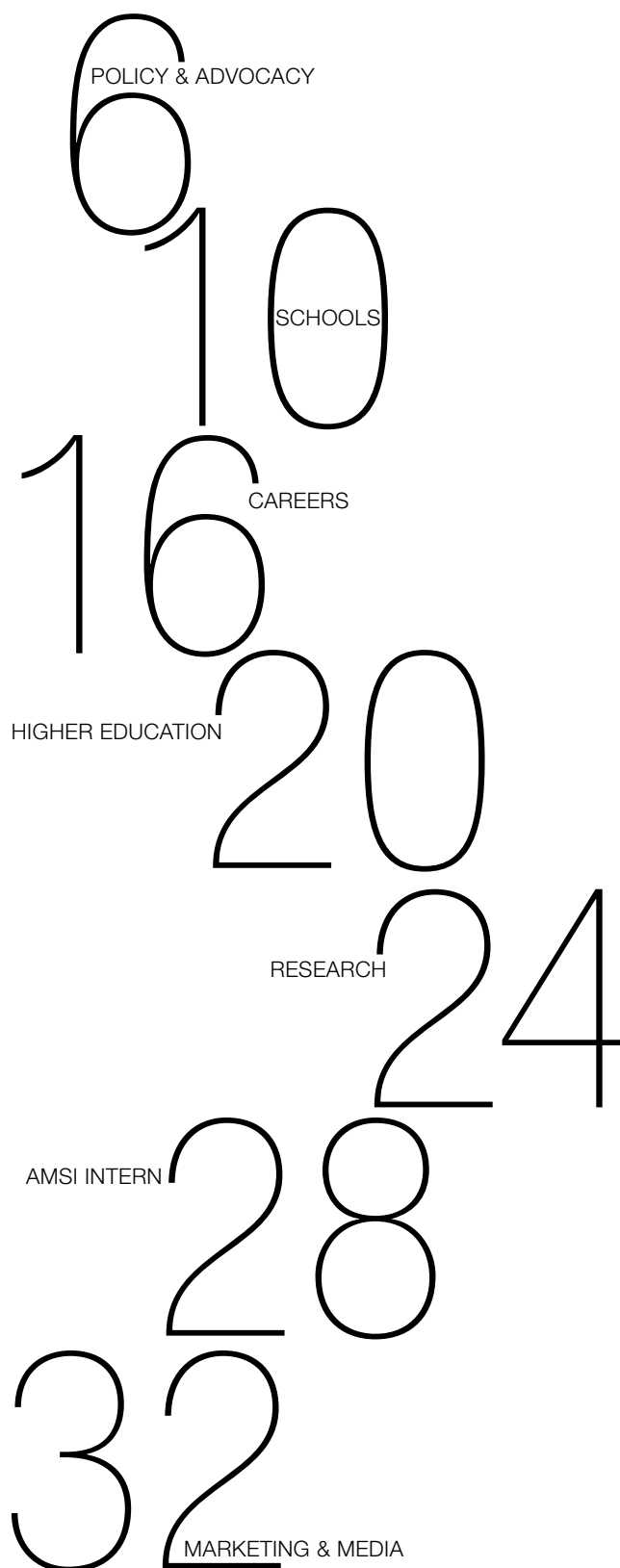
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Joining AMSI

THERE ARE THREE MEMBERSHIP CATEGORIES:

Full Members

Associate Members

Societies & Government Agencies

Full members of AMSI are signatories to the Joint Venture Agreement (JVA) that forms the basis of AMSI's structure and governance.

BENEFITS TO ALL AMSI MEMBERS INCLUDE:

- links with the national and international mathematical sciences community
- active engagement with AMSI's advocacy agenda. This includes involvement with submissions and policy and advocacy documents, such as our annual review of the discipline; monetary sponsorship and support for the delivery of research activities including workshops, seminars, guest lecturers and theme programs
- monetary sponsorship and support for the delivery of, or participation with, AMSI Higher Education flagship events, and
- access to AMSI Intern (NOTE: it is not necessary for industry partners to be members of AMSI to engage with the internship program)

BENEFITS TO UNIVERSITY MEMBERS INCLUDE:

- access to workshop funding
- travel support for staff and students
- careers materials and copies of Maths Adds Careers Guide
- student access to the Vacation Research Scholarship program, and
- travel funding for students to attend AMSI's Summer and Winter Schools

BENEFITS TO SIGNATORIES OF THE JVA INCLUDE:

- precedence to host the AMSI Summer School, AMSI BioInfoSummer and AMSI Optimise
- increased travel allowance for students and staff, and
- input and sign off on AMSI's business plan
- election of AMSI's Deputy Director

Government agency and society member benefits are negotiated. They can include provision of short courses, discounted conference and event registration, advertising at AMSI events and in Maths Adds, as well as the opportunity to host workshops and access to travel funds.

“AMSI is Australia’s mathematical sciences institute. It is the collaborative venture of the nation’s universities, professional societies and government agencies.”

Professor Geoff Prince, AMSI Director

Foreword

AMSI is the central voice for the mathematical sciences in Australia.

We facilitate effective communication within the community and successfully advocate for increased government funding. Our established program of activities has created significant benefits, both tangible and intangible, for Australia’s professional and aspiring mathematical scientists. AMSI has provided initiative and support for activities across research, education and industry. Access to AMSI’s activities brings immediate benefits to members in mathematical sciences departments and agencies. This applies especially to early career researchers, postgraduate and honours students, including those from cognate disciplines. AMSI provides members with support for cross-disciplinary research.

AMSI offers an effective and efficient way of delivering mathematical and statistical capability to research, education and industry. It does this in a way that seeks to integrate research, education and industry involvement to provide a strong base for national innovation.

After 15 years of solid support to Australia’s mathematical science, AMSI has entered a period of growth and consolidation with all program areas funded over the next three to five years. Significantly, AMSI’s place as the central voice for Australia’s mathematical pipeline has been cemented by significant government and corporate investment, including \$22m from BHP to strengthen education through the Choose Maths project, Australian government investment of \$2 million for Research and Higher Education flagship training event delivery, and \$28m for the national-scale expansion of the AMSI Intern program.

Above all, AMSI is a unique collaborative venture providing members with the structure and support that no individual entity alone could provide. It is vitally important for the mathematical sciences in Australia that AMSI continues to grow and expand.



Professor Geoff Prince
Director



Dr Ron Sandland
Chair, AMSI Board

FULL MEMBERS



AMSJ and its members acknowledge the significant contribution of the University of Melbourne as our Lead Agent and host

ASSOCIATE MEMBERS



GOVERNMENT AGENCIES



SOCIETIES



List of members as of August 2017

We strive to improve the appreciation of policy makers and politicians of the importance of mathematics in a sophisticated economy and community.

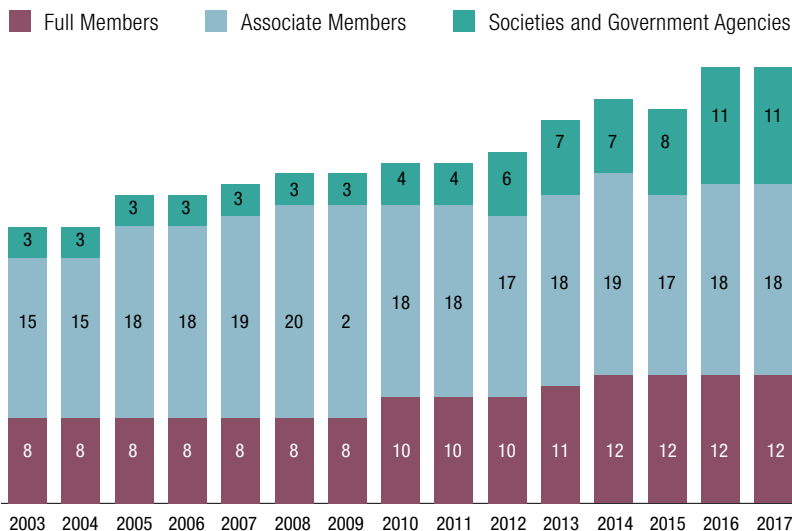
AMSI member growth

AMSI has made, and continues to make, a significant contribution to the interests of the mathematical sciences in Australia. AMSI's initiatives and programs are important parts of an overall strategy to enhance the standing and health of mathematics and statistics across the Australian community.

We strive to improve the appreciation of policy makers and politicians of the importance of mathematics in a sophisticated economy and community. A strong and diverse membership base is key to AMSI's endeavours in lobbying for government and business support of programs to advance capacity and capability in the mathematical sciences.

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 its many services that are of direct benefit to the mathematical sciences.

We all reap the benefits of the investment of AMSI's members' subscriptions and corporate contributions.



Achievements

<h2>2002</h2> <p>AMSI established through a \$1m grant from the Victorian government's Science, Technology and Innovation infrastructure grants program</p>	<h2>2006</h2> <p>AMSI supports the Australian Academy of Science's National Strategic Review of the Mathematical Sciences in Australia</p>	<h2>2010</h2> <p>AMSI Intern program expanded through \$1.7m three-year partnership with Enterprise Connect, an initiative of the Department of Innovation, Industry, Science and Research</p> <p>A wide-ranging, transparent, external review of AMSI leads to the revision of AMSI's mission statement and expansion of the board</p>
<h2>2003</h2> <p>AMSI is a collaborating partner and significant influence in the establishment of the Centre of Excellence for Mathematics & Statistics of Complex Systems (MASCOS). Out of an Australian government grant of \$10.9m, \$2.2m jointly administered by AMSI and MASCOS</p>	<h2>2007</h2> <p>AMSI awarded a \$2m Collaborative and Structural Reform (CASR) grant to fund flagship programs in Higher Education, industry collaboration through workshops and the establishment of AMSI Intern</p>	<h2>2011</h2> <p>2nd edition of ICE-EM Mathematics textbooks published by Cambridge University Press</p>
<h2>2004</h2> <p>The International Centre of Excellence for Education in Mathematics (ICE-EM) is established with \$7.8m from the Department of Education, Science and Training, providing funding for AMSI's Schools and Higher Education programs</p>	<h2>2008</h2> <p>AMSI wins the National Innovation Award for Science Innovation</p> <p>\$100,000 provided by The Carrick Institute of Learning and Teaching (now the Office for Learning and Teaching) for the year-long project <i>Mathematics for 21st Century Engineering Students</i></p>	<h2>2012</h2> <p>AMSI awarded \$750,000 contract from Education Services Australia to develop electronic resources to support the senior national curriculum for Australia</p> <p>National forum <i>Maths for the future: keep Australia competitive</i></p> <p>AMSI's Research and Higher Education flagship programs receive \$2m over four years from the Department of Education and Training, enabling expansion of flagship events</p>
<h2>2005</h2> <p>\$750,000 funding provided through ICE-EM for the installation of Access Grid Rooms in 11 member universities</p> <p>1st edition of ICE-EM Mathematics textbooks published</p>	<h2>2009</h2> <p>AMSI awarded a \$2m grant from the Department of Education, Employment and Workplace Relations (DEEWR) for <i>The Improving Mathematics in Schools (TIMES)</i> project</p>	

at a glance

2013

Australian effort for the *International Year of Mathematics of Planet Earth* led by AMSI

AMSI Schools boosted with funding from Boeing, The William Buckland Foundation and an AMSPP grant in partnership with Regional Universities Network to deliver professional development to mathematics teachers around Australia

2014

AMSI Intern secures a co-investment scheme with eight member institutions worth a total of \$6.7m over three years

Student participation in AMSI Higher Education flagship events doubles between 2012-2014

2015

AMSI partners with the Australian Academy of Science to produce the decadal plan *The Mathematical Sciences in Australia: A Vision for 2025*

The BHP Billiton Foundation grants funding of \$22m for Choose Maths: a five year national program to turn around public perception of the mathematical sciences as a career choice for girls and young women

\$80,000 Boeing investment to expand AMSI Teacher Training Resources

ACE (formerly AGR) network upgraded to enhance connectivity with Australia and globally

2016

New annual publication AMSI Research Report launched

Inaugural Choose Maths Awards launches, attracting over 660 student entries and 30 teacher nominations



AMSI partners with AustMS to launch MathsFest, a three-week long multi-event including the AustMS conference flanked by 2 international workshops

AMSI sponsors its 200th scientific workshop

Launch of digital version of Maths Adds

AMSI R&HE programs receive \$2m over four years from Department of Education and Training, enabling expansion of flagship programs, including AMSI Optimise



2017

Australian Government provides \$28 million to fund expansion of AMSI Intern program

Launch of Choose Maths Careers Awareness Campaign

3rd edition of ICE-EM mathematics textbooks published by Cambridge University Publishing

20th edition of Maths Adds Careers Guide published

Inaugural AMSI Optimise event launched

Policy & Advocacy

AMSI continues to drive a strong advocacy agenda to radically improve Australia's mathematical sciences capacity and capability.

For 15 years, we have raised awareness of mathematics, its economic and social benefits, and vital contribution to the advancement of Australian communities through:

- policy advice
- public outreach events
- reviews of the discipline
- engagement with politicians
- formal submissions and consultations
- communication of our activities through targeted marketing and
- building relationships with the media

A cash value cannot be placed on AMSI's contributions in this arena. While we will continue undertaking this important work, the breadth and quality of our services relies on continued funding from our various stakeholders.

Key Achievements

2017

Response to Innovation and Science Australia's *2030 Strategic Plan Issues Paper* submitted

2016

Submissions included responses to the *National Research Infrastructure Roadmap Capability Issues Paper* and the *ARC Research Engagement and Impact Consultation*

AMSI's fifth *Discipline Profile* released, providing an in depth look

at the state of the mathematical sciences across Australia

Industry Task Force set up

2015

ACOLA Research Training System Review submission

Contributed to the Australian Academy of Sciences' Decadal Plan for the mathematical sciences in Australia

2014

AMSI's first Gender Report published

2013

Hosted Australia's program for the International Year of Maths of Planet Earth

2012

AMSI held the national forum *Maths for the future: keep Australia competitive*

“This plan is a clear vision for governments, universities and industry to shape mathematical sciences over the next 10 years, starting now. Fundamental to that vision is education. We know that 75 per cent of the fastest growing occupations will need STEM skills, and that maths is at the heart of this skill set. If we’re not preparing our teachers and students the way we should, Australia will be left behind by the rest of the world.”

Professor Geoff Prince, AMSI Director

STRATEGIC CONNECTIONS

By engaging with the government and public agencies through submissions and policy advice, AMSI is a strong public voice for the mathematical sciences. We have been recognised as one of the chief advocates on issues related to the mathematics pipeline, from education and research, to workforce supply.

AMSI is a member of Science Technology Australia (STA) and currently represents the mathematical sciences on the STA Board and the Policy Committee. AMSI is actively represented at both *Science Meets Parliament* and *Science Meets Business*.

AMSI works with the Academy of Science through its National Committee for the Mathematical Sciences and shares the resourcing of Australia’s membership of the International Mathematical Union. AMSI made a significant contribution to the Academy’s Decadal Plan for the Mathematical Sciences, in part through the AMSI Director’s role on the Plan’s Executive Committee.

The Australian Council of Learned Academies (ACOLA) has called on AMSI’s participation in a number of its reviews and studies commissioned by the Australian government.

We maintain a close working relationship with the Office of Chief Scientist sharing data, consulting on policy and collaborating on outreach.

AMSI undertakes formal and informal consultation with government departments and with ministerial offices. For example, we were heavily engaged with the Research Workforce Strategy project undertaken by the Department of Innovation, Industry,

Science and Research. This project led to the Commonwealth’s support for AMSI’s research training program.

amsi.org.au/submissions/

INDUSTRY ENGAGEMENT

AMSI’s Industry Advisory Committee, led by Dr Mark Lawrence, established the Industry/Mathematical Sciences Engagement (IMSE) Task Force in partnership with Australian industry in 2016.

The IMSE Task Force, which includes eight industry leaders and eight senior mathematical scientists from AMSI’s member universities, is leading urgent action to address the following objectives:

- Raising careers awareness in schools and the community – maths ‘opens doors’ to a wide range of exciting and challenging careers
- Strengthening industry engagement with the mathematical sciences
- Increasing the supply of industry-ready mathematical science graduates

NATIONAL PARTNERSHIPS

AMSI currently works with the Australian Mathematical Society (AustMS), Australia and New Zealand Industrial and Applied Mathematics (ANZIAM), BHP Billiton Foundation, Boeing, Bureau of Meteorology, Defence Science and Technology Group (DST Group), Defence Science Institute (DSI), several Australian Research Council Centres of Excellence and the Statistical Society of Australia (SSA), among others.

AMSI lent considerable support to the Decadal Plan for the Mathematical Sciences and hosts the annual meeting of the Australian Council of Heads of Mathematical Sciences (ACHMS).

Representatives from all Australian mathematical science departments, societies and professional associations, as well as government agencies and research groups, make up the ACHMS.

INTERNATIONAL LINKAGES

AMSI has established and maintained strong partnerships and open communications with many international organisations. We have ongoing close links with Mitacs, the Canadian national research organisation that operates a highly successful intern program, through AMSI Intern. AMSI is a founding member of the Pacific Rim Mathematical Association and has links with the Pacific Institute for the Mathematical Sciences, the European Mathematical Society and with the Mathematical Sciences Research Institute in Berkeley, USA. We also maintain strong connections with prominent overseas mathematicians involved in school mathematics.

Reviews, Reports and Submissions

DISCIPLINE PROFILE

The Discipline Profile of the Mathematical Sciences is an annual publication highlighting trends and developments in school education, higher education, research, research training and career prospects in the mathematical sciences. The fifth edition of the Discipline Profile was published in November 2016. It is complemented by our updated policy document in which we outline key priorities for intervention. Our Discipline Profile is relied upon by media, policy makers, and those interested in the state of the field for a clear picture of mathematics in Australia.

amsi.org.au/discipline_profiles

“Oftentimes, in these layered networks, traditional techniques we have developed in queuing theory do not work as well or lead to surprising results. Ultimately, it is these mathematical peculiarities that drive me.”

Associate Professor Maria Vlasidou, Eindhoven University of Technology — AMSI-ANZIAM Lecturer 2017

2016 POLICY DOCUMENT: *SECURING AUSTRALIA'S MATHEMATICAL WORKFORCE*

Released annually in conjunction with the Discipline Profile, AMSI's core policy document outlines key priorities for intervention by Australian governments and for action by peak bodies—commercial, educational, scientific and technological. AMSI believes that these priorities must be addressed as the Commonwealth plans and implements its *National Innovation and Science Agenda (NISA)*.

In 2016, AMSI's policy document, *Securing Australia's Mathematical Workforce*, outlined five key priorities for intervention:

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

amsi.org.au/mathsworkforce

SUBMISSIONS AND REPORTS

AMSI actively contributes to relevant reviews and consultative processes, through submissions, workshop and panel participation and more.

Recent contributions include:

- Response to Innovation and Science Australia's *2030 Strategic Plan Issues Paper* (June 2017)
- Response to ARC *Research Engagement and Impact Consultation*, with AustMS and ACEMS (October 2016)
- Response to the 2016 *National Research Infrastructure Roadmap Capability Issues Paper* (September 2016)
- ACOLA *Research Training System Review Submission* (September 2015)
- Submission to the DET's *Review of Research Policy and Funding Arrangements* (September 2015)
- Submission to the *Senate Inquiry into Australia's Innovation System* (July 2014)
- Submission to *The National Security Science and Technology Discussion Paper* (May 2014)
- Professor Geoff Prince was a member of the working group that produced ACOLA's report: *STEM: Country Comparisons — International Comparisons of Science, Technology, Engineering and Mathematics (STEM) Education* (June 2013)
- Submission to the *Senate Inquiry: Teaching and learning — Maximising our investment in Australian schools* (October 2012)
- Response to the Productivity Commission's *School Workforce Report* (September 2012)

Decadal plan

AMSI contributed to the Australian Academy of Sciences ten-year vision for Australia's mathematical sciences *The Mathematical Sciences in Australia: A Vision for 2025*. AMSI Director Professor Geoff Prince was a member of the plan's Executive Committee along with Professors Peter Hall and Nalini Joshi.

These are available at amsi.org.au/submissions

AMSI GENDER REPORT

One of AMSI's key priorities is to engage more women in mathematics, from schools, through universities and beyond. Our annual Discipline Profile shows that the percentage of girls taking advanced mathematics in Year 11 and 12 is at an all-time low. At the tertiary level, less than 30 per cent of all undergraduate and postgraduate students in mathematics are female and this continues into mathematical sciences departments. Fewer than 10 per cent of staff employed in senior academic positions are women.

In 2014, AMSI undertook an international literature survey and reported the results in the AMSI Gender Report 2014. This research provides the evidence base for the design of the BHP Billiton Foundation-funded Choose Maths project and underpins our efforts to increase participation in our programs by female mathematicians.

A new gender report will be published later in 2017 by AMSI as part of the Choose Maths project.

amsi.org.au/genderreport2014



AMSI-ANZIAM Lecturer, Assoc. Prof. Maria Vlasiou

Public Engagement

The mathematical sciences lie hidden from public view most of the time. AMSI's mission to lift it from the shadows is accomplished through our advocacy work and by involving the general public in our events. Several public lectures by distinguished speakers are held annually in conjunction with AMSI's lecture tours, flagship events, conferences and sponsored workshops.

We have a broad target market, from primary and secondary students, teachers and parents, university students, to the AMSI membership, government and industry. Our position as an authority on the state of the mathematical sciences in Australia has grown throughout our 13 years; in 2016, we had 103 media occurrences across newspapers, radio and television. This is on track to increase three-fold in 2017.

Our public lectures appeal to those in the mathematical sciences community, families, mathematics teachers searching for fresh approaches to inspire their students, and to anyone seeking to learn something new.

Notable academics, such as Professors Arun Ram, Jeffrey Rosenthal and Hugh Possingham, as well as pop-culture mathematicians — Simon Singh and Margaret Wertheim — have given AMSI public lectures, bringing the serious and exciting aspects of mathematics to an Australian audience. Attendance growth has been exponential, as has the diversity of the crowds; we owe this to our reputation with the general public as well as our collaborative work within academia.

AMSI LECTURE SERIES

Each year AMSI supports and sponsors eminent international researchers through its scientific lecture programs — the annual AMSI Lecturer, held in alternating years with SSA and ANZIAM, and the biennial Mahler Lecturer, which AMSI co-sponsors with AustMS. Both specialist and public lectures are scheduled in cities around Australia, giving both the mathematical sciences community and the general public an opportunity to hear top academics in the fields of both pure and applied mathematics and statistics speak about their research. These lecturers also receive significant media attention during their travels around Australia.

Recent lecturers have included:

Associate Professor Maria Vlasiou, Eindhoven University of Technology — AMSI-ANZIAM Lecturer 2017

Professor Jeffrey Rosenthal, University of Toronto — AMSI-SSA Lecturer 2016

Professor Michael Shelley, New York University — AMSI-ANZIAM Lecturer 2015

THE INTERNATIONAL YEAR OF MATHEMATICS OF PLANET EARTH (MPE)

The international mathematical sciences community dedicated 2013 to the Mathematics of Planet Earth. In Australia, AMSI worked with members and other societies and organisations to spread the word about the role mathematics and statistics has in understanding the challenges of our planet. The year, which ran throughout 2013, provided a platform to illustrate the wide and varied role that

mathematics plays in all aspects of life.
mathsofplanetearth.org.au

ACCELERATE AUSTRALIA

Held in February 2013, this one-day event focused on issues relating to productivity, industry engagement and the work-readiness of PhD students.

amsiintern.org.au/accelerate-australia/

MATHS FOR THE FUTURE: KEEP AUSTRALIA COMPETITIVE

Held in February 2012, Maths for the future aimed to publicise both the state of the discipline and its importance to future growth. With an impressive line-up of speakers and extensive media coverage, our discipline's voice was heard loud and clear at a time when policymakers were keen to listen.

amsi.org.au/maths-for-the-future/

Schools

AMSI's direct involvement with schools supports high quality mathematics education for all young Australians, improving the supply of mathematically well-prepared students entering tertiary education.

AMSI's Schools program has been supporting Australian mathematics teachers and students for over a decade. Face-to-face professional development is delivered through workshops, in-class support, modelled lessons, digital and print resources and program development support. Materials are in line with the *Australian Curriculum: Mathematics* and are tailored to meet the needs of individual schools. Our team are experienced primary and secondary school teachers, statisticians and mathematicians and leaders in marketing and design.

Key achievements

2017

Third edition of the ICE-EM Mathematics textbooks is published and distributed by Cambridge University Press

20th edition of Maths Adds careers guide is published

Four new *Maths Delivers* videos produced, with the support of Boeing

Choose Maths Careers Awareness campaign launches

First Choose Maths Research Report is published

2016

Maths Adds website is launched to complement and extend on the careers guide

Inaugural Choose Maths Awards attracts almost 700 entries from teachers and students, and recognises 10 teachers and 10 schools across Australia.

Work begins to support teachers and students in 120 Choose Maths schools around Australia

Boeing invests \$84,000 to produce four videos and related classroom content for Year 11 and Year 12

2015

BHP Billiton Foundation invests \$22m for the five-year national project Choose Maths

2014

\$200,000 AMSPP grant funds professional development activities in the Warialda and Dalby/Oaake clusters

2013

Receives \$407,000 grant from The William Buckland Foundation to fund professional development activities in the Geelong cluster

DEECD grant funds professional development activities in the Gippsland cluster

Four *Maths Delivers* videos are produced

2012

Develops online resources for teachers and students to support the new national mathematics curriculum

2011

Second edition of the ICE-EM Mathematics textbooks published and distributed by Cambridge University Press

2009

Australian Government grant of \$2m for TIMES Project

2007

BlueScope Steel grant of \$150,000 to support teachers in the Illawarra

2005

Face-to-face professional development for mathematics teachers commences

ICE-EM Mathematics textbooks and teacher resources for Years 5–10 are developed

2004

ICE-EM is established with \$7.8m Federal Government investment

“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 (speaking at the Choose Maths Awards in August 2016)

Professional development delivered to 120 Australian schools

Careers awareness packs sent to 10,000 schools around Australia

More than 660 applications for the student video award

2016 CHOOSEMATHS Student Awards

Choose Maths

AMSI and the BHP Billiton Foundation are empowering Australian students to pursue mathematics through their five-year national project, Choose Maths.

Launched in 2015, the comprehensive \$22 million project aims to turn around public perception of mathematics and will contribute to the health of the mathematics pipeline in Australia from school through university and out to industry and the workplace.

Choose Maths will work with students, parents and teachers over five years through 2019 to shift community attitudes to participation in mathematics, especially for girls and young women.

The project has four key components:

1. Teacher Professional Development

Professional development is being delivered on-the-ground in 120 Australian schools. Based on a cluster arrangement, where a secondary school and usually three of its feeder primary schools are formed into a professional development group, teachers work with an AMSI Schools Outreach Officer, focusing on enhancing content knowledge and teaching strategies in mathematics.

**EXECUTIVE DIRECTOR,
CHOOSE MATHS**

Associate Professor Inge Koch

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**PROGRAM MANAGER, SCHOOLS and
CHOOSE MATHS PROGRAM DIRECTOR**

Janine McIntosh – janine@amsi.org.au

2. Careers Awareness Campaign

Launched early in 2017, our national campaign aims to increase awareness of mathematics career pathways and the rewarding and interesting opportunities open to those who 'stick with maths'. Featuring women from a cross-section of careers whose jobs all require maths in one form or another, the campaign launched across Australia in May with profiles, posters and other supporting material. A series of videos is also in production (see p. 19).

In August 2017, a national advertising campaign was launched across Australia on public transport platforms including trams, trains and buses, and in digital media including major newspaper websites, Facebook and Twitter.

3. Women in Maths Network

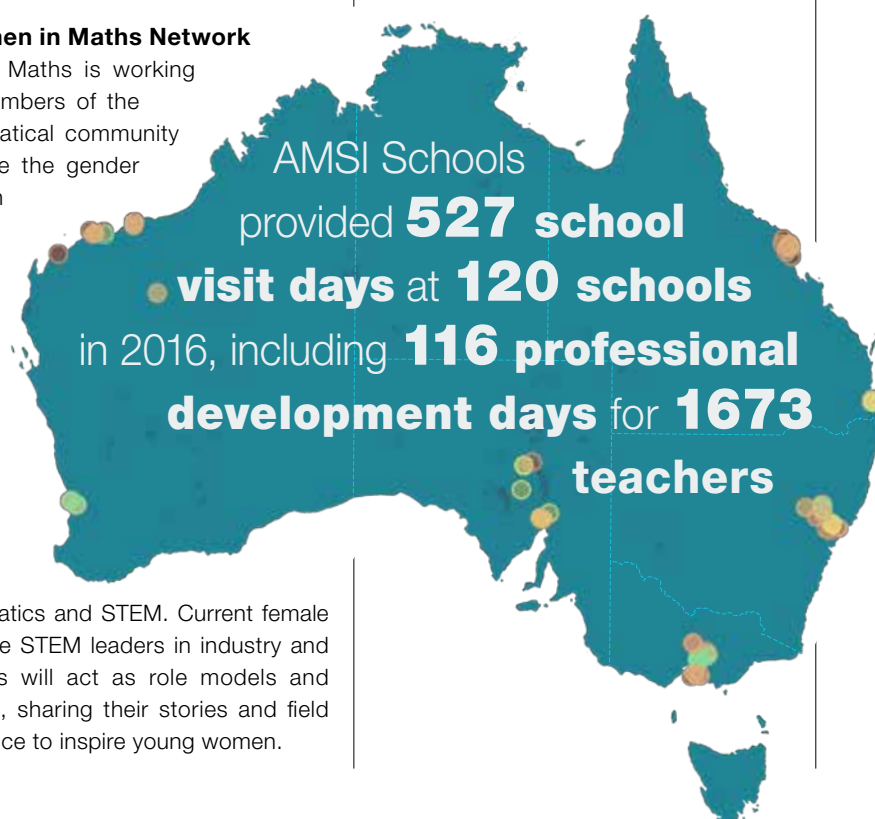
Choose Maths is working with members of the mathematical community to tackle the gender divide in

mathematics and STEM. Current female and male STEM leaders in industry and business will act as role models and mentors, sharing their stories and field experience to inspire young women.

This component also includes the Maths and Biology initiative: an opportunity to highlight the role of mathematics in biology both in the context of curriculum and industry, and to promote potential emerging cross-discipline career pathways to students, teachers and parents.

4. Choose Maths Awards

While teachers are very good at celebrating their student achievements to foster and nurture talent and learning confidence, they are not often celebrated for their own accomplishments. The Choose Maths project recognises outstanding mathematics teachers and students through the Choose Maths Awards.



More than 30 nominations for exceptional teacher awards

2016 CHOOSEMATHS Teacher Awards



The Choose Maths Awards initiative also includes a grants program providing financial assistance to female mathematical sciences students and early career researchers, allowing them to attend AMSI events including the Winter and Summer Schools and BioInfoSummer (see page 21 Higher Ed).

More info on the 2016 Choose Maths Awards winners can be found at: choosemaths.org.au/award-winners-2016/

Choose Maths is supported by statistics and gender research. Annual teacher surveys and surveys of students in the Choose Maths schools provide excellent sources to measure the effectiveness of the program. The first research report based on the analysis of the 2016 teacher survey data is available from the AMSI publications website. choosemaths.org.au

“Every school we visit, teachers are so excited to tell us what their students are gaining from participation in AMSI Schools outreach work.”

Janine McIntosh, Program Manager, AMSI Schools

Strengthening Schools since 2004

The International Centre of Excellence for Education in Mathematics (ICE-EM), was established in 2004 with assistance from the Australian Government.

Through ICE-EM, high-quality mathematics texts, teacher resources and PD were developed for Years 5–10. The ICE-EM Mathematics textbooks covered the curricula of all states and territories at these levels.

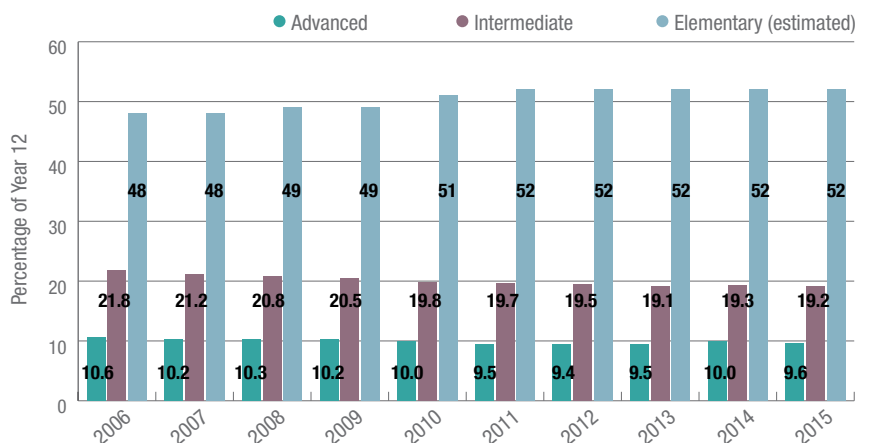
Support from BlueScope Steel allowed AMSI Schools to provide texts and teacher professional development to schools in the Illawarra region throughout 2007.

In 2009 the then Department of Education, Employment and Workplace Relations provided funding for the extension of AMSI Schools activities under TIMES (The Improving Mathematics Education in Schools) Project. This allowed us to:

expand our reach across the country; further develop digital and print teacher resources for Years 5–10; and produce *Maths: Make your career count* — materials that show how mathematics is used daily in many careers.

YEAR 12 DATA COLLECTION

Dr Frank Barrington, Dr Michael Evans and Peter Brown work with us annually to collect and publish data on national enrolments in mathematics at Year 12. This work also makes careful state-by-state comparisons of the Year 12 curricula, and is the benchmark study of this kind. The data appears in AMSI's *Discipline Profile* each year.



67% of AMSI website traffic is for **TIMES Teacher Modules** & **32% for the SAM Middle and Senior Years Modules**

(Google analytics 24 November 2016) Modules are available at calculate.org.au

Resources for Teachers

AMSI Schools provides both services and resources for mathematics teachers at both primary and secondary levels.

TEACHER PROFESSIONAL DEVELOPMENT NATIONWIDE

AMSI delivers professional development for mathematics teachers across Australia, both through its Choose Maths project and on an ad hoc basis.

Through Choose Maths (see p12) we are delivering professional development to 120 schools nationwide. Additional professional development services have grown out of past outreach programs in clusters located in Newcastle, Wollongong and Warialda (NSW), Buderim, Townsville and Oakey/Dalby (QLD), Perth (WA), Adelaide (SA), Geelong (VIC), Gippsland (VIC) and Yarraville/Footscray (VIC).

We rely heavily on our funding partners, which have included the BHP Billiton Foundation, Boeing, the William Buckland Foundation, BlueScope Steel, the Victorian Department of Education and Early Childhood Development (DEECD) and the Australian Government through the Australian Maths and Science Partnership Project (AMSP) with the Regional Universities Network (RUN).

Ongoing funding from our partners ensures expansion of our work in metropolitan and remote areas. The thanks we receive from teachers, students and parents attest to the quality and importance of our work.

ICE-EM MATHEMATICS TEXTBOOKS

First published by AMSI Schools in 2005, the third edition of the ICE-EM Mathematics series will be available from mid-2017. Like the second edition, the new version is available through Cambridge University Press. This full-colour edition retains the structure, depth and approach of the first two editions and has been rewritten to remain in-line with changes to the Australian Curriculum: Mathematics. It covers all required content, as well as providing additional topics relevant to and essential for a robust understanding of the curriculum. The series spans Years 5–10, supporting the transition from primary to secondary schooling.

amsi.org.au/publications_category/publications/textbooks/

AMSI CALCULATE

AMSI Calculate brings together the resources from all AMSI Schools projects. A series of resources developed by the AMSI Schools team includes planning resources, maths activities and 20-minute professional development articles. The resources include:

TIMES Professional Development Modules

In 2010 AMSI Schools developed a suite of Teacher Content Modules for The Improving Mathematics Education in Schools (TIMES) project, funded through a grant of \$2 million by the Australian Government.

The modules support the implementation of the Australian Curriculum: Mathematics and are available on Calculate, as well as

through Scootle — an online resource used by school teachers and maintained by Education Services Australia (ESA).

scottle.edu.au
calculate.org.au

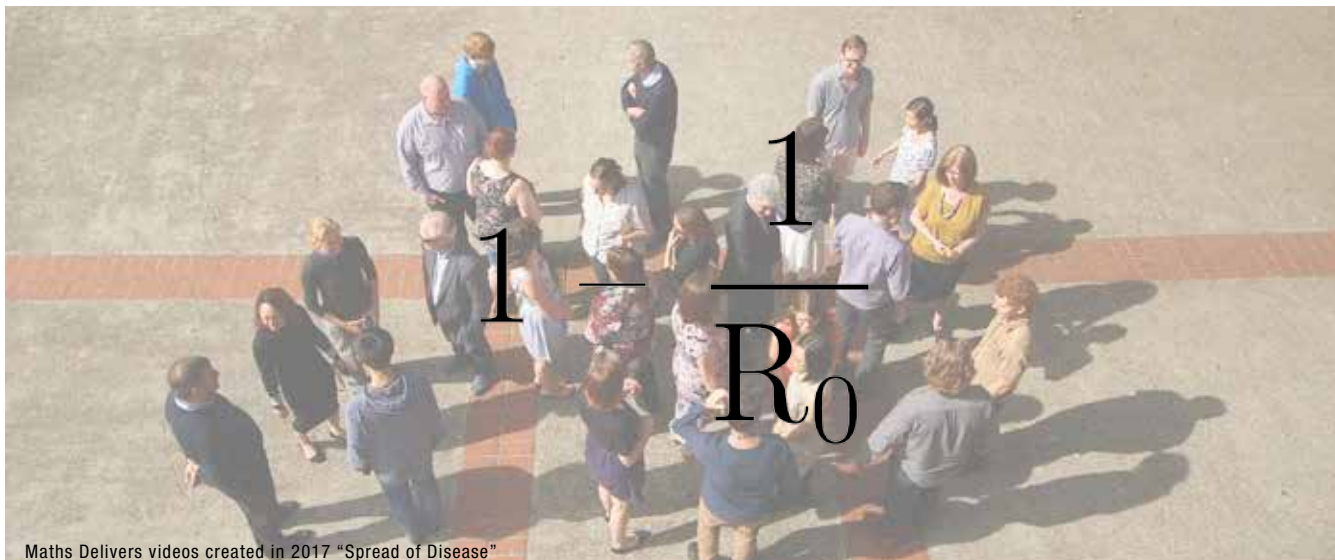
Supporting Australian Mathematics (SAM) Modules

Supporting Australian Mathematics (SAM) is a suite of open-access digital resources developed by AMSI in collaboration with ESA. The resources are aligned with the Australian curriculum and help teachers and students deepen their mathematical content knowledge.

- SAM Middle Years modules provide teachers and students with access to 45 packages that explain concepts from the mathematics curriculum for Years 5–9. Included are interactive student exercises and teacher resources formed from the Australian curriculum content descriptors
- SAM Senior Years modules have been developed for teachers and consist of 25 packages that cover all topics from the Year 11 and 12 curricula. Included are interactive animations and screencasts.

“The PD modules are widely used by teacher educators across Australia who regard them as a valuable resource.”

Independent review of AMSI 2010



Maths Delivers videos

As part of the SAM project, the Maths Delivers videos were produced in 2013 to expose students to enticing and exciting applications of mathematics. The four videos cover topics including gene mapping, cryptography, braking distance and the Google PageRank algorithm and each video is accompanied by a comprehensive set of notes explaining the underlying mathematics.

More recently, a second set of Maths Delivers videos was funded by Boeing Australia, with topics including aircraft wing design, airline scheduling, ecological modelling and the spread of disease. These videos will be launched later in 2017 along with accompanying Year 11 and Year 12 classroom resources.

Improve

In conjunction with ESA, AMSI developed material for the Improve program which is linked to the Australian Curriculum through Scootle and provides students, teachers and parents with an online learning environment to familiarise themselves with NAPLAN-style questions. The aim is to guide students on their approach to the questions, allowing them to gain a deeper understanding of NAPLAN expectations.

Maths of Solar Panels

In 2014, ATSE (Australian Academy of Technological Sciences and Engineering) approached AMSI Schools to assist in producing materials as part of the STELR (Science and Technology Education Leveraging Relevance) project. This

collaboration promotes links between the science, geography and mathematics curricula. View the materials online: stelr.org.au/maths-of-solar-panels

RESOURCES AVAILABLE THROUGH TES AUSTRALIA

In 2013, we were invited to share our online teacher resources on the TES Australia website. This site is the Australian division of TES Connect – the world's largest digital network of teachers – that first published the TIMES Educational Supplement over 100 years ago; it currently boasts 3.6 million registered users in Australia. The TES Australia site provides teachers with free access to over 500,000 resources, lesson plans, worksheets and activities. AMSI became a member of TES Australia in 2013. Since then there have been a staggering 23,985 unique views of the 100 resources we shared.

AUSTRALIAN CURRICULUM: MATHEMATICS

The Australian Curriculum, Assessment and Reporting Authority (ACARA) actively consults AMSI. Janine McIntosh and Dr Michael Evans were appointed in 2012 to the 10-member mathematics F-10 writing team by ACARA. AMSI facilitated consultation between ACARA and the Australian Council of Heads of Mathematical Sciences. This connection is extremely valuable: academics aware of where the field is headed are in direct conversation with those establishing

mathematics education at its roots. Dr Michael Evans was lead consultant on the Year 11 and 12 curricula which began rolling out in 2016.

AMSI GENDER REPORT

AMSI undertook an international literature research on gender bias in the mathematical sciences and reported the results in the AMSI Gender Report 2014. The research articulates the underlying causes of under representation of women in STEM fields, particularly mathematics, and outlines effective measures for causing change. This research provides the evidence base for the design of the BHP Billiton Foundation program.

A new gender report will be published later in 2017 by AMSI as part of the Choose Maths project.

amsi.org.au/genderreport2014

Careers

AMSI's careers programs aim to raise awareness of how the mathematical sciences underpin innovation. A fundamental aspect of this is informing teachers, parents, career advisors, school students and university students of the breadth of careers that involve mathematics and statistics.



“Many of the jobs listed in Maths Adds didn’t exist when I was deciding what to study at university, and we can only estimate and imagine what the jobs of the future will be. But we can be sure of the need for a steady supply of mathematically-trained graduates and a workforce and community with the mathematical skills required for the challenges of the future.”

Dr Alan Finkel AO, Chief Scientist of Australia

ADDRESSING THE SKILLS DEFICIT

The mathematical sciences have a significant impact on enhancing national productivity by addressing our country's challenges in areas as disparate as health care, the development of new industries, taming the data deluge and national security.

Australia has been running a mathematical deficit for years; the fundamental role played by mathematical scientists must enter the limelight; the demand for these professionals must cease to outstrip supply.

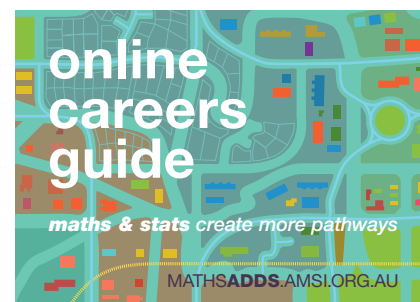
All four of AMSI's programs work together to bring the often-hidden employment potential of mathematics into full view:

- our Maths Adds careers guide provides up to date information about the careers that use mathematics, including real examples of jobs
- the new Choose Maths Careers Awareness campaign highlights a variety of careers where maths is used, and builds on previous AMSI career campaigns
- AMSI exhibits at career expos around Australia each year to highlight and raise awareness of mathematics and statistics careers, in many cases in partnership with organisations including the Mathematical Association of Victoria and the Mathematical Association of NSW
- AMSI careers events embedded within our flagship higher education programs explore the diverse perspectives of maths in industry through panel discussions and networking opportunities
- through the AMSI Intern program, postgraduate students are given the opportunity to work with industry, addressing the work-readiness of research students and providing opportunities to network and form contacts with potential employers.



MATHS ADDS CAREERS GUIDE

Now in its 20th edition, *Maths Adds* is produced in conjunction with La Trobe University. Each annual edition gathers together recent job advertisements with the common theme of mathematics and statistics — the jobs included range from manufacturing to academia, and everything in between.



Our new Maths Adds online resource was launched in 2016, to complement and expand on the print edition and act as a portal to all of AMSI's careers resources. In addition to showcasing job advertisements from the past three years, the website provides profiles of careers and individuals using maths in their jobs, links to video resources on maths careers and information about graduate programs and career pathways.

mathsadds.amsi.org.au

CHOOSE MATHS CAREERS AWARENESS CAMPAIGN

The new Choose Maths Careers Awareness Campaign was launched in June 2017, with careers packs distributed to almost 7500 schools, including posters, a booklet and other collateral.

The campaign features inspirational professionals from a broad range of industry sectors, who use maths in their careers. Some work in medical research, coding or engineering, while others stem from astrophysics or mining and resources. While the campaign is aimed at all students, there is a strong emphasis on women using maths in their careers, as part of the wider Choose Maths project.

The initial launch features 12 profiles, with the campaign expected to expand to include around 60 career profiles over the next three years. A new series of videos to accompany the Choose Maths Careers Awareness campaign is in production and will be launched later in 2017.

In March 2017, almost 1700 girls from high schools in Adelaide, Brisbane, Melbourne and Sydney attended special screenings of the movie *Hidden Figures*. Several of the new Choose Maths Careers Ambassadors attended each screening, taking part in panel discussions and answering questions from the students.

MATHS: MAKE YOUR CAREER COUNT

Maths: make your career count was a national careers campaign established in 2010 by the TIMES project and funded by the Australian Government. The campaign included profiles of 20 diverse careers that depend on mathematical skills, ranging from guitar makers, electricians and builders to financial analysts, sports statisticians and bioinformaticians. Nine of the profiles also featured in videos, which are available on Calculate, AMSI's portal for educational resources.

calculate.org.au/home/careers-videos/mathscareers.org.au

“The stories shared by these inspiring people highlight perfectly the core message of this campaign. That maths is available to everyone and opens pathways you never imagined.”

Janine McIntosh, Program Manager, AMSI Schools

CHOOSE MATHS
AN AMSI SCHOOLS PROJECT

SPONSORED BY
AMSI
iif
Institute of Information
Foundation

When I was young I wanted to become a meteorologist so I went to university to study maths. While there I discovered a world of new things that interested me, particularly medical data.

Data connects families and patterns pinpoint genomes that map family history. It's like solving a human puzzle that could eradicate diseases for future generations.

Applying mathematical knowledge to real-life medical data means that I am able to help people.

My name is
Lyndal Henderson

MORE THAN JUST NUMBERS. because it's at the forefront of medical research and can change lives.

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CHOOSEMATHS.ORG.AU

Higher Education

AMSI's Higher Education program pursues our mission to enhance the undergraduate and postgraduate experience of students in the mathematical sciences and related disciplines.

The AMSI Higher Education program provides first class research training for graduates in Australia and contributes toward a highly skilled mathematical sciences workforce. As a STEM discipline, mathematics is an important building block for the future technologies and the ideas that will improve Australian prosperity. The AMSI flagship research-training schools, scholarships and graduate courses build student networks and create the vibrant community of researchers required for innovation in the public and private sectors.

Key achievements

2017

Inaugural AMSI Optimise symposium is launched

2016

Participation by women across AMSI flagship events exceeds 42 per cent

112 per cent increase in participation in AMSI flagship events since 2012

Department of Education and Training invests \$2m over 4 years

2015

Partners with AustMS to send Australian early career researchers and students to the annual Heidelberg Laureate Forum

Launches Choose Maths Travel Grants

ACE Network replaces AGR Network

2014

Partnership with the ABACBS is established

Ongoing funding agreement for annual AMSSC begins

2013

Partnership with the AustMS WiMSIG to embed Women in Maths events in AMSI flagship events

2012

Department of Education and Training invests \$2m over 4 years

2011

National bioinformatics partnership with EMBL Australia and BioPlatforms Australia

2008

Grant for *Mathematics for 21st Century Engineering Students* research project

2007

AGR Network launches through ICE-EM to broadcast courses and provide remote access to honours subjects

2005

Annual AMSI Winter School is launched with funding from ICE-EM

2003

Annual AMSI BioInfoSummer symposium begins

2002

Establishes the annual AMSI Summer School

Launches the AMSI VRS program

“Working on a real project was an invaluable experience. Exploring topics that may or may not have been addressed before, and being required to find my own way to tackle the problem, brought a strong sense of connection to mathematics and ownership of my own work. As a result I learned a lot more in the time I had, than I ever have from typical undergraduate coursework.”

Morris Vsyoma, the University of Newcastle, Vacation Research Scholar

Enhancing the student experience

AMSI's flagship events bring together students from around Australia to participate in training schools, graduate courses and scholarship programs designed to develop their mathematical talents with specialist subjects. During these events students take specialist subjects taught by mathematical experts, meet potential employers and build networks.

In 2016, the Department of Education and Training invested a further \$2 million (over four years) into AMSI's flagship training programs under the Securing Australia's Mathematical Workforce banner. This will see AMSI continuing to build on the success of the existing programs (Winter and Summer Schools, BioInfoSummer and the Vacation Research Scholarships) as well as launch AMSI Optimise, a week long research and research training event focused on mathematical optimisation and its applications across industry. The first AMSI Optimise event was held in June 2017.

The Advanced Collaborative Environment (ACE) Network is now in full operation following a substantial upgrade in 2015. The new, sophisticated software platform provides greater functionality and enhanced connectivity within the Australian and international mathematical sciences communities. Since 2007, AMSI has delivered 148 honours subjects remotely using the ACE network. The shared honours program ensures students enrolled at any AMSI member institution can remotely access a wider range of honours courses.

We have seen a 112 per cent increase in participation across our flagship events since the Department of Education and Training funding began in 2012.



PROGRAM MANAGER

Chloe Pearse – chloe.pearse@amsi.org.au

POSITIVE STEPS TO ENCOURAGE FEMALE PARTICIPATION

Currently women make up less than 30 per cent of undergraduate and postgraduate enrolments in the mathematical sciences. We have successfully introduced a number of measures to support female participation in our programs. These have included setting participation targets, increasing female representation in our speakers and introducing Women in Maths events. These events are in collaboration with the Australian Mathematical Society's Women in Mathematics Special Interest Group (WIMSIG).

A new program to encourage female mathematicians to attend AMSI's flagship events, the Choose Maths travel grants were introduced to provide funding in support of travel and accommodation including partner and family travel and childcare where appropriate. Following its launch in late 2015, 2016 saw 17 women receive grants to support their attendance at the BioInfoSummer, Winter School and Summer School events. Feedback from initial funding rounds has been overwhelmingly positive with many recipients reporting they otherwise would not have attended.

We have seen strong increases in the proportion of females attending our flagship events. Whilst 2016 saw the proportion of attendees at flagship events increase again (to 42 per cent overall) this was largely predicated on the high proportion of females attending BioInfoSummer (51 per cent) and Winter School (42 per cent). Notwithstanding this, this excellent female participation result across our flagship events is testament to our positive actions.

391 Students
supported over
11 Winter
Schools

1,959
students
have attended
15 Summer
Schools

In 2016 **more**
than half of
the attendees at
BioInfoSummer
were **female**

AMSI WINTER SCHOOL

ws.amsi.org.au

Our Winter School is based on successful European and US models. With a different theme each year, the two-week residential program offers courses in advanced postgraduate mathematics. It is designed for graduate students and postdoctoral fellows in the mathematical sciences and cognate disciplines and is hosted by one of AMSI's full member institutions in Queensland.

The program includes in-depth specialist lectures from eminent national and international academics.

Recent themes have included:

- computational foundations of data science (2017)
- biological and environmental modelling (2016)
- algebra, geometry and physics (2015)
- contemporary aspects of cryptography (2014)

"I was really excited to have the opportunity to explore so many different fields and the questions within them."

Ross Ogilvie, The University of Sydney

AMSI SUMMER SCHOOL

ss18.amsi.org.au

Each year a different AMSI member institution hosts our four-week residential Summer School. Students have the opportunity to tackle one or two intensive subjects that may not be available at their home institution with many of the students taking one subject for credit.

Classes are chosen from eight honours level subjects in pure mathematics, applied mathematics, statistics and probability together with two mathematical subjects from cognate disciplines. Academic work is complemented by enrichment lectures, social events, careers information sessions and other program extras. Summer School is a fantastic opportunity for students to be immersed in two higher mathematical subjects of their choice. It is the largest mathematics and statistics event for students in Australia.

"Summer School introduced me to areas of mathematics I would not have been exposed to otherwise and spiked my interest to learn more about these fields,"

Diclehan Erdal, The University of Adelaide

AMSI BIOINFOSUMMER

bis.amsi.org.au

BioInfoSummer is the major annual bio-informatics event in Australia. This exciting area of science blends technologies from mathematics, statistics and computing to solve biological problems.

More than two hundred students and researchers from the public and private sectors gather at BioInfoSummer to learn about the latest developments in bioinformatics.

Each year an outstanding group of Australian and international speakers help upskill and inspire delegates through careers information, lectures and software training. BioInfoSummer is supported by the Australian Bioinformatics and Computational Biology Society (ABACBS), together with a number of other sponsors.

"BioInfoSummer was a wonderful chance to hear about home-grown and international research, at a level that is accessible to someone who may not be that field."

Shila Ghazanfar, The University of Sydney

478 students have completed a VRS project

VACATION RESEARCH SCHOLARSHIPS (VRS)

vrs.amsi.org.au

Each year around 50 of our brightest undergraduate students work through their summer on a research project. Over six weeks, students experience life as a researcher, work closely with a supervisor and present their findings at the AMSI Connect (formerly Big Day In) conference. AMSI provides monetary scholarships to give students a taste of research life and encourage them to pursue mathematics and statistics as a career. Since 2002, 521 students have participated in the program.

Recent VRS projects include:

- How to cool burns using maths
- Neural networks: algorithms and applications
- Chaotic dynamics on the Riemann sphere
- Topological invariants in quantum systems
- Time delays in gene expression

The VRS program safeguards Australia's future supply of researchers with expertise in the mathematical sciences: encouraging students to take their studies to the next level and pursue the mathematical sciences as a career.

Evidently the program delivers; a generation on and several VRS students are now VRS supervisors.

AMSI Optimise 2017 attracted 108 registrations

AMSI OPTIMISE

optimise.amsi.org.au

With a focus on applied mathematical optimisation, AMSI Optimise is a new event that launched in June 2017 to strengthen mathematical optimisation research engagement and its applications across industry. Modelled on the successful AMSI BioInfoSummer, the event comprised a three-day industry-research conference with expert and end user talks, computer workshops, collaboration showcases and challenge sessions. The conference was followed by a two-day research workshop.

“One of the most enjoyable aspects of this event was the opportunity to network with Mathematics students and recent graduates entering the workforce”

Dan Sutherland, Energy Mining and Infrastructure Lead, Biarri

8,275 Research & Higher Ed E-news subscribers

HEIDELBERG LAUREATE FORUM

research.amsi.org.au/hlf

A highlight of the international mathematics and computer science calendars, the Heidelberg Laureate Forum provides highly talented young researchers with the opportunity to engage with the winners of the most prestigious scientific awards in Mathematics (Abel Prize, Fields Medal and Nevanlinna Prize) and Computer Science (ACM Turing Award). This provides an outstanding platform for scientific dialogue across generations. Since 2015 AMSI and AustMS have provided funding to support nine young Australian researchers' attendance at the event with five attending in 2015, and four in 2016.

“It was extraordinary to interact with some of the world's greatest mathematicians and computer scientists, to share ideas and learn from their experience and knowledge.”

Tian Sang, PhD Student, RMIT University

Research

AMSI Research has been supporting and building Australia's research base since 2002, delivering on our mission to support mathematical sciences research and its applications, including cross-disciplinary areas and both public and private sectors.

The program is one of the nation's largest sustained workshop programs, attracting a wide range of workshops to support the Australian mathematical sciences community.

The internationally recognised program features international expert speakers and assists in facilitating national and international research collaborations, while also providing training and support to students and early career researchers alike. Australia's academic mathematical sciences community is supported and promoted as the critical links between researchers in universities, government agencies and business are developed.

Key achievements

2016

AMSI sponsors its 200th scientific workshop

AMSI Research Report launches

AMSI and AustMS partner to create the significant 3-week long MathsFest event

2015

ACE (formerly AGR) network is upgraded to enhance connectivity with Australia and globally

Review of AMSI Scientific Workshop Program

2014

AMSI-CARMA research collaboration begins

Partners with ANU for Mathematical Sciences Institute special year

2013

AMSI coordinates Australia's participation in the International Year of the Mathematics of Planet Earth

2012

MISG partnership with ANZIAM

National Seminar Series begins over the ACE Network

2011

AMSI, AustMS and ANZIAM scientific funding partnership

2009

Inaugural Early Career Workshop

2007

ACE (formerly AGR) network provides global access to seminars

CASR grant of \$2m to build research-industry linkages

2006

AMSI Travel Fund established

2005

Annual AMSI Distinguished Lecture Tours begin

MITACS and MASCOS partnership

2004

AMSI Scientific Workshop Funding commences

2003

Partners in the establishment of MASCOS

“AMSI research workshops provide fertile environments to sow the seeds for research innovation and excellence. Encouraging the exchange of ideas as well as national and global collaboration, these events deliver training and development to foster future research leaders.”

Professor Terence Tao, UCLA

FACILITATING NATIONAL & INTERNATIONAL COLLABORATION

AMSI is acknowledged for promoting collaborative mathematical research through its internationally recognised program of scientific events, which brings together researchers from around the world to strengthen Australia's research capability. A constant theme of the workshop reports is the significant benefits gained through collaboration. This includes not only cross-geographic border collaboration but also cross-disciplinary collaboration and partnerships with government and industry.

With an annual budget of more than \$250,000, the program competitively awards sponsorship across approximately 20 scientific workshops, local and international conferences each year, and provides travel grants for AMSI members to attend these workshops.

An overhaul of our workshop-funding program in 2014 resulted in an improvement in the delivery of the workshops, increasing the national benefit for our members. The workshops cover a broad range of topics from fractal geometry to mathematical finance, encompassing the spectrum of pure through applied mathematics and statistics.

PROGRAM MANAGER

Chloe Pearse – chloe.pearse@amsi.org.au

More than 218 scientific events funded and more than 500 travel grants awarded since 2004

We keep the mathematics community connected through our E-news newsletter, interactive websites and strong social media engagement.

WOMEN IN MATHS

AMSI Research is actively encouraging workshop organisers of AMSI-sponsored workshops to improve the participation of female researchers through a range of measures including the inclusion of at least one woman on the organising committee, engagement of female speakers and provision of information such as childcare availability. The current goal for female attendees at AMSI-sponsored programs is 30 per cent. In 2016, female mathematicians attending AMSI-sponsored workshops made up 19 per cent of the participants across 18 funded workshops.

SUPPORTING AUSTRALIA'S YOUNG RESEARCHERS

Since 2009, AustMS, ANZIAM and AMSI have put on an annual Early Career Workshop, most recently alternating at the annual meeting of either AustMS or ANZIAM. The workshop has provided a forum for over 500 young researchers to build their networks and increase their skills. Attendees receive advice from experts on a broad range of topics from the secrets to grant success to effective strategies in managing time between teaching, research and administrative commitments. This workshop is part of our mission to enhance the postgraduate experience of students.

INTERNATIONAL EXPERTISE

The AMSI Lecture Tour and the Mahler Lecture Tour, held in conjunction with AustMS, ANZIAM and the SSA, bring renowned international mathematicians and statisticians to Australia to engage and inspire the research community and the general public. In addition, our scientific workshop program sponsors international academics to participate in workshops. In 2016, 88 international speakers were supported.

ADVANCED COLLABORATIVE ENVIRONMENT (ACE)

The National Seminar Series broadcasts specialist lectures and has included talks from Fields medallists and young prize-winning researchers. In 2015, a major software upgrade was implemented to enhance and simplify national collaboration. The seminars are run in

“I’m delighted AMSI is taking a proactive lead in encouraging and supporting women as essential contributors to the mathematical sciences. The Institute’s initiatives play an important role in opening opportunities for women within Australia’s mathematical sciences community, particularly through conference attendance, research networks and collaborative opportunities.”

Professor Cheryl Praeger AM, FAA, The University of Western Australia

collaboration with AustMS, ANZIAM, the Australian and New Zealand Association of Mathematical Physics (ANZAMP), the Australian Society for Operations Research (ASOR) and the SSA.

RESEARCH PARTNERSHIPS

AMSI has established and maintained partnerships with leading research networks across Australia. These relationships provide mutual benefit by bringing the community together and increasing national participation.

The Mathematical Sciences Institute at the Australian National University and the Centre for Computer Assisted Research Mathematics and its Applications (CARMA) at the University of Newcastle, are our newest partners. These agreements will enhance and increase the reach of our individual programs.

INDUSTRY LINKAGES

The Mathematics in Industry Study Group (MISG) is an annual event supported by ANZIAM and AMSI, currently held at the University of South Australia. Over a hundred mathematicians and statisticians come together at MISG to apply their expert knowledge to help solve real world, relevant problems to industry.

mathsinindustry.com



Distinguished Professor Kerrie Mengersen speaking at the Women in Maths networking event

APR Intern

APR Intern (formerly known as AMSI Intern) creates opportunities for PhD students—from all disciplines—to work with industry and apply their research to complex real-world challenges. As we seek to strengthen Australia's STEM and innovation capability, our aspiration is for these short-term industry engagements to become a vital and routine part of the Australian postgraduate experience.

Exposure to industry environments enables postgraduate researchers to develop valuable skills to improve their work-readiness for future employment. The student is supported throughout their internship by a supervisor from within the partner organisation, an academic mentor from an AMSI member university and an AMSI Intern facilitator.

Key achievements

2017

Expanded APR Intern program launches with \$28m from Australian Government

2016

New partnerships with the Australian Bureau of Statistics, BHP Billiton, Meat and Livestock Australia

Australian government pledges \$28m investment to expand AMSI Intern Program across all states and all industry sectors and disciplines

AMSI Intern program highlighted in ACOLA's *Review of Australia's Research Training System*

2015

Strategic partnerships established with the Defence Science Institute

2014

Co-investment agreement is signed with eight Australian universities to expand program

Partnerships with ACFS and DSI

DSTO joins AMSI membership to access internship program

Service expands to include 25 industry sectors

AMSI Intern becomes supplier of the NT government R&D voucher program

2013

AMSI Intern becomes supplier of the VIC government DSDBI R&D Voucher Program

Accelerate Australia forum

2010

Three year Enterprise Connect funding begins

2009

Expansion to place interns from all disciplines

2007

CASR grant from the Australian Government to establish AMSI Intern program

“The AMSI Intern program is essential in filling what has been a gaping hole in training for graduates with a PhD... and allows those students who would prefer to work in industry after completion of their PhD to gain the necessary skills to make them job-ready.”

Dr Regina Cramer, Defence Science Institute Associate Director

More than 200 interns have been placed since the program began

We provide organisations with a simple, cost-effective and flexible option to obtain expert advice and research capability. An internship can be used to build continuing relationships with the university and provides SMEs, large companies and agencies access to the cutting edge expertise of academia: driving company innovation and growth.

106 public & private organisations have used AMSI Intern

Many types of organisations contact AMSI Intern in search of help to solve problems facing their business. AMSI Intern connects these organisations with postgraduate students with the expertise needed to help solve these problems through short, focused internships.

96 per cent customer satisfaction

NATIONAL PROGRAM MANAGER

Cate Ballard – cate@amsi.org.au

(on maternity leave from October 2016)

Glen Sheldon – glen.sheldon@amsi.org.au

(acting national program manager from Oct 2016)

Transition to APR Intern

During the 2016 election campaign, the Australian Government pledged \$28.2 million to expand AMSI Intern to create a national-scale industry engaged program, and the expanded program launched under new name Australian Postgraduate Research (APR) Intern in 2017/2018.

With innovation a core policy focus, the expanded internship program delivers on the Australian Government’s National Innovation and Science Agenda (NISA), and addresses both Watt and ACOLA report recommendations highlighting the need to strengthen Australia’s capacity to translate publicly funded research into commercial outcomes. The AMSI program’s tight focus on industry-led research outcomes informed by PhD projects provides an effective translation process.

The funds will support the delivery of 1400 new internships over four years with access provided to all of Australia’s universities. Building on AMSI’s existing intern program, APR Intern will provide PhD students with the opportunity to work with an industry partner on a research project of up to five months’ duration. Projects will have a focus on science, technology, engineering and mathematics (STEM) fields and an increased participation by women in STEM.



Nithi Sopitpongstorn, Monash University completes his internship with ANZ Banking Group

Visionary partnerships

The success of the AMSI Intern program is supported by AMSI's relationships with both the organisations hosting internships and the institutions supplying the interns.

AMSI Intern has established partnerships with a number of large national organisations, including:

- The **Defence Science Institute** partnership continued into its second year with five internships secured. Partnership discussions continue with **DST Group**
- AMSI Intern secured three **BHP** internships — a mathematics-focused project commenced in December 2016 with a further two projects in development. Based in WA these internships build on AMSI's existing Choose Maths partnership with BHP
- An agreement with the **Australian Bureau of Statistics** has been negotiated for 11 internships over three years.
- The program's partnership with **ANZ** has strengthened with another three placements beginning in January 2017 focusing on data science/ analytics. A second round of interns will be recruited through mid-2017
- The partnership with **Parks Victoria** continued in 2016, with six students placed over the past eight years.
- A successful partnership with **Telstra** delivered four internships in 2016
- **Canon Information Systems Research Australia** accepted their fourth intern, with additional placements planned for 2017

- **Meat Livestock Australia** are planning at least two intern placements in 2017 laying the foundations for the annual placement of multiple internships nationally
- Consultant engineering firm **Aurecon** has placed six interns in the first two quarters of 2017

Other major organisations that have made use of the AMSI Intern program include CBA, CSR, NBN Co, NAB, CSL and the Bureau of Meteorology.

The strong resonance of AMSI Intern's value proposition with leading and respected Australian companies acts as a beacon to SMEs — a critical focus for AMSI and the intern program. Among the SMEs that have hosted interns are:

- Memko
- Goulburn Broken Catchment Management Authority
- BMT Design and Technology
- OmniTanker

More Intern success stories can be found on our website amsiintern.org.au/success-stories/

Complementing AMSI Intern's growing relationships with industry are its co-investment partnerships with six AMSI member universities in Victoria and two in NSW. The \$6.7 million investment is allowing AMSI Intern to expand and build scale through its embedded business development officers helping industry connect with university expertise. The co-investment has increased opportunities for PhDs from these institutions to gain valuable workplace experience and improve their ability to communicate and collaborate with industry.

PAST PROGRAMS AND EVENTS

Inspiring Women Industry Internship with veski

Between 2014-2016, AMSI Intern partnered with **veski** and the Victorian Office of the Lead Scientist to launch the Inspiring Women industry internship program connecting female Honours and Masters students with Victorian industry and government agencies to address research problems facing those organisations. Four women were awarded internships through the program.

Voucher programs and other government partnerships

In 2014, we became suppliers for the NT government's Innovation and Technology Vouchers. Both voucher programs provide funding to help businesses improve their competitiveness and productivity.

In July 2013, AMSI Intern became an approved supplier of the Victorian government's Business R&D Voucher Program, which provides access to innovation and R&D funding of up to \$25,000 for Victorian small to medium enterprises (SMEs).

In 2010, we began a successful three year partnership with Enterprise Connect — this federal government partnership subsidised the placement of 33 PhD interns into SMEs across Australia.

Accelerate Australia

Accelerate Australia was held in February 2013 in Canberra. The forum acted as a platform for discussions on industry engagement and the work-readiness of PhD students and featured speakers from industry, government and research.



“Australia must increase the penetration of Australian graduates with advanced research expertise into the private sector. They will boost innovation and business-university collaboration but we must give them those skills. And give business the confidence to employ them.”

Professor Geoff Prince, AMSI Director

Parks Victoria

Since 2011, AMSI has been providing Parks Victoria with statistical support. Presently, Dr Kally Yuen is embedded as a statistician within the organisation. Her work has provided significant benefits for Parks Victoria. Kally contributes to the design of monitoring protocols, sets up data management systems and conducts statistical analysis for a range of Parks Victoria projects.

As the resident statistician at Parks Victoria, Kally has conducted analysis of a three-year survey of weed monitoring in the Dandenong ranges; evaluated the efficacies of several treatments to control English Broom in Alpine National Park; conducted an assessment of feral horse impacts on treeless drainage lines in the Australian Alps; and been involved in remote camera monitoring projects across a range of parks and habitats. As a result of these projects, Kally co-authored a number of scientific papers in peer-reviewed journals and a chapter in the CSIRO publication *Camera trapping wildlife management and research*. She has also provided assistance for all AMSI Intern projects at Parks Victoria.

We have developed a mutually beneficial ongoing relationship with Parks Victoria that delivers improved project outcomes and has significant benefits for the conservation of Australia’s iconic flora and fauna.



Marketing and Media

AMSI engages with a broad target audience from primary and secondary students, teachers and parents, university students, the AMSI membership, government and industry. Our strengthened media presence supports policy engagement, advocacy and research training activities.

The success of AMSI's marketing strategy can be seen in the consistently high engagement through communications, events, social and online channels with AMSI programs.

Media coverage, both national and regional, continues to expand as our programs and projects, including Choose Maths, reach across Australia.

Key achievements

2017

National careers campaign features Choose Maths Careers Ambassadors on buses, trams and trains across Australia

Media coverage is on track to more than triple 2016 figures

20th edition of *Maths Adds* careers guide published

2016

More than 3500 followers on Facebook and 1200 followers on Twitter

AMSI's media coverage doubled to more than 100 media occurrences during the year

Digital version of *Maths Adds* launched

Introduction of *AMSI Research Report*, an annual review of AMSI's RH&E activities

AMSI Intern brand refresh

2015

Launch of *Update*, a bi-annual bulletin for the mathematical sciences community

AMSI brand refresh

2014

Member review of publications strategy

First publication AMSI Track Record

2013

National marketing campaign for Australia's program for the International Year of Maths of Planet Earth

2012

First annual edition of the *Discipline Profile of the Mathematical Sciences* published



Choose Maths careers awareness campaign

Marketing Strategy

AMSI has implemented a customer-centric marketing strategy aimed at raising awareness of AMSI and its programs, increasing lead generation and promoting advocacy.

Our strategy focuses on the delivery of tailored campaigns with messaging targeted to specific market demographics, including media. Key campaigns consider tone, timing, channel, strong design, cost and resourcing with a clear call-to-action.

The success of AMSI's marketing strategy can be seen in the consistently high engagement through email communications, social and online channels with AMSI programs.

Strategic marketing partnerships have proven beneficial in furthering reach and impact of our brand and products, opening new channels to access key audience sectors. As an example, we have worked with the Australian Association of Mathematics Teachers (AAMT) and the Careers Education Association of Victoria (CEAV) to promote *Maths Adds*.

Where possible, we cross-promote program products and services to maximise engagement with key audiences. Cross communicating stories optimises soft promotion of the mathematical sciences pipeline while highlighting linkages between AMSI programs, and emphasising the exciting

MARKETING AND COMMUNICATIONS MANAGER

Mari Ericksen – mari@amsi.org.au

career pathways available to students after studying maths and statistics.

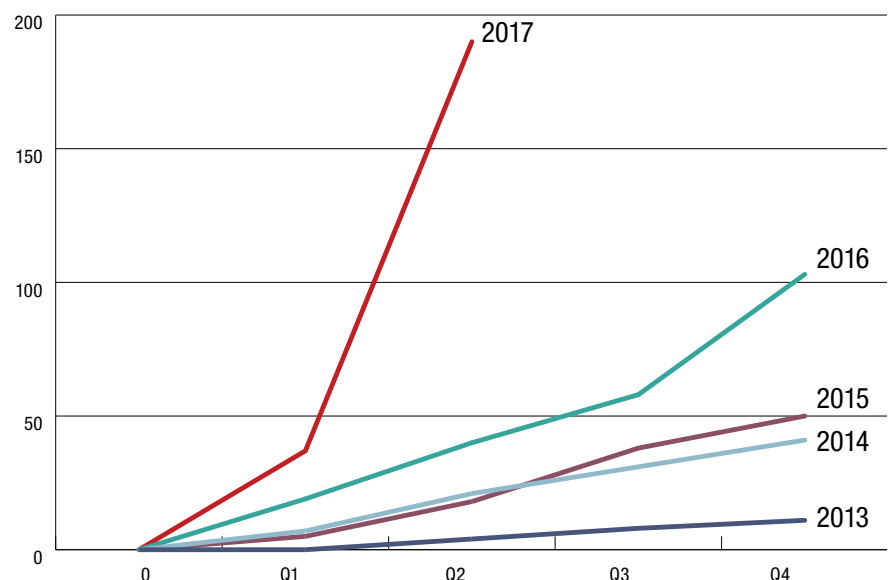
Strong design concepts and messaging across campaigns and publications continue to play a fundamental role. AMSI's brand recognition has enjoyed tremendous growth through our increased media presence, Choose Maths project and research training events.

Media Growth

AMSI has actively increased its media presence by implementing targeted media strategies to secure proactive media and leverage reactive media opportunities. As the go-to authority on the state of mathematics in Australia, AMSI more than doubled its media exposure in 2016, with 103 news articles and is on track to significantly increase further in 2017.

Media coverage is predominantly national, ensuring advocacy and policy measures

Growth in media occurrences



are communicated through the media to a national audience. But AMSI's regional media coverage has also increased, largely due to increased local coverage for the Choose Maths Awards winners.

AMSI issued 24 media releases in 2016, up from 18 media releases in both 2014 and 2015. amsi.org.au/category/news/

AMSI's Facebook page attracts 350 new likes a month

AMSI Newsletters

AMSI RESEARCH & HIGHER ED E-NEWS

A monthly newsletter highlighting AMSI events and news, as well as external events and news of interest to the mathematical sciences community. research.amsi.org.au/news/e-news/

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/track-record-publication

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/annual-report

DISCIPLINE PROFILE OF THE MATHEMATICAL SCIENCES



Released annually, this is Australia's most trusted 'go to' data resource for media, policy makers and stakeholders interested in the state of Australian mathematics. This publication should be read with the associated core policy document.

amsi.org.au/discipline_profiles

POLICY DOCUMENTS AND SUBMISSIONS

AMSI's core policy documents such as 2016's *Securing Australia's mathematical workforce* set the institute's key priorities

for intervention at all stages of the mathematical pipeline as identified in the *Discipline Profile*. AMSI's submissions and responses to reviews and consultative processes may also be found here.

amsi.org.au/submissions/

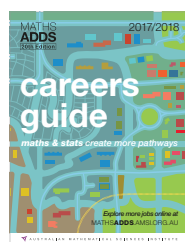
RESEARCH REPORT



Illustrating the cross-discipline 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/publications/research_reports

MATHS ADDS



Australia's leading mathematics career resource, this guide is updated annually to inspire students with a full overview of the growing industry opportunities open to those with high-level mathematics.

mathsadds.amsi.org.au

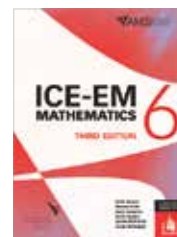
UPDATE



Spanning the mathematical sciences pipeline, this biannual magazine explores the 'hot topics', industry successes and research from AMSI and Australia's mathematical sciences community.

amsi.org.au/the-update-publication

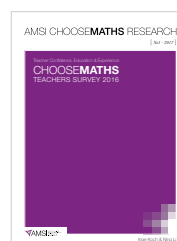
TEXTBOOKS



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 essential for a robust understanding of mathematics.

amsi.org.au/ice-em-textbooks

RESEARCH AND DATA



The Choose Maths project has released the first in a series of surveys and reports, a look at teacher confidence, education and experience. This and other surveys are planned for annual release, to assess and document the efficacy of the Choose Maths project.

amsi.org.au/publications/research-and-data

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
mathsadds.amsi.org.au (includes content previously stored on careers.amsi.org.au)

AMSI Social Media

facebook.com/DiscoverAMSI
facebook.com/amsischools
facebook.com/AMSIIntern
facebook.com/choosemaths

twitter.com/discoverAMSI
twitter.com/amsiintern
twitter.com/AMSIschools

“Inspiring students, researchers and professionals to pursue study and careers in fields such as bioinformatics, is crucial to the future of research and innovation in Australia.”

Senator the Hon Simon Birmingham, Minister for Education and Training

