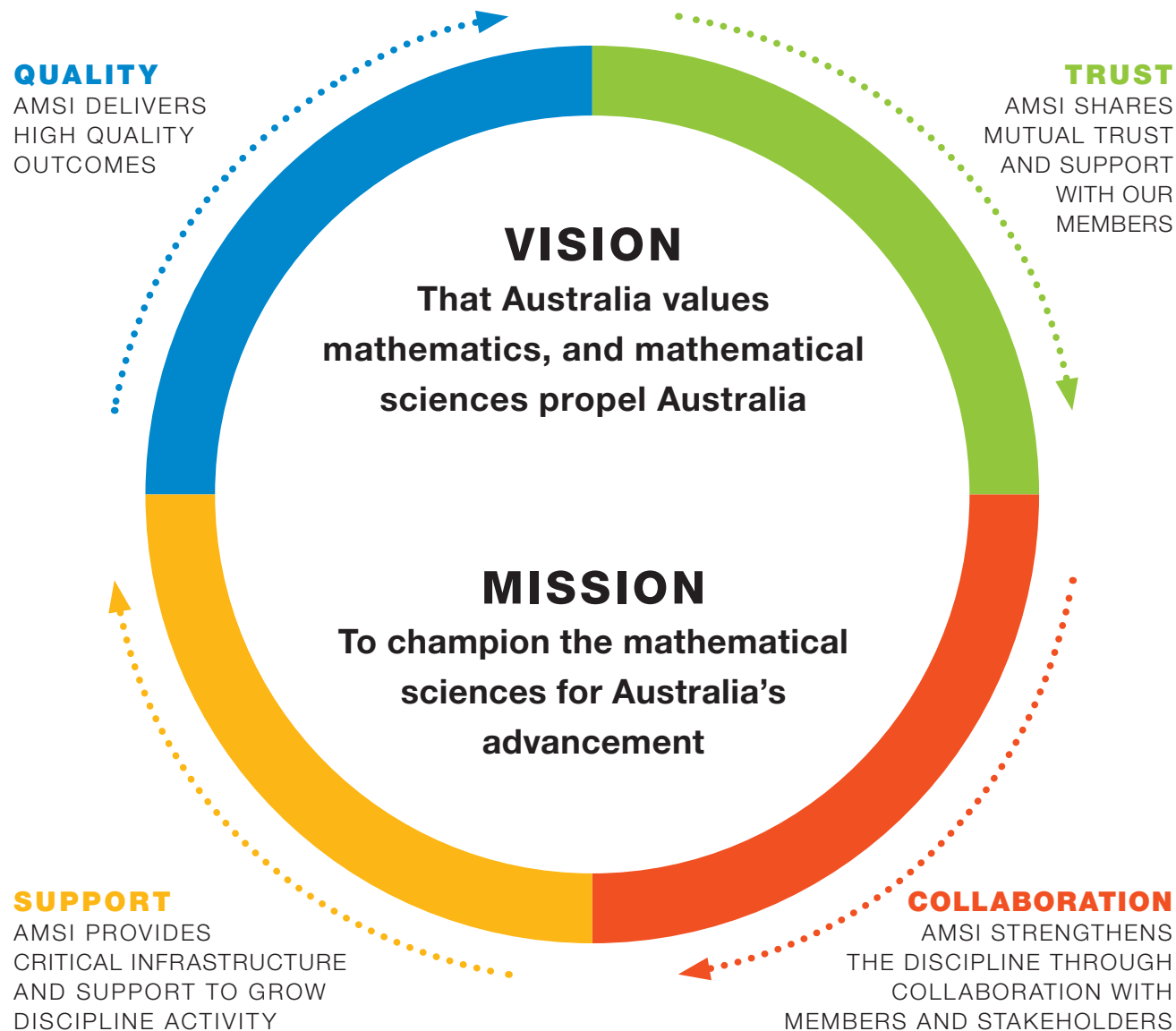


ANNUAL REPORT **2019**

Our Vision & Mission



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AMSI Members

Full Members



Associate Members



Government Agencies



Societies



From the Chair

I first joined the Board of AMSI in 2012 for the simple reason that I believe in the importance of mathematical sciences to Australia's economic and social prosperity. So it was an honour to be appointed as Chair of the AMSI Board in March 2019 after the retirement of my predecessor, Dr Ron Sandland. Ron's leadership was integral to establishing AMSI's resilience and saw AMSI expand significantly to achieve record levels of impact in schools, research and higher education and the commencement of the ambitious APR.Intern program.

An expansion of the Board occurred during the year and in April we welcomed five new independent members to the Board. The contributions of Anne Baly, Dr Sue Barrell, Professor Robyn Owens, Joe Forbes and Professor Andrew Peele are incredibly valuable to AMSI, providing additional diversity and capacity to the Board.

Also in April, with a new Director at the helm of AMSI and an expanded Board, we invested in a review and refresh of the AMSI Strategy, Vision and Mission and these were critical to building the 2020–2022 business plan priorities and initiatives. The Vision and Mission continue to serve us well and help to guide our focus and priorities in this new world.

A review of the Joint Venture Agreement was initiated to clarify roles and responsibilities, to support strong governance and operational efficiency, the foundations required for the sustainability of AMSI.

A significant activity for AMSI is the APR.Intern program and extensive learnings have been made in 2019 since its commencement in 2017. Following a mid-term review of the program, pleasingly AMSI and the Department agreed to a revised set of terms. The APR.Intern program is delivering astounding results and the feedback from participants—both intern students, mentors and the sponsors reveals the power of applying bright minds to many worthy projects across a diversity of sectors and disciplines. A particular highlight of the year for me was to attend the APR.Intern STEM fest in September, celebrating Women changing Australia.

The ChooseMATHS program supported by the BHP Foundation continued to deliver outstanding achievements and does not fail to

impress. These achievements were celebrated at the ChooseMATHS awards ceremony with an amazing reflection of teachers and student initiatives, innovation and enthusiasm. The entire Schools team at AMSI must be commended for this work.

The achievements of the higher education initiatives including Summer and Winter School activities were acknowledged by an independent review to be “outstanding at an international level” and to “generate intellectual, technical, and economic wealth for the Commonwealth of Australia”. These activities enable several hundred young people each year to develop and exploit research skills in mathematics.

I thank all the Board members for their contributions, including those who rotated out during the year notably Dr Mark Lawrence following a significant contribution to AMSI over many years. A special thanks is due to the Chairs of the various Committees. In 2019 we established two new interim committees or working groups to support the APR.Intern revision and the JVA review.

Thank you Professor Tim Brown, for your hard-work, commitment and leadership of AMSI in a very challenging year, and thanks to the AMSI staff, for your continued dedication and passion to help AMSI achieve its mission—the great achievements and progress in 2019 were delivered by the AMSI staff. Finally, we are indebted to the many friends and supporters of AMSI who volunteer to support our range of activities. This includes the members of the various committees. These unpaid volunteers provide a diversity of ideas and suggestions, and connections to support AMSI in a highly professional way.

The environment in 2020 provides new challenges for AMSI and the AMSI Foundation has an important role to play as we navigate into the future. I look forward to the ongoing support of the AMSI members, Board and staff and our lead agent the University of Melbourne as we work to solve for the sustainability of AMSI.

Adelle Howse
June 2020





From the Director

My term as AMSI Director started in mid-January 2019. It was such a privilege to re-join the mathematical sciences community in such a central role, after many years in university administration and several as a part-time Professor of Statistical Data Science.

In traditional AMSI fashion the year began with the February AMSI Meetings, at which point Dr Ron Sandland was replaced by Dr Adelle Howse as Chair of the AMSI Board and I took up the role of Director after the retirement of Professor Geoff Prince. I and AMSI sincerely thank them for their years of service and dedication to AMSI and the mathematical sciences.

The legacy that Geoff Prince left in his decade as Director was huge, with AMSI expanding from a small staff in 2009 to a peak of over 50 in 2019. Our range of programs means that AMSI's successful reach extends through mathematical sciences education from the early school years through to PhD level, supporting mathematical sciences research workshops and industry engagement. As well, the APR.Intern program, generously funded by the Commonwealth Government, sees AMSI facilitating research internships for PhD students with industry partners across all disciplines, having a special focus on supporting women into STEM careers. Geoff not only drove this expansion of scope for AMSI but also secured Commonwealth support and that of BHP through the ChooseMATHS program. In recognition of this tireless and wonderful work, Geoff Prince received the AMSI Distinguished Service Award in February 2019.

Ron Sandland had previously signalled his intention to step down from the Chair of the AMSI Board early in 2019, and a smooth transition to the new Chair, Adelle Howse occurred in March 2019. Ron's wisdom, perception, intellect, wit, experience and network of contacts have always been the strong basis of his many contributions to AMSI. His skill in chairing meetings, negotiating difficulties, hands-on personal style, fearless advice, deep commitment and system-wide perspective have been a tremendous asset to AMSI and its staff. Members, staff and the

Board sustain a great respect and affection for Ron. As Chair, Ron always "walked the second mile" and everyone appreciated this greatly. Ron Sandland received the AMSI Distinguished Service Award in April 2019.

My first goal as AMSI Director was to meet with staff individually and to visit Member organisations. It was exciting to find the enthusiasm and commitment displayed by so many people spread right across Australia. Although my initial aim of visiting every Member organisation proved over-ambitious, I gained insight into the diversity of experience of our Members. My initial impression of the hard work and dedication of our staff was confirmed throughout the year, along with their many exceptional talents. AMSI is so lucky to have all these contributions from its staff and Members.

In March and April, AMSI commenced an extensive process of consultation with its many stakeholders leading to the adoption of a new Strategy Statement by the Board in May. A highlight of this process was the Strategy Day held in April, with Staff, Joint Venture Partners and the Board joining together to chart the future. A key feature was the development of our Vision—*that Australia values mathematics, and mathematical sciences propel Australia*—and Mission—*to champion the mathematical sciences for Australia's advancement*—both centred on the importance of mathematical sciences for Australia, as well as AMSI's role in advocating for that.

AMSI had many successes in 2019 through its projects in communication, schools, higher education, research and industry engagement. Particular highlights for me were the Summer School at UNSW and the Winter School at QUT, *Optimise* organised by Curtin University, BioInfo Summer at the University of Sydney, the ChooseMATHS Awards for outstanding teachers and students, and the STEMfest APR.Intern afternoon celebrating women in STEM and industry engagement.

My colleagues on the Executive contributed with their many gifts, ideas and dedication in our weekly meetings and through their management of their portfolios. Mari Ericksen's resignation came with mixed feelings for the group: we celebrated Mari's success in winning a big promotion, acknowledged her many contributions to AMSI in marketing and communications, and were sad to say goodbye to her infectious enthusiasm.

The marketing and communications success was acknowledged in significantly increased media engagement and reach, a Universities Australia award for the best smaller budget marketing campaign for "Open Up Your World", and a Snapchat monthly award for Careers Awareness.

Funding was a significant challenge through 2019. Half of the Commonwealth contribution of \$10m for expanding APR.Intern was secured through a mid-term review of the program. This review was conducted by a joint working group of the Board and Joint Venture Partners chaired by Joe Grotowski from the University of Queensland, and supported by staff in AMSI. Recommendations to the Federal Government were accepted in full, and revised Conditions of Grant were signed in December leading to funding being released. This year was also the last for the original term of the BHP Foundation's funding for ChooseMATHS. However, the Foundation agreed to extend the program into 2020 using savings of around \$2m.

It is a special pleasure to thank the Board for their outstanding oversight, and to have enjoyed their many insights. New independent members Anne Baly, Sue Barrell, Joe Forbes, Andrew Peele and Robyn Owens added greatly to the depth and breadth of the Board's wisdom and experience. Equally, the Joint Venture Partner representatives played crucial roles in successfully negotiating the many challenges. AMSI's continuing success is underwritten by their efforts, experience and guiding endorsement.



Finally, a special word of gratitude for the special honour of working with Adelle Howse as Board Chair. Adelle was a constant source of advice, encouragement and counsel to me. Adelle's detailed consideration, calmness, insight, logic, focus, perception, creativity and constant availability were deeply appreciated by me .

AMSI entered 2020 full of hope in all its programs, and with a determined Business Plan to secure a sustainable future.

A handwritten signature in black ink that reads "Timothy Brown".

Professor Tim Brown
June 2020

Policy & Advocacy

The central voice for Australia's mathematical sciences, AMSI actively enters the national debate to advocate for critical reform across the mathematics pipeline spanning school-based and higher education, research, training and funding to industry collaboration and innovation to increase capacity and engagement.

Maaïke Wienk - Research & Policy Officer
maaïke.wienk@amsi.org.au

[AMSI.ORG.AU](https://amsi.org.au)



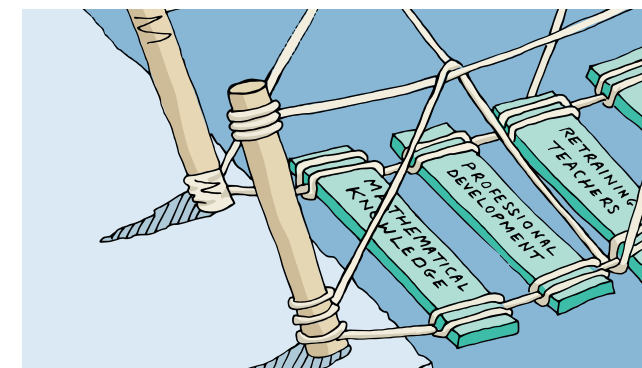
ADVOCACY

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

- Australian Council of the Heads of Mathematics (Tim Brown)
- International Day of Mathematics (*Pi Day*)
- AustMS Steering Committee (Tim Brown)
- STA President and CEO Forum (Tim Brown)
- Science Meets Parliament, Canberra (Chloe Pearse)
- Bob Anderssen's 80th Birthday Seminar, ANU (Janine Sprakel)
- Attended CSIRO's BHP Science and Engineering Awards (Janine Sprakel)
- National Future Schools Expo (Janine Sprakel & Schools Team)
- Actuaries Institute (Tim Brown & Janine Sprakel)
- World Science Festival, Brisbane (Schools Team)
- ANZSRC (Tim Brown and Maaikie Wienk)
- Journey to Entrepreneurship - a night with Biarri (Tim Brown)
- MERGA Conference (Janine Sprakel)
- 2019 Central Council AGMs for SSA and ASPAI (Tim Brown)
- SMMC 2019 (Tim Brown)
- AAMT Conference (Janine Sprakel)
- MASA Conference (Helen Booth)
- CMA Conference (Cassandra Lowry and Michael O'Connor)
- Australian Mathematics Trust - Mathematics Challenge for Young Australians Problems Committee, Canberra (Janine Sprakel)
- CPA Australia (Janine Sprakel)
- Women in Maths Day, The University of Melbourne (Janine Sprakel)
- ChooseMATHS Event, BHP Collins Street Melbourne - (Schools Team, Janine Sprakel MC)
- STEMfest Promoting Women in STEM - (APR.Intern)
- Pacific Maritime Expo Sydney - (APR.Intern)
- Knowledge Commercialisation Australia and New Zealand Conference Sydney (Gary Hogan)
- MANSW Conference (Cassandra Lowry, Marcus Garrett and Michael O'Connor)
- MATRIX Advisory Board (Tim Brown)
- CDAA Conference (Janine Sprakel and Claire Embregts)
- The Royal Institute of Australia Bragg Lunch 2019 (Tim Brown)
- ATSE - Ensuring Quality Mathematics and Science Teaching Australia (Tim Brown)
- QAMT Conference (Anna Bock and Leanne McMahon)
- Swan DELTA Conference, Fremantle WA (Janine Sprakel Keynote Presentation)
- STAR Portal Steering Committee member (Janine Sprakel)
- Education Council Event (Tim Brown)
- International Mining Resources Conference - Melbourne (Tim Brown)
- UoM Faculty of Science - WiSN - Professional Staff Careers Seminar (Tim Brown)
- Women in Science Steering Committee member, Faculty of Science, University of Melbourne (Janine Sprakel)
- PASL Reference Group (Tim Brown)
- SMRI Board Meeting (Tim Brown)
- Australian Mathematics Trust - Member Mathematics Challenge for Young Australians Problems Committee (Janine Sprakel)
- Australian Mathematics Trust - Member AMOC Committee (Janine Sprakel)
- MAWA Conference (Vicky Kennard and Jacinta Blencowe)
- MAV Conference (Schools Team)
- ICME 2024 Bid CoME Committee Member (Janine Sprakel)
- Out of Field Teachers Discussion Group member (Janine Sprakel)
- Year 12 Consultation Group VCAA facilitator and member (Janine Sprakel)
- Diversity and Inclusion Committee, Faculty of Science, University of Melbourne (Janine Sprakel and Chloe Pearse)
- Mentoring program, Faculty of Science, University of Melbourne (Janine Sprakel)

OCCASIONAL PAPER

Australian Secondary Mathematics Teacher Shortfalls: A Deepening Crisis



Co-authored by Michael O'Connor and Jan Thomas, this paper addresses the history of the long-standing issue of out-of-field teaching of mathematics in Australia, tracing this issue back to the late 1980s. At the time, mathematics teacher shortages were precipitated by increased school enrolments and programs to encourage the participation of girls in mathematics. Since then, the teacher shortage has gradually grown worse. In 2019, secondary schools faced and will continue to face increased enrolments, with an extra 650,000 students expected to attend Australian schools in the years up to 2026.

The undersupply of secondary school mathematics teachers is the result of not having prepared enough teachers for many years. To turn this around, Australia needs to make a long-term commitment to attract more teachers to the mathematics teaching profession, as well as, upskill teachers currently teaching mathematics out-of-field.

“Australia is failing to provide enough teachers with the mathematical content knowledge they need to teach the classes they are being assigned.”

STRATEGY AND POLICY RESET

In 2019, AMSI reset its strategic goals and redefined its core values to guide its activities in the coming years.

To align with AMSI's long-term vision for Australia, AMSI's policy document is currently under review.

A refreshed policy document was presented to the AMSI members for consultation early in 2020 and will be published later in the year.

AMSI'S LONG-TERM GOALS FOR THE MATHEMATICAL SCIENCES IN AUSTRALIA

Australia **recognises and enjoys the benefits** of mathematical sciences

Australia **recognises the necessity for diversity** in the mathematical sciences workforce

Australia has **balanced supply and demand** for the Australian mathematical sciences workforce

Australia values mathematical sciences **research and its contributions**

The overall participation in high-level mathematical sciences at schools and universities **meets Australia's needs**

SUBMISSIONS

AMSI represented the mathematical sciences through submission of several responses to national issues papers and reviews during 2019.

2019 Policy Submissions

ARC Review into the implementation of the National Science and Research Priorities under the National Competitive Grants Program

Submission: amsi.org.au/review-national-science-research-priorities

Review into the Australian and New Zealand Standard Research Classification

Submission (joint with the Australian Mathematical Society and the Statistical Society of Australia): amsi.org.au/anzsrc-review-au-nz-classification

Senior Secondary Pathways Review

Submission: amsi.org.au/submission-senior-sec-pathways

AMSI delivers for women in STEM - Response to Women in STEM Decadal Plan Champions

Response: stemwomen.org.au/champions

ARC Review into the implementation of the National Science and Research Priorities under the National Competitive Grants Program

At the request of Minister Tehan, a panel of experts led by Professor Sue Thomas undertook a review of the National Science and Research Priorities under the National Competitive Grants Program (NCGP) in 2019. The review included an assessment of the way the existing priorities are used, and whether the current structure appropriately supports the NCGP.

Central to the current structure is that the ARC does not target a specific proportion of funding to research in the existing priority areas—the Australian Research Council (ARC) leaves it to individual applicants to determine whether to undertake research in the National Science and Research Priority areas. After member consultation, AMSI put forward in its submission that this voluntary and widely accepted approach should be left in place.

In its submission, AMSI stressed that a critical component of the role of public funding through the NCGP is to facilitate fundamental research. While fundamental research delivers long-term benefits via a multi-stage pipeline, the initial stages tend to be high-risk for the private sector and are therefore not possible without public NCGP investment. Given the importance of enabling research across the whole pipeline, public funding of excellent research and supporting a strong scientific workforce will always be in Australia's long-term national interest.

The evidence shows that Australian researchers are engaged with impactful research and accept that publicly funded research should support the national interest both now and into the future. It is to be expected that there are differences in the proportions of immediate and longer-term impact between different disciplines. It is therefore appropriate to measure alignment of funding with national Science and Research Priorities at the aggregate level and not by discipline.

“To safeguard research capacity in future areas of importance, Australia must continue to invest in a broad-based research community. In the case of the mathematical sciences, the funding of high-quality fundamental research will ensure that Australia is best equipped for future challenges.”

In addition, it is important to recognise that projects falling outside the National Science and Research Priorities equally lead to growing knowledge and innovation and have the same potential for a transformative impact on society and the economy. Targeted funding alignment in certain research areas, linked to short term priorities, will inevitably lead to lost opportunities in other research areas. This will likely be to Australia's detriment in the longer term.

Review into the Australian and New Zealand Standard Research Classification

The Australian and New Zealand Standard Research Classification (ANZSRC) is a set of classifications used in the measurement and analysis of research and experimental development (R&D) in Australia and New Zealand.

ANZSRC was first published in 2008. It was subjected to a joint New Zealand and Australian review announced in 2018 to ensure that the classification continues to reflect current practice and is sufficiently robust to allow for long-term data analysis.

AMSI coordinated the consultation with academic research staff in the mathematical sciences associated with the Statistical Society of Australia (SSA), AMSI and the Australian Mathematical Society (AustMS)—including its divisions ANZIAM (Australian and New Zealand Industrial and Applied Mathematics) and ANZAMP (Australian and New Zealand Association of Mathematical Physics).

The main finding from the consultation was that while the current overall structure of the Field of Research (FoR) codes was still regarded as adequate to the task, several amendments and new inclusions were proposed to align with recent national and international developments in the mathematical sciences discipline.

Given the increasing importance of data science research in the mathematical sciences, the subject area of Data Science and/or Large

and Complex Data should be included in the FoR structure. Consultation revealed that the preferred option was inclusion under Statistics, covered by 2 distinct codes. What this would accomplish is ensuring that data science as a discipline has a distinct home under mathematical sciences.

After consultation, there was no evidence that any of the main groups under Mathematical Sciences 0101 (Pure Mathematics), 0102 (Applied Mathematics), 0103 (Numerical and Computational Mathematics), 0104 (Statistics), 0105 (Mathematical Physics) and 0199 (Other Mathematical Sciences) were no longer useful so no change was proposed to the main structure.

Senior Secondary Pathways Review

Under the National School Reform Agreement, the Education Council of the Council of Australian Government (COAG) agreed to review senior secondary pathways into work, further education and training. The review draws upon the experiences and views of a broad range of stakeholders about which essential skills, knowledge and capabilities students should have once they complete senior secondary school, and how best to support students making decisions about post-secondary pathways.

In our submission to this review, AMSI emphasises that to cope with current and future workforce needs, mathematical understanding must be widespread and current gender barriers broken down. AMSI is in favour of encouraging students to take up mathematics in high school to the

highest level they are personally capable of. The resulting knowledge, skills and attitudes will benefit them as they follow their post-school pathways, be it vocational education, work or university.

While the number of students completing Year 12 and pursuing a university degree afterwards has been steadily increasing, this is not reflected in the level of participation in senior secondary school mathematics subjects intended to prepare for university study. Altogether, only 28.9% (66,866) of the Year 12 population studied mathematics to at least level C in 2017, compared to 31.2% (63,077) in 2008.

Given the expected increase in secondary school students in the future, and the ageing of the current mathematical teaching workforce, growing the number of qualified teachers and upskilling teachers who are currently teaching mathematics “out-of-field” must be an urgent priority. Secondly, secondary school students must be given the right incentives and guidance about appropriate subject choices.

Students, and those people advising and supporting their decisions including parents, teachers, careers professionals and friends need better information about the possible pathways students may take. This information should include TAFE, VET and trade pathways and university courses. A continued focus on improving the gender balance should remain a priority. Universities should provide clear and timely information on what level of mathematics background is necessary in each of their degrees and subjects – and preferably provide incentives – so that students can take

this into account to facilitate good subject choices in Year 11 and 12.

AMSI delivers for women in STEM - Response to Women in STEM Decadal Plan Champions

This document provides an overview of AMSI's commitment to improving gender diversity in the mathematical sciences and in STEM disciplines in general as outlined in the Australian Academy of Science's Women in STEM Decadal Plan. All AMSI's major programs include a substantial focus on improving the gender balance in the mathematical sciences as well as in other STEM disciplines, covering school education, university education, research and industry participation.

“To increase historically low female participation AMSI has set an immediate participation target of 30 per cent in all higher education and research program activities. With significant success, AMSI actively works with event and workshop partners towards the target.”

Schools

The conversation is changing with regard to the teaching and learning of mathematics. Students, teachers, parents and the public see the value mathematics brings to their lives.

The work of the AMSI Schools team has gone a long way to transforming this narrative across the country through a deliberate and planned program of careers awareness, awards and rewards, mentoring, research and in-school support.

Janine Sprakel - Program Manager, AMSI
Schools & ChooseMATHS Project Director
janine@amsi.org.au

SCHOOLS.AMSI.ORG.AU, CHOOSEMATHS.ORG.AU



KEY STATS 2019 (OVERALL FOR LIFE OF PROJECT*)

Delivering the ChooseMATHS project, AMSI Schools has conducted:

372 (2116*) school visit days at 120 schools across Australia

44 (337*) professional development days attended by 919 (6196*) teachers

9 (46*) ChooseMATHS Family Nights were held

14 (70*) Careers Events were attended or hosted as part of the ChooseMATHS Careers Awareness Campaign

12 (27*) ChooseMATHS Days were organised in school and university locations

3 ChooseMATHS Games Days were held in schools

68 mentees and **65** mentors participated in the mentor program across **18** schools

64 (162*) ChooseMATHS grants were awarded in 2019

60 (168*) teacher nominations and 452 (1726*) student team videos were submitted for the ChooseMATHS Awards

AMSI Schools programs have come to be known as the lighthouse for mathematics teaching and learning in Australia. Through our support, students and their teachers are more competently and confidently navigating the world of mathematics and can make decisions based on sound knowledge of what benefits the study of mathematics can bring to their lives.

Careers

Decision making around careers and school or university courses can be a confusing time for students. For many years AMSI Schools has lead the conversation about subject choice and public perception of mathematics. The public are keen for information, and AMSI is known as the group who provide it. Careers events are well attended, the materials are popular and the conversation is growing—with continued public and media interest. This is evident in the uptake of the Maths Adds booklets. For 22 years now we have worked with La Trobe University colleagues to produce Maths Adds.

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, 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 continue to be the most visited part of any AMSI website and received more than 695,000 page views in 2018.

Module	Page Views
Teacher Modules	588,680
SAM Middle Years	156,592
SAM Senior Years	51,359
Other Calculate content (blog posts, articles)	113,172

ICE-EM Mathematics

The *ICE-EM Mathematics* textbooks series was first self-published by AMSI in 2006. Together with AMSI Schools teacher professional development, the textbooks have become a well regarded source of classroom support in the industry and a vital source of income for AMSI. Now published by Cambridge University Press and including a large online component, sales of the Third Edition continue to do well, with 13,724 units sold between May 2019 and January 2020.

ChooseMATHS

Since 2015, AMSI has been empowering students, particularly girls and women, to pursue careers in mathematics through the ChooseMATHS Project.

Supported by the BHP Foundation, the AMSI Schools team has been working with students, parents, teachers, careers advisors and young women to increase mathematics participation and equity across four components: Awards, Schools Outreach, Careers and Mentoring.



Change in education comes gradually, and investment must be made across the pipeline if there is to be impact. We work with school communities to deliver:

- Teacher professional development and support
- Classroom tools and resources
- Mentoring for high school students
- Research to inform and enhance
- Recognition of teacher and student excellence
- Careers awareness and industry engagement

Schools Outreach

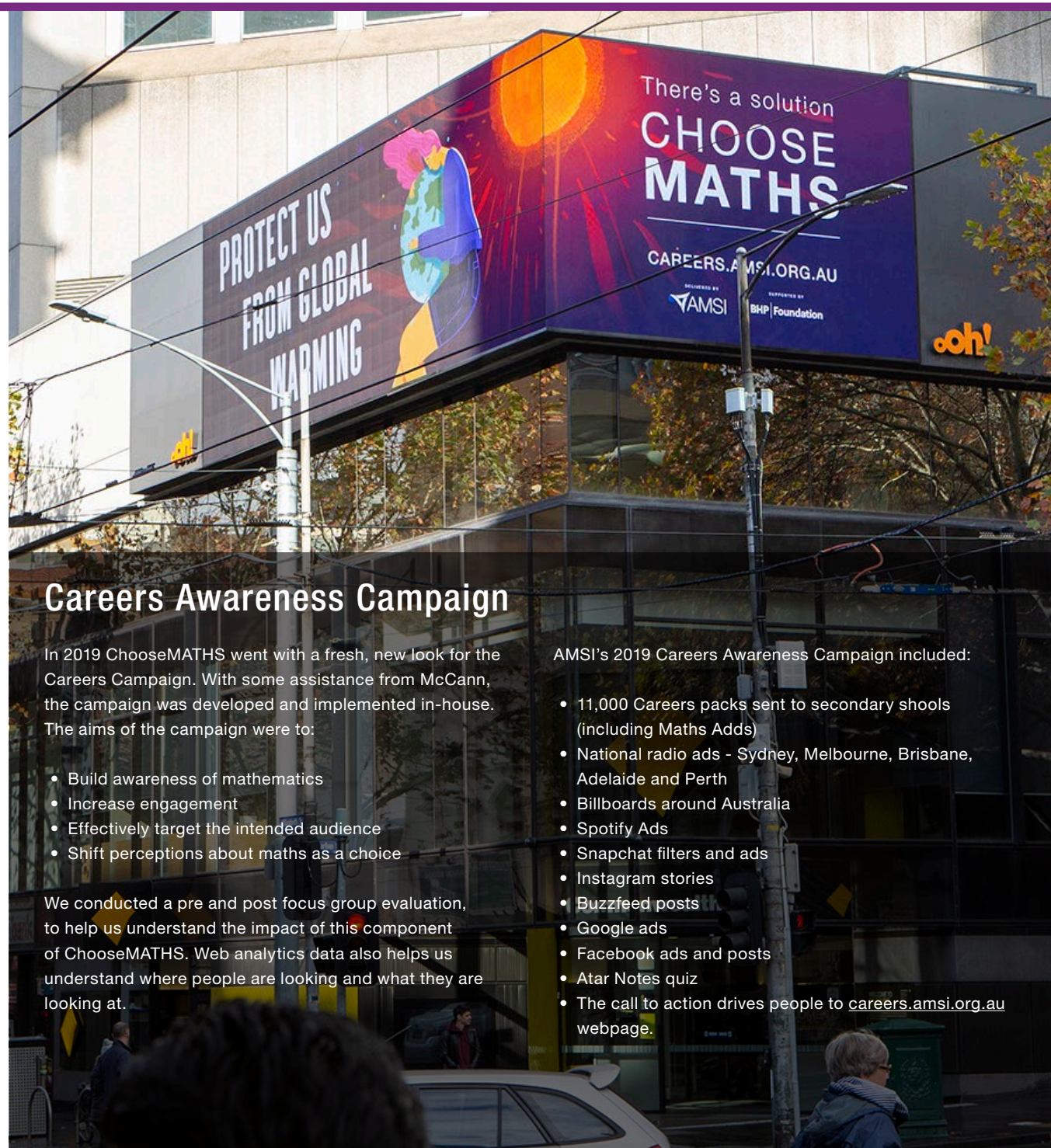
Empower teachers to enhance learning for future generations

Outreach Officers, themselves experts in teaching and learning of mathematics, work directly in schools to support teachers to enhance mathematics knowledge and confidence in the classroom.

Working on-the-ground in over 120 schools across Australia including regional and remote areas, the ChooseMATHS Schools Outreach program has delivered professional development and training support, as well as resources and online tools to transform mathematics learning.

Over 3000 teachers have been engaged in the program, positively impacting thousands of students nationally, predominantly from regional and remote areas.

Our research shows those teachers involved in the Schools Outreach program for more than one year have shown a significant growth in teaching confidence.



Careers Awareness Campaign

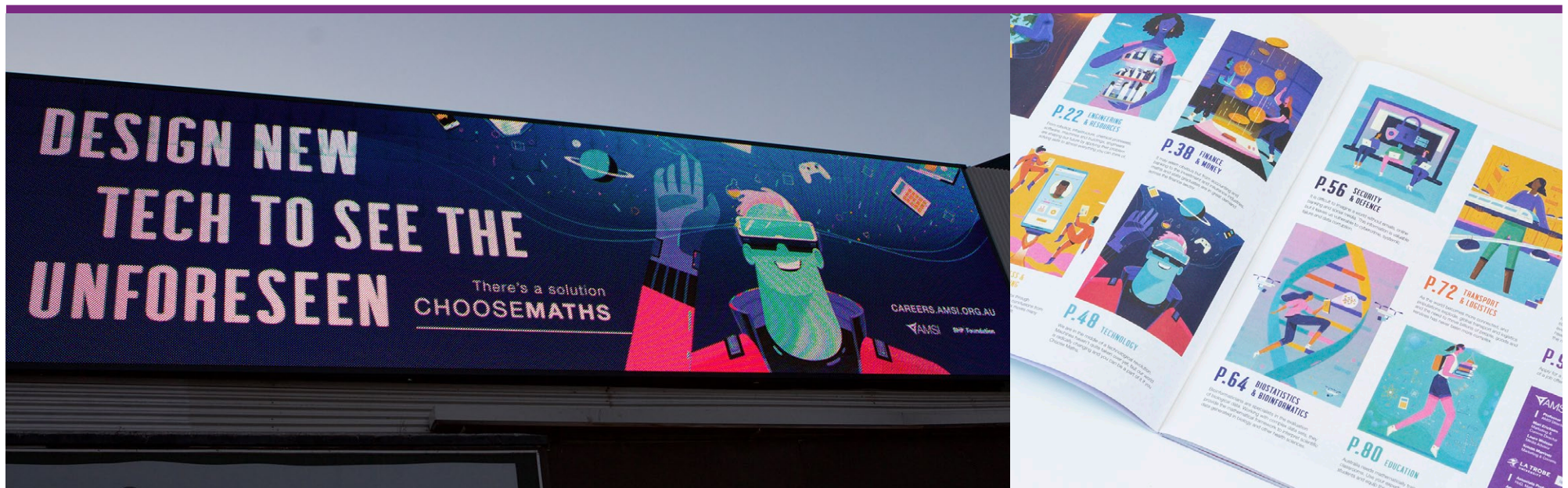
In 2019 ChooseMATHS went with a fresh, new look for the Careers Campaign. With some assistance from McCann, the campaign was developed and implemented in-house. The aims of the campaign were to:

- Build awareness of mathematics
- Increase engagement
- Effectively target the intended audience
- Shift perceptions about maths as a choice

We conducted a pre and post focus group evaluation, to help us understand the impact of this component of ChooseMATHS. Web analytics data also helps us understand where people are looking and what they are looking at.

AMSI's 2019 Careers Awareness Campaign included:

- 11,000 Careers packs sent to secondary schools (including Maths Adds)
- National radio ads - Sydney, Melbourne, Brisbane, Adelaide and Perth
- Billboards around Australia
- Spotify Ads
- Snapchat filters and ads
- Instagram stories
- BuzzFeed posts
- Google ads
- Facebook ads and posts
- Atar Notes quiz
- The call to action drives people to careers.amsi.org.au webpage.



The campaign ran from 16 June to the end of August 2019. The following statistics help give a picture of the audience and the sources of people to our site during the campaign:

- We had 41,005 hits on the careers site
- 90% of these sessions were 'new users'
- We had 36,745 unique users
- The most viewed pages were 'Search Careers', 'Profiles' and 'Poster downloads'
- 48% of our traffic is coming through Google. We ran a large Google Adwords campaign—which looks to be the bulk of the traffic. This also means that people are looking for us by searching for ChooseMATHS or AMSI rather than just clicking through on an ad, confirming we have good brand recognition.
- 87% of users start at the AMSI Careers page
- A great deal of our traffic is coming through Social Media Channels: Snapchat (28%) and Instagram (5%). The Snapchat filter was shared 52,000 times throughout the campaign with 555,000 interactions with the filters. We engaged with 690,000 people through Instagram.
- The ATAR Notes quiz was completed 2000 times

- 12% of our traffic is direct, which means people may have seen billboards, heard radio ads, or picked up Maths Adds at one of the Expos.
- 65% of the audience were female
- The key audiences were in the age-group 35–55 with children aged 12–17 drawing in an estimated 20% of clicks
- 64% of people access the site whilst on their mobile

Focus group data shows that engagement, the power of the message and the brand recognition are strong:

- The Snapchat campaign was memorable in the cohort of school students aged 13 to 17
- Higher maths consideration increased across the two waves of research
- Two thirds of students in the post focus groups recalled the advertising on social channels
- Social media channels were the most effective means of communication to this audience
- There was an increase in the understanding of the role of maths in different careers

- The longer the ChooseMATHS schools had been working with us, the greater the student interest in maths
- The STEM push in the media is influencing maths interest in a positive way
- The general consensus was: in an ideal world you would take maths methods or higher
- The perceived importance of maths increased across all schools between the pre and post focus group sessions
- Awareness of AMSI and of ChooseMATHS increased due to the campaign, though ChooseMATHS was more recognised in this agegroup than AMSI
- The likelihood of choosing higher maths increased across the two phases of research
- Barriers to choosing maths include: perceived difficulty, practical use not understood, teacher skill, stress at Years 11 and 12, they do not enjoy maths
- Summary findings include: AMSI does seem to have a positive influence, it is hard to mitigate the effects of poor teaching, there are strong reasons to study maths and avoidance of maths is largely driven by perceived difficulty of the subject

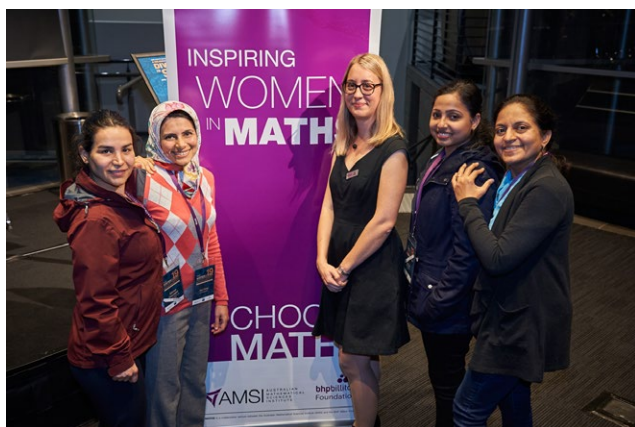
Student Events and Careers Expos

The ChooseMATHS team presented and distributed maths careers information at Careers expos and Conferences to thousands of students, parents and teachers from Sydney to Alice Springs, Townsville to Perth and everywhere in between. There is nothing quite like targeted advice and materials to help considerations at home. In all, 14 Careers expos, five conferences and one AMSI-organised event were attended by ChooseMATHS staff, with many presentations made.

Women in Mathematics Initiatives

Inspiring and supporting a new generation of girls and women through our powerful network of Australian maths leaders, the ChooseMATHS Mentor program links industry professionals and academics with students to strengthen engagement of girls and women in maths.

The program has achieved increased growth and engagement and has been successful in highlighting the many career opportunities available in maths.



ChooseMATHS DAYS

University-based ChooseMATHS Days were held at the following universities: Adelaide, Edith Cowan, La Trobe, Melbourne, Murdoch, QUT, Sydney and University of South Australia. Students were involved in mathematical activities, and had the opportunity to meet and discuss careers issues with academics and industry professionals.

Additionally, four ChooseMATHS Days were held in regional schools.

ChooseMATHS MENTORING

The mentoring program was conducted for young women in 6 states and territories in 2019. A total of 19 groups ran across the year. Though there were struggles, mostly related to technology, the program was well received by mentees and mentors.

Some general comments from mentees included:

"There are technical issues with Zoom, the sound is very bad and the school's internet service is poor." (NSW)

"I love how the program has connected me with people who have similar interests." (VIC)

"It's really inspiring and motivational to see my peers and the mentors express their passions and how going about them has shaped them into who they are today." (VIC)

"I enjoy collaborating with likeminded girls in my year level and seeing all of the job opportunities [there are], some of which I didn't know existed." (SA)

"I really like being able to ask questions about subject selection and the sort of things I need to do in Year 11 and 12, and in university, because I was really confused about it." (WA)

And from mentors:

What did you enjoy most about ChooseMATHS Mentoring?

"Seeing the smiles on the girls' faces when I was able to say something that connected with them." (SA)

"The students were very engaged and helped drive the direction of the discussions. The other mentors in my circle were very organised and had different perspectives on a range of topics (study techniques, for example)." (VIC)

Which aspects worked particularly well in your circle?

"In-person mentoring. Using the themes document to structure the program. Talking about career aspirations." (SA)

"I liked the diversity of experience within our mentor group although some people were only able to attend one or two sessions. Some of the structured sessions were good - around maths careers, reading them things from the career cards that we had been given, talking about resumes etc." (NSW)

Overall, finding a tech solution that is simple, effective and fits within an ethics policy is very difficult when it comes to child protection and creating a nationwide network. It seems that this program will always have to have a separate platform for conducting the sessions, and for communication.

ChooseMATHS GRANTS

In 2019 the ChooseMATHS Project provided \$101,499 in grants to young women to attend AMSI Flagship events.

These grants provided travel and accommodation, registration fees and childcare to enable 132 women to attend events that might have otherwise been out of their reach. At each event, catch up sessions were well attended by recipients, and the feedback about the opportunities offered was overwhelmingly positive.

	2016	2017	2018	2019
Summer School	3	20	16	33
Optimise	Did not exist	2	6	5
Winter School	5	6	2	5
BioInfoSummer	9	12	17	21
Total	17	40	41	64



ChooseMATHS Awards

In total, 40 metropolitan and regional teachers and 80 student teams from around Australia have been honoured since the ChooseMATHS Awards began in 2016.

More than \$308,000 has been awarded to both schools and teachers since the awards program began.

Over 3000 registrations from 2016 to 2019 have resulted in more than 1700 student videos submitted

A CELEBRATION OF ACHIEVEMENT, CREATIVITY AND EXCELLENCE IN SCHOOLS

Attracting over 15,000 student and teacher participants nationally since 2016, the ChooseMATHS Awards have inspired discussion and allowed students to explore real-world applications of maths.

A chance to acknowledge the outstanding contribution of Australia's most engaging, innovative and inspiring maths educators, the teacher awards recognise the power and impact of creative practice and mentorship.

Highlighting achievement, creativity and collaboration, the student awards challenge teams to make short films exploring themes related to maths in the realworld.

Prize money awarded to teachers has allowed them to grow their skills and enthusiasm through professional development and expand their school maths programs to increase engagement.

For more information, visit amsi.org.au/cm-awards

TEACHER AWARDS

The Teacher Excellence Awards recognise commitment and outstanding achievement by maths educators in and beyond the classroom. The 2019 winners were no exception. These ten inspiring, innovative and passionate maths educators receive

\$1000 for themselves as well as \$1000 to help with their school mathematics program.

The awards for Outstanding Primary and Outstanding Secondary Teacher both received prize money of \$10,000 – \$5000 for their own professional development and \$5000 for their school maths program. The Mentoring Girls in Maths Award winner received \$20,000 – \$10,000 to further develop their skills and \$10,000 to support their mathematics program.

OUTSTANDING PRIMARY TEACHER 2019

Ryan Jellie & Elizabeth Dewar - Boneo Primary School, VIC
Ryan and Elizabeth have transformed maths teaching and learning at Boneo Primary School. Concerned about student outcomes, they secured additional budget to establish initiatives to improve maths engagement across the whole school community. They staged a meteor crash in the school's garden, leading to research projects about space, including calculating the size of the meteor. Their students have enjoyed the chance to apply maths across three dinosaur bone dig sites, taking

turns drawing and measuring the fossils. Ryan and Liz have also assisted in the professional development of their colleagues.

OUTSTANDING SECONDARY TEACHER 2019

Deb Woodard-Knight - Walford Anglican School for Girls, SA

Deb has taught mathematics for over three decades. In the last two years, she has transformed the teaching at Walford Anglican School. By encouraging problem solving strategies to open ended maths problems and linking learning to real-world applications, her approaches have increased participation in Specialist Mathematics into university. She has increased careers awareness through her advice on future pathways and STEM related university courses. As well as this, Deb has provided professional development to teachers in MathsCraft and runs professional development sessions.

MENTORING GIRLS IN MATHS AWARD 2019

Louise Puslednik - St Matthews Catholic College, NSW

In just five years, Louise Puslednik has significantly shaped the way mathematics is taught and learnt at St Matthews Catholic College and across the Bathurst region. She has innovated events such as the Engineering, Maths and Science Careers Expo, astronomy nights, and coordinated events during Science Week. She has established a partnership with the University of Sydney Research Mentor Program, giving students a taste of research through projects including investigations into breast cancer detection.

FINALISTS

Chris Niven - Sheldon College, QLD

Chris genuinely loves teaching mathematics and mentoring students and colleagues in and beyond Sheldon College. He has turned his passion into creative maths initiatives, developing programs which support students of all abilities—including MathsX, a Maths Clinic, and the online platform, MC Squared. Chris films his lessons and allows teachers to view the footage. He has also led many professional development



sessions for his faculty and beyond, on topics such as Integration of ICT's in mathematics; What does 'Extension' look like, and Swivl in Mathematics.

Diana Agnew - Naracoorte High School, SA

Diana has spent most of her career working in rural communities, significantly influencing numeracy outcomes within these regional areas. At Naracoorte High School, she has been pivotal in developing mechanisms to deliver student support outside of class. She has instigated lunch-time and after school student help sessions, as well as early morning sessions to allow students additional support. Diana has introduced her school to the RMIT University's Reframing Maths Futures program, increased student engagement, resilience, and understanding in class.

Jess Szalek - Hillsmeade Primary South, VIC

Jess has collaborated with the STEM learning specialist to boost engagement at Hillsmeade Primary School. She formed two lunch-time clubs, STEM GEMS—a girls only club for Year 4 students and the STEM Agency—a club for Year 5/6 students that promotes STEM curriculum areas. She has written songs about the importance of maths goals and established a display corridor to increase visibility of student learning and engagement throughout the school. Jess mentors colleagues in and beyond her school, working to power their confidence and capacity to teach mathematics.

Kate Petchell - Dowerin District High School, WA

Kate is a respected maths curriculum leader at Dowerin District High School. Her approach centres on empowering students with a positive mindset towards maths learning. Kate meets with parents to reinforce opportunities to support learning at home, giving parents greater confidence to support their children's maths development. A lifelong learner, Kate gives up time and resources to continuously improve her mathematics knowledge and teaching practice expertise.

Melinda Golinski - Bunbury Cathedral Grammar School, WA

Melinda has established a number of initiatives to make learning fun at Bunbury Cathedral Grammar School. She has turned the school boat race into a maths challenge by asking students to calculate buoyancy, weight, and drag. Melinda is currently completing a research-based Master's Degree in Science and Mathematics Education, developing a professional learning model to increase female teachers' self-efficacy for STEM education. Melinda believes in the power of personal development for teachers, and coordinated the 2018 South West Primary Teachers Conference.

Samantha Dodras - Churchlands Senior High school, WA

Samatha has successfully rolled out several initiatives at Churchlands Senior High School. These include an after-school maths club - featuring workshops on mathematical modelling, programming, and simulation - and a math lab room. She also trains Mathematical Olympiad teams, collaborates with the school's STEM club and runs Maths Week. Samantha has proposed ideas to improve the Mathematics Curriculum, mentored students to co-write articles for the AAMT journal, and collaborated with Murdoch University to run research on implementation of differentiation in maths classrooms.

Thom Mutton - Daramalan College, ACT

Thom has been engaging Daramalan College students with maths since 1988. He has developed and refined many programmes to boost student involvement, including lunchtime tutorials, senior maths tutors and a maths noticeboard. As well as this, Thom developed competitions such as a Pi Day

recitation, where students compete to recite the digits of Pi, and Dara 7s, where students complete mental computations based on the number 7.

STUDENT AWARDS

This year the theme for the student awards was *MATHS MAKES EVERYTHING POSSIBLE*.

The ChooseMATHS Student Awards encourage students to get creative beyond the classroom and bring their love of maths to life on film. Some of the videos show real world applications of maths and others demonstrate the reasons why our world needs maths.

The top team in each category won \$2000 for their team to share. Every finalist won \$1000 for their team to share.

The panel of judges for 2019 was:

Dr Susan James, ChooseMATHS Careers Awareness & Awards Project Officer

Nagla Jebeile, Deputy Principal, Endeavour Sports High School

Karin Ditchfield, Principal - Mergers & Acquisitions, BHP ChooseMATHS Ambassador

Cass Lowry, ChooseMATHS Schools Outreach Officer

JUNIOR CATEGORY

WINNING TEAM

Team: Time Travellers

Coco Champion, Amacia Mathews, Sophie Shang-Power - Rossmoyne Primary School, WA

Video: Indiana Jones and the Maths Crusade

Join the Dr Jones sisters on their adventurous crusade as they travel through time from the 19th Century to 2019. Along the way they show people how to solve their everyday problems through the power of Maths.



FINALISTS

Team: Team 1

Nethra Chandrasekar, Emma Monroe, Jordan Kay, Andy Tran - Matthew Flinders Anglican College, QLD

Video: Maths Makes Everything Possible...and More!

Did you know our daily activities, events and interactions in life are all made possible by maths? Without maths we would not be able to sleep, exercise or even make pancakes. In this video, students from Mathew Flinders College show everyone how maths makes everything possible.

Team: Downlands Year 6

Claudia Russell, Ellen Cahill, Madeleine Tooley, Annabelle Arnold - Downlands College, QLD

Video: Colour In Our World

Could you imagine a world with no colour in it? Who would have thought that the colours we see are made possible thanks to maths. In this video, the students from Dowlands College colourfully show us that if it wasn't for maths, we would be living in a dull colourless world.

INTERMEDIATE CATEGORY

WINNING TEAM

Team: Danebank Year 9 Group 2

Nadia Elsayed, Adina Tan, Sabina Xie, Aldora Bui - Danebank Anglican School for Girls, NSW

Video: We need to start

Isn't it amazing how many of the beautiful things in our world are

made possible because of maths? In this video, the girls from Danebank Anglican School show us how maths is necessary in order to save our world from global environmental issues.

FINALISTS

Team: 4 Pieces of Pi

Jessica Nipperess, Anthea Kearins, Rikeya Alhovirta, Lara Disher - St Matthews Catholic School - Mudgee, NSW

Video: Maths Of The Mind

Thea is bored in her Maths class and suddenly falls asleep. In her dream state, Thea realises that maths is an important part of her existence. She even begins to change the minds of those who are cynical of maths.

Team: Huddling Penguins

Aditi Seepersad, Alexis Bonelli, Anida D'Agostino, Lauren Daly - Mary MacKillop College, SA

Video: Why Penguins Huddle?

We all love how cute penguins are, but did you know that these cute little birds can also teach us a thing or two about maths? In this video, the students from Mary MacKillop College, show us how penguins use maths in order to huddle and stay warm.



SENIOR CATEGORY

WINNING TEAM

Team: On-Time Productions

Daniel Einhorn, Tabitha Clark, Shayli Harris, Rhys Souza -
Trinity Lutheran College, QLD

Video: Made it

Rhys is running late to meet his friend at the mall because he is stuck in detention. In a race against the clock, Rhys uses Kara, an artificial intelligence super-computer, who uses maths to help him navigate the fastest route to the mall and get him there in time.

FINALISTS

Team: MathYou

Christopher Hamilton, Jack Jones, Lachlan Rehder - Ferny
Grove State High School, QLD

Video: From the Past to the Future - #ChooseMATHS2019

For thousands of years, maths has been one of humanity's greatest tools for innovation. In this video, the team from Ferny Grove State High School show us how maths has helped us achieve what was deemed impossible and is continually helping us to do more than we ever imagined.

Team: Centenary SHS Senior Team

Ishaann Cheema, Sam Muharem, David Dau -
Centenary State High School, QLD

Video: Maths Summed Up

Take a journey back through time to learn how maths has shaped the society we live in today. Starting from the 5th century BC, through to the 19th century, 20th century and beyond—in this video we learn the importance of maths and how it has made everything possible.

Team: Lily, Sasha and Jasmine

Lily Baker, Sasha Hughes, Jasmine Yates -
Margaret River Senior High School, WA

Video: Maths Makes Everything Possible

From the industrial revolution to the information technology revolution, maths has been the centre of the development of



mankind. While we don't know what the future holds, we can be certain that maths will be a fundamental part of it.

Research

ChooseMATHS Gender Researcher, Dr Ning Li, managed the research program in 2019. Surveys of classroom teachers, research lessons involving Years 5 to Year 9 students including pre and post surveys and an extended survey questionnaire of Year 9 and 10 students were conducted. Detailed reports are available on the website [AMSİ.ORG.AU/SCHOOLS](https://amsi.org.au/schools)

Staff list

AMSİ SCHOOLS

Nadia Abdelal Outreach Officer (until December 31 2019)
Jacinta Blencowe Outreach Officer (until December 31 2019)
Anna Bock Outreach Officer
Helen Booth Outreach Officer (until December 31 2019)
Julia Collins Women in Maths Project Officer (until 30 August 2019)
Claire Embregts Executive Assistant to AMSİ Schools Program Manager
Marcus Garrett Outreach Officer
Dr Susan James Outreach Officer (until October 18 2019)
Vicki Kennard Outreach Officer (until December 31 2019)
Dr Ning Li Gender Researcher
Cassandra Lowry Outreach Officer
Kristin Marriner ChooseMATHS, Marketing & Communications Coordinator (until 23 August 2019)
Leanne McMahon Outreach Officer
Lulu Nyirenda ChooseMATHS, Marketing & Communications Coordinator (from 14 August 2019)
Michael O'Connor Schools Outreach Project Manager
Darla Trejo ChooseMATHS, Finance & Admin Officer

Higher Education

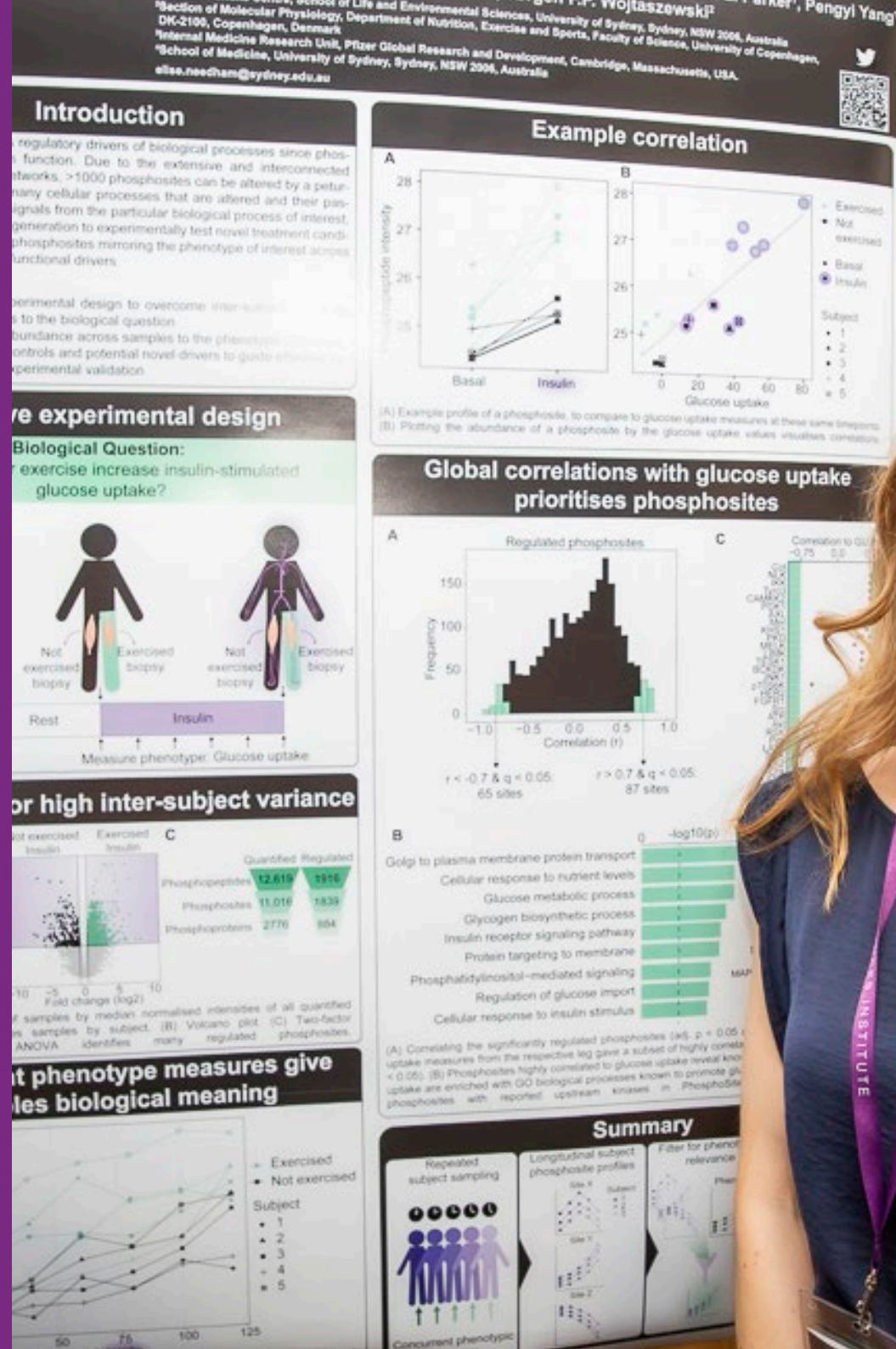
AMSI's Higher Education program enhances the undergraduate and postgraduate experience for students of the mathematical sciences and related disciplines.

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.

Angela Coughlin
Acting National Program Manager
angela.coughlin@amsi.org.au

RHED.AMSI.ORG.AU



KEY STATS

638 2019 Higher Education flagship event attendees

41% of flagship event participants were female

79 students received AMSI Travel Grants

64 women received ChooseMATHS Grants

Empowering students and early career researchers to grow and develop their mathematical skills, the AMSI flagship events continue to demonstrate their relevance and importance in the Australian mathematical sciences landscape. Providing access to world-class lecturers and teachers, these programs provide the opportunity to deepen knowledge, encounter cutting edge research, forge new networks and uncover the wide-ranging impacts of the mathematical sciences in industry and solving real world problems.

Entering the final twelve months of the *Securing Australia's Mathematical Workforce 2016–2020* project, our funding partner, The Department of Education continues to support these events, allowing AMSI to strengthen program outcomes for participants and contribute to its long-term goal of building Australia's mathematical innovation capacity.

Providing a Platform for World-Class Talent

Experts from all areas of the mathematical sciences featured in the 2019 program delivering courses, workshops and public lectures. International guests came from universities including Cambridge University (UK), The University of Augsburg (Germany), University of Strathclyde (UK), Johns Hopkins University (USA), Harvard University (USA), The University of Hong Kong (Hong Kong) and The University of Zurich (Switzerland).

Fifty-five national experts and lecturers were also invited to take part in these programs, delivering specialised courses and seminars that are not always available to students in their day-to-day academic studies and activities.

These events were well attended with 638 students taking part across all flagship events for 2019, demonstrating the demand for cutting edge content in Australia to further enrich their studies.

Supporting Inclusivity and Participation

Currently women account for fewer than 30% of undergraduate and postgraduate enrolments in the mathematical sciences. The ChooseMATHS Grants address financial and social barriers to participation of women at AMSI flagship events by providing travel, accommodation and carer support.

In 2019, AMSI Higher Education recorded its highest number of ChooseMATHS grants, awarding 61 women across all flagship events, assisting them to fully participate in all programs and training, a 64% increase on 2018 figures. Funded by the BHP Foundation through the AMSI ChooseMATHS project, the grants are awarded to recipients selected on a competitive basis by the ChooseMATHS Grant Committee.

Events held by AMSI include a session spotlight on underrepresented groups, including the Aboriginal and Torres Strait Islander (ATSI) and LGBTIQ 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 2019 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, Diversity in STEM event, ChooseMATHS Grant winners networking event, careers session/panels, public lectures, event dinners, lunchtime lectures, poster sessions and student social events. Building networks and being part of a wider mathematical sciences community is particularly important in what can otherwise be an isolating field of study and research for students.

These extras have been very well attended by flagship event participants, 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/) and social media channels.

2019 ChooseMATHS GRANTS BY EVENT

AMSI Summer School – 33 awards

AMSI Winter School – 5 awards

AMSI Optimise – 5 awards

AMSI BioInfoSummer – 21 awards



Higher Education Events

AMSI FLAGSHIP PROGRAMS

AMSI Summer School 2019

7 January – 1 February, The University of New South Wales
SS.AMSI.ORG.AU

Now in its 17th year, the 2019 AMSI Summer School brought together 171 honours and postgraduate students from around the country for an intensive four-week residential program. Under the supervision of Australian mathematical sciences research leaders, students participated in eight intensive courses covering all aspects of mathematical research, from pure and applied mathematics to statistics and cognate quantitative disciplines such as mathematical biology and earth science, incorporating lectures, tutorials and computer labs.

Complementing the academic program were social events ranging from the welcome reception and closing dinner to BBQ lunches, movie nights and virtual reality experiences. Public lecturer Dr Stephen Griffies (Princeton University) drew a crowd of about 120 attendees for his talk *A Maths/Physics View of Ocean Circulation*, focused on some of the mechanisms of ocean circulation and questions confronting ocean scientists today.

AMSI Vacation Research Scholarships 2018–2019

December 2018 – February 2019
VRS.AMSI.ORG.AU

A bumper crop of undergraduate students took part in this year's AMSI Vacation Research Scholarship (VRS) program. From 91 applications, 71 students were awarded scholarships and 68 completed their research projects (three students withdrew due to external circumstances). Mentored by

established researchers at their home universities, the students took on six-week research projects and submitted research reports at the end of the project.

At the end of the summer, students presented their findings at the AMSIConnect student conference at the University of Melbourne. In addition to presenting their work to their peers, students wrote blog posts outlining their research and results, giving them experience in scientific writing for broader audiences.

AMSI Optimise 2019

17–21 June, Curtin University
OPTIMISE.AMSI.ORG.AU

In its third year AMSI Optimise moved to Perth, bringing together academic experts, industry leaders from the natural resources sector and the nation's current postgraduate talent. The event provided a platform to understand industry drivers and foster research collaborations, connecting business with Australia's future workforce.

As in previous years, the first three days of the program had a conference format, while the final two days were workshop-based. A hands-on session with an agricultural focus held on the third day proved popular. Several well-attended networking sessions, including a conference dinner and a welcome reception with an accompanying poster session, were held during the workshop. The 99 participants came from 18 academic organisations including four international universities, as well as from 16 industry organisations. The four Western Australian member universities were particularly well-represented.

Hosted jointly by AMSI and BHP, and well-attended by Optimise delegates and other guests, the Business Breakfast was a highlight of the conference.

AMSI Winter School 2019

1–12 July, Queensland University of Technology
WS.AMSI.ORG.AU

In its 14th year, AMSI Winter School has become an integral part of the events calendar for PhD and postgraduate students, as well as early-career researchers in the mathematical sciences and cognate disciplines. The aim of this program is to introduce students to cutting edge research and methodologies. It does this by drawing upon the knowledge of national and international lecturers at the forefront of their fields and attracts students from all around Australia.



The theme for the 2019 Winter School was Computational Modelling of Heterogeneous Media. The two-week program featured modules on multiscale modelling, computational homogenisation, finite volume, finite element, spectral and meshless methods, Stokes flow, parameter estimation and Krylov subspace methods. Interspersed between classes were a variety of networking activities, workshops and excursions for students to become better acquainted with each other and gain a deeper insight into the topic and its industrial applications.

Hosted at Queensland University of Technology, the event attracted 74 attendees from all around Australia, including four

students from Jimei University in China. The Public Lecture featured Mr Michael Elford, Dr Andrew Stephan and Dr Yunpeng Zhang from Boeing Defence Australia discussing numerical simulation in sheet metal manufacturing processes and its impact on the aerospace industries.

AMSI BioInfoSummer 2019

2–6 December, The University of Sydney
BIS.AMSI.ORG.AU

In 2019, AMSI BioInfoSummer returned to Sydney where 226 students, researchers and professionals from 42 universities and research institutes participated in the five-day program to develop their bioinformatics skills, national networks and employability.

Morning conference presentations were followed by parallel hands-on lab workshops tailored to various discipline backgrounds. The Fast Forward poster presentations proved popular again this year with 27 students and early-career researchers taking up the challenge of sharing their research in under 90 seconds.

Several social events were held to complement the scientific program including a welcome reception, careers evening and an inspiring public lecture on the various applications of statistics by Harvard's Professor Rafael Irizarry which reinforced the power and impact of the mathematical sciences now and into the future.

OTHER EVENTS/PROGRAMS

Advanced Collaborative Environment (ACE) Network Honours and Masters Courses

RESEARCH.AMSI.ORG.AU/ACE

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 and masters programs.

Seventeen honours and masters courses were delivered over the ACE Network in Semesters One and Two, enabling simultaneous student participation across multiple universities.

AMSI thanks the following people for their leadership in 2019: Summer School Directors Associate Guoyin Li and Dr Shane Keating (UNSW), BioInfoSummer Directors Professor Jean Yang and Dr Ellis Patrick (The University of Sydney), Optimise Director Professor Louis Caccetta (Curtin University), Winter School Director Professor Ian Turner (Queensland University of Technology) and ACE Network 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.

SPONSORS

Australian BioCommons, Australian Bioinformatics and Computational Biology Society (ABACBS), Australian Research Council's Centre for Excellence for Mathematical and Statistical Frontiers (ACEMS), Australian Government—Department of Defence, Australian Mathematical Society (AustMS), Australian New Zealand Industrial Applied Mathematicians (ANZIAM), BHP, BHP Foundation through the AMSI ChooseMATHS program, Biarri, Charles Perkins Centre, Children's Medical Research Institute, Commonwealth Bank, Curtin Institute of Computation, Curtin University, Optiver, Perth Convention Bureau, Queensland Cyber Infrastructure Foundation (QCIF), Queensland University of Technology, Statistical Society of Australia (SSA), The University of Queensland, The University of Sydney, The Westmead Institute for Medical Research, University of New South Wales

Research

AMSI Research's internationally recognised scientific workshop program nurtures collaboration and knowledge sharing critical to mathematical discovery.

The Institute sponsored 21 Australian mathematical sciences workshops and conferences held in 2019, with the interdisciplinary impact of the mathematical sciences attracting participants from academia, industry and government.

Angela Coughlin

Acting National Program Manager
angela.coughlin@amsi.org.au

RHED.AMSI.ORG.AU



KEY STATS

21 sponsored workshops held in 2019

More than **900** participants

Approx. **29%** of workshop participants were female

69 sponsored international speakers

33 travel grants awarded via AMSI Member Travel Funds

Workshop Program

AMSI supports collaborations between Australian and international researchers by funding scientific workshops and conferences. 2019 was a strong year for research support, with 69 international speakers at 21 events approved for AMSI funding. Covering topics such as subfactors, physiological rhythms and computational topology, these workshops and conferences highlighted the breadth of research and application within the mathematical sciences in Australia.

AMSI Travel Grants support the accommodation and travel expenses of staff members and students at AMSI Member institutions attending AMSI-sponsored events. In 2019, travel grants were awarded to 33 applicants attending 13 events including workshops and AMSIConnect (the annual conference attended by current AMSI Vacation Research Scholars and their supervisors).

More information

Upcoming workshops list: amsi.org.au/events

AMSI workshop funding:
research.amsi.org.au/workshop-funding

Lecture Tours

2019 Mahler Lecture Tour - Dr Holly Krieger

Occurring biennially, the Mahler Lecture Series invites world-class lecturers to visit universities around Australia, giving a range of lectures and workshops including several public lectures. This tour is a key opportunity for members of the Australian mathematics community and the general public to learn the latest developments in mathematics.

In 2019, Dr Holly Krieger (University of Cambridge) was featured as the Mahler lecturer. Dr Krieger gave a variety of presentations including *Elliptic curves and complex dynamics*; *Transcendence and dynamics* as well as other lectures and workshops in number theory, algebra and topology.

The public lectures on *A tour of the Mandelbrot Set* were the centrepiece of this series, with impressive presentations at The University of Melbourne and The University of Queensland. Attendances of 145 people were recorded in Melbourne and over 100 people in Queensland. Thanks to our partners at AustMS who coordinated this lecture series.

AMSI Research Report

The AMSI Research Report 2018–19 is a comprehensive record of the Institute's research workshops and activities for the year ending in June 2019.

Please refer to the Research Report for detailed information on the individual workshops funded by AMSI until June 2019. All recent reports are available online at amsi.org.au/publications_category/publications/research-reports/.

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 2019.

Research Events

ADVANCED COLLABORATIVE ENVIRONMENT (ACE) NETWORK RESEARCH SEMINARS

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

HEIDELBERG LAUREATE FORUM 2019

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 event, awarding 2019 HLF travel grants to Ellena Moskovsky (Monash University) and Jane Tan (ANU).

2019 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.

For more information, visit www.bamconf.com/

AMSI SPONSORED SCIENTIFIC WORKSHOP PROGRAM 2019

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

To see the details and outcomes of sponsored events up to June 2019, please refer to AMSI's *Research Reports*:

amsi.org.au/publications_category/publications/research-reports/

Topology of Manifolds: Interactions Between High and Low Dimensions

7–18 Jan 2019, MATRIX Institute, Creswick

Attendees: 48

Geometric Evolution Problems and Related Topics

15–18 Jan 2019, The University of Newcastle

Attendees: 27

Asia-Australia Algebra Conference

21–25 Jan 2019, Western Sydney University

Attendees: 111

Australian-German Workshop on Differential Geometry in the Large - Conference

4–8 Feb 2019, MATRIX Institute, Creswick

Attendees: 63

Subfactors in Sydney

4–8 Feb 2019, The University of New South Wales

Attendees: 39

10th International Conference on Matrix-Analytic Methods in Stochastic Models

13–15 Feb 2019, University of Tasmania

Attendees: 45

Dynamics and Number Theory

12–14 June 2019, The University of Sydney

Attendees: 30

Applications of Nonlinear Diffusion Equations 2019

19–21 June 2019, La Trobe University

Attendees: 48

Geometric Analysis and Homogeneous Geometry

24–28 June 2019, The University of Queensland

Attendees: 34

Workshop on Mathematical Billiards

24–27 June 2019, The University of Sydney

Attendees: 19

Data-Informed Mathematical Models of Infectious Diseases

1–12 July 2019, MATRIX Institute, Creswick

Attendees: 23

Workshop for Women in Computational Topology (WinCompTop) 2

1–5 July 2019, Australian National University

Attendees: 42

Flags, Galleries and Reflection Groups

5–9 July 2019, The University of Sydney

Attendees: 56

Challenges in HPC

2–6 Sept 2019, Australian National University

Attendees: 43

Mathematics of Physiological Rhythms

9–13 September 2019, Deakin University

Attendees: 31

Analysis on Manifolds

30 Sept – 4 Oct 2019, The University of Adelaide

Attendees: 30

Optimisation Methods in Wildfire Emergency Management

11 Nov 2019, RMIT University, city campus

Attendees: 41

Workshop on Stochastic and Algebraic Models for Genome Evolution

20 Nov 2019, University of Tasmania

Attendees: 48

Sensitivity Analysis and Uncertainty Quantification Workshop

25–29 Nov 2019, Australian National University

Attendees: 50

Data Science Down Under Workshop

8–12 Dec 2019, The University of Newcastle

Attendees: 53

Finite Geometry: A Workshop in Honour of Tim Penttila

16–17 Dec 2019, The University of Adelaide

Attendees: 32



Research Collaboration - Parks Victoria

Parks Victoria is responsible for managing a diverse estate that covers more than 4 million hectares (about 18 per cent of Victoria) and includes national parks, urban parks, wilderness areas, 75 per cent of Victoria's wetlands 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.

WEED SURVEY IN THE DANDENONG RANGES NATIONAL PARK

Commencing in 2002, weed surveys have been conducted periodically in four management blocks of the Dandenong Ranges National Park—Doongalla, Ferntree Gully, Olinda and Sherbrooke. For the latest survey conducted in 2018, Kally collaborated with Parks Victoria's Environmental Scientist—Flora, Dr Marie Keatley, to plan the survey and produce detailed instructions for the survey work.

The data collected were analysed to determine the current locations of weeds and to assess any changes in the distribution of each weed over the years. The analysis is nearing completion and results will be presented to park managers in due course. This will provide useful information on the management of weeds in the National Park.



Tutsan—an example of an invasive weed that can be found in the Dandenong Ranges National Park (photo source: Lay Geoff 2020 Royal Botanic Gardens CC BY NC SA)



English Ivy—an example of an invasive weed that can be found in the Dandenong Ranges National Park (photo source: Messina, Andre 2020 Royal Botanic Gardens CC BY NC SA)



English Holly—an example of an invasive weed that can be found in the Dandenong Ranges National Park (photo source: Blair Neil 2020 Royal Botanic Gardens CC BY NC SA)

SALLOW WATTLE CONTROL MONITORING PROGRAM IN THE GRAMPIANS NATIONAL PARK

The allocation of State government funding to control Sallow Wattle in the Grampians National Park last year has enabled the continuation of the Sallow Wattle control monitoring program in the park.

Since 2015, experimental plots have been monitored annually with the interim results informing the current management of Sallow Wattle within the park. The fifth round of monitoring occurred in November 2019. Kally analysed the collected data and presented the results to the project team in December 2019. This has influenced decisions about further treatment of this invasive plant. Kally will continue to work with Parks Victoria on this important program.



Sallow Wattle plants seen in one of the experimental plots in the Grampians National Park during the fifth round of monitoring in November 2019 (photo source: Parks Victoria).

AMSI'S APR.INTERN PROGRAM

Parks Victoria is AMSI's long-term APR.Intern industry partner, providing opportunities for postgraduate students to gain industry experience and apply their research skills in projects that arise from real-life situations.

In August 2019, Peter Somerville, a then PhD candidate at the University of Melbourne, was selected to embark on a new internship to document, describe and quantify the economic and other contributions to Victoria made by research conducted under permit in Victoria's parks and reserves.

Peter commenced his internship with Parks Victoria in October 2019 and in late 2019 held a workshop with a group of ecologists and an environmental economist from the university to help find a solution to address the questions raised through this project.

It is hoped that the outcomes from this research will enable Parks Victoria to gain a more comprehensive understanding of the contribution that research makes to the State.

This will hopefully influence resources allocation to ensure effective and efficient delivery of research, and to maximise the contribution of the research to Victoria's parks and reserves and to the broader community.

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



Discussion of the current results from the Grampians Sallow wattle monitoring program on 18 December 2019

Left to right: Annika Spiridis (Environmental Project Coordinator, Halls Gap Office, Parks Victoria), Marie Keatley (Environment Scientist—Flora, Science and Management Effectiveness Branch, Parks Victoria), Kally Yuen (AMSI Statistician) and Brendan Barbetti (Project Manager for the Sallow wattle monitoring program, Southern Ecosystems Management)

APR.Intern

APR.Intern is Australia's only PhD internship program spanning all sectors, disciplines and universities.

The program connects PhD students with industry through short-term research projects, empowering students to thrive in a practical research environment.

For businesses, APR.Intern is a platform to access some of Australia's brightest research minds and tap into new worlds of innovation.

Lisa Farrar

National Program Manager
lisa.farrar@aprintern.org.au

APRINTERN.ORG.AU



In 2019, APR.Intern placed 165 interns with 162 eligible for NRIP rebates, a significant increase from 102 internships placed in 2018, representing 65% growth and demonstrating strong progress.

Much of the growth in 2019 came through new business. The number of industry partners doubled in this reporting period, from 65 in 2018 to 122 in 2019. Of the 122 industry partners, 100 (82%) were new industry partners, that's to say, they had not participated in the APR.Intern program prior to 2019. 75 were new private industry partners, representing 61% of businesses engaged within 2019. This is above the target of 65 new private business partnerships for 2019 and is the second consecutive year this performance deliverable has been exceeded.

APR.Intern continues to assist higher education institutions to build new partnerships with industry, facilitating 165 business-university collaborations in 2019; 136 of these were new collaborations.

Female participation in the program has increased year on year from 22% in 2017, to 44% in 2018 and 50% in 2019. A total of 82 female interns were placed during 2019.

APR.Intern continues to exceed the target for regional internship placements with 24 regional students placed in 2019 (15%), an increase from 9 students (10%) in 2018.

KEY STATS 2019*

165 interns placed from **19** disciplines

122 industry partners across **11** industry sectors

50% interns were female

67% interns were domestic, **33%** were international

* Counting method for internships changed in 2019. 2019 Internships were counted by start date from 01/01/2019 – 04/04/2019 then contract execution date from 05/04/2019 – 31/12/2019.



2019 Highlights

- New industry partner Inventia Life Science Operations placed five internships in 2019.
- Six internships were delivered in 2019 as part of the Victorian Comprehensive Cancer Centre Memorandum of Understanding. Six additional internships planned in 2020
- In Western Australia, five Curtin students took part in internships in 2019, an increase from two in 2017.
- BHP Billiton placed two interns for their Olympic Dam project.
- Five projects delivered through Environmental Protection Authority Victoria.
- Developed relationships with the industry growth centres Food Innovation Australia Ltd, MedTech and Pharma Connect. These collaborations provide additional financial support for eligible businesses undertaking internships as well as cooperative marketing campaigns.
- Seven internships in Tasmania in 2019 (only one previously in 2017), four internships were with University of Tasmania alone.
- The standout university in 2019 was RMIT with 21 internships, followed by Deakin University with 12 internships and University of Technology Sydney with 11 internships.



CUSTOMER SATISFACTION SURVEY RESULTS (2008–2019)

Overall satisfaction with intern program **98%**

Student satisfaction **97%** (225 respondents)

Academic Mentor satisfaction **98%** (221 respondents)

Industry Partner satisfaction **99%** (186 respondents)

53% interns reported internship was first industry experience*

**Affirmative responses to the question: "Was this your first professional experience in the workplace?" were "No, I have previously been a tutor or lecturer in a university" and "Yes, this was my first experience in an industry setting".*

Strategic Partnerships

AMSI continued to develop strategic partnerships with high-level Australian organisations in 2019.

Throughout 2019 a range of important relationships were formed with organisations that allowed APR.intern to connect more deeply with its market. Building on the DST Group agreement, APR.intern established relationships with the Defence Science Centre in Western Australia. These agreements will increase awareness of the NRIP program and provide additional financial support to businesses working in Defence.

The program achieved new agreements with Industry Growth Centres, including, the Advanced Manufacturing Growth centre and Food Innovation Australia Ltd, an industry led not-for-profit focussing on the Australian food and agribusiness industry.

Discussion with the med tech and pharma growth centre, MTPConnect is advanced and should see an important agreement in 2020.

An agreement with the Victorian Comprehensive Cancer Centre to place 6 interns also commenced in 2019.

STEMFest Event

On 5 September 2019, APR.Intern hosted its second women in STEM event, STEMFest: Women Changing Australia 2019. The event was hosted at KPMG Melbourne and live streamed across Australia to maximise engagement with key audiences within industry, government and universities (PhD students and academics) across the country.

The objective of STEMFest was to position APR.Intern as a thought leader in STEM innovation and highlight the program as a solution for workplaces looking to champion STEM diversity. APR.Intern was a congregator of STEM innovation solutions, by putting the spotlight on some of Australia's outstanding women in STEM and bringing together leading businesses such as Flamingo Ai, KPMG, Australian Academy of Science, Toyota and Cochlear to discuss their current STEM strategies.

There was a total of 322 attendees, including 160 webinar viewers and 162 in-person. In-person guests included a significant amount of high-level industry and government representatives compared to APR.Intern's first inaugural Women in the STEM Workforce event in 2018. There was a 76% increase in in-person attendees in 2019 compared to 2018.

Website Engagement: STEMFest 2019 drove 3,695 total page views to the APR.Intern website—a 25% increase compared to that of the 2018 event.



Marketing & Media

Our Marketing, Communications and Multimedia teams are privileged to project Australia's national voice for the mathematical sciences.

Throughout 2019 AMSI continued engaging with audiences via a diverse spectrum of channels promoting innovation by our Schools, Research and Higher Education and APR.Intern programs.

Clint Rodgers - Marketing & Communications Manager
clint.rodgers@amsi.org.au

AMSİ.ORG.AU



Highlights and Key Themes

A professional highlight was AMSI winning Universities Australia's Marketing, Communications and Development Award in the category of Best Marketing Campaign—Smaller Budget recognising the *Open Up Your World* Campaign for APR.Intern.

Key themes and events promoted during 2019 included:

- Promoting Mahler lecture tour: *The Mathematics of Life* by the University of Cambridge's Dr Holly Kreiger
- Promoting AMSI BioInfoSummer lecture by Harvard University's Professor Rafael Irizarry
- Recognising Professor Cheryl Praeger AM as the recipient of the Prime Minister's Prize for Science
- Celebrating awards of ChooseMATHS scholarships through the generosity of the BHP Foundation, inspiring student confidence to study mathematics and pursue tertiary education
- Enhancing diversity in science through STEMfest 2019: *Women Changing Australia*
- Promoting Melbourne's selection as host city for the 2025 International Mathematical Olympiad (IMO)
- Reinforcing mutual benefits of the \$230,000 partnership between the Australian Mathematical Sciences Institute's APR.Intern program and the Defence Science Centre (DSC) Western Australia accelerating the role of STEM PhDs in defence innovation

Brand and Corporate Identity

In accordance with the 2018–20 AMSI Business Plan, branding guidelines continued to evolve throughout the reporting period with new design concepts permeating our communications. Increased brand exposure to key target audiences through programs and advocacy campaigns reinforced AMSI as the leading national voice for the mathematical sciences, though future effort is focused upon in-house generated brand awareness in accordance with revised budgets.

Communications effort emphasised AMSI's role as an entity delivering major national programs with significant government and industry funding such as ChooseMATHS and APR.Intern. The rebrand, launch and rollout of APR.Intern reflected the multi-discipline scope of the program beyond the mathematical sciences.

Mass and Social Media

AMSI's tiered media strategy continued a trend of growing media coverage. A calendar of proactive media communications was delivered securing exposure across multiple media channels generating a combination of national, state and regional media stories. Media management strategies and policies ensured rapid response to media requests without detriment to aligning messaging with key advocacy and policy priorities.

FINANCIAL REVIEW

'Worrying': Fewer girls studying advanced maths than ever



Robert Bolton
Education editor

Mar 7, 2019 - 11.00pm

Save

Share

Figures being released on Friday, International Women's Day, show that only half as many girls are studying advanced maths in year 12 as boys, and the number of girls has slipped further.

In 2017, the latest available figures, only 6.9 per cent of girls took advanced maths for their final-year exam. That compares with 12.2 per cent of boys. The figure for girls is down from 7 per cent in 2016, compared with 7.3 per cent of girls a decade ago.

"A decade ago 7.3 per cent was far too low for Australia's future. But the fact that it has declined even more is worrying and depressing," said the director of the [Australian Mathematical Sciences Institute](#), Professor Tim Brown.



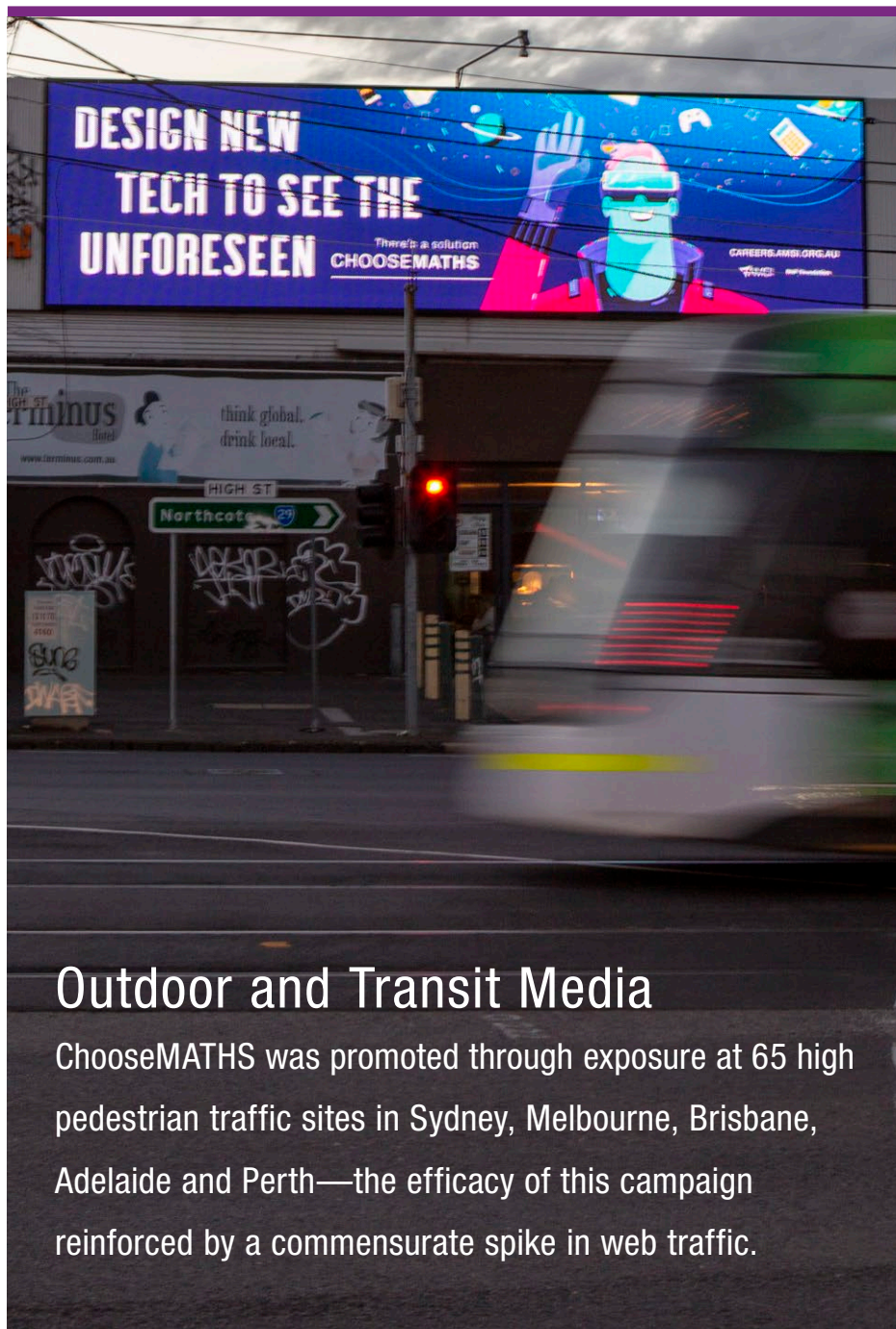
@Discover AMSI
2,264 followers



@Discover AMSI
5,431 follows

@AMSIchoosemaths
1,129 follows

@AMSIschools
421 follows



Outdoor and Transit Media

ChooseMATHS was promoted through exposure at 65 high pedestrian traffic sites in Sydney, Melbourne, Brisbane, Adelaide and Perth—the efficacy of this campaign reinforced by a commensurate spike in web traffic.

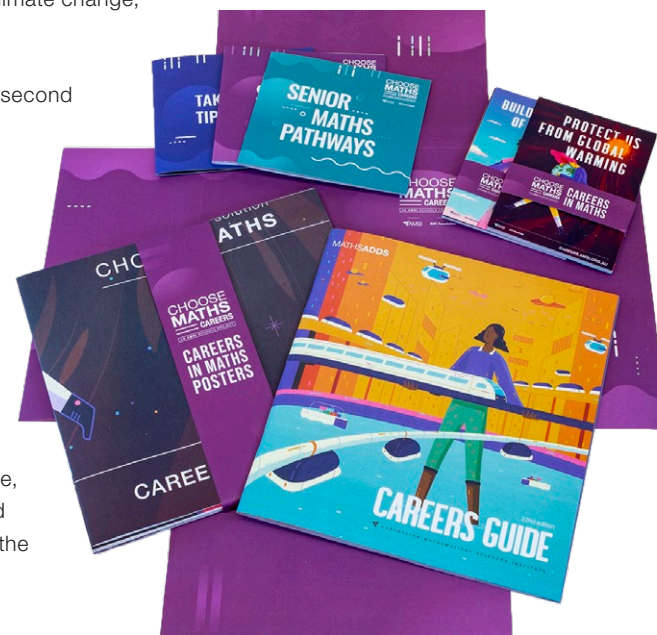
Publications

During 2019 the 22nd edition of *MathsADDS* was published, reinforcing the breadth and attraction of careers requiring expertise in the application of mathematics. This title is distributed to secondary students and careers teachers across Australia. The prologue for this edition was written by high profile secondary school educator Eddie Woo, with astrophysicist and *Stargazing Live* ABC television presenter Professor Lisa Harvey-Smith of the University of New South Wales being one of the year's contributors. Profiled graduates for 2019 include Marita Cheng, founder of Robogals and technology start-up Aubot.

Two editions of AMSI Update magazine were published during 2019.

Edition 8 featured articles on teaching and student issues at regional and remote schools, interviews with Professors Geordie Williamson (SMRI, University of Sydney) and Kate Smith-Miles (outgoing AustMS President), and APR.Intern success stories from both employer and graduate perspectives. Professor Jerzy Filar and Dr Matthew Holden from the University of Queensland presented case studies in Natural Resource Mathematics with a focus on maintaining and managing our natural systems such as fisheries, forestry and biodiversity in the face of habitat destruction, climate change, pollution and over-harvesting.

Edition 9 of *Update* included the second occasional paper on out-of-field teaching and release of joint research with CSIRO Data 61's Ribit.net: *Advancing Australia's Knowledge Economy*. Special coverage of the AMSI Vacation Research Scholarship Program and a research feature on Statistical Astronomy also featured. Interview subjects in this edition included superstar maths teacher Eddie Woo and the, Professor Jacqui Ramagge (Head of Mathematics and Statistics at the University of Sydney).



Social Inclusion and Widening Participation

Launched at APR.Intern's 2019 STEMFest event, the AMSI Women in STEM Pledge is opening opportunities and creating career-changing gateways for women in STEM. Pledgers are asked to post a photo of themselves taking the Pledge on social media accompanied by the hashtag #WiSTEMpledge to encourage campaign awareness. During 2019 over 100 industry and academic change-makers pledged to be part of this diversity solution.

Future Directions

Emerging environmental and economic challenges require a re-think across marketing management processes and supporting AMSI's core program streams. Closer relationships with both mass and specialty media, sharing of material with members and partners, and enhanced international linkages are key marketing objectives for the future.

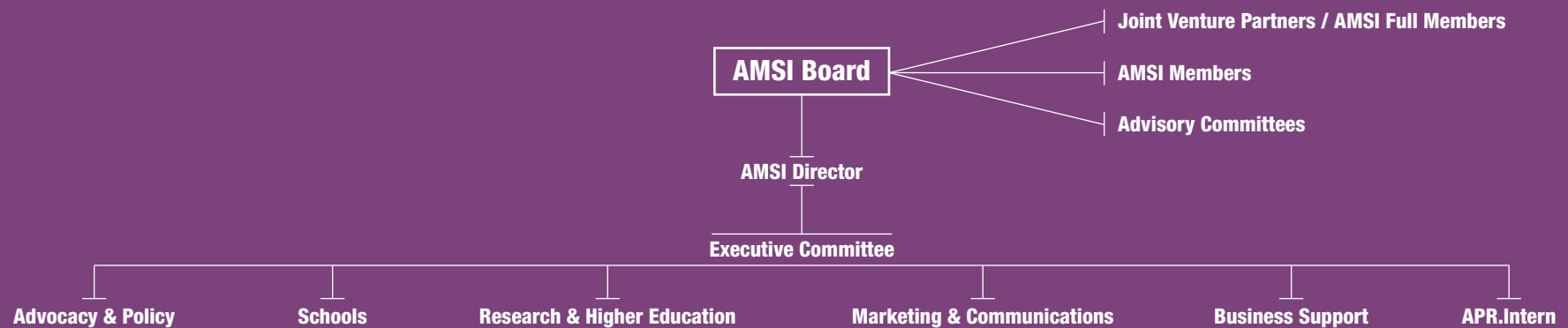
Increased digitisation will result in AMSI's digital channels (including social media) playing a central role in sustaining connection with discrete audience segments. An objective of increasing video content is core to this strategy. Incremental improvements across these channels is intended to raise awareness and interest in AMSI's function, making it a 'go to' source of information, expert commentary and resources across the mathematical sciences.



Governance



Effective Organisation Structure



AMSI's Organisational Structure

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 2019, 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 18 universities, five government agencies and six mathematical and statistical learned societies.

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 page 42).

AMSI's four portfolio areas are:

- Research and higher education
- Advocacy
- Industry engagement
- Schools education

External advice is provided by five 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
- The Institute Director
- The Institute Deputy Director appointed by the full members
- One person representing the lead agent— 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

Board representatives for the full members and associate members serve two-year terms.

We actively seek participation of women and under-represented groups in AMSI, for diversity across all levels promotes the greatest outcomes for all.

Board Meetings

In 2019 scheduled Board meetings were held on the following dates:

Date	Location
Thu 21 February	AMSI
Tue 7 May	Video conference
Fri 16 August	AMSI
Thu 14 November	Video conference

ATTENDANCE:

Dr Ron Sandland (1/1) until February 2019

Dr Adelle Howse (4/4)

Professor Tim Brown (4/4)

Professor Mat Simpson (4/4)

Professor Joseph Grotowski (3/3) until August 2019

Professor Graeme Hocking (2/3)

Dr Mark Lawrence (3/3) until August 2019

Professor Aleks Owczarek (3/4)

Professor Peter Taylor (4/4)

Professor Robyn Owens (2/2) from May 2019

Associate Professor Linda Galligan (4/4)

Anne Baly (2/3) from May 2019

Joe Forbes (3/3) from May 2019

Professor Andrew Peele (3/3) from May 2019

Dr Sue Barrell (2/2) from August 2019

Professor Bishnu Lamichhane (2/2) from August 2019

Committees & Stakeholders

BOARD MEMBERS

Dr Ron Sandland AM *Chair - until February 2019*

Dr Adelle Howse *Chair - Assumed Chair February 2019*

Professor Tim Brown *AMSI Director*

Professor Mat Simpson *AMSI Deputy Director* (Queensland University of Technology)

Professor Aleks Owczarek *Lead Agent Representative* (University of Melbourne)

Professor Peter Taylor *Full Member Representative* (University of Melbourne)

Professor Bishnu Lamichhane *Full Member Representative* (University of Newcastle) - *from August 2019*

Professor Joseph Grotowski *Full Member Representative* (University of Queensland) - *until August 2019*

Associate Professor Linda Galligan *Associate Member Representative* (University of Southern Queensland)

Professor Graeme Hocking, *Associate Member Representative* (Murdoch University)

Professor Robyn Owens *Independent Member* (University of Western Australia) - *from May 2019*

Dr Mark Lawrence *Independent Member* (Mark Lawrence Group) - *until August 2019*

Anne Baly *Independent Member* (PhillipsKPA) - *from May 2019*

Joe Forbes *Independent Member* (Biarri Commercial Mathematics) - *from May 2019*

Professor Andrew Peele *Independent Member* (ANSTO) - *from May 2019*

Dr Sue Barrell *Independent Member* (Science and Technology Australia) - *from August 2019*

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*

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

Professor Scott Sisson *Past President, Statistical Society of Australia*

Professor Phil Broadbridge *Chair, AMSI Scientific Advisory Committee*

Professor Jacqui Ramagge *Australian Mathematical Society - until December 2019*

AMSI RESEARCH & HIGHER EDUCATION COMMITTEE

Professor Mat Simpson *Committee Chair, AMSI Deputy Director*, Queensland University of Technology

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

Professor Tim Brown *AMSI Director*

Dr Nicola Armstrong *BiolInfoSummer Standing Committee representative*, Murdoch University

Professor Nigel Bean *Industry Advisory Committee representative*, University of Adelaide

Dr Phillip Isaac *Winter School Standing Committee representative*, Queensland University of Technology

Professor Aidan Sims *Associate Member representative*, University of Wollongong

Professor Scott Sisson *Full Member representative*, University of New South Wales

Professor Phil Broadbridge, *Chair, AMSI Scientific Advisory Committee*

Professor Andreas Ernst *Optimise Standing Committee representative*, Monash University

Associate Professor Guoyin Li *Summer School Standing Committee representative*, University of New South Wales

Dr Judy-Ann Osborn *ACE Committee representative*, University of Newcastle

Professor Natalie Thamwattana *Australian Mathematical Society representative*, University of Newcastle

AMSI SCIENTIFIC ADVISORY COMMITTEE

Professor Philip Broadbridge *La Trobe University - Chair*

Chloe Pearce *AMSI Research & Higher Education Program Manager, ex officio*

Professor Tim Brown *AMSI Director, ex officio*

Professor Darren Crowdy *Imperial College London*

Professor Ezra Getzler *Northwestern University*

Professor Elizabeth Mansfield *University of Kent*

Professor Terry Tao (UCLA; Clay Mathematics Institute)

Professor Ole Warnaar *University of Queensland*

Professor Mary Myerscough *University of Sydney*

Professor Lesley Ward *University of South Australia*

Professor Andrew Barbour *University of Melbourne*

AMSI INDUSTRY ADVISORY COMMITTEE

Dr Mark Lawrence Mark Lawrence Group - *Chair*

Professor Nigel Bean University of Adelaide

Dr Eileen Doyle FAICD, Company Director

Joe Forbes Biarri Commercial Mathematics

Dr Adelle Howse AMSI Chair / AMSI Deputy Chair

Professor Tim Brown AMSI Director, *ex officio*

Gary Hogan APR.Intern Director, *ex officio*

Janine Sprakel AMSI Schools and ChooseMATHS Program Manager, *ex officio*

Chloe Pearse AMSI Research and Higher Education / Acting Marketing and Communications Manager, *ex officio*

AMSI EDUCATION ADVISORY COMMITTEE

Dr Bob Anderssen CSIRO *Chair*

Dr Amie Albrecht University of South Australia

Dr Mary Coupland University of Technology Sydney

Dr Michael Evans Senior Consultant, AMSI

Janine Sprakel Program Manager, AMSI Schools; ChooseMATHS Program Director, AMSI

Professor Jacqui Ramagge University of Sydney - *until December 2019*

Philip Swedosh King David School

Allason McNamara AAMT

Mike Clapper AMT

Michael Jennings University of Queensland

ChooseMATHS ADVISORY COMMITTEE

Professor Kate Smith-Miles Monash University - *Chair*

Dr Michael Forbes Biarri Commercial Mathematics

Pauline Carter Department of Education and Early Childhood Development

Doreen Thomas University of Melbourne

Bridget McLaughlin Kensington Primary School

Professor Inge Koch Executive Director, ChooseMATHS

Ewan Johnston Office of Chief Scientist Australia - *from June 2018 to July 2019*

Professor Gilah Leder Monash University / La Trobe University

Professor Jennifer Graves AO (Distinguished Professor, La Trobe University

Nagla Jebeile NSW Department of Education - *until October 2018*

Janine Sprakel Program Manager, AMSI Schools; ChooseMATHS Program Director, AMSI

Michael O'Connor Schools Outreach Project Manager, AMSI

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

Jen Dawson Australia Country Program Director, Principal Indigenous Affairs - BHP Australia

Financials

AMSI's financial records are managed and administered by AMSI Finance staff by utilising the accounting policies 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 policies and to confirm the amount of cash reserves held by the University of Melbourne on behalf of AMSI at the end of each financial year.

Our financial performance was within expectation having regard to a number of factors, including:

- Refinements to the APR.Intern Program budget to better reflect operational costs and liabilities; and
- Expenditure deferrals in the ChooseMATHS program, allowing us to extend the program until 31 December 2020.

AMSI's revenue for the year ended 31 December 2019 was \$9,467,095 and comprised:

Membership Income	\$ 1,264,390
SAMW grant from Commonwealth	\$ 507,152
BHP Foundation Grant for ChooseMATHS	\$ 3,400,000
APR.Intern (Commonwealth grant and placement fees)	\$ 3,632,715
Block Grant Funding	\$ 250,004
Publishing and copyright revenue	\$ 146,838
Other Income (consulting, sponsorships and interest)	\$ 265,999
Total Income	\$ 9,467,098

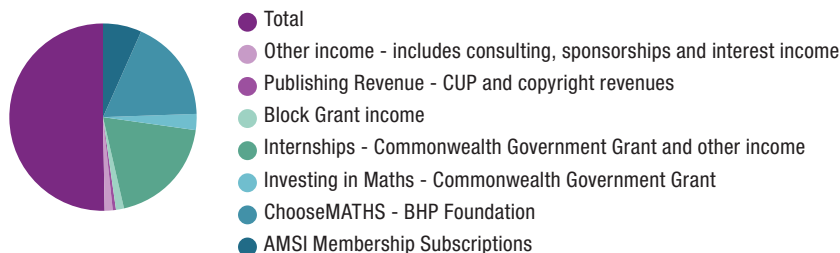
AMSI's expenditure for the year ended 31 December 2019 was \$12,743,969 and comprised:

Directorate	\$ 960,052
Research and Higher Education	\$ 1,549,328
Schools Program including ChooseMATHS	\$ 4,607,857
APR.Intern	\$ 5,626,733
Total Expenses	\$ 12,743,970

AMSI's Funds on hand as at 31 December 2019 was \$3,082,310 and comprised:

Project 003058 - AMSI Core	\$ 844,734
Project 099901 - ChooseMATHS BHP Grant account	\$ 301,631
Project 023324 - APR.Intern Income Commonwealth Grant account	\$ 1,935,945
Total Funds on hand	\$ 3,082,310

Institute Income



Institute Expenditure



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 2019 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 2019 of \$3,082,310 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 2019.

Timothy Brown

Tim Brown
AMSI Director

Rod Birch

Rod Birch
AMSI Institute Finance Manager

Statement of Financial Performance

	2019	2018
	\$	\$
INCOME		
Membership Income		
AMSI Membership Subscriptions	1,264,390	1,011,500
Major Grants		
Investing in Maths - Commonwealth Grant for Higher Education	507,152	497,696
ChooseMATHS - BHP Foundation	3,400,000	2,727,272
Internships - includes Commonwealth Grant and placement fees	3,632,715	594,085
Block Grant funding	250,004	183,169
Publishing Revenue - CUP and copyright revenues	146,838	122,528
Other income - includes consulting, sponsorships and interest income	265,999	237,689
Total Income	9,467,098	5,373,939
EXPENDITURE BY PROGRAM		
Directorate - including Governance and Outreach	960,052	732,187
Research and Higher Education	1,549,328	1,524,514
Schools Education - including the ChooseMATHS Program	4,607,857	4,694,566
Internships	5,626,733	3,638,851
Total Expenditure	12,743,970	10,590,118
OPERATING SURPLUS/(DEFICIT)	(3,276,872)	(5,216,179)
STATEMENT OF FINANCIAL POSITION		
	As at 31 December 2019	As at 31 December 2018
	\$	\$
ASSETS		
Funds on Hand:		
Project 003058 - AMSI Core	844,734	961,568
Project 099901 - ChooseMATHS BHP Foundation Grant	301,631	1,488,243
Project 023324 - Commonwealth Grant for APRIIntern	1,935,945	3,909,371
Project 003059 - Commonwealth Grant for Higher Education Program	0	0
Net Assets	3,082,310	6,359,182
EQUITY		
Retained income brought forward after prior period adjustments	6,359,182	11,575,361
Total Operating Result (Income less expenses)	(3,276,872)	(5,216,179)
Net Equity	3,082,310	6,359,182

Our Staff

Professor Timothy Brown

Director of AMSI

Tim Brown began his directorship of the Australian Mathematical Sciences Institute (AMSI) in 2019 following several years as a Professor of Statistical Data Science at the University of Melbourne. He held positions with LaTrobe University as the Vice-Chancellor (Research) from 2008 to 2013 in addition to two separate Deanships (College of Science 2005 - 2007 and of Faculty of Science 2002 - 2007) at the Australian National University. Tim was Head of the Department of Mathematics and Statistics at the University of Melbourne from 2000 to 2002 and Department of Statistics from 1992 to 1996, with Professorships of Statistics and/or Probability from 1987 at University of Western Australia, University of Melbourne, Australian National University and La Trobe University.

His current role as Director of AMSI involves oversight and management of the Institute as a whole and its programs. He works closely with the Executive to facilitate success of AMSI Program initiatives and goals. As Director, Tim Brown, also works with the funders, stakeholders, the AMSI Board and AMSI Members. Tim Brown operates at the forefront of the AMSI philosophy to champion the mathematical sciences across Australia and further establish its standing as an integral driver of change and development for all.

Janine McIntosh

Program Manager, AMSI Schools, ChooseMATHS Program Director

Janine Sprakel (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.

From 2015 to 2020 Janine has led the ChooseMATHS Project as Project Director; a \$22M program including Awards, Mentoring, Outreach and a national Careers Awareness Campaign. 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.

Chloe Pearse

Program Manager, Research & Higher Education

Acting Marketing & Communications Manager (Nov 2019 – Feb 2020)

Chloe Pearse 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. In November 2019, Chloe took up the role of acting Marketing and Communications Manager, working across two locations and teams.

Professor Gary Hogan, AM, CSC

Director, APR.Intern

Gary Hogan 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. He spent more than 30 years in the Australian Defence Force—retiring with the rank of Brigadier. 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. 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

Strategic Development Leader, APR.Intern

Cate Ballard was appointed as Apr.Intern's Strategic Development Lead in December 2019. Prior to this role Cate held the position as the National Program Manager for APR.Intern and managed the program since 2011.

Glen Sheldon

Deputy National Program Manager, APR.Intern

Acting National Program Manager, APR.Intern (Nov 2019 – Mar 2020)

Glen Sheldon is the Deputy National Program Manager/Acting National Program Manager for APR.Intern, responsible for the strategic direction and operational management of the 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.

Mari Ericksen

Marketing & Communications Manager (until Nov 2019)

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

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

Nathan Smith Executive Assistant to the Director (from July 2019)
Kirsten Doert Executive Officer (until August, 2019)
Gayani Gunawardana Administration & Finance Assistant
Jenny Weng Finance Officer
Maaïke Wienk ACE Coordinator/Finance Officer

MARKETING & COMMUNICATIONS

Paul Murphy Art Director, Designer Manager (until Dec 2019)
Lulu Nyirenda Event & Marketing Coordinator (from Aug 2019)
Victoria Ong Junior Designer (until Dec 2019)
Michael Shaw Art Director, Multimedia Manager
Agnes Tam Digital Designer
Melissa Trudinger Publications Officer
Laura Watson Media Advisor
Dinusha Withanage Web Developer & Data Analytics Officer

APR. INTERN

Jiamin Aw Business Development Officer (until Dec 2019)
David Beecham Business Development Officer (SA)
Margo Brown Senior Program Coordinator
Edwina Buckle Business Development Officer (until 2019)
Laura Carmichael CRM Reporting & Analytics Coordinator
Maria Galanis Business Development Officer
Rachel Geddes Business Development Officer (until Dec 2019)
Fan Gunawan Finance Officer, APR. Intern
Sophie Kennedy Administrative Assistant
Zak Blaney Administrative Assistant (from Nov 2019)
Michael Koczyrkewycz Business Development Officer (JCU, QLD)
Rachel Misitano Marketing & Communications Coordinator (until Nov 2019)
Alex Mullany Administrative Assistant
Anne Nuguid Program Consultant (until Apr 2019)
Mark Ovens Business Development Officer (NSW)
Johanna Piltz Marketing & Communications Assistant (until Nov 2019)
Marketing & Communications Coordinator (from Nov 2019)
Gaye Richman Executive Assistant APR. Intern (until Oct 2019)
Kimberley Riskas Business Development Officer (until Mar 2019)
Joanna Steinle Administrative Assistant (until Jul 2019)
Susan Sobotzick Business Development Officer (JCU, QLD)

PARKS VICTORIA (Detached staff)

Dr Kally Yuen Statistician

RESEARCH & HIGHER EDUCATION

Angela Coughlin Project Coordinator
Francesca Hoban Ryan Administrative Assistant
Anna Muscara Project Coordinator
Liam Williamson Administrative Assistance

AMSI SCHOOLS

Nadia Abdelal Outreach Officer (until Dec 2019)
Jacinta Blencowe Outreach Officer (until Dec 2019)
Anna Bock Outreach Officer
Helen Booth Outreach Officer (until Dec 2019)
Julia Collins Women in Maths Project Officer (until Aug 2019)
Claire Embregts Executive Assistant to AMSI Schools Program Manager & ChooseMATHS Executive Director
Marcus Garrett Outreach Officer
Dr Susan James Outreach Officer (until Oct 2019)
Vicki Kennard Outreach Officer (until Dec 2019)
Ning Li Gender Researcher
Cassandra Lowry Outreach Officer
Kristin Marriner ChooseMATHS, Marketing & Communications Coordinator (until Aug 2019)
Leanne McMahon Outreach Officer
Michael O'Connor Schools Outreach Project Manager
Darla Trejo ChooseMATHS, Finance & Admin Officer



AMSI.ORG.AU

t: +61 3 8344 1777 | e: enquiries@amsi.org.au

Australian Mathematical Sciences Institute

Building 161, c/- The University of Melbourne Victoria 3010 Australia