



## **ANNUAL REPORT 2018**



# AMSI's **MISSION**

**THE RADICAL IMPROVEMENT OF MATHEMATICAL SCIENCES CAPACITY AND CAPABILITY IN THE AUSTRALIAN COMMUNITY THROUGH:**

**Supporting** high-quality **mathematics education** for all young Australians

**Improving** the **supply of mathematically well-prepared students** entering **tertiary education** by direct involvement with schools

**Supporting** mathematical sciences **research** and its applications including **cross-disciplinary areas** and the **public** and **private sectors**

**Enhancing** the **undergraduate** and **postgraduate** experience of students in the mathematical sciences and related disciplines



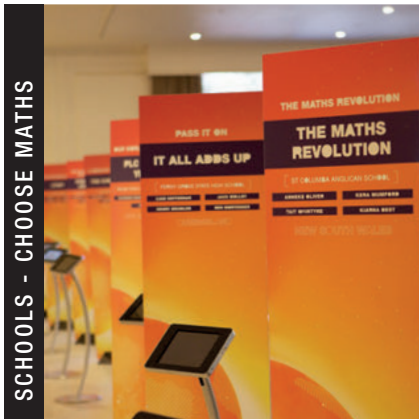
POLICY & ADVOCACY



OUTREACH



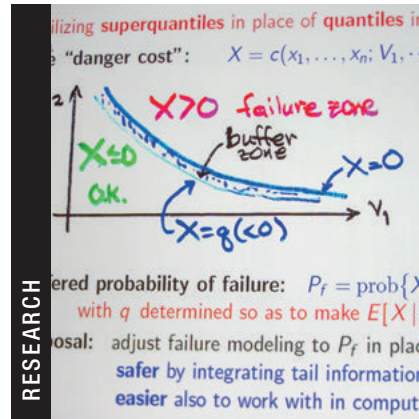
SCHOOLS



SCHOOLS - CHOOSE MATHS



HIGHER EDUCATION



RESEARCH



APR. INTERN



MARKETING & MEDIA



GOVERNANCE

# Contents

FROM THE CHAIR .....4

FROM THE DIRECTOR .....5

AMSI MEMBERS .....6

KEY ACHIEVEMENTS .....7

POLICY & ADVOCACY.....8

OUTREACH.....12

SCHOOLS.....16

    CHOOSE MATHS .....18

HIGHER EDUCATION .....22

RESEARCH .....26

    RESEARCH COLLABORATION: PARKS VICTORIA .....29

APR.INTERN.....30

MARKETING & MEDIA .....34

GOVERNANCE .....36

STAFF.....40

FINANCIALS .....42

AMSI PUBLICATIONS .....44

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# From the Chair

2018 was undoubtedly a challenging year for AMSI culminating in the retirement of our longest-standing Director, Professor Geoff Prince. Geoff's many achievements in his storied career with AMSI have been well documented ([amsi.org.au/2018/12/04/close-of-play-for-amsis-longest-serving-director/](https://amsi.org.au/2018/12/04/close-of-play-for-amsis-longest-serving-director/)). More than anything else Geoff changed the playing field for what AMSI might be able to achieve: for example, a massive increase in AMSI's grant funding from both government and industry and a concomitant increase in AMSI's ability to act as an advocate for the mathematical sciences.

The search process to find Geoff's replacement also came to a very satisfactory conclusion. Following an extensive international search, AMSI's Board appointed Professor Tim Brown, an eminent statistician with experience at the highest levels of university administration, as AMSI's next Director taking up his position in early 2019 ([amsi.org.au/2018/12/06/new-director-for-the-australian-mathematical-sciences-institute/](https://amsi.org.au/2018/12/06/new-director-for-the-australian-mathematical-sciences-institute/)).

With the retirement of Professor Prince and after seven years as the Chair of AMSI's Board it is also time for me to retire from my position. It has been a privilege to serve the Australian mathematical sciences community and see just how much has been achieved over the last few years. It is also an appropriate time to refresh the external board representation following several retirements and ends of term.

2018 was not an easy year for AMSI. For a variety of reasons the number of students taking up the internships has not met the aggressive targets we set ourselves and agreed with the Department of Education and Training. The reasons are now largely understood and include the inflexibility of Ph.D. completion rules, difficulties in appointing business development managers, a delayed start to the project and complexities arising from the make-up of the eligible cohort among others. The management of the Program has now been strengthened with the appointment of industry professor Gary Hogan AM and the return from family leave of Cate Ballard. A gratifying aspect of the Program's evolution is the interest from industry and the public sector in appointing interns across the STEM disciplines.

Once again, it was a thrill to attend the AMSI Choose Maths Awards this year. These awards celebrate the achievements of both inspirational teachers and wonderfully engaged students. AMSI has long been a champion of the need to address such issues as women

in the mathematical sciences, out-of-field teaching in high schools and the concerns expressed by many primary teachers about their preparedness to teach the mathematical components of the syllabus. The quality and insights of some of the student videos was mind-blowing.

I continue to be inspired by the teachers in the Choose Maths program and the work they do in often remote environments. This work has been generously supported by the BHP Foundation. An emerging challenge will be to future-proof the program once the funding comes to an end. I'm sure that some of the teachers could write wonderful books about the work they have been doing and the problems they have encountered and overcome.

Space precludes my saying everything I would like to, but I must add my continuing delight at the quality of the work being done (organising Summer and Winter schools) by the Research and Higher Education Program and by the depth of coverage of AMSI stories in the media and on display in various forms of advertising. AMSI's marketing and communications team is world-class.

AMSI would not be nearly as successful as it is today without the passion and commitment of its very special people. I cannot speak highly enough of them. I would like to thank them all personally for their often selfless dedication.

And my final thank you is to AMSI's unique membership at all levels and my fellow board members. It has truly been a privilege to serve with you and I wish you all the very best for the future. I shall certainly be watching.

**Dr Ron Sandland AM FTSE**  
**February 2019**



# From the Director

AMSI delivered on many elements of its mission in 2018, from significant policy and advocacy initiatives to public awareness and to delivery of major teaching, research and research training programs. And, more than ever before, our work is publicly known through AMSI's exceptional media exposure and marketing campaigns.

The 2018 policy and advocacy effort focussed significantly on the school teaching profession and mathematics prerequisites for university study, both major pillars of the 2016 decadal plan for the mathematical sciences. It is pleasing that our work on out of field teaching has brought this critical issue to public attention and that, with the support of the Chief Scientist, Dr Alan Finkel, and Science Technology Australia, governments and universities are facing the prerequisites question. Increased female participation in the mathematical sciences continues to be a fundamental theme for AMSI.

Our Research and Higher Education Program delivered a stellar range of research training events in conjunction with our members, with excellent attendances and supported by grants for female students through the Choose Maths initiative with the BHP Foundation. I take great personal pleasure in attending these events, particularly AMSI Connect where our Vacation Research Scholarship students present their work to one another; the quality and enthusiasm on display are remarkable. We also supported 14 research workshops, many in collaboration with the Australian Mathematical Society, bringing 47 international speakers to Australia. It has been gratifying to work closely with the Society, and our comprehensive landmark agreement was renewed at the end of 2018

for another 3 years. All these activities are showcased in our annual Research Reports which I commend to you on our website.

The annual Choose Maths Awards are now established as the gala event in the mathematical sciences calendar. The 2018 edition was particularly notable for the wonderful work of the awarded teachers and for the extraordinary quality of the student videos. But most of all the wonderful sense of excitement and achievement in the room make it my favourite AMSI event.

Our Choose Maths Outreach officers continue to inspire and support the teaching of mathematics in primary and secondary schools around the country. Choose Maths is also a contributor to the major careers resource now available online at [careers.amsi.org.au](http://careers.amsi.org.au). This represents the consolidation of our famous Maths Adds collaboration with La Trobe University, the video resources developed with support from Boeing and the Choose Maths Ambassadors' inspiring stories.

2018 has been a mixed year for AMSI's Australian Postgraduate Research Internship Program (APR.Intern). Following the five-month delay contract signing with the Commonwealth in 2017, we are carrying a placement shortfall which has attracted adverse attention from the Department of Education and Training and the mid-year Senate Estimates hearings. Nonetheless, relationships have been stabilised following intensive rounds of meetings with both sides of politics, major stakeholders and departmental officers. I am pleased that we have had an overwhelmingly positive response from the universities to our block placement allocation pilot in late 2018. This

augurs well for placements at scale in 2019, as does the appointment of Professor Gary Hogan as program director and the return of Cate Ballard as national program manager.

It has been a very great privilege to serve the Australian mathematical sciences community as AMSI Director. In an intensely competitive Australian university sector AMSI has been a bastion of collegiality, a characteristic which attracted me back in 2004 when I became Deputy Director to visionary inaugural director Garth Gaudry. I owe a great deal to AMSI Board chairs Jim Lewis and Ron Sandland and to Jan Thomas. I also acknowledge the deep contribution of my various deputy directors over the last ten years and of many Board members and committee chairs. The greatest pleasure has been recruiting and working with AMSI's wonderful staff to deliver our vital mission. And I thank the AMSI Executive for sharing the rewards and responsibility of leadership. My personal thanks go to Anne Nuguid and Kirsten Doert who managed directorate, board and members' affairs so tirelessly.

My very best wishes go to new director Tim Brown and to AMSI's 12 joint venture partners as they exercise their ownership of this unique national enterprise.



**Professor Geoff Prince FAustMS**  
**February 2019**





# AMSI Members

List of members as of December 2018

## Full Members



## Associate Members



## Government Agencies



## Societies



AUSTRALIAN MATHEMATICS TRUST



Mathematics Education Research Group of Australia



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



# Key Achievements

THE CHOOSE MATHS AWARDS ATTRACT OVER **617 STUDENT ENTRIES** (FROM 1200+ REGISTRATIONS) AND **43 TEACHER NOMINATIONS**

**567 SCHOOL VISITS** AND **93 PROFESSIONAL DEVELOPMENT DAYS** FOR TEACHERS IN 2018

**21ST EDITION** OF MATHS ADDS **CAREERS GUIDE** PUBLISHED

AROUND **1000 RESEARCHERS** ATTEND AMSI R&HE EVENTS IN 2018

AMSI SPONSORS **14 RESEARCH WORKSHOPS**

AMSI WORKSHOPS FEATURE **97 INTERNATIONAL SPEAKERS**

**28%** OF ATTENDEES AT AMSI HIGHER EDUCATION EVENTS ARE **WOMEN**

**467 RESEARCH STUDENTS, ECRS AND RESEARCHERS** ATTEND AMSI'S FLAGSHIP TRAINING EVENTS IN 2018

**111 INTERNSHIPS** COMPLETED THROUGH THE INTERN PROGRAM, UP FROM 77 IN 2017

**44% INTERNS** WERE **FEMALE**

**691 MEDIA ARTICLES** IN 2018 – A **215% INCREASE** IN MEDIA COVERAGE OVER 2017

**SOCIAL MEDIA** ENGAGEMENT **UP BY 232%** ACROSS ALL OF THE PROGRAMS



# Policy & Advocacy

The central voice for Australia's mathematical sciences, AMSI actively supports the development of national research policy and frameworks to help shape future innovation. We deliver critical reform across the mathematics pipeline spanning school-based and higher education, research training and funding to industry collaboration and innovation.



## Policy

### OCCASIONAL PAPER: CRUNCHING THE NUMBERS ON OUT-OF-FIELD TEACHING

Launched in 2018, AMSI's Occasional Paper series will provide detailed analysis on core policy issues across the pipeline. *Crunching The Numbers On Out-Of-Field Teaching* placed national attention on the depth and scale of Australia's secondary mathematics teacher crisis and its threat to future capability.

Co-authored by AMSI Director, Professor Geoff Prince and AMSI Schools Outreach Manager, Michael O'Connor using simplifying assumptions, the paper revealed around 76 per cent of students will be taught by an out-of-field teacher at least once and 35 per cent of students twice in the first four years on high school. Worryingly, approximately 8 per cent will be taught by out-of-field teachers for all four years.

Assuming the current rate of out-of-field teaching is 30 per cent, AMSI's modelling shows it would take 13.5 years to halve Australia's current rate of out-of-field teaching using a graduate recruitment only solution. With a solution needed much sooner than this, we must support recruitment with retraining of current out-of-field teachers. A reduction to a rate of 10 per cent out-of-field teaching within the next decade would require at least 200 current out-of-field teachers to be retrained for every 1000 new graduates annually. A 5-year solution would see this figure soar to 600 current teachers for every 1000. These figures cast doubt on an aspirational ten-year recruitment solution posed earlier in 2018 by the Australian Government.

*There is a 76 per cent chance of at least one out-of-field teacher, 35 per cent for at least two and 8 per cent for at least three years of out-of-field teaching. Less than one in four Year 7 to 10 students have an in-field maths teacher every year.*

## 1 in 10 classes

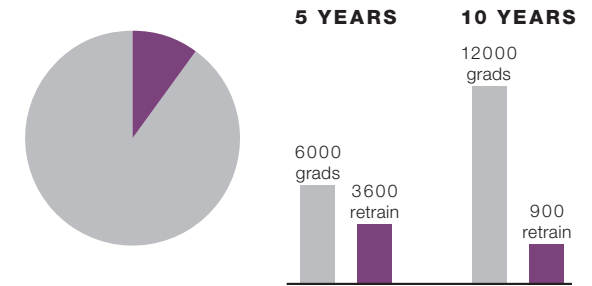


IMAGE: PROFESSOR GEOFF PRINCE & MICHAEL O'CONNOR, AMSI

### Secondary students taught by an out-of-field teacher from 1-4 years.

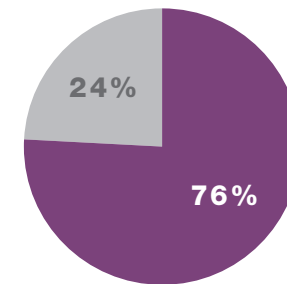


IMAGE: PROFESSOR GEOFF PRINCE & MICHAEL O'CONNOR, AMSI

### IMPROVING AUSTRALIA'S MATHS GRADES

AMSI's policy document *Improving Australia's Maths Grades* calls 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. Mathematical literacy requires decisive policy action and reform today.

## KEY AMSI POLICY PRIORITIES

### **PRIORITY A: Repair the Teacher Workforce**

Support the unqualified teachers of secondary school mathematics; deal with the widespread maths anxiety among primary school staff and secure the future supply of properly trained maths teachers

### **PRIORITY B: Restore Prerequisites**

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

### **PRIORITY C: More Maths, Less Disadvantage**

Increase the rates of graduation in the mathematical sciences, especially among women and Aboriginal and Torres Strait Islanders, to grow and refresh the quantitative professions

### **PRIORITY D: Build National Research Infrastructure**

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

### **PRIORITY E: Boost Business Engagement**

Boost the engagement of Australian business with mathematical sciences research and better equip our graduates with the coding and data skills for business careers

## Submissions

AMSI represented the mathematical sciences through submission of several submissions in response to national issues papers and reviews during 2018.

### **OPTIMISING STEM INDUSTRY-SCHOOL PARTNERSHIPS: INSPIRING AUSTRALIA'S NEXT GENERATION – ISSUES PAPER – RESPONSE**

The STEM Partnerships Forum's draft issues paper, *Optimising Stem Industry-School Partnerships: Inspiring Australia's Next Generation*, explored ways to strengthen industry engagement with the education sector to ensure Australian students develop the competencies needed to succeed in STEM-based careers, outlining 10 recommendations.

In responding to these recommendations, AMSI's submission emphasised the need for greater understanding by teachers and

students of the role of mathematics in STEM-based industries, as well as mapping clear pathways from the maths and science subjects taken in high school to the courses taken at university and beyond into industry.

The Institute also suggested tertiary institutions and industry take a more proactive role in working with schools and teachers by providing STEM-focused work experience programs for Year 10 students, the development of resources and professional development programs for teachers and industry-supported careers awareness campaigns focusing on real STEM careers.

*Closer engagement of industry with Australia's schools is highly desirable as we build an innovation system driven by Australian talent. Making a clear and real connection between the school mathematics and STEM jobs has manifold benefits in this context.*

### **PARLIAMENTARY INQUIRY INTO FUNDING AUSTRALIA'S RESEARCH**

AMSI submitted to the *Parliamentary Inquiry Into Funding Australia's Research* in July 2018. Noting the inquiry's failure to address funding gaps with direct implications for the mathematical sciences, the Institute made several recommendations to streamline the grant application process:

- Sections requiring repetitive information and subjective self-assessment of track record should be pared back as much as possible
- Bibliographic information required for lists of publications should be automatically downloadable from SCOPUS and saved in RMS accounts, saving precious time in re-doing publication lists every year
- The calculation and justification of a detailed budget, especially if this has no bearing on the eventual funds being granted, should be replaced with a "tick box" budget with standard elements such as postdoctoral fellowships and conference travel

## 2018 POLICY SUBMISSIONS

### **Optimising STEM industry-school partnerships: Inspiring Australia's next generation – Issues Paper**

Response: [amsi.org.au/publications/optimising-stem-industry-school-partnerships-inspiring-australias-next-generation-submission/](https://amsi.org.au/publications/optimising-stem-industry-school-partnerships-inspiring-australias-next-generation-submission/)

### **Parliamentary inquiry into funding Australia's research:**

Submission: [amsi.org.au/publications/submission-to-the-parliamentary-inquiry-into-funding-australias-research/](https://amsi.org.au/publications/submission-to-the-parliamentary-inquiry-into-funding-australias-research/)

### **Women in STEM strategy consultation – Discussion Paper:**

Response: [amsi.org.au/publications/women-in-stem-strategy-consultation/](https://amsi.org.au/publications/women-in-stem-strategy-consultation/)

### **Women in STEM decadal plan:**

Submission: [amsi.org.au/publications/women-in-stem-decadal-plan/](https://amsi.org.au/publications/women-in-stem-decadal-plan/)

### **Parliamentary inquiry into the status of the teaching profession:**

Submission: [amsi.org.au/publications/submission-to-the-parliamentary-inquiry-into-the-status-of-the-teaching-profession](https://amsi.org.au/publications/submission-to-the-parliamentary-inquiry-into-the-status-of-the-teaching-profession)

### **Independent review into Regional, Rural and Remote Education:**

The 2017 submission by AMSI to the Review to Achieve Educational Excellence Submission was also included in this review, which concluded in 2018.

Original submission: [amsi.org.au/publications/review-achieve-educational-excellence-australian-schools-submission-form/](https://amsi.org.au/publications/review-achieve-educational-excellence-australian-schools-submission-form/)

AMSI also recommended against speeding up or tightening assessment procedures, suggesting that instead it would be beneficial to give unsuccessful applicants more detailed feedback. AMSI's recommendations were specifically discussed with AMSI's Policy Officer, Maaikie Wienk, during the Inquiry's Melbourne consultations. The final report of the Inquiry recommends adopting a two-stage grant application process, in which the project budget would only be submitted by proposals reaching stage two.



*Within the mathematical sciences discipline there is broad agreement that the success rate of ARC funding applications is not commensurate with the amount of time and effort required from researchers to submit funding applications. The issue is not the writing of the actual research proposals, but rather the disproportionate amount of time and effort necessary to complete the supporting elements.*

#### **WOMEN IN STEM STRATEGY CONSULTATION – DISCUSSION PAPER**

In August, the Department of Industry, Innovation and Science sought input in its preparation of a Women in STEM Strategy to support and coordinate the Australian Government's endeavour to increase women's participation in science, technology, engineering and mathematics (STEM). AMSI's response outlined the Institute's policy position and current programs aimed at increasing female participation in maths, and more broadly STEM across the pipeline, with reference to the specific questions asked in the discussion paper.

Specifically the response noted that there needed to be greater attention paid to students, parents and teachers in schools. By providing adequate training to teachers, decreasing the number of out-of-field secondary school mathematics teachers, and engaging with parents to support maths learning at home the pipeline will be strengthened.

In addition, AMSI recommended that data be gathered on key indicators such as geographic, business or research distribution of female STEM graduations and employment, as well as reviewing existing programs in the Women in STEM space to identify the significant participants to assist with forward planning and sustainable progress.

*The pipeline of female STEM graduates is most fragile in schools. This appears to be particularly so in mathematics. It will be fatal not to address these issues in parallel with those in higher education and employment. We advocate a coordinated, whole of school approach combining student pedagogy and career planning, teacher awareness and training, and parental engagement both in supporting their daughters' learning and in encouraging them into STEM careers.*

- AMSI's response to the Women in STEM Strategy Consultation

#### **WOMEN IN STEM DECADAL PLAN**

AMSI welcomed the opportunity to respond to the *Women in STEM Decadal Plan* in October 2018. Aimed at providing a 10-year roadmap for achieving sustained increases in women's STEM participation and retention from school through to careers, the plan is being developed by the Australian Academy of Science and the Australian Academy of Technology and Engineering.

The key points made by AMSI in its submission included:

- The road to gender balance starts at school, therefore we need to
  - assist our practising teachers and ensure that our faculties of education are giving higher priority to mathematical preparation
  - attract more undergraduate students to become school teachers in mathematics
- Data about the school teaching workforce is non-existent
  - Workforce planning is inadequate and has led to high levels of out of field teaching in secondary mathematics
- Universities must address the issue of pre-requisites
- Make the M in STEM visible

*It is our firm view that wider participation in, and respect for, the STEM disciplines and professions is the platform from which increased female participation will be built.*

#### **PARLIAMENTARY INQUIRY INTO THE STATUS OF THE TEACHING PROFESSION:**

In December 2018, AMSI made a comprehensive submission to the *Parliamentary Inquiry Into The Status Of The Teaching Profession*, focusing on the current and future needs of teachers of mathematics. AMSI's recommendations include:

- Universities and state tertiary admissions centres should ensure that subject scaling does not discourage students from choosing advanced subjects while at high school
- Universities need to re-introduce mathematics prerequisites for university bachelor degrees in science, engineering, computer science and commerce
- Universities offering teaching qualifications should set rigorous benchmarks to ensure depth and breadth of knowledge to improve the quality of the qualifications and the esteem in which teachers are held
- State and federal governments should facilitate the collection and dissemination of data about teacher qualifications in subject domains as a starting point for workforce planning. This includes the instigation of an annual census of teacher qualifications, including through professional learning, to monitor and track the standard of the teaching workforce
- There should be an agreed qualification standard for teaching mathematics at senior secondary level. Teachers can attain this level of qualification by engaging in appropriate professional learning whilst already a teacher
- Given the scale of the problem and the long-term effort required to remedy it, an urgent, concerted initiative by Australian governments, schools and universities is required to provide retraining for existing out-of-field school teachers of mathematics and enhance their commitment to the recruitment and retention of new, properly qualified mathematics teachers

- Fund a national on-the-ground professional learning system for mathematics. To significantly improve the baseline level of content and pedagogy, on-going training should be split into two parts: Professional development (non-subject necessities) and professional learning (subject-based)

AMSI is particularly concerned with the current high rate of out-of-field secondary teaching, and many of the recommendations in this submission are aimed at providing adequate training and support to teachers of mathematics.

*Despite a large number of our secondary schools experiencing a severe shortage of properly trained mathematics teachers for over two decades, most state teacher registration boards do not record the discipline qualifications of registered teachers. Nor does the Commonwealth record the disciplines of students as they graduate from pre-placement training at faculties of education in our universities. In most cases a teacher completes their undergraduate degree and a postgraduate qualification to teach. The undergraduate degree may identify them as a science or mathematics specialist, but once they have completed their postgraduate teaching qualification they are ‘counted’ as education graduates. The result is a lack of central information and a planning vacuum, which compromise adequate teacher supply in all subject domains.*

## INDEPENDENT REVIEW INTO REGIONAL, RURAL AND REMOTE EDUCATION

AMSI’s submission to the 2017 *Review to Achieve Educational Excellence Submission* was also included in the *Independent Review into Regional, Rural and Remote Education*, which concluded in 2018.

## Advocacy

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

- ACOLA Research Training Working Group, Advisory Panel (Glen Sheldon, Geoff Prince)
- Australian Mathematics Olympiad Committee of the Australian Mathematics Trust (Janine McIntosh)
- Flinders University Course Review
- Industrial Doctoral Training Centre Board
- Innovation, Science and Research System 2030 Strategy consultations
- Mathematics Association of Victoria (Michael O’Connor)
- Mathematics by Inquiry Stakeholder Reference Group (Geoff Prince, Vicki Kennard)
- MATRIX Advisory Board
- National Committee for the Mathematical Sciences (AAS)
- Science Technology Australia (STA) Board
- STA Policy Committee
- STAR Portal Committee (Janine McIntosh)
- Year 1 Literacy and Numeracy Expert Ministerial Advisory Panel

The Director of AMSI attended the following external events:

- AAS Women On and Off the Field, Melbourne (with Rachel Geddes)
- ACDS National Research Forum, Melbourne
- AMT Board Dinner, Melbourne
- ATSE STEM Education Workshop, Melbourne
- BAM Conference, Melbourne (with Rachel Geddes)
- BHP Billiton Science and Engineering Awards, Melbourne (with Janine McIntosh, Inge Koch)
- BHP Foundation Australian Partners Intro to UN Women and Second Chance, Melbourne (with Janine McIntosh, Michael O’Connor, Susan James)

## AMSI OPINION PIECES

**Professor Geoff Prince:** PhD Students: Australia needs them to aspire to working in the private sector ([www.afr.com/news/policy/education/phd-students-australia-needs-them-to-aspire-to-working-in-the-private-sector-20180525-h10jip](http://www.afr.com/news/policy/education/phd-students-australia-needs-them-to-aspire-to-working-in-the-private-sector-20180525-h10jip)), *The Australian Financial Review*, May 2018

**Penny Li:** PhD Students are unnecessarily apprehensive about leaving academia ([www.theaustralian.com.au/higher-education/phd-students-are-unnecessarily-apprehensive-about-leaving-academia/news-story/1b184fbbdd23a898bc08b326debeab16](http://www.theaustralian.com.au/higher-education/phd-students-are-unnecessarily-apprehensive-about-leaving-academia/news-story/1b184fbbdd23a898bc08b326debeab16)), *The Australian*, November 2018

- BHP Lunch and Town Hall with UN Women, Melbourne (with Janine McIntosh, Michael O’Connor, Susan James)
- Council of Deans of ICT, Parramatta
- Defence Industry Analysis and Skilling Strategy, Melbourne (with Janine McIntosh)
- ICMM Welcome Reception, Melbourne
- Meeting of Unreasonable Champions, Department of Economic Development, Jobs, Transport and Resources, Melbourne
- RiAus Bragg Awards luncheon, Melbourne
- RiAus Women in STEM Dinner, Melbourne
- Science Meets Business, Brisbane (with Glen Sheldon, Rachel Geddes)
- Science Meets Parliament, Canberra (with Chloe Pearse)
- SMRI Advisory Board meeting & SMRI Launch, Sydney
- STA Member Workshop 2018, Brisbane
- STA National Youth Science Forum 2019 Launch
- STA President and CEO Forum, Canberra
- STEM Education Conference, Geelong (with Janine McIntosh)
- STEM Partnerships Forum
- Workshop: Increasing participation in STEM studies, Office of the Lead Scientist for Victoria, Melbourne



# Outreach & Engagement

Strengthening awareness and understanding of the mathematical sciences, AMSI's public events, media, flagship publications and social media fostered collaboration and engagement at all stages of the pipeline. Highlighting AMSI's key policy priorities, outreach activities focused on key challenges facing Australian mathematics and STEM capability for the future.



Photo by: Michael Straw

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## Schools Outreach

The central driver for AMSI Schools outreach activities, Choose Maths delivers careers and maths events, teacher training and professional development. This includes school community events such as Choose Maths Days and Family Maths nights, mentoring, national awareness campaigns and the Choose Maths Awards.

Run as school and university events, Choose Maths Days are an important component of the outreach program. Aimed at Years 9 and 10 girls, the events typically have students participating in a range of hands-on workshops showcasing different areas of maths and its applications, plus speakers from both universities and industry and a Q&A-style panel discussion. Surveys completed at each event showed this engagement positively impacted students' perceptions and enjoyment of mathematics to influence subject selection.

Building on a successful pilot project in 2017, the Choose Maths mentoring initiative expanded to more than 20 schools across four states. Working with female students in Years 9-10, the year-long program provides mentors from local universities as well as industry and government agencies to support the girls through conversations about setting goals, careers, mathematical confidence-building, subject selections, problem-solving, maths in the real world, and more.

AMSI Schools has also continued to have a significant presence as active participants and exhibitors at national and state-based career expos, mathematics education events, as well as careers and teacher meetings and conferences.

A calendar highlight, the Choose Maths Awards recognise teacher and student mathematical excellence in and beyond the classroom. Recognising mathematics teaching excellence and mentorship, the Choose Maths teacher awards received 43 applications nationally. With the theme '*Our World Needs Maths*', the student awards attracted registrations from more than 1100 student teams equalling over 4000 students, with more than 600 videos submitted from schools across Australia. The top ten teachers and ten student finalist teams attended the awards ceremony in September.

## Careers

AMSI provides careers advice and support across the mathematical sciences pipeline from school and university students and beyond. As well as schools events, careers sessions are embedded into flagship research training events to foster student-industry engagement. With a broader STEM focus, the APR.Intern program provides PhDs with industry pathways to develop essential soft skills and experience.

Further expanding resources and reach, AMSI rolled out its 2018 national classroom and community campaign with resources and a national radio, digital and outdoor advertising push in June. Featuring 20 new careers ambassadors using maths in diverse careers, classroom packs distributed to all Australian secondary schools included posters, ambassador profiles, study guides and the *Maths Adds Careers Guide*.

The campaign launched with 150 girls from Melbourne secondary schools attending a livestreamed event and lunch at the University of Melbourne. Featuring a panel of Choose Maths careers ambassadors, schools across Australia including regional Victoria and WA participated online with the livestreamed video viewed more than 1100 times.

Simultaneously, AMSI launched its revamped careers site ([careers.amsi.org.au](http://careers.amsi.org.au)), creating a central portal for institute-wide resources including the online *Maths Adds Careers Guide*, career ambassador profiles and videos, resources from past careers campaigns such as the Make Your Career Count initiative. Further development of the careers site will continue into 2019.

Well-attended Careers afternoons held at AMSI's Summer School and BioInfoSummer linked students and potential employers of mathematics and statistics graduates to give students a clearer idea of what lies beyond their degree. At AMSI Connect, the two-day conference held for students participating in the Vacation Research Scholarship (VRS) program, the program included talks about life as a post-graduate student and as a researcher, as well as a presentation on careers by AMSI director Geoff Prince.

AMSI also supported external careers-focused events for students, including Early Career Workshops at the ANZIAM and AustMS meetings.

## Women in Maths

A key AMSI policy priority, increasing representation of women in the mathematical sciences is remains central to delivery of initiatives from the classroom to the boardroom.

With female participation a key objective of the AMSI Schools' Choose Maths project, research conducted by the team has focused on the rate of maths anxiety in students and their teachers, particularly in girls and female teachers.

The project's mentoring initiative pairs up female secondary school students with university STEM students and mathematics professionals to increase their confidence and encourage them to select mathematics subjects in Years 11 and 12.

The Choose Maths team also ran several careers events in 2018 targeting female students in Years 9-12. Featuring presentations from Choose Maths Careers Ambassadors, the events primarily focused on the diversity of careers involving mathematics.

In June, Choose Maths Executive Director, Associate Professor Inge Koch led the *Mathematics, Gender and Mathematics Education Workshop* attended by 40 teachers, researchers and government representatives. Over three days participants examined student and teacher attitudes towards mathematics. With program of featured talks by leading education researchers, Choose Maths researchers and outreach officers and Choose Maths Award-winning teachers, discussion focused on strategies to increase student and teacher confidence and reduce maths anxiety.

Funded under the Choose Maths project, the Choose Maths grants supported 41 female students and early career researchers to attend AMSI's flagship research training events including the Winter and Summer Schools, BioInfoSummer and Optimise in 2018. With 28 per cent female participation in 2018, these events actively provided networking opportunities for the grant recipients and other female participants through Women in Maths and Choose Maths functions.



A highlight at AMSI Optimise was a panel discussion on Women in Optimisation, which featured long-serving University of Melbourne mathematical sciences tutor and staff member Alison Harcourt, a pioneer in optimisation research. Alison's contributions to the optimisation field have since been recognised in many ways including coverage by the ABC's *7:30 Report* and the award of Senior Victorian of the Year.

AMSI's Research program also reported increased participation of women in its sponsored workshops from 21 per cent in 2017 to 26 per cent in 2018, supporting the effectiveness of specific measures to actively encourage the participation by female researchers in these events. These measures include a requirement to have at least one woman on the organising committee, invitations to prominent female mathematicians to present talks, targeted advertising through organisations like WIMSIG, provision of information on funding support and assistance with childcare, and formal/informal opportunities within workshop programs to highlight issues facing women in maths and foster networking.

At the other end of the pipeline, APR.Intern has been actively encouraging female PhD students to participate in the Intern program. With women making up 44 per cent of interns in 2018 (up from 27 per cent in 2017), the program is more than meeting the targets set by the program's funding agency, the Department of Education and Training.

In October, APR.Intern hosted the *Women in the STEM Workforce* event/webinar at Engineers Australia. With a local audience of 50 and livestreamed to more than 350 viewers across Australia, the one-day forum focused on identifying existing initiatives and new opportunities to address barriers for women in STEM. Keynote speakers, Dr Milica Ng (Head of Data Science, CSL) and Kathryn Fagg (President of Chief Executive Women) were joined by panels featuring representatives from Westpac, Telstra, Alcoa, STA Superstar of STEM, IMNIS, Australian Academy of

Science, Australian Research Council, Engineers Australia and SAGE Athena Swan. Split into two sessions, the panel discussions focused on barriers facing women working in STEM, as well as solutions to accelerate and support their careers.

At a policy level, AMSI took part in the Department of Industry, Innovation and Science's Women in STEM Strategy consultations as well as in the consultation phase of the Women in STEM Decadal plan. For more details see pages 9-10.

## Industry

Industry engagement remains a critical priority in delivery and impact of AMSI's programs. While the APR.Intern program is a key component of these activities, industry engagement also includes industry partnerships driven by the AMSI's Schools and RHE programs and AMSI support of industry events.

AMSI put the spotlight on the mathematical sciences in industry at its annual Optimise event. Academic and agency researchers and industry professionals engaged on emerging challenges in the field over a week-long seminar and workshop program.

Through its membership of Science & Technology Australia (STA), AMSI took part in the annual Science Meets Parliament and Science Meets Business events:

- Science Meets Parliament was held on 13-14 February in Canberra, and was attended by Geoff Prince and Chloe Pearse
- Science Meets Business was held on 10-11 October in Brisbane, with Geoff Prince, Glen Sheldon and Rachel Geddes in attendance

AMSI was a sponsor of the 2018 Biarri Applied Mathematics conference, with Rachel Geddes presenting on the APR.Intern program.

## Public Events and Sponsorship

With the aim of bringing a real-life context to mathematics for a broader audience, AMSI regularly incorporates public events including lectures and panel discussions into its flagship training and research event programs. In addition, events such as the popular Women in Maths evenings and the careers events associated with AMSI's Summer and Winter Schools create networking and mentoring opportunities for students, academics and industry participants alike.

Winter School, Summer School and BioInfoSummer all featured well-attended public lectures as part of their programs. Topics included the incomputible numbers known as eigenvalues and wildlife genome research.

2018 saw AMSI sponsor two national lecture tours: the AMSI-SSA lecture tour featuring Harvard University's Professor Susan Murphy (August) and the Mahler-AMSI lecture tour, featuring Professor Ivan Corwin, from Columbia University (October-November). Featuring both academic and public talks, the tours attracted audiences around Australia.

AMSI continues to also support a number of external events including the Biarri Applied Mathematics conference, Early Career Workshops held at annual meetings for AustMS and ANZIAM, the Australian Mathematical Sciences Student Conference, and the Maths in Industry Study Group (MISG). In addition, AMSI partners with AustMS to fund students to attend the Heidelberg Laureate Forum.

## KEY PUBLIC EVENTS 2018

### PUBLIC LECTURES:

*Discrete or Continuous?*

Professor Nick Trefethen FRS, University of Oxford, presented by AMSI Summer School

*The Spectrum: Incomputable yet Physically Tangible Numbers*

Associate Professor Julie Rowlett, Chalmers University of Technology, presented by AMSI Winter School

*Optimising Mobile Health Interventions*

Professor Susan Murphy, Harvard University, 2018 AMSI-SSA Lecturer, public lecture series

*Beyond the Gaussian Universality Class*

Professor Ivan Corwin, Columbia University, 2018 Mahler Lecturer, public lecture series

*Wildlife Detectives: The Story of Genome Research, Discovery and Exploration at Australia's First Museum*

Dr Rebecca Johnson, Australian Museum Research Institute, presented by AMSI BioInfoSummer

### EVENTS/WEBINARS

Choose Maths Careers Campaign launch webinar: [www.facebook.com/amsichoosemaths/videos/2122149031331756/](http://www.facebook.com/amsichoosemaths/videos/2122149031331756/)

APR.Intern Women in the STEM Workforce webinar:

Keynote one is available here: [aprintern.org.au/2018/10/02/witsw18-keynote-1-kathryn-fagg/](http://aprintern.org.au/2018/10/02/witsw18-keynote-1-kathryn-fagg/)

### OTHER PUBLIC OUTREACH EVENTS:

World Science Festival, Brisbane





## DELIVERING THE CHOOSE MATHS PROJECT, AMSI SCHOOLS HAS CONDUCTED:

**567** (1774 PROJECT TO DATE) SCHOOL VISIT  
DAYS AT **120** SCHOOLS ACROSS AUSTRALIA

**93** (293) PROFESSIONAL DEVELOPMENT DAYS  
ATTENDED BY 2096 (5277) TEACHERS

**11** (37) CHOOSE MATHS FAMILY NIGHTS WERE HELD

**40** (56) CAREERS EVENTS WERE ATTENDED  
OR HOSTED AS PART OF THE CHOOSE  
MATHS CAREERS AWARENESS CAMPAIGN

**9** (19) CHOOSE MATHS DAYS WERE ORGANISED  
IN SCHOOL AND UNIVERSITY LOCATIONS

**147** MENTEES AND **102** MENTORS PARTICIPATED IN  
THE MENTOR PROGRAM ACROSS **22** SCHOOLS

**41** (98) CHOOSE MATHS GRANTS  
WERE AWARDED IN 2018

**43** (108) TEACHER NOMINATIONS AND **617** (1274)  
STUDENT TEAM VIDEOS WERE SUBMITTED  
FOR THE CHOOSE MATHS AWARDS





# Schools

The AMSI Schools team works with school students, teachers, parents and the public to inspire the next generation of problem solvers and creative mathematicians.

AMSI Schools initiatives support teachers, students and parents to be the best they can be mathematically. With \$22M funding from the BHP Foundation, the Choose Maths Project (see page 18) builds on AMSI's many years of experience in developing engagement and outreach programs for schools.

## Careers

A conversation with a knowledgeable professional can make all the difference to a student at a critical point in their life. Students grapple with decisions about subject selection, university courses and life skills development while still unsure of the direction they are heading. AMSI's careers materials, careers events and the website all aim to assist decision-making and demonstrate the value of keeping options open with the infinite possibilities enabled by mathematics.

**Associate Professor Inge Koch**  
Executive Director, CHOOSE MATHS

**Janine McIntosh**  
AMSI Schools Program Manager, CHOOSE MATHS  
Project Director

[SCHOOLS.AMSI.ORG.AU](https://schools.amsi.org.au) [CHOOSEMATHS.ORG.AU](https://choosemaths.org.au)

Available through schools, career expos, university open days and digital download, AMSI's *Maths Adds Careers Guide* continues to be a popular and powerful resource for students, parents and teachers. Each issue features the stories of real-life professionals using mathematics, examples of maths jobs across a wide variety of industries and sectors and career pathway information. AMSI's careers site features even resources and job advertisements along with careers posters and videos.

## Teacher Resources

AMSI Schools has developed a sizeable collection of teacher resources and modules with support from various funding partners. Supporting teachers of Foundation to Year 12 with free mathematics materials, AMSI's standalone website Calculate ([calculate.org.au](https://calculate.org.au)) features:

- planning materials and lesson plan support
- classroom games and activities
- curriculum resources
- student learning modules
- teacher content modules and units of work
- online professional development

In addition, the AMSI Schools website and Calculate host *The Improving Mathematics Education in Schools* (TIMES, funded by the Australian Government) and *Supporting Australian Mathematics* (SAM, funded by Education Services Australia) curriculum resource modules.

Nationally and internationally popular, AMSI's teacher resources received more than 830,000 page views in 2018.

Module	Page Views
Teacher Modules	552,993
SAM Middle Years	160,635
SAM Senior Years	53,157
Other Calculate content (blog posts, articles)	70,017

## ICE-EM Mathematics

Published by Cambridge University Press (CUP) in 2017, strong sales saw the third editions of the *ICE-EM Mathematics* series retain a two per cent market share. In January 2019, sales for the CUP Financial year were already at 78 per cent of that for the same period in the 2017/2018 financial year (CUP Financial year runs May to April). Retaining much of the Australian Curriculum-aligned content featured in the second edition, substantial online components have streamlined the third edition series into one volume per year level.

*The Australian Mathematical Sciences Institute (AMSI) and the BHP Foundation are working together to empower students, particularly girls and women, to pursue careers in mathematics.*

*Since 2015 we have been leading the national implementation of key classroom and pipeline strategies to transform Australia's mathematical capability. As mathematics is essential to a growing number of jobs, it is critical we foster understanding of the value and impact of mathematics and equip students to embrace these opportunities now and into the future. Working across the pipeline from the classroom to university and industry, this initiative aims to strengthen mathematics capability, improve public perception and increase engagement of women and girls.*

# Choose Maths

Funded by the BHP Foundation and delivered by AMSI Schools, Choose Maths drives national initiatives to strengthen Australia's mathematics capability and the engagement of women and girls. In 2018, the project bolstered outreach with an expanded careers awareness campaign and delivery of a national mentoring network connecting girls with industry and academic mentors.

Entering its final year, insights from the project's work with schools, universities and communities will shape future engagement. The project has:

- Delivered real-time support to develop healthy and dynamic mathematics programs in 120 schools
- Provided mentoring to Years 9 and 10 girls on the importance of sticking with mathematics
- Increased public understanding of the importance of mathematics
- Acknowledged the inspiring work and achievements of mathematically engaged teachers and students through national awards
- Delivered insight into the underlying causes driving low female mathematics participation rates
- Built AMSI's delivery expertise including what does and doesn't work and activity gaps

## Schools Outreach

In 2018, Choose Maths Outreach Officers organised 3 Choose Maths Days, 11 Choose Maths Family Nights, 3 Choose Maths Sessions and 4 other school-based outreach events. They also delivered teacher support across 120 schools:

- **Schools visits:** site visits to Choose Maths schools have enhanced mathematics lesson planning and preparation, as well as teacher knowledge and confidence in mathematics. This has assisted teachers to implement strategies to inspire students, especially girls and young women, to continue with studies of mathematics
- **Professional Development Sessions:** outreach officers have delivered extended support to teacher groups on specific content or pedagogy topics
- **School Community Events:**
  - Choose Maths Family Nights – parents and students attend events outside of school hours to participate in activities and sessions highlighting the benefits of sticking with mathematics
  - Parent forums – outreach Officers lead parent information sessions. For example, Helen Booth ran a session for parents of children starting school
- **Local Community Events:**
  - Choose Maths outreach officer Jacinta Blencowe participated in the 2019 Karratha Careers Expo. This community-organised event enables secondary students to connect with industry, businesses and community and explore broader career options. This event has allowed the local community to engage with Choose Maths and the Careers Awareness campaign
  - Hosted by Moranbah State High School (Queensland), Choose Maths had a presence at the annual Careers Expo attended by secondary students from across the region. Choose Maths shared the space with the apprentices from BMA (BHP – Mitsubishi Alliance), who really encouraged the students to continue with higher level maths, highlighting the importance of the BHP-AMSI partnership. Attending students reported they found conversations valuable and enlightening

## Careers Awareness Campaign

Targeted to students, parents, teachers, educational leaders and the general public, the Choose Maths campaign highlights the growing demand for mathematical skills across current and future career pathways. Diversity of the target audience has required a range of approaches to maximise impact with a focus on Choose Maths ambassadors. Mostly women, those featured have been selected from a variety of different disciplines and careers dependent on mathematics.

Taking an integrated approach, campaign touchpoints have included school resource packs to support classroom engagement, as well as earned media and a radio, digital and outdoor (bus and billboard) advertising push. The following have been highly effective:

- Hard copy materials: highly valued by teachers and displayed in schools
- Outdoor campaigns: enhance impact by reinforcing the messaging
- Radio: powerful targeted reach to specific audiences and demographics such as parents and teachers
- Events: one-on-one conversations with students, parents and teachers
- Targeted AMSI-hosted events: make the most impact on those students

The 2018 Careers Awareness Campaign expanded existing resources with an additional group of 20 Careers Ambassadors. Delivery included:

- Careers packs in classrooms across every Australian high school featuring posters, brochure, study tips and senior subject pathways booklets and branded sticky notes
- Videos featuring various Careers Ambassadors – viewed over 110,000 times

## RADIO AD SCRIPT FOR CHOOSE MATHS NATIONAL ADVERTISING CAMPAIGN

Did you know **75%** of the world's fastest **growing jobs** are in **science, technology, engineering and maths**, and it's maths that's needed for all of these.

It's more than numbers, combine maths with your passion and change the world.

Choose maths and develop the latest app

Choose maths and discover a new galaxy

Choose maths and make a medical breakthrough, or

Choose maths and save the environment

The possibilities are endless — It's your toolkit for life.

Make an impact. Choose maths and be ready for the jobs of the future.

Start searching at [careers.amsi.org.au](http://careers.amsi.org.au)

- Billboards aligned to posters and brochures located in 37 locations and on 50 buses across Australia. Outdoor advertising reached 72.5 per cent of the target audience, who on average saw the ads 4.6 times with an estimated 31,106.8 contacts
- 453 Austereo Network radio spots, broadcast nationally in July and August targeting parents and students during the 'drive' timeslots and had a reach of 293,000 with an average frequency of 4 times

### STUDENT EVENTS AND CAREERS EXPOS

The Choose Maths team attended over 40 events nationally, including 13 Careers Expos and 15 teacher and career advisor conferences. These activities enabled engagement with thousands of students, teachers and careers advisors in both cities and regional centres, giving them subject selection and careers advice and strengthening linkages between mathematics and future careers.

In addition to these large expos and conferences, Choose Maths held several well-attended careers events targeting female Year 9 to 12 students. Ambassadors engaged with students on a personal level sharing stories of their careers and inspiring students to remain engaged with mathematics. The ambassadors were specifically chosen not just to demonstrate a variety of careers but also to represent diversity in terms of their journey and careers.

Event	Date	Location	Number of attendees
A: International Women's day	8 Mar	IMAX, Melbourne, VIC	450
B: Careers launch	17 Aug	The University of Melbourne, VIC	150
C: Hidden Figures Screening	18 Sept	West Melbourne Cinema, VIC	300
D: Careers Event	6 Dec	Launceston College, TAS	150

While the events varied slightly in their purpose and format, each involved a general presentation on mathematics and careers, with emphasis on some important statistics including the gender difference, and talks from a variety of ambassadors. Students from all events were surveyed at the beginning and the end of the event to assess the impact of the events. The completion of the surveys was both completely voluntary and anonymous, and about half of the students in attendance completed them.



## Women in Mathematics Initiatives

In 2018, nine Choose Maths Days were held, three at schools and six at universities.

These events aim to raise mathematical aspirations and enjoyment of Years 9 and 10 girls. The general format features short industry and academic talks, presentations from Choose Maths careers ambassadors, interactive activities, local industry speed-dating and a Q&A session.

Students from eight of the events were surveyed at the beginning and the end of the event to assess the impact of the events on students' perceptions and enjoyment of mathematics and aspirations to continue studying maths. The completion of the surveys was both completely voluntary and anonymous, and results, although limited, suggested that these events can have a positive effect. More details of the surveys can be found in the report AMSI Choose Maths Research: Choose Maths Days for Year 9 and 10 students 2018 ([amsi.org.au/publications/in-brief-choosemaths-days-for-year-9-and-10-students-2018/](http://amsi.org.au/publications/in-brief-choosemaths-days-for-year-9-and-10-students-2018/)).

### CHOOSE MATHS MENTORING

Choose Maths Mentoring works with female secondary school students, university STEM students and mathematics professionals. Choose Maths Mentoring aims to:

- increase the number of girls choosing mathematics subjects in Years 11 and 12
- increase the level of mathematics chosen by girls in Years 11 and 12
- increase students' confidence in their mathematical abilities
- inform students about the careers that need mathematics
- provide students with guidance about subject selections and career pathways beyond school
- build a support network for mathematics professionals, particularly women
- develop local community networks, linking schools with universities and industry

The mentoring program currently runs in four states (NSW, SA, VIC, WA) and also ran in QLD during the 2017 pilot. Schools are a mix of government, Catholic and independent schools, and range from urban to regional and rural. In 2018, the program had 147 mentees across 22 schools and 102 mentors from 11 universities, 13 companies and



7 government organisations, grouped into 'circles' comprising 10 students and 4-5 mentors.

### CHOOSE MATHS GRANTS

The Choose Maths Grants assist women to attend AMSI flagship events, assisting with the costs of accommodation, registration and travel for the attendee and their childcare helper (if needed). Recipients of the grants were invited to attend networking sessions held at the Summer and Winter Schools, and BiolnfoSummer.

Events	2016	2017	2018	TOTAL
Summer School	3	20	16	
Optimise	n/a	2	6	
Winter School	5	6	2	
BiolnfoSummer	9	12	17	
<b>Total Awards</b>	17	40	41	<b>98</b>
<b>Total Award Monies</b>	\$20,261.21	\$60,350.58	\$82,455.60	<b>\$163,427.39</b>



Photo by: Drew Echberg

## CHOOSE MATHS AWARDS

In total, 30 metropolitan and regional teachers and 60 student teams from around Australia have been honoured since the Choose Maths Awards began in 2016.

More than \$215,993.00 has been awarded to both schools and teachers since the awards program began.

Over 2798 registrations in 2016 to 2018 has resulted in more than 1200 student videos submitted

## Choose Maths Awards

Launched in 2016, the Choose Maths Awards celebrate mathematical achievement, creativity and excellence in Australian schools.

Growing each year in popularity, the Choose Maths Teacher Awards recognise Australia's most inspiring mathematics educators for impact beyond the classroom through mentorship initiatives and innovative practices designed to encourage and inspire the next generation of mathematical leaders. Awardees are selected based on their demonstrated capacity to engage and inspire students or by providing ongoing mentoring support.

The Choose Maths Student Awards encourage students to be creative and explore real-world applications of maths. Collaborating in teams, students bring their understanding of mathematics to life on film, demonstrating their talent by exploring problem solving and the real-world applications in an interesting and engaging way. Each team creates and submits a 3-5 minutes long video based on the year's competition theme. In 2018 the theme was *Our World Needs Maths*.

Student participation has increased year-on-year, with 617 videos received in 2018 from 1178 registrations.

Student Awards	2016	2017	2018
No. of Registrations	623	997	1178
No. of videos received/uploaded	312	345	617

## Research

Choose Maths research increases understanding of the project's impact, while also supporting and informing the wider research base around teacher effectiveness and capacity. Research activities comprise teacher and student surveys on attitudes to mathematics and Choose Maths outreach activities. These are undertaken with appropriate ethics approval through the University of Melbourne. Results have been reported at teacher education conferences, in research journals and to our stakeholders via AMSI publications and websites.

The Gender Report 2019 (in press) describes the positive impact the Outreach work is having on teacher attitudes and beliefs about their ability to teach mathematics. Findings from our research include:

- Schools Outreach can be effective in increasing teachers' confidence when teaching mathematics and decreasing the feeling of being tense when teaching mathematics.
- Teachers who participated in both 2016 and 2017 show more confidence/less tension in teaching mathematics than those who only participated in 2016 suggesting that the ongoing Schools Outreach work is important.

## Project Review

The Social Ventures Australia (SVA) Mid-Term Review of AMSI's Choose Maths project was delivered on 23 November 2018. A high-level analysis of the project to date, this review focused on successes and challenges across each component.

Findings show the project is satisfactorily meeting key performance indicators with delivery outcomes aligned to both initial project scope and its subsequent modifications.

SVA has recommended the continuation of Choose Maths project components with modifications to improve or redirect focus. At the time of publication, these modifications are currently under negotiation with BHP Foundation.

# Choose Maths Awards

## Student Awards:

### *Our World Needs Maths*

In 2018, 537 student teams (out of more than 1194 teams that registered) submitted entries to the video competition in the three school year groups: Junior (Years 5-7), Intermediate (Years 8-9) and Senior (Years 10-12).

#### BEST JUNIOR VIDEO:

**St Matthews Catholic College (NSW)** – *Without Maths*

#### BEST INTERMEDIATE VIDEO:

**Ferny Grove Senior High School (QLD)** – *Pass It On*

#### BEST SENIOR VIDEO:

**Geelong Grammar (VIC)** – *The Mathematician*

#### AWARDS FOR EXCELLENCE

**Presbyterian Ladies College Sydney (NSW)** – *Mathematical Chef*

**Presbyterian Ladies College Sydney (NSW)**

– *Our World Needs Maths*

**St Columba Anglican School (NSW)** – *The Maths Revolution*

**Senior Fort Street High School (NSW)** – *Our World Needs Maths*

**Tintern Grammar (VIC)** – *A World of Disease*

**John Monash Science School (VIC)**

– *Applications of Mathematics & its Models*

**Australian Islamic College (WA)** – *Maths in Biodiversity Protection*

## Teacher Awards:

In 2018 we received 43 nominations and applications for consideration by the judging panel.

#### MENTORING GIRLS IN MATHEMATICS AWARDS:

**Corinne Vingerhoed – Hunter School of Performing Arts (NSW)**

When in high school herself, Corinne felt that opportunities were limited and the presence of female role models was rare in STEM fields. She uses this as a driver and is now a role model for her own students at the Hunter School of Performing Arts.

Corinne is creative and innovative and saw an opportunity to create a robotics club at the school, where previously there was no course or opportunity for students to learn to code. She independently forged relationships with local organisations and institutions to gain access to materials and to learn skills herself. The mainly female club has gone from strength to strength and creates a highly engaging and fun learning environment.

As STEM coordinator, Corinne goes out of her way to highlight career paths for students, particularly in mathematics and has mentored and guided many young female mathematicians, encouraging them to see the higher level maths courses as a challenge to be overcome.

#### OUTSTANDING PRIMARY TEACHER

**Sheila Griffin – Singleton Primary School (WA)**

Since her arrival at Singleton Primary School Sheila has engaged staff, students and the wider community with her passion for mathematics. The initiatives she has developed and implemented have made a significant difference to the way maths is taught and embedded into the school culture.

Sheila's expertise has been consistently demonstrated through mentoring of staff and supporting the planning and delivery of engaging maths lessons across the school. Her extensive knowledge and exemplary practice in her teaching has ensured that she is regularly called upon to provide feedback and support to all teaching staff.

Her 'Mad Maths Mornings', 'Maths Wizard' competition and 'Ten-a-day' program have become staples at Singleton Primary, having an impact not only on the students, but also on parents and the wider community. Her passion and commitment to teaching financial literacy ensures she has provided many students with vital life skills which will assist them in navigating the financial world in their adult lives.

#### OUTSTANDING SECONDARY TEACHER

**Hayley Dureau – Mount Waverley Secondary College (VIC)**

When asked what she sees as most important for a teacher of Mathematics. Hayley's response was immediate: 'Relationships!'. The leader has a vibrant and enthusiastic approach to learning and the care she displays to all of her students enables her to develop a great rapport with students and staff alike.

In 2013 Hayley developed a successful 'Maths Boot Camp' for senior mathematics students who had gaps in their knowledge. The voluntary before-school sessions have become a staple at Mount Waverley Secondary College and over time VCE performance has steadily increased.

Hayley is a positive role model at the college, particularly for girls. She is committed to building students' confidence, and encouraging them to persevere with high-level mathematics. She pays special attention to reducing maths anxiety in students who may be at risk of disengaging and ensures they have the encouragement and support needed to continue with maths at VCE level.

#### TEACHING EXCELLENCE AWARDS

**Anne-Louise Gilbert** – Eagle Junction State School (QLD)

**Bruce Ferrington** – Radford College (ACT)

**Fiona McRobie** – Tennant Creek High School (NT)

**James Milne** – Springfield Gardens Primary School (TAS)

**Lorien Mackriell** – Campbelltown Performing arts School (NSW)

**Michael Minas** – Williamstown North Primary School (VIC)

**Sarah Rose** – Singleton Heights Public School (NSW)



# Higher Education

AMSI's Higher Education program enhances the undergraduate and postgraduate experience for students of the mathematical sciences and related disciplines. Our flagship events enable students to develop specialist knowledge and talents. Featuring training schools, graduate courses, careers events and scholarships, these events set the standard for research training infrastructure.

**467** – TOTAL 2018 HIGHER EDUCATION FLAGSHIP EVENT ATTENDEES

APPROX. **28%** OF FLAGSHIP EVENT PARTICIPANTS WERE FEMALE

**78** PARTICIPANTS RECEIVED AMSI TRAVEL GRANTS

**41** WOMEN RECEIVED CHOOSE MATHS GRANTS



Photo by: Mireia Straw

## 2018 CHOOSE MATHS GRANTS BY EVENT

AMSI Summer School – **16** awards  
AMSI Winter School – **2** awards  
AMSI Optimise – **6** awards  
AMSI BioInfoSummer – **17** awards

In 2018, students need a range of skills to ensure their future success in academia and the workforce. AMSI Research Training programs expose students to new career opportunities, cutting-edge research and national networking within the mathematical sciences and cognate disciplines to fuel future opportunities and collaborations. Our research training programs are supported by the Department of Education and Training's *Securing Australia's Mathematical Workforce 2016–2020* project. AMSI's flagship events aim to strengthen postgraduate research training to build Australia's mathematical innovation capability.

## Providing a Platform for World-Class Talent

World-class experts delivered specialised public lectures and workshops across Australian cities to educate our current and future student pipeline and workforce. Academic guests came from a variety of institutions around the world including Oxford University (United Kingdom), Chalmers University of Technology (Sweden), HEC Montreal (Canada) and the DNA Learning Center (USA). In addition, Australian talent was endorsed heavily with over 50 presentations from locals including Dr Rebecca Johnson (Australian Museum Research Institute), Mark Gray (Pawsey Supercomputing Centre) and Craig Brownlie (Country Fire Association).

**Chloe Pearse**

National Program Manager (from June 2017)

**HIGHERED.AMSI.ORG.AU**

## Public Recognition for Contributions to the Field – Alison Harcourt

In 2018, long-serving University of Melbourne mathematical sciences tutor and former senior lecturer Alison Harcourt was asked to join the Women in Optimisation panel discussion and participate in a media release as part of the AMSI Optimise conference. Since then, Alison's early contribution to the optimisation field has been recognised in many ways including coverage by the ABC's *7:30 Report* and the award of Senior Victorian of the Year. AMSI congratulates Alison on her academic career and praises her continued teaching efforts in the mathematical sciences.



Alison Harcourt

## Supporting Inclusivity and Participation

Currently women account for fewer than 30 per cent of undergraduate and postgraduate enrolments in the mathematical sciences. The Choose Maths Grants address financial and social barriers to participation of women at AMSI flagship events by providing travel, accommodation and carer support. In 2018, 41 women received funding support through the program with notable growth in the participation of women at AMSI Optimise from 2017 to 2018. Funded by the BHP Foundation through the AMSI Choose Maths project, the grants are awarded to recipients selected on a competitive basis by the Choose Maths Grant Committee. Events held by AMSI include a session spotlight on underrepresented groups, including the ATSI and LGBTQI communities, and on barriers to participation for those with a disability.

AMSI Higher Education's embedded outreach program continues to foster community engagement with 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 and speaker and student profiles. Each of our 2018 flagship training events featured a significant number of program extras and outreach activities, to provide students with a variety of development opportunities. Activities include:

- Opening address by a keynote speaker
- Women/Diversity in STEM event
- Choose Maths Grant winners networking event
- Careers session or panel
- Public lecture
- Event dinner
- Other events including lunchtime lectures, poster sessions and student social events

These extras have generally been very well supported by flagship event attendees, host university staff and the public. Further value is gained through the filming of our public lectures and sharing on AMSI YouTube ([www.youtube.com/user/amsitubn/](http://www.youtube.com/user/amsitubn/)) and social media channels.



## Vacation Research Scholarships



Photo by: Krystle Westcott

## Higher Education Events

### AMSI FLAGSHIP PROGRAMS

#### AMSI SUMMER SCHOOL 2018

8 Jan – 2 Feb, Monash University, Clayton  
[ss.amsi.org.au](http://ss.amsi.org.au)

An intensive four-week program, the 16th annual AMSI Summer School was attended by 168 honours and postgraduate students. Hosted by Monash University (Clayton), the program allowed students 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 by Professor Nick Trefethen (University of Oxford) on *Discrete or Continuous* was very successful drawing 119 general public attendees.

#### AMSI VACATION RESEARCH SCHOLARSHIPS 2017–2018

Dec 2017 – Feb 2018  
[vrs.amsi.org.au](http://vrs.amsi.org.au)

AMSI's Vacation Research Scholarships provide students with a taste of life as a researcher. In 2017/18, 39 high-achieving recipients completed real-world mathematical research projects under the supervision of academics from their home university. This model is highly effective in exposing students to current research while inspiring them to continue in their chosen discipline.

Concluding the six-week program, each student presents their research to their peers and supervisors at the AMSIConnect conference. Held in Melbourne, this event gives students the opportunity to build their science communication skills, network with their peers from across Australia and attend information sessions led by field leaders. Following the conference students submit a research report and blog post – both available online.

#### AMSI OPTIMISE 2018

18 – 22 Jun, The University of Melbourne  
[optimise.amsi.org.au](http://optimise.amsi.org.au)

After a successful first year, AMSI Optimise 2018 explored two themes: 'Optimisation Under Risk' and 'Disaster Management'. The three-day conference and two-day workshop attracted 95 participants and substantial media coverage. Features included industry challenges, presentations, case studies and hands-on sessions with coverage by both domestic and international speakers. Three international keynote speakers joined the conference – Professor Emeritus R. Tyrrell Rockafellar (University of Washington, USA), Associate Professor Marie-Ève Rancourt (HEC Montréal) and Associate Professor Maria Antónia Carravilla (Universidade do Porto Portugal). This was followed by a two-day workshop exploring optimisation under uncertainty, disaster management, continuous optimisation, healthcare applications, transportation and logistics, and other applications.





Associate Professor Julie Rowlett

Photo: Annette Webb

SPONSORS	
ABACBS	QUANTITATIVE FINANCE
ACEMS	AND INVESTMENT
ANZIAM	STRATEGIES
AUSTMS	MONASH UNIVERSITY
AUSTRALIAN SIGNALS	MURDOCH UNIVERSITY
DIRECTORATE	PAWSEY
BHP FOUNDATION	SUPERCOMPUTING CENTRE
BIARRI	QCIF
COMMONWEALTH BANK	QUEENSLAND UNIVERSITY
DECODE SCIENCE	OF TECHNOLOGY
DEPARTMENT OF DEFENCE	SSA
DEPARTMENT OF	THE SIMULATION GROUP
EDUCATION AND TRAINING	THE UNIVERSITY OF
EDITH COWAN UNIVERSITY	MELBOURNE
EMBL-ABR	THE UNIVERSITY OF
FLINDERS UNIVERSITY	QUEENSLAND
HARRY BUTLER INSTITUTE	THE UNIVERSITY OF
LA TROBE UNIVERSITY	WESTERN AUSTRALIA
MACQUARIE UNIVERSITY	UNIVERSITY OF
MONASH CENTRE FOR	TECHNOLOGY SYDNEY

**AMSI WINTER SCHOOL 2018**

2 – 13 Jul, The University of Queensland  
[ws.amsi.org.au](http://ws.amsi.org.au)

Hosted by the University of Queensland, this year's Winter School attracted 27 graduate and undergraduate students as well as a member of industry. Attendees explored the theme of curvature, attracting a variety of participants from various fields of mathematics, engineering and physics.

Delivered by Associate Professor Julie Rowlett from Chalmers University of Technology (Sweden), the public lecture was extremely well-received and attracted a general public audience of 100. Associate Professor Rowlett talked the audience through eigenvalues and the special role they play in creating sound in music, as well as how waves travel, the flow of heat and the energy of quantum particles.

**AMSI BIOINFOSUMMER 2018**

3 – 7 Dec, The University of Western Australia  
[bis.amsi.org.au](http://bis.amsi.org.au)

AMSI held its first research training event in Perth – a three-way partnership between Edith Cowan University, Murdoch University and the University of Western Australia. Almost 140 participants and public- and private-sector researchers gathered at the University of Western Australia for a showcase of cutting-edge developments in bioinformatics. Sessions ranged from hands-on introductory levels through to specialist lectures by local and international experts.

Dr Rebecca Johnson, Director of the Australian Museum Research Institute, delivered a highly accessible public lecture titled *Wildlife Detectives: The Story of Genome Research, Discovery and Exploration at Australia's First Museum*. The lecture gave insight into Rebecca's career to date including her international research missions, genome sequencing of illegal imports and sequencing the koala genome.

**Other Events/Programs**

**ADVANCED COLLABORATIVE ENVIRONMENT (ACE) NETWORK HONOURS AND MASTERS COURSES**

[highered.amsi.org.au/ace-hons-courses](http://highered.amsi.org.au/ace-hons-courses)

The ACE Network facilitates collaboration within the mathematical sciences community locally and internationally, broadening the student research experience beyond existing academic programs and supporting our smaller member universities to provide full honours programs.

Fifteen honours and masters courses were delivered over the ACE network in Semesters One and Two enabling simultaneous student participation in honours subjects across multiple universities.

*AMSI thanks the following people for their leadership in 2018: Summer School Director Dr Simon Clarke (Monash University), BioInfoSummer Director Associate Professor Nicola Armstrong (Murdoch University), Optimise Director Dr Alysson Costa (University of Melbourne), Winter School Director Dr Phillip Isaac (University of Queensland) and ACE Director Dr Judy-anne Osborn (University of Newcastle). We also acknowledge the contributions of the speakers and lecturers, and Vacation Research Scholarship supervisors and support staff. We are grateful for their generosity in giving their time to ensure the success of these events.*

**14** SPONSORED WORKSHOPS HELD IN 2018

MORE THAN **500** PARTICIPANTS

APPROX. **26%** OF WORKSHOP PARTICIPANTS WERE FEMALE

**47** SPONSORED INTERNATIONAL SPEAKERS

**26** TRAVEL GRANTS AWARDED VIA AMSI MEMBER TRAVEL FUNDS

## Research

AMSI Research's internationally recognised scientific workshop program nurtures collaboration and knowledge sharing critical to mathematical discovery. The Institute sponsored 14 Australian mathematical sciences workshops and conferences held in 2018, with the interdisciplinary impact of the mathematical sciences attracting participants from academia, industry and government.







## Workshop Program

Reporting to the AMSI Board, the Scientific Advisory Committee (SAC) provides scientific advice to support AMSI's research-facing activities and reviews, as well as evaluating applications for AMSI Scientific Workshop funding. Strong application rounds in 2018 led the committee to approve 21 workshops (to be held in 2018 and 2019) for funding – a total of 14 sponsored workshops were held in 2018. Covering topics as broad as geometry, algebra and biology, these workshops highlighted the breadth of research and application within the mathematical sciences in Australia. AMSI provided funding for 47 international mathematical experts to attend Australian workshops in 2018.

AMSI Travel Grants support the accommodation and travel expenses of staff members and students at AMSI Member institutions attending AMSI-sponsored events. In 2018, support was granted to 26 attendees at nine AMSI-sponsored events. With funding already committed to 18 workshops and more applications to come, we anticipate another strong year in 2019.

## 2018 AMSI-SSA Lecture Tour

Co-sponsored by AMSI and the Statistical Society of Australia (SSA), the 2018 AMSI-SSA Lecture Tour featured Susan Murphy, Professor of Statistics at Harvard University. From 14-24 August, Professor Murphy toured Adelaide, Perth, Melbourne, Brisbane and Sydney to deliver a series of five public lectures (*Optimising Mobile Health Interventions*) and four specialist talks on two topics (*Stratified Micro-Randomised Trials with Applications in Mobile Health* and *Assessing Time-Varying Causal Interactions and Treatment Effects with Applications in Mobile Health*).

With a background in clinical trial design and data analysis, Professor Murphy explored the possibilities of mobile devices and wearable sensors as health-intervention aids that can indicate optimal times and places for treatment. AMSI outreach was supported by media engagement, including coverage in *The Australian*. With three different perspectives on the topic of mobile health, the 2018 AMSI-SSA

### MORE INFORMATION

Upcoming workshops list:

[research.amsi.org.au/events/category/scientific-workshop](https://research.amsi.org.au/events/category/scientific-workshop)

AMSI workshop funding: [research.amsi.org.au/workshop-funding](https://research.amsi.org.au/workshop-funding)

Travel funding: [research.amsi.org.au/travel-funding](https://research.amsi.org.au/travel-funding)

Lecture Tour encouraged the research and general communities to engage with new ideas at the cutting edge of statistics.

[research.amsi.org.au/amsi-lecturer/](https://research.amsi.org.au/amsi-lecturer/)

## 2018 Mahler Lecture Tour

Co-sponsored by AMSI and the Australian Mathematical Society (AustMS), the 2018 Mahler Lecture Tour featured Ivan Corwin, Professor of Mathematics at Columbia University. From 29 October – 9 November, Professor Corwin toured universities in Canberra, Adelaide, Melbourne, Brisbane and Sydney to deliver a series of lectures (*Beyond the Gaussian Universality Class*) and specialist talks on three topics (*Random Permutations, Partitions and PDEs, Diffusion in Random Media* and *The Stochastic Six Vertex Model*).

## AMSI Research Report

The *AMSI Research Report 2017–18* is a comprehensive record of the Institute's research workshops and activities for the year ending in June 2018.

Please refer to the Research Report for detailed information on the individual workshops funded by AMSI. All recent reports are available online at [amsi.org.au/publications\\_category/publications/research-reports/](https://amsi.org.au/publications_category/publications/research-reports/) or by contacting us at [funding@amsi.org.au](mailto:funding@amsi.org.au)

*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 2018.*

**Chloe Pearce**

National Program Manager (from June 2017)

**RESEARCH.AMSI.ORG.AU**

Photo supplied by Lynn Batten

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## Research Events

### ADVANCED COLLABORATIVE ENVIRONMENT (ACE) NETWORK RESEARCH SEMINARS

In addition to running the ACE honours program (see page 25), AMSI advertised access to 13 research seminars broadcast by universities around Australia using their ACE facilities.

### HEIDELBERG LAUREATE FORUM 2018

Held annually in Germany, the Heidelberg Laureate Forum (HLF) is a once-in-a-lifetime opportunity for highly-skilled young scientists to engage with annual recipients of the world's most prestigious mathematics and computer science awards. AMSI and AustMS co-fund a grant to support Australia's presence at this prestigious event, awarding the 2018 HLF travel grant to Becky Armstrong and Pantea Pooladvand.

### 2018 BIARRI APPLIED MATHEMATICS (BAM) CONFERENCE

AMSI and APR.Intern shared a co-sponsorship of Biarri's Optimisation Conference. With free admission, BAM gives 100 participants an opportunity to learn from both industry and academia over two days. Supported by an expo space, AMSI had the opportunity to talk with students about APR.Intern programs and how to get involved in Research and Higher education events.

*bamconf.com*

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### AMSI-SPONSORED SCIENTIFIC WORKSHOP PROGRAM 2018

AMSI's Scientific Workshop program facilitates mathematical research collaboration by:

- Sponsoring local and international workshops and conferences
- Providing travel support to Australian students and researchers attending AMSI-sponsored events
- Bringing leading international researchers to Australia for scientific collaboration and public outreach

For full workshop and speaker details and event outcomes, please refer to AMSI's Research Reports:

*[amsi.org.au/publications\\_category/publications/research-reports/](http://amsi.org.au/publications_category/publications/research-reports/)*

#### Diophantine Approximation and Dynamical Systems

6-8 Jan 2018, La Trobe University

**Attendees: 22**

#### Conference on Geometric and Nonlinear Partial Differential Equations

5-9 Feb 2018, The Australian National University (held at Murramarang Resort, NSW)

**Attendees: 52**

#### Workshop on Logic, Algebra and Category Theory 2018

12-16 February 2018, La Trobe University

**Attendees: 32**

#### Harmonic Analysis Conference Celebrating the Mathematical Legacy of Alan McIntosh

12-16 February 2018, The Australian National University

**Attendees: 34**

#### Variational Analysis Down Under (VADU2018)

19-21 February 2018, Federation University Australia (held at the Mount Helen Campus)

**Attendees: 30**

#### Workshop on Microlocal Analysis and its Applications in Spectral Theory, Dynamical Systems, Inverse Problems and PDE

18-23 March 2018, The Australian National University (held at Murramarang Resort, NSW)

**Attendees: 39**

#### Topology in Australia and South Korea 2018

23-27 April 2018, The University of Melbourne (held at Institute for Basic Science, Pohang, South Korea)

**Attendees: 46**

#### Index Theory and Applications to Positive Scalar Curvature and Related Areas

4-8 June 2018, The University of Adelaide

**Attendees: 37**

#### Virtual Tissues: Progress and Challenges in Multicellular Systems Biology

1-7 July 2018, The University of Melbourne (held at MATRIX)

**Attendees: 26**

#### Agent-Based Spatio-Temporal Stochastic Systems in Biology

15-20 July, The University of Melbourne (held at MATRIX)

**Attendees: 22**

#### AMSI-CARMA Workshop on Mathematical Thinking

14-16 November 2018, The University of Newcastle

**Attendees: 33**

#### Workshop on Nonlinear Waves in Oceanography and Beyond

26-30 November 2018, University of Southern Queensland (held at Toowoomba campus)

**Attendees: 38**

#### Authentication for the Future Internet of Things

28-30 November 2018, Deakin University (held in Melbourne CBD)

**Attendees: 44**

#### Classical and Quantum Three-Manifold Topology

17-21 December 2018, Monash University

**Attendees: 61**





Horse-free

Alpine streams at a horse-free (top) and horse-occupied (bottom) site in the Alpine National Park. Note the intact vegetation and well-vegetated, stable stream bank at the horse-free site. By comparison, signs of environmental damage including trampled and grazed vegetation, bare ground, soil pugging and streambank disturbance are clearly evident at the horse occupied site. This is typical of many horse-occupied sites across the Australian Alps.



Horse-occupied

Photos: Parks Victoria

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

## Research Collaboration: Parks Victoria

Parks Victoria is responsible for managing a diverse estate that covers more than 4 million hectares (about 17 per cent of Victoria) and includes national parks, urban parks, wilderness areas and 70 per cent of Victoria's coastline. In 2010, AMSI entered into a three-year agreement with Parks Victoria to provide statistical support for their environmental monitoring, evaluation and reporting activities. Due to its continuing success, the agreement was extended until 2020.

Through this agreement, enabled through Parks Victoria's Research Partners Panel, AMSI statistician Kally Yuen has been embedded within Parks Victoria's Science and Management Effectiveness Branch, actively supporting research and monitoring activities to help improve park management. Projects include evaluation of data capture options for wildlife monitoring using remote cameras and assessing the effectiveness of invasive plant control programs. The AMSI partnership plays a key role in Parks Victoria's commitment to utilise evidence-based decision making in environmental management and in providing access to specialist skills.

### SALLOW WATTLE CONTROL MONITORING PROGRAM IN THE GRAMPAINS NATIONAL PARK

Since 2015, AMSI and Parks Victoria have joined forces to fight the spread of Sallow wattle and protect biodiversity in the Grampians National Park. Home to more than one third of Victoria's flora species, the National Heritage listed park's rich biodiversity is under threat from a rapidly spreading native plant species - Sallow wattle. This plant does not naturally occur in the area and is behaving like a weed, spreading rapidly and threatening the survival of important native species. AMSI and Parks Victoria have been examining the effectiveness and costs of five different treatments to control this native weed in the national park.

Results to date indicate that mulching is the most efficient treatment for controlling the weed, with no major impacts on native species. However, further monitoring is required to determine the most effective method in the long term. The timely announcement of the recent state government's funding of \$647,000 to control Sallow wattle in the Grampians National Park has enabled the extension of the monitoring program. A media release, *Native species behaving badly*, was jointly developed by AMSI and Parks Victoria to distribute to local Grampians

region media and score coverage. Kally will continue to work with Parks Victoria on this important program.

### EVALUATION OF SOFTWARE FOR AUTOMATED ANALYSIS OF IMAGES FROM REMOTE CAMERAS

Remote cameras are frequently used by Parks Victoria for survey and monitoring of fauna. Cameras can capture thousands of images, and sorting these images is very tedious and time consuming. It involves manually viewing and removing unwanted images that result from false triggers (e.g. by vegetation moving with the wind) and identifying species present in the photos. An automated process that can reliably assist the above tasks will potentially save a lot of time and effort.

Parks Victoria and Arthur Rylah Research Institute for Environmental Research (ARIER) have recently collaborated in evaluating a software package developed for automated analysis of images from remote cameras. Kally worked with Dr Alan Robley from ARIER to develop a study protocol and conduct the analysis for the evaluation of the software. The results have provided very useful information for the ongoing development of the software. Kally will continue to provide support for Parks Victoria in the evaluation of the product. This three-way collaboration is enabling Parks Victoria to refine and improve innovative wildlife survey techniques.

### AN ASSESSMENT OF FERAL HORSE IMPACTS ON STREAMS AND WETLANDS IN THE AUSTRALIAN ALPS

Feral horses are widespread across the Australian Alps and their numbers are increasing. Feral horses degrade alpine and sub-alpine ecosystems and damage the habitat of a range of threatened species and vegetation communities. Parks Victoria and the NSW Office of Environment and Heritage undertook a collaborative study to assess the impacts of feral horses on streams and wetlands across the Australian Alps. Kally conducted statistical analysis of the data. The study found significant differences between horse-occupied and horse-free sites for a number of soil and stream stability measures. Kally contributed to the writing of a manuscript which has been accepted for publication in the peer-reviewed *Ecological Management and Restoration* journal (*Ecological Management & Restoration* (2019), 20(1): 21-30).



# APR ] INTERN

ACCELERATING  
WOMEN IN STEM  
THROUGH  
INDUSTRY PhD  
INTERNSHIPS

**111** INTERNS PLACED FROM **16** DISCIPLINES

**67** INDUSTRY PARTNERS ACROSS  
**10** INDUSTRY SECTORS

**44%** INTERNS WERE FEMALE

**82%** INTERNS WERE DOMESTIC,  
**18%** WERE INTERNATIONAL

**\$2.15M** FUNDING GENERATED FOR UNIVERSITIES

**97%** OF PARTICIPANTS SATISFIED  
WITH THE PROGRAM

DELIVERED BY



SUPPORTED BY



APR ] INTERN.ORG.AU



# APR.Intern

APR.Intern is the only national all-sector, all-discipline internship program placing PhD students into short-term industry and university research collaborations. Driving innovation and accelerating PhDs in industry, the program is open to women and men with an emphasis on gender equity, domestic, regional, indigenous and disadvantaged PhD students.

During 2018, APR.Intern worked closely with the government during a review of its \$28.2 million *Supporting more women in STEM careers: Australian Mathematical Sciences Institute (AMSI) – National Research Internships Program (NRIP)*. Through this process the program has identified strategies to strengthen delivery and accelerate internship placements.

In 2018 APR.Intern placed 111 interns of which 101 were eligible for NRIP rebates. This represents 55 per cent growth on 2017 (and 258 per cent increase on 2016). 2019 will be a pivotal and exciting year for the Program as staffing finally approaches planned capacity and APR.Intern Business Development representation is present in key regions across Australia.

As mentioned in the Director's report, 2018 proved to be a challenging year for APR.Intern. While the program missed its target of 200 internships it was able to significantly increase its female and domestic student placements which are core objectives of the program.

To manage the expansion of the program and to provide strategic direction, Melbourne University Enterprise Professor Gary Hogan AM has been appointed as APR.Intern Director. A graduate of the Royal Military College, Duntroon, Gary spent more than 30 years in the Australian Defence Force – most notably as Director-General Scientific and Technical Analysis, and as Head of Military Intelligence, retiring with the rank of Brigadier-General.

In addition to this significant appointment, Cate Ballard returns from parental leave to resume her role as National Program Manager, focusing on key success measures to deliver and carry out the remaining two years of the NRIP Program. High-level stakeholder engagement in both the university and industry sectors will be of the highest priority moving into 2019. Rachel Geddes has been promoted to Business Development Manager with oversight of the Business Development team. Business Development Officers have been appointed in Adelaide, Brisbane, Perth, Melbourne and Sydney, expanding the program to all major jurisdictions.

The backbone of APR.Intern's model is repeat business from major clients. In 2018, organisations including Telstra, ANZ, Aurecon and ABS, to name a few, continued to see real value in the program and placed multiple interns throughout the year. In some cases this has also led to the development of an ongoing partnership in the form of an MoU to place a specific number of interns over a longer period.

## CUSTOMER SATISFACTION SURVEY RESULTS (2008–2018)

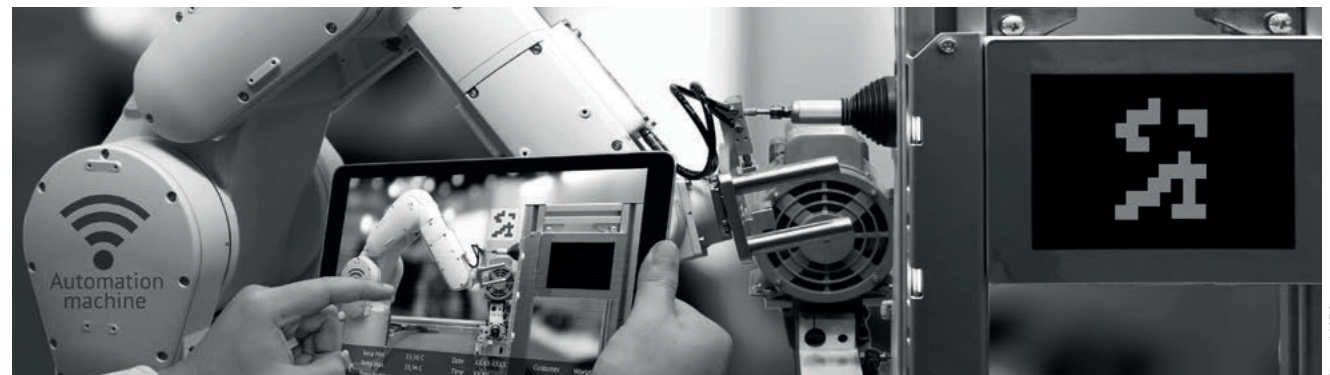
Overall satisfaction with intern program **97%**  
Student satisfaction **97%**  
Academic Mentor satisfaction **98%**  
Industry Partner satisfaction **98%**  
**50%** interns reported internship was first industry experience

**Gary Hogan**  
Director and Melbourne University Enterprise Professor

**Cate Ballard**  
National Program Manager

**Glen Sheldon**  
Deputy National Program Manager

**APRINTERN.ORG.AU**



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## 2018 Highlights

From February 2018 APR.Intern had full time representation in SA for the first time. In less than 12 months David Beecham, our Business Development Officer based in Adelaide, placed 19 interns and the University of Adelaide ranked equal first for internships with 12 projects. We are looking forward to similar results in Brisbane and Perth, where we now have representation.

The number of industry partners APR.Intern engaged with in 2018 almost doubled (36-67) and much of the growth came through new business, a trend that is essential if we are to achieve our targets.

We have also continued to develop partnerships with industry partners to deliver multiple interns, with several Memorandums of Understanding (MoUs) established in 2018 and more in discussion for 2019.

NSW had a great year in 2018 with 30 placements – given the size of market and the pre-existing appetite for the program, this region will be one of the main drivers of growth through 2019.

Through diligent monitoring and effective marketing activity the female participation rate rose from 27 per cent to 44 per cent – exceeding the Department of Education and Training (DET) KPI of 40 per cent and the domestic participation rate increased to 82 per cent which is also better than the DET KPI of 80 per cent.

Finally, the Block Allocation pilot has been adopted by 21 universities who have collectively pledged to place 197 internships by second quarter 2019. This initiative is designed to embed AMSI's internship program in universities' processes. It represents a deepening of the relationship with universities and a true collaboration. Universities will be able to apply for blocks of internships that they can use exclusively with their industry partners and their students.

Other highlights:

- Aurecon have placed 20 interns since 2017, with another four projects currently advertised
- An MoU with the Victorian Comprehensive Cancer Centre (VCCC) will facilitate up to 10 internships for the biomedical research field
- The first 21 interns have been placed under the DST MoU, in line with expectations from both parties, and a review will be undertaken for feedback for 2019 placements
- Our ongoing relationships with major financial institutions including ANZ, CBA and Westpac continue. A new project from Macquarie Bank is under development
- WA-based rail technology company MRX Technologies has taken on two projects
- Two Interns placed with the Office of the Chief Scientist of Australia are working on the STEM workforce report
- Five projects through Environmental Protection Authority Victoria (EPA Vic)
- First internship with consultancy agency EY
- Ongoing projects with Meat & Livestock Australia will be formalised in an MoU

## Strategic Partnerships

AMSI continued to develop strategic partnerships with high-level Australian organisations in 2018:

- The Defence Science and Technology Group (DSTG) MoU collaboration (signed in October 2017 to provide 100 internships through 2021), has so far resulted in 21 internships from 27 projects advertised, an excellent conversion rate
- A signed MoU with the Victorian Comprehensive Cancer Centre (VCCC) will see APR.Intern facilitate up to 10 internships for the bio-medical research field. Internships to be a five-month duration with a clear pathway for ongoing employment
- A partnership with NSW Defence Innovation Network (DIN) to place 23 internships over the next three years was launched in late 2018, and placements are underway
- The Defence Science Institute partnership continued into its third year, benefitting from the heightened profile and focus on defence via the DSTG Partnership. Two projects are currently underway, with a commitment to place five projects per year going forward
- Defence Innovation Partnership SA have offered space to accommodate an APR.Intern Business Development Officer and will promote internships to their members. An MoU should be concluded in Q1, 2019
- An MoU with Industrial Transformation Training Centre (ITTC) for Personalised Therapeutics Technologies was signed in April 2018 to place six interns per year. APR.Intern staff attended the ITTC launch in late November, and we are continuing to build opportunities for later in 2019 when internship placements should start coming into effect
- A new Australian Bureau of Statistics agreement for 10 internships over 2018/19 has resulted in five placements underway so far. A renewal for 2019 is in discussion
- Aurecon continue to place multiple internships and have also taken part in our marketing activities
- Our ongoing partnership with Telstra continues, with an opportunity to expand across other departments
- Meat and Livestock Australia (MLA) have placed 5 internships and have expressed interest in an MoU for 15 over the next 2 years
- An MoU partnership is currently awaiting final approval from the Innovative Manufacturing CRC (IMCRC) and is expected to commence in quarter 2, 2019

## Women in the STEM Workforce Event

APR.Intern hosted the nationally livestreamed *Women in the STEM Workforce* event in early September. Online access significantly boosted engagement with key audiences within industry, government and universities (academics and PhDs). The event attracted 413 total attendees, including 366 viewers of the webinar. The marketing campaign for this event included two ads in Women's Agenda eNews and on LinkedIn, generating over 150 clicks through the event webpage and with a potential reach of over 150,000 people. The focus on women in STEM will continue through 2019, with a number of events planned. Media included TV, print and online coverage.





Women in the STEM Workforce

Top row (L-R): Regina Cramer (Defence Science Institute); Marguerite Evans-Galea (Industry Mentoring Network in STEM); Karen Lamb (Murdoch Children's Research Institute)  
Middle row (L-R): Hosna Tashakkori (former intern at Aurecon); Kathryn Fagg (Chief Executive Women)  
Bottom row (L-R): Alesha Printz (Engineers Australia); Asha Rao (RMIT University); Kylie Fuller (Telstra)

# Marketing & Media

As Australia's national voice for the mathematical sciences, AMSI is engaging with audiences across the mathematics pipeline through our three programs: Schools Education, Research and Higher Education and the STEM-focused APRItern. AMSI's enviable media presence supports the Institute's policy engagement, advocacy and research training activities.

BRAND AWARENESS INCREASED BY **54%**

**691** NEWS ARTICLES QUOTE AMSI IN 2018, A **215%** INCREASE ON 2017

MEDIA AUDIENCE REACH OF **780** MILLION WITH ADVERTISING VALUE **\$4.5** MILLION

SOCIAL MEDIA ENGAGEMENT INCREASED BY **232%**





## Branding & Strategy

Brand awareness, increased audience engagement and lead generation were key overarching marketing objectives for the Institute in 2018. Significant growth was achieved across these key performance indicators and delivered by a dedicated MarComs team inclusive of marketing, media, design and web development staff.

A suite of strategic, integrated business-to-business and business-to-consumer marketing plans provided a strong foundation for approximately 20 national, state-based and regional campaigns targeted to AMSI's very broad audience ranging from teachers, school students and parents, university students, academics, membership, government and industry. Plans comprised market research, new and traditional forms of advertising, as well as direct marketing, media, events, website and targeted communications plan.

While AMSI's brand is still relatively young, the Institute's marketing activities resulted in a 54 per cent increase in brand awareness and recall for 2018. Advertising campaigns played a key role and, when coupled with timely communications, prompted audiences to engage.

### ADVERTISING

Major advertising campaigns included innovative digital and traditional channels such as: outdoor billboards and public transport, radio, programmatic display, social media, print, events and search engine marketing, the latter proving instrumental in driving new leads to websites. New advertising channels optimised market engagement and increased return on investment and were supported by an expansion of AMSI's creative assets library to further include digital artwork, videos, new websites, gamification, promotional collateral and merchandise.

### WEB

A new careers site [careers.amsi.org.au](http://careers.amsi.org.au) was launched in May to house AMSI's expanding careers materials for secondary and higher education students, careers advisers, teachers and parents. This free online resource is home to ambassador videos, posters, profiles and

hundreds of real job ads highlighting the maths and stats skills in demand in today's job market. The site accompanies the Choose Maths Careers Awareness campaign and the Institute's longstanding *Maths Adds Careers Guide*.

Website traffic increased significantly across AMSI's 14 sites in 2018, with a 2096 per cent increase in sessions and a 2151 per cent increase in users. AMSI's teacher resource portal, [calculate.org.au](http://calculate.org.au), has secured notable traffic, especially from international audiences. Aside from this anomaly, much of this growth correlates with major media, marketing and advertising campaigns.

### SYSTEMS

AMSI's EDM communications calendar grew in 2018 with increased campaigns, achieving an average overall open rate of 36.02 per cent and click through rate of 8.64, above industry standard of 21.80 per cent and 2.48 per cent respectively (Source: Mailchimp). Recruitment of a dedicated digital designer in January improved the digital delivery of EDMs and websites and drove engagement statistics.

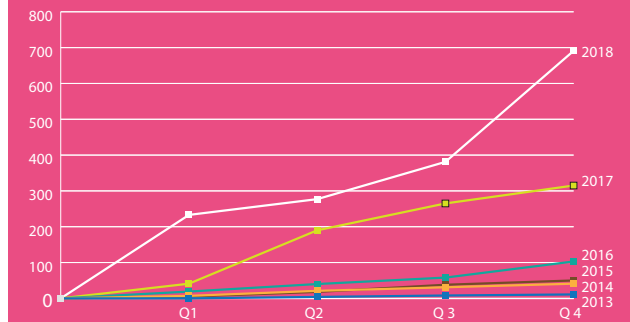
The Institute's cloud-based customer relationship management (CRM) system underpins engagement capability and strategy, journey mapping and the Institute's business development pipeline. Enhanced functionality of our CRM, content management and media intelligence systems has further streamlined processes for the Institute and driven productivity.

## Media Exposure

With an increase of 215 per cent and 691 news articles, AMSI drove an effective tiered, multi-channel media strategy in 2018. This generated a combination of national, state and regional media stories reflective of our national audience and membership. AMSI's audience reach was 780 million, which corresponds to an advertising value of \$4.5 million.

AMSI's strengthened position as a 'go to' source for comment on the mathematical sciences across the pipeline has increased reactive media opportunities, with the Institute also driving a planned calendar of proactive media communications. Significantly, AMSI generated a strong media response with the launch of its planned series of Occasional Papers tied to core policy objectives and pipeline

Media Growth 2013–2018



touchpoints. Breaking down the true impact of Australia's deepening maths teacher crisis, *Crunching the Numbers on Out-of-field Teaching* was covered nationally including mainstream print, TV and radio.

## Social Media

Social media engagement increased by 232 per cent on the previous year with growth achieved Institute-wide across Facebook, LinkedIn, Twitter and Instagram platforms. A social strategy including organic content and advertising fuelled engagement. The launch of APR. Intern on Facebook, LinkedIn and Twitter significantly contributed to this growth.

## Publications

Supporting core program delivery, AMSI's suite of publications, resources and reports enhance engagement with key stakeholders, the domestic and international mathematical science communities and the Australian public. Aligned media strengthens impact as a platform to drive policy measures to key decision-makers. In addition to delivery of five annual publications in 2018, we further expanded the suite with the launch of the first of a series of planned Occasional Papers, *Crunching the Numbers on Out-of-field Teaching*. Aligned to key policy priorities, these papers will amplify AMSI's advocacy impact, creating focused opportunities to champion pipeline issues with significant media impact. We plan to continue the series in 2019.

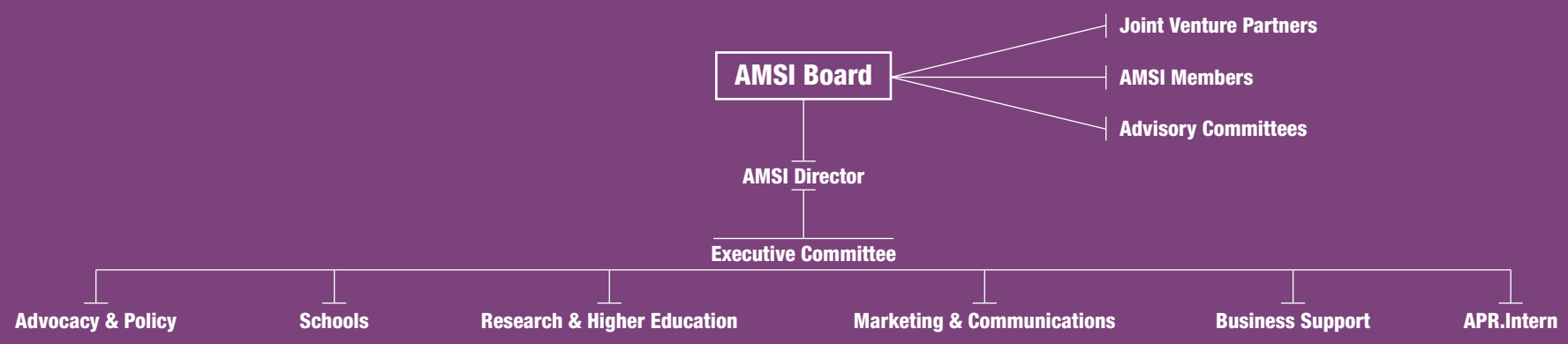
A full list of AMSI 2018 publications can be found on page 44.

**Mari Ericksen**

Marketing and Communications Manager



## Effective Organisation Structure





# Governance

AMSI is an unincorporated collaborative joint venture of Australia's universities and other bodies related to the mathematical sciences. In 2002, six universities signed a Joint Venture Agreement (JVA) to become the first full members of AMSI. As of 2012, AMSI's full membership totalled 12 universities, including all of the Group of Eight. The University of Melbourne acts as AMSI's lead agent in the JVA. Beyond the full membership, our extended membership is made up of an additional 17 universities, five government agencies and six 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.

The Institute is critically dependent upon the support of its membership. Without this support—both financial and via active participation in AMSI's enterprise—it would not be possible 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 oversight of the management of the Institute. Management of the Institute and its activities is the responsibility of the Executive Committee (listed on pages 40-41).

AMSI's three portfolio areas are:

- School education
- Research and higher education
- Industry engagement

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.

## AMSI Board Composition

The board comprises:

- An independent chair appointed by the full members
- A deputy chair appointed by the full members from amongst the independent members
- The Institute Director
- The Institute Deputy Director appointed by the full members
- One person representing the lead agent — the University of Melbourne
- Two full member representatives appointed by mutual agreement of full members
- Two associate member representatives appointed by mutual agreement of associate members
- Up to five independent persons with relevant affiliations beyond the Institute's membership

Remuneration of board members is noted in the financial statements on page 43.

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.

# Committees & Stakeholders

## Board Meetings

In 2018 board meetings were held on the following dates:

- 23 February, AMSI
- 18 May, video conference
- 18 July, University of Adelaide
- 14 December, video conference

## ATTENDANCE:

**Dr Ron Sandland** (4/4)

**Dr Adelle Howse** (4/4)

**Professor Karen Day** (0/3, until September 2018)

**Professor Jim Denier** (3/3, until July 2018)

**Dr Eileen Doyle** (2/2)

**Professor Andrew Eberhard** (3/3, until July 2018)

**Professor Joseph Grotowski** (4/4)

**Professor Mark Hargreaves** (proxy for Karen Day, 1/1)

**Professor Markus Hegland** (3/4)

**Professor Graeme Hocking** (3/4)

**Dr Mark Lawrence** (2/4)

**Professor Aleks Owczarek** (As proxy for Karen Day 2/3, as lead agent representative 1/1)

**Professor Geoff Prince** (4/4)

**Associate Professor Linda Galligan** (2/2, from July 2018)

**Professor Peter Taylor** (2/2, from July 2018)

## AMSI BOARD

### Board Members

**Dr Ron Sandland AM** *Chair*

**Dr Adelle Howse** *Deputy Chair*

**Prof. Karen Day** *Lead Agent Representative*

(The University of Melbourne) (until September 2018)

**Prof. Jim Denier** *Associate Member Representative*

(Macquarie University) (until July 2018)

**Dr Eileen Doyle FAICD** *Company Director* (until June 2018)

**Prof. Andrew Eberhard** *Full Member Representative*

(RMIT University) (until July 2018)

**Prof. Joseph Grotowski** *Full Member Representative*

(The University of Queensland)

**Prof. Mark Hargreaves** *Lead Agent Representative – Proxy for Karen Day*

(The University of Melbourne)

**Prof. Markus Hegland** *AMSI Deputy Director* (until end 2018)

**Prof. Graeme Hocking** *Associate Member Representative* (Murdoch University)

**Dr Mark Lawrence** *Mark Lawrence Group*

**Prof. Aleks Owczarek** *Proxy for Karen Day, Lead Agent Representative*

(from September 2018)

**Prof. Geoff Prince** *Director, AMSI*

**Assoc. Prof. Linda Galligan** *Associate Member Representative*

(University of Southern Queensland) (from July 2018)

**Prof. Peter Taylor** *Full Member Representative*

(The University of Melbourne) (from 18 July 2018)

## Board Observers

The Chairs of the Advisory Committees, the President of the Australian Mathematical Society, the President of the Statistical Society of Australia, and the Chair of the National Committee for the Mathematical Sciences (NCMS) are also invited onto the Board as observers.

**Dr Bob Anderssen** *Chair, AMSI Education Advisory Committee*

**Prof. Kate Smith-Miles** *President, Australian Mathematical Society* (until December 2018)

**Prof. Terry Speed** *Chair, AMSI Scientific Advisory Committee* (until January 2018)

**Prof. Peter Forrester** *Chair, National Committee for the Mathematical Sciences (NCMS) Representative*

**Prof. Scott Sisson** *Past President, Statistical Society of Australia*

**Prof. Phil Broadbridge** *Chair, AMSI Scientific Advisory Committee* (from November 2018)

## ADVISORY COMMITTEES

### AMSI Research & Higher Education Committee

**Prof. Markus Hegland** *Deputy Director, AMSI – Chair*

**Dr Nicola Armstrong** *Murdoch University*

**Prof. Nigel Bean** *The University of Adelaide*

**Thomas Dyer** *Student Representative* (University of Wollongong)

**Prof. Anthony Henderson** *The University of Sydney*

**Dr Phillip Isaac** *Queensland University of Technology*

**Assoc. Prof. Inge Koch** *Executive Director, Choose Maths, AMSI*

**Chloe Pearce** *Program Manager, Research and Higher Education, AMSI*

**Prof. Geoff Prince** *Director, AMSI, Interim Chair, AMSI Scientific Advisory Committee* (from January - November 2018)

**Prof. Aidan Sims** *University of Wollongong*

**Prof. Scott Sisson** *Full Member Representative*

(The University of New South Wales)

**Prof. Kate Smith-Miles** *President, AustMS*

**Prof. Terry Speed** *Chair, AMSI Scientific Advisory Committee* (until January 2018)

**Maaïke Wienk** *ACE Network Coordinator, AMSI* (until July 2018)



## AMSI Scientific Advisory Committee

**Prof. Terry Speed** Walter and Eliza Hall Institute of Medical Research – *Chair* (until January 2018)

**Prof. Geoff Prince** Director, AMSI – *Interim Chair* (from January – November 2018)

**Prof. Philip Broadbridge** La Trobe University – *Chair* (from November 2018)

**Prof. Ben Andrews** The Australian National University

**Prof. Andrew Barbour** The University of Melbourne

**Prof. Darren Crowley** Imperial College London

**Prof. Ezra Getzler** Northwestern University

**Prof. Elizabeth Mansfield** University of Kent

**Prof. Mary Myerscough** The University of Sydney

**Chloe Pearse** Program Manager, Research and Higher Education, AMSI

**Prof. Terry Tao** UCLA; Clay Mathematics Institute

**Prof. Lesley Ward** University of South Australia

**Prof. Ole Warnaar** The University of Queensland

## AMSI Industry Advisory Committee

**Dr Mark Lawrence** Mark Lawrence Group – *Chair*

**Prof. Nigel Bean** University of Adelaide

**Dr Eileen Doyle FAICD** Company Director

**Joe Forbes** Biarri

**Dr Adelle Howse** Independent

**Prof. Geoff Prince** AMSI Director

**Glen Sheldon** Acting National Program Manager, APR.Intern (from February 2018)

## AMSI Education Advisory Committee

**Dr Bob Anderssen** CSIRO – *Chair*

**Dr Amie Albrecht** University of South Australia

**Dr Frank Barrington** The University of Melbourne

**Peter Brown** The University of New South Wales

**Dr Mary Coupland** University of Technology Sydney

**Dr Michael Evans** Senior Consultant, AMSI

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

**Prof. Geoff Prince** Director, AMSI

**Prof. Jacqui Ramagge** The University of Sydney

**Philip Swedosh** King David School

## PROGRAM COMMITTEES (EXTERNALLY FUNDED PROGRAMS)

### Choose Maths Committee (Schools)

**Prof. Kate Smith-Miles** Monash University – *Chair*

**Dr Michael Forbes** Biarri Commercial Mathematics

**Assoc. Prof. Inge Koch** Executive Director, Choose Maths, AMSI

**Adjunct Prof. Gilah Leder** Monash University

**Prof. Jennifer Graves AO** Distinguished Professor, La Trobe University

**Nagla Jebeile** NSW Department of Education

**Janine McIntosh** Program Manager, AMSI Schools;

Choose Maths Program Director, AMSI

**Michael O'Connor** Schools Outreach Project Manager, AMSI

**Prof. Geoff Prince** Director, AMSI

**Dr Roslyn Prinsley** National Adviser, Science and Mathematics Education and Industry, Office of the Chief Scientist

**Rebecca Samulski** BHP Specialist Social Investment Australia, Community and Indigenous Affairs

### Program Stakeholder Committee (APR.Intern)

**Prof. Geoff Prince** Director, AMSI – *Chair*

**Natasha Abrahams** National President, Council of Australian Postgraduate Associations

**Anna-Maria Arabia** CEO Australian Academy of Science

**Prof. Sue Berners-Price** Australian Council of Graduate Research

**Dr Peter Binks** CEO Business-Higher Education Round Table

**Sarah Brown** Chief of Staff, Office of Chief Scientist (from Oct 2018)

**Blye Decker** Business Council of Australia

**Rachel Geddes** Business Development Manager

**Prof. Arvind Gupta** University of Toronto

**Dr Margaret Hartley FTSE** CEO Australian Academy of Technology & Engineering

**Prof. Gary Hogan** Director, APR.Intern and

Melbourne University Enterprise Professor (from Oct 2018)

**Anne-Marie Lansdown** Chief of Staff, Office of Chief Scientist (until Oct 2018)

**Robyn Owens** Chair ACOLA Implementation Committee

**Belinda Robinson** Universities Australia (until Oct 2018)

**Glen Sheldon** Acting National Program Manager, APR.Intern (from February 2018)

**Dr Dong Yang Wu** DST Group

**Anne Younger** General Manager Education & Training, Australian Industry Group

## Program Management Advisory Committee (APR.Intern)

**Glen Sheldon** Acting National Program Manager, APR.Intern (from February 2018) – *Chair*

**Prof. Amanda Davis** Australian Council of Graduate Research

**Dr Elizabeth Ebert** Bureau of Meteorology

**Dr Alison Ewart** Mitacs, Canada

**Rachel Geddes** Business Development Manager

**Prof. Gary Hogan** Director, APR.Intern and Melbourne University Enterprise Professor (from Oct 2018)

**Prof. Tim Marchant** Deputy Vice-Chancellor (Research and Innovation) University of Wollongong

**Prof. Helene Marsh** James Cook University

**Steve Morris** Telstra

**Dr Milica Ng** CSL

**Prof. Geoff Prince** Director AMSI

## OTHER AMSI COMMITTEES

**ACE Network Standing Committee**

**BioInfoSummer Standing Committee**

**Maths and Biology Initiative**

**Optimise Standing Committee**

**Summer School Standing Committee**

**Vacation Research Scholarships Academic Panel**

**Winter School Standing Committee**

# AMSI Staff

## Executive Committee



**PROFESSOR GEOFF PRINCE**  
DIRECTOR OF AMSI (until end 2018)  
*director@amsi.org.au*

Geoff Prince has been the Director of the Australian Mathematical Sciences Institute (AMSI) since 2009. Geoff has a long academic career as a teacher and researcher at RMIT University, 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 (Hons) and a DipEd from Monash University and PhD from La Trobe University.



**PROFESSOR MARKUS HEGLAND**  
DEPUTY DIRECTOR (until end 2018)  
*markus.hegland@anu.edu.au*

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 areas 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.



**PROFESSOR GARY HOGAN, AM, CSC**  
DIRECTOR, APR.INTERN AND MELBOURNE  
UNIVERSITY ENTERPRISE PROFESSOR  
(from October 2018)

Gary joined the APR.Intern team in 2018 as Director and is responsible for leading stakeholder engagement and corporate relations with government agencies, universities, peak bodies and industry partners. A graduate of the Royal Military College, Duntroon, Gary spent more than 30 years in the Australian Defence Force – most notably as Director-General Scientific and Technical Analysis, and as Head of Military Intelligence, retiring with the rank of Brigadier-General. He spent two years on faculty at the US Industrial College of the Armed Forces, in Washington DC. Gary has held executive and advisory positions at KPMG, RMIT, UNSW and the Victorian Government. He is currently an Enterprise Professor at the University of Melbourne. Gary holds a First Class Honours degree in History (UNSW), a Master of Strategic Studies (UNSW) and is fluent in Mandarin, Vietnamese and Bahasa Indonesia, having served ten years in diplomatic posts, variously in Port Moresby, Hanoi and Jakarta. A member of the Order of Australia, Gary

was also awarded the Conspicuous Service Cross for operations in the Middle East, as well as foreign government decorations from the USA (Legion of Merit) and the Republic of Indonesia (Grand Meritorious Military Order).



**CATE BALLARD**  
NATIONAL PROGRAM MANAGER, APR.INTERN  
(on maternity leave from February 2018)  
*cate@amsi.org.au*

Cate has been the National Program Manager for APR.Intern since September 2011. Her role is to develop and grow the postgraduate 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.



**GLEN SHELDON**  
ACTING NATIONAL PROGRAM MANAGER,  
APR.INTERN (from February 2018)  
DEPUTY NATIONAL PROGRAM MANAGER,  
APR.INTERN  
*glen.sheldon@amsi.org.au*

Glen is the Deputy National Program Manager/ Acting National Program Manager for APR.Intern.

Glen is responsible for the strategic direction and operational management of the APR.Intern program. His role provides high-level leadership, strategic development and implementation for the expansion of the APR.Intern program, while driving the number of placements across our member universities. 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.



**CHLOE PEARSE**  
PROGRAM MANAGER,  
RESEARCH & HIGHER EDUCATION  
*chloe.pearse@amsi.org.au*

Chloe is responsible for the AMSI Research and Higher Education portfolios. Prior to joining AMSI, Chloe worked on international and domestic marketing and recruitment strategies to attract undergraduate and postgraduate students to the University of Melbourne. Chloe also has experience in policy and advocacy relating to equity in higher education and public health reform in the state of Victoria.





### ASSOCIATE PROFESSOR INGE KOCH

EXECUTIVE DIRECTOR, CHOOSE MATHS

*inge@amsi.org.au*

As Executive Director for the Choose Maths program, 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 the University of Newcastle, 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@amsi.org.au*

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 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.



### MARI ERICKSEN

MARKETING & COMMUNICATIONS MANAGER

*mari@amsi.org.au*

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

INSTITUTE FINANCE MANAGER

*r.birch@amsi.org.au*

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** Executive Officer

**Gayani Gunawardana**, Administration and Finance Assistant (from February 2018)

**Grace Haslinghouse** Finance, Administrative Assistant (February 2018)

**Jenny Weng** Finance Officer (from December 2018)

**Maaikie Wienk** Finance & Policy Officer

### MARKETING & COMMUNICATIONS

**Danny Doan** Web development (until November 2018)

**Paul Murphy** Art Director, Graphic Designer

**Victoria Ong** Junior Designer (from February 2018)

**Michael Shaw** Art Director, Multimedia Manager

**Agnes Tam** Digital Designer (from January 2018)

**Melissa Trudinger** Publications Officer

**Laura Watson** Media Advisor

**Dinusha Withanage** Web Developer & Data Analytics Officer (from August 2018)

### APR. INTERN

**Jiamin Aw** Business Development Officer (from July 2018)

**David Beecham** Business Development Officer (SA) (from March 2018)

**Margo Brown** Senior Program Coordinator

**Edwina Buckle** Business Development Officer (from February – July 2018)

**Fiona Druitt** Business Development Officer (until December, 2018)

**Maria Galanis** Business Development Officer (from December 2018)

**Rachel Geddes** Business Development Manager

**Fan Gunawan** Finance Officer, APR.Intern (from November 2018)

**Sophie Kennedy** Administrative Assistant

**Michael Koczyrkewycz** Business Development Officer (JCU, QLD) (from August, 2018)

**Rachel Misitano** Marketing & Communications Coordinator

**Alex Mullany** Administrative Assistant (from August 2018)

**Anne Nuguid** Program Consultant

**Mark Ovens** Business Development Officer (NSW)

**Johanna Piltz** Marketing and Communications Assistant (from May 2018)

**Gaye Richman** Executive Assistant APR.Intern (from December 2018)

**Kimberley Riskas** Business Development Officer (from July 2018)

**Susan Sobotzick** Business Development Officer (JCU, QLD) (from April – August 2018)

**Joanna Steinle** Administrative Assistant

### PARKS VIC

**Kally Yuen** Statistician

### RESEARCH & HIGHER EDUCATION

**Angela Coughlin** Project Coordinator

**Francesca Hoban Ryan** Administrative Assistant

**Anna Muscara** Project Coordinator

**Liam Williamson** Administration Support

### AMSI SCHOOLS

**Nadia Abdelal** Outreach Officer

**Jacinta Blencowe** Outreach Officer

**Sarah Blood** Marketing/Administration Assistant (until September 2018)

**Anna Bock** Outreach Officer

**Helen Booth** Outreach Officer

**Julia Collins** Women in Maths Project Officer

**Claire Embregts** Executive Assistant to AMSI Schools Program Manager and Choose Maths Executive Director

**Marcus Garrett** Outreach Officer

**Dr Susan James** Outreach Officer

**Vicki Kennard** Outreach Officer (from March 2018)

**Dr Ning Li** Gender Researcher

**Cassandra Lowry** Outreach Officer

**Kristin Marriner** Choose Maths, Marketing & Communications Coordinator

**Leanne McMahon** Outreach Officer

**Michael O'Connor** Schools Outreach Project Manager

**Darla Trejo** Choose Maths, Finance & Admin Officer

# 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.

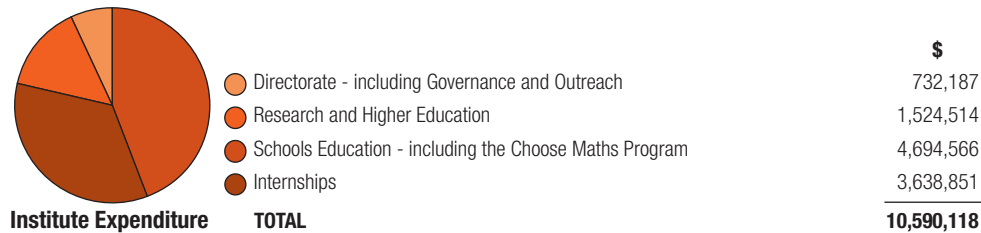
Our total income for the year was \$5,373,939 and comprised:

- member subscriptions - \$1,011,500
- our Higher Education Grant from the Commonwealth - \$497,696
- our Choose Maths Program funded by the BHP Foundation - \$2,727,272
- internship placement revenues of \$594,085
- publishing revenue - \$122,528, and
- other income, including sponsorships, block grants and interest - \$420,858

Grants due from both BHP and the Commonwealth in 2018 were deferred until 2019, consistent with budget revisions we developed in the second half of 2018 and taking into account our historically high cash opening balances from 2017.

Our total expenses for the year were \$10,590,118 incurred across our key operating areas:

- Directorate activities which includes Governance and Outreach - \$732,187
- Research and Higher Education Programs - \$1,524,514
- Schools Program incorporating Choose Maths - \$4,694,566 and
- Internship Program \$3,638,851



Major commitments to the Schools Program, the Intern Program and to Research and Higher Education are a feature of our increased expenditure this year.

Whilst the Institute derived a net operating deficit of \$5,216,179 for the reporting period (\$5,373,939 income less \$10,590,118 expenses), its closing cash balance was \$6,359,182, due to our opening cash position of \$11,575,361.

From this year, for reporting purposes, we do not recognise as income, amounts invoiced to industry partners relating to our Intern Program, which are ultimately to be granted to AMSI members for student stipends and academic mentor fees. Nor do we recognise as expenses, those grants paid or due to be paid to AMSI members arising from their participation in our intern program. To do so would distort our cash balance. Accordingly, we have revised the opening cash balance from \$11,657,468 to \$11,575,361 by excluding \$82,107 which related to amounts due to member universities for internships at the end of 2017.

The total carried forward cash balance of \$6,359,182 as at 31 December 2018 comprises:

• balance of Choose Maths Grant Account	\$ 1,488,243
• balance of Intern Program Grant Account	\$ 3,909,371
• and committed and uncommitted funds within AMSI Core	\$ 961,568
	<b>\$ 6,359,182</b>

## 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 year ended 31 December 2018 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 2018 of \$6,359,182, as detailed in the following financial statements, is entirely consistent with the balance of AMSI funds as represented in the accounting records of the University of Melbourne as at 31 December 2018.

  
Tim Brown  
AMSI Director

  
Rod Birch  
AMSI Institute Finance Manager

## Statement of Financial Performance

	Year ended 31/12/2018	Year ended 31/12/2017
	\$	\$
<b>INCOME</b>		
<b>Membership Income</b> - AMSI Membership Subscriptions	1,011,500	1,135,928
<b>Major Grants</b>		
Investing in Maths - Commonwealth Grant for Higher Education	497,696	490,342
Choose Maths - BHP Billiton Foundation	2,727,272	3,181,818
<b>Internships</b> - includes Commonwealth Grant, collaboration and placement fees	594,085	9,404,078
<b>Publishing Revenue</b> - CUP and copyright revenues	122,528	117,456
<b>Other income</b> - includes consulting, sponsorships and interest income	420,858	292,832
<b>Total Income</b>	<b>5,373,939</b>	<b>14,622,454</b>
<b>EXPENDITURE BY PROGRAM</b>		
Directorate - including Governance and Outreach	732,187	739,163
Research and Higher Education	1,524,514	1,326,699
Schools Education - including the Choose Maths Program	4,694,566	4,338,043
Internships	3,638,851	1,530,323
<b>Total Expenditure</b>	<b>10,590,118</b>	<b>7,934,228</b>
Operating Surplus/(Deficit)	(5,216,179)	6,688,226

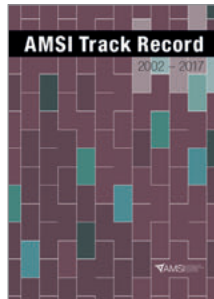
## Statement of Financial Position

	As at 31 December 2018	As at 31 December 2017
	\$	\$
<b>ASSETS</b>		
Funds on Hand:		
<b>Project 003058</b> - AMSI Core	961,568	815,821
<b>Project 099901</b> - Choose Maths BHP Billiton Foundation Grant	1,488,243	3,398,005
<b>Project 023424</b> - Commonwealth Grant for Internships	3,909,371	7,403,478
<b>Project 003059</b> - Commonwealth Grant Investing in Mathematics	0	40,164
<b>Net Assets</b>	<b>6,359,182</b>	<b>11,657,468</b>
<b>EQUITY</b>		
Retained income brought forward after prior period adjustments	11,575,361	4,969,242
Net of income over expenditure	(5,216,179)	6,688,226
<b>Net Equity</b>	<b>6,359,182</b>	<b>11,657,468</b>



# 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

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-2017/](http://amsi.org.au/publications/amsi-annual-report-2017/)



## 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-2017/](http://amsi.org.au/publications/amsi-annual-report-2017/)



## 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. This publication should be read with the core policy document below.

[amsi.org.au/publications/discipline-profile-mathematical-sciences-2017/](http://amsi.org.au/publications/discipline-profile-mathematical-sciences-2017/)



## IMPROVING AUSTRALIA'S MATHS GRADES

AMSI's core policy document in 2017, *Improving Australia's Maths Grades* sets the institute's key priorities for intervention at all stages of the mathematical pipeline as identified within the *Discipline Profile*.

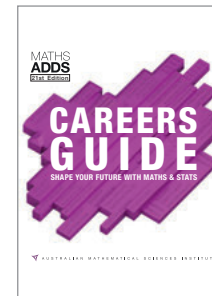
[amsi.org.au/publications/improving-australias-maths-grades/](http://amsi.org.au/publications/improving-australias-maths-grades/)



## 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-report-2017-18/](http://amsi.org.au/publications/research-report-2017-18/)



## 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.

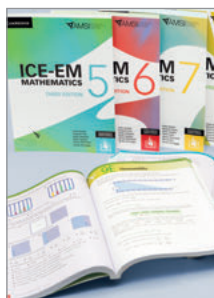
[amsi.org.au/publications/mathsadds-2018-19/](http://amsi.org.au/publications/mathsadds-2018-19/)



## 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/publications/7th-edition-2018-the-update/](http://amsi.org.au/publications/7th-edition-2018-the-update/)

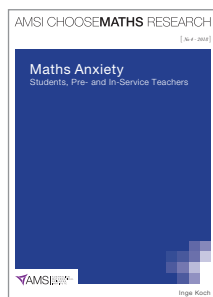


## TEXTBOOKS

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](http://amsi.org.au/publications_category/publications/textbooks)

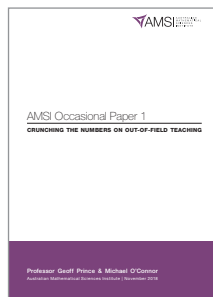


## CHOOSE MATHS & AMSI SCHOOLS

The Choose Maths program produces a number of reports each year based on surveys and research conducted by Choose Maths staff. In 2018 these included both:

[amsi.org.au/publications/choosemaths-days-for-year-9-and-10-students-2018/](http://amsi.org.au/publications/choosemaths-days-for-year-9-and-10-students-2018/)

[amsi.org.au/publications/maths-anxiety-students-pre-and-in-service-teachers/](http://amsi.org.au/publications/maths-anxiety-students-pre-and-in-service-teachers/)



## AMSI OCCASIONAL PAPER 1: CRUNCHING THE NUMBERS ON OUT-OF-FIELD TEACHING

The first of a new series of Occasional Papers, this report provides the numbers on out-of-field teaching in Australia and models possible solutions.

## AMSI WEBSITES

[amsi.org.au](http://amsi.org.au)

[aprintern.org.au](http://aprintern.org.au)

[calculate.org.au](http://calculate.org.au)

[careers.amsi.org.au](http://careers.amsi.org.au)

(includes content previously stored on [mathsadds.amsi.org.au](http://mathsadds.amsi.org.au))

[choosemaths.org.au](http://choosemaths.org.au)

[highered.amsi.org.au](http://highered.amsi.org.au)

[research.amsi.org.au](http://research.amsi.org.au)

[schools.amsi.org.au](http://schools.amsi.org.au)

## SOCIAL MEDIA SITES

### Schools Education Program

[facebook.com/amsischools/](https://facebook.com/amsischools/)

[facebook.com/amsichoosemaths/](https://facebook.com/amsichoosemaths/)

[instagram.com/amsichoosemaths](https://instagram.com/amsichoosemaths)

### Research & Higher Education Program

[facebook.com/discoveramsi](https://facebook.com/discoveramsi)

[twitter.com/discoveramsi](https://twitter.com/discoveramsi)

[www.linkedin.com/company/australian-mathematical-sciences-institute/](https://www.linkedin.com/company/australian-mathematical-sciences-institute/)

### APR.Intern Program

[linkedin.com/company/aprintern/](https://linkedin.com/company/aprintern/)

[twitter.com/aprinternau](https://twitter.com/aprinternau)

[facebook.com/apr.intern/](https://facebook.com/apr.intern/)

### AMSI YouTube channels

[www.youtube.com/user/AMSIIntern](https://www.youtube.com/user/AMSIIntern)

[www.youtube.com/user/amsitubn](https://www.youtube.com/user/amsitubn)





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