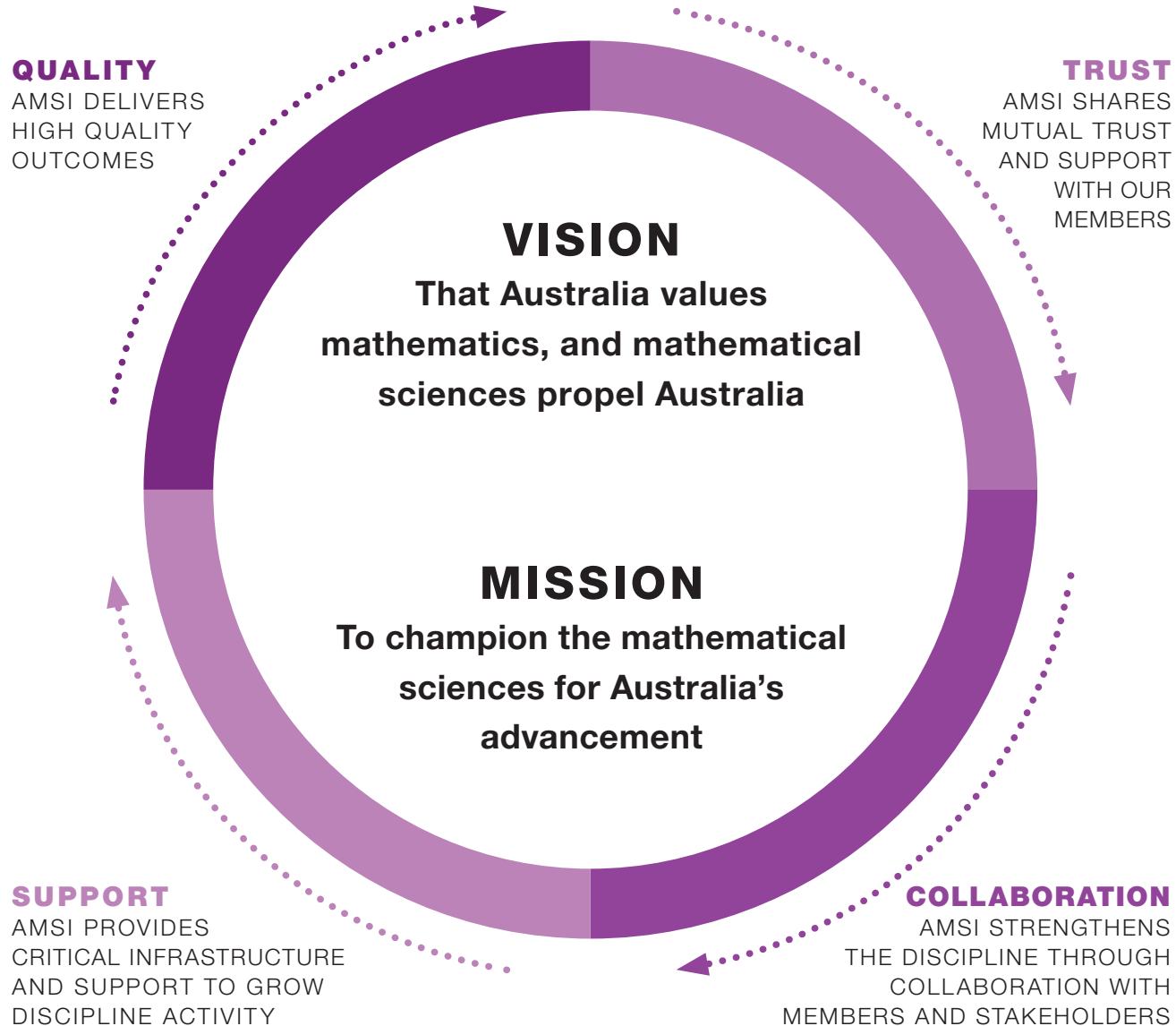




ANNUAL REPORT **2020**

Our Vision & Mission



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AMSI Members

Full Members



Associate Members



Government Agencies



Societies



From the Chair

It remains an honour to serve as Chair of AMSI, which continues to deliver outstanding programs, advocacy and collaboration for the benefit of the mathematical sciences community in Australia. The past 12 months have been witness to ongoing change for AMSI. However, what remains constant is the overwhelming support and loyalty from the AMSI alumni, members and sponsors who continue to provide much valued support for AMSI.

A special thanks goes to Professor Asha Rao for taking on the role as Interim Director at a very critical time for AMSI, to Leanne Taylor, Interim COO of AMSI, and to Professor Mat Simpson, former Deputy Director of AMSI. Despite working remotely, a most wonderful team environment was established as we joined forces to fill the void left after the departure of Professor Tim Brown when he stepped down as AMSI Director.

The AMSI Board remains grateful to its many supporters and stakeholders. Our thanks goes to the BHP Foundation, a bold sponsor of the ChooseMATHS program, which has achieved significant milestones to be both celebrated and built on as we plan future ChooseMATHS endeavours. We are thankful for the ongoing partnership with the Department of Education, Skills and Employment (DESE) that supports our very important and renowned Higher Education programs via the *Securing Australia's Mathematical Workforce (SAMW)* grant and we look forward to a continued partnership with DESE going forward.

The year included important nation-building milestones for the APR.Intern program. The support we have received from DESE in the COVID-19 environment has seen truly amazing results from this program, which continues to achieve outstanding awards and recognition, contributing significantly to innovation and jobs across Australia.

Our operating environment is facilitated by the University of Melbourne and AMSI is grateful for their continued support as both a Joint Venture Partner and for providing the Lead Agency role.

My thanks go to all the staff of AMSI, for their contributions, innovation and loyalty during the year. Despite the added challenges of a lockdown environment, so many goals have been achieved and AMSI programs have continued to excel even in remote control. In this challenging context, AMSI has continued to produce high quality reports and contribute to important policy matters. I would like to mention how much I have enjoyed working with the AMSI team, including Lisa Farrar and Dr Maaïke Wienk and it was a pleasure to welcome Professor Tim Marchant as AMSI Director in January 2021. The leadership for AMSI is now in a very strong position and can build on the strong foundations and reputation that exist to ensure a bright future for AMSI.

Finally, thanks to my colleagues on the AMSI Board, its supporting committees, and to the AMSI members for their continued support and mentorship of AMSI.

Adelle Howse
June 2021





From the Director

From the Interim Director 2020

I am honoured to have been able to serve AMSI and the Australian mathematical sciences community as Interim Director from August to December 2020. I am very grateful to Dr Adelle Howse, AMSI Chair, and Leanne Taylor, Interim COO of AMSI, for the support I received during my directorship.

In mid-2020, I was approached to step in as Interim Director, while the search began for a full-time Director to replace Professor Tim Brown, who had recently stepped down. I commenced the role part-time with some trepidation, as the pandemic was in full swing and the role would need to be completed online. My substantive role as Associate Dean, Mathematical Sciences at RMIT University was also demanding for similar reasons; teaching, supervision and research, all pivoting to remote arrangements.

The year presented some challenges for AMSI, with several large grants coming to an end, including ChooseMATHS, APR.Intern and Research & Higher Education. But hope does spring strong, and the first goal was reached when Research & Higher Education's *Securing Australia's Mathematical Workforce (SAMW)* grant was extended for another year, due to the hard work and stewardship of Adelle and AMSI's Deputy Director at the time, Professor Mat Simpson. Then came the welcome news that APR.Intern was rapidly picking up speed, and every month new internship targets were achieved.

I learnt many things during my term as Interim Director. I tapped into new networks, such as MATRIX and SMRI, negotiated with Government departments, and became one of the Independent Reviewers for VCAA Maths. This latter role enabled me to reach out to the many maths teachers I know and seek their views.

I am very pleased that Leanne, Adelle and I were able to work collaboratively to secure the future of AMSI, with wonderful support from Lisa Farrar, APR.Intern's National Program Manager, and Dr Maaïke Wienk, AMSI's Finance, Advocacy and Policy Manager, who commenced the shared role of Acting COO in January 2021.

I wish to thank the staff of AMSI, who worked incredibly hard throughout the year and were supportive of my role, even as many of them secured new jobs outside of AMSI as the year came to an end. It was a pleasure to hand over to AMSI's new Director, Professor Tim Marchant, in January 2021.

As AMSI's RMIT Joint Venture Partner representative, I continue to enjoy supporting Tim and AMSI to kick new goals and strengthen the advocacy for mathematics in Australia.

A handwritten signature in black ink, reading 'Asha Rao' in a cursive style.

Professor Asha Rao
August 2021

Introducing our new Director

I commenced my role as AMSI Director in January 2021. I have found it a great pleasure to re-engage with my colleagues in the mathematical sciences, after my university management roles.

During 2020, Professor Tim Brown resigned as AMSI Director, and Professor Asha Rao undertook the role as Interim Director. I wish to acknowledge and thank both Tim and Asha for their leadership and contributions to AMSI. I am pleased that both Tim, via his role on the AMSI Advisory Panel, and Asha, via her role as a Joint Venture Partner representative, continue to provide support and sage advice on AMSI matters. I wish to thank the Chair of the board, Dr Adelle Howse, for her strong and sustained commitment to AMSI. Her leadership and support during 2020 was critical in guiding AMSI during this period of leadership transition. I am also grateful for the support of our members, from the university sector, government and the professional societies.

AMSI is a national voice for the mathematical sciences and offers major programs across the mathematical pipeline of school education, higher education and research and industry to increase the capacity of Australia's mathematical workforce, which is so critical for our future prosperity. These programs also play an important role in improving the diversity of our student and workforce populations, with key targets to increase female and First Nations participation in the mathematical sciences.

In 2020, AMSI, like all sectors of the Australian economy, was heavily impacted by the COVID-19 pandemic. AMSI has pivoted its response to the changed circumstances, and I am very grateful to AMSI staff, members and the Board for their significant efforts. In particular, I wish to acknowledge AMSI staff, in continuing to provide strong member support and services, during a period in which they have been impacted by extended lockdown periods. AMSI's programs have been modified and adapted to

the changed circumstances of 2020, with some outstanding outcomes, such as increased enrolments in our Higher Education events and increased numbers of APR.Intern placements.

Major Higher Education programs were held during 2020, including the AMSI Summer School (La Trobe), AMSI Vacation Research Scholarships, ACE Network and BioInfoSummer (ANU). Particular thanks go to the AMSI Research & Higher Education team and the organisers of BioInfoSummer for transitioning the event online. All the events were a great success, with students participating from an increased number of universities. AMSI continued to support research workshops, with five held in person and five online.

In 2020, AMSI's Higher Education grant, *Securing Australia's Mathematical Workforce (SAMW)*, was due to expire. Thanks go to Adelle and AMSI's former Deputy Director, Professor Mat Simpson, for their government negotiations, which secured a one-year grant extension. Mat was appointed as AMSI's Deputy Director from 2019–2021 and was primarily responsible for strategic direction of mathematical research activity within AMSI's governance and business planning frameworks—I thank Mat for his leadership, guidance and significant contribution to AMSI during this time.

During 2020, the APR.Intern program also enjoyed outstanding success, placing over 150 PhD students into industry internships. The program transitioned to online arrangements in March, which led to increases in student applications and allowed the program to continue during lockdown. In October, the government rebate was increased to 90 per cent, again causing a large increase in demand for internships. The AMSI Schools ChooseMATHS project also moved away from outreach visits to online support for teachers, parents and students via materials on the Calculate



website and the increasingly popular MathsTalk podcast.

In 2020, AMSI worked with the Office of the Chief Scientist to produce the joint report '*Mapping University Prerequisites in Australia*', which analyses university mathematics and science prerequisites for domestic undergraduate courses. It also submitted a response to the ARC Engagement & Impact Assessment Consultation Paper jointly with the AustMS and ACEMS.

In 2021, AMSI is focused on sourcing new funding for its Schools, Research & Higher Education and industry programs, and delivering excellent value to its members.

A handwritten signature in black ink that reads "J. R. Marchant". The signature is written in a cursive, slightly slanted style.

Professor Tim Marchant
August 2021

Policy & Advocacy

As the central voice for Australia's mathematical sciences, AMSI actively enters the national debate to advocate for critical reform across the mathematics pipeline.

This spans schools and higher education, research, training and funding to industry collaboration and innovation to increase capacity and engagement.

Dr Maaike Wienk—Finance, Advocacy & Policy Manager
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AMSI.ORG.AU



Discipline Profile

The State of Mathematical Sciences 2020: 7th discipline profile of mathematics and statistics in Australia

The State of Mathematical Sciences 2020 is the seventh edition of AMSI's periodic discipline profile for mathematics and statistics, providing a detailed snapshot of the condition of the mathematical sciences at all stages of the continuum—from the classroom and higher education through to research and development, workforce utilisation and innovation by commerce and industry. This publication brings together diverse information from many sources, complemented by AMSI research and the latest data from the 2018 PISA survey of academic performance in secondary schools. This edition also includes data on university prerequisites and the mathematical workforce.

Print copies of the report have been distributed under a cover letter from the AMSI Director to every Education Minister, Science Minister, Vice-Chancellor, Dean of Science, Federal Parliamentarian, Education departmental secretary, selected education journalists and other stakeholders.

Report: amsi.org.au/7th-discipline-profile-2020

Year 12 Participation in Intermediate & Higher Mathematics

AMSI has collected data on participation in mathematics subjects in Year 12 for many years. The data collection continues to show that the proportion of Year 12 students taking more advanced, calculus-based levels of mathematics as their 'highest' maths subject has been in long-standing decline.

Data: amsi.org.au/year12-participation-2008-19

Strategy and Policy

During the course of 2020, AMSI reset its strategic goals and redefined its core values to guide its activities in the coming years. To align with this long-term vision for Australia, AMSI published the policy document *Mathematical Sciences: foundation for Australia's future — policy priorities realising AMSI's long-term strategic goals*. AMSI proposes immediate action in three areas of priority in line with AMSI's long-term strategic goals for the mathematical sciences in Australia:

- Equity and diversity
- Mathematical education
- Industry engagement in university teaching and research

These priority areas inform AMSI's current advocacy for the mathematical sciences and add to its ongoing programs to support mathematical research and education in schools and at universities.

Policy Document: amsi.org.au/foundation-for-australias-future

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**

University Prerequisites

The paper, *Mapping University Prerequisites in Australia*, is a joint report with the Office of the Chief Scientist that analyses university mathematics and science prerequisites for domestic undergraduate courses in the disciplines of Architecture, Computer Science, Economics and Commerce, Education, Engineering, Health and Medical Science, and Science.



Paper: amsi.org.au/au-university-prerequisites

Submissions

AMSI represents the mathematical sciences through submission of responses to national issues, papers and reviews.

2020 Policy Submissions

A joint response to the ARC Review of Excellence in Research for Australia (ERA) and the Engagement and Impact Assessment (EI) with the Australian Mathematical Society (AustMS), and the Statistical Society of Australia (SSA) was made in 2020.

This submission in collaboration with the AustMS and the SSA sets out observations and recommendations for the ERA and EI after consultation with academic research staff in the mathematical sciences.

Submission: amsi.org.au/amsi-austms-ssa-era-review.pdf

Schools

The AMSI Schools program delivers a range of initiatives that support and strengthen mathematics teaching in schools including resources and training for teachers, students and parents.

The work of the AMSI Schools team has gone a long way to transform the conversation regarding the teaching and learning of mathematics. Students, teachers, parents and the public are now more confidently navigating the world of mathematics, seeing the value mathematics brings to their lives.

Leanne McMahon

Schools Outreach Officer—ChooseMATHS

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



ChooseMATHS

Since 2015, AMSI Schools' flagship project has been the BHP Foundation-supported ChooseMATHS initiative. This project was built on AMSI's vast experience developing outreach programs for schools, aiming to empower students, particularly girls and young women, to pursue careers in mathematics, enhance teacher knowledge and confidence in mathematics, and grow the understanding of the importance of mathematics in the minds of the public.

ChooseMATHS was originally a five-year collaboration between AMSI and the BHP Foundation. However, the need to continue the work was considered vital. In 2020, the AMSI Schools team maintained ChooseMATHS on a reduced program of activities with a smaller staff. Despite COVID-19 challenges, the team delivered a successful hybrid program of in-school and online support for teachers, students and parents. These resources were made available through the popular AMSI Schools 'Calculate' website, calculate.org.au.

The Calculate website recorded incredible 88 per cent traffic growth in 2020 from 2019, reaching 1.3 million visitors.

School Visits & Professional Learning Post COVID-19

Due to restrictions, school visits were replaced with a suite of online resources developed by the ChooseMATHS Outreach team, including:

- Planning materials and lesson plan support
- Classroom games and activities — also appropriate for home
- Curriculum resources
- Student learning modules
- Teacher content models
- Podcasts dedicated to home learning
- Online professional learning modules and courses for teachers
- Online staff meetings
- Online leadership advice
- Online support for graduate and early-career teachers
- Planning for online or hybrid learning

KEY STATS — ChooseMATHS IMPACT (2015–2020)

2400+ school visit days at **120** schools across Australia

358 professional development days attended by **6384** teachers

46 ChooseMATHS Family Nights held

70 Careers events attended or hosted as part of the ChooseMATHS Careers Awareness campaign

27 ChooseMATHS Days organised at schools and university locations

3 ChooseMATHS Games Days held in schools

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

162 ChooseMATHS grants awarded

168 teacher nominations and **1726** student team videos submitted for the ChooseMATHS Awards

Delivery of hybrid in-school/online resources for teachers and students post-COVID-19

MathsTalk Podcast

The AMSI Schools MathsTalk podcast was scaled in 2020, with the team releasing 18 new episodes — up from five episodes in 2019. It remains the only podcast dedicated to the teaching and learning of mathematics in Australia and has extended the reach of AMSI Schools beyond participating schools to the wider education community nationally and internationally. In 2020, the podcast received more than 8500 downloads and is anticipated to continue in 2021.

2020 PODCAST EPISODES

FEB	Starting the year in maths Part 1 – What maths classrooms need Part 2 – What makes a good maths lesson?	AUG	Misconceptions in geometry Geometry and reasoning Twitter for maths education
MAR	Pi day special – Making maths real	OCT	Talking geometry with Mike Clapper
APR	Maths at home – For parents & teachers Using maths games & activities during home learning Tips and tricks compilation	NOV	The equals sign Fluency in mathematics
MAY	Listening to students' voices in mathematics	DEC	MAV virtual conference preview MAV conference roundup
JUN	Developing number sense in young children Keep calm & remain critical with Dr Catherine Attard		Addition

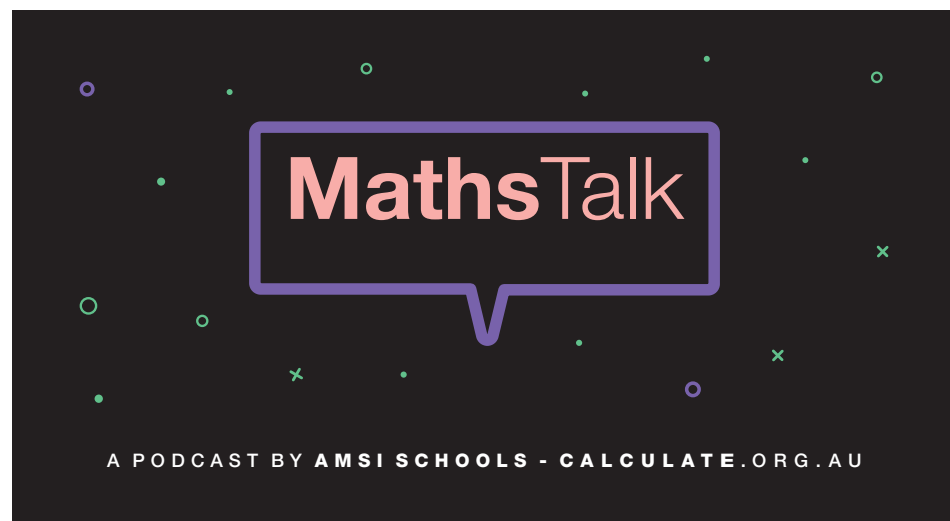
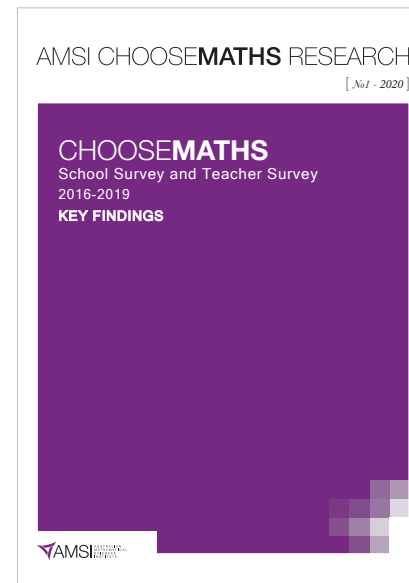
Research

ChooseMATHS Gender Researcher Dr Ning Li managed the research program in 2020.

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 and analysed. Detailed reports are available on the website amsi.org.au/schools.

Key findings from the ChooseMATHS research:

- While the majority of school mathematics teachers are female, and male teachers are less experienced and remain in the profession for a shorter time, a significantly higher percentage of males were teaching the most senior classes in both primary and secondary schools.
- A significant minority of teachers say that their degrees did not adequately prepare them for the mathematics they are teaching.
- Out-of-field teachers are less confident and less likely to report that they teach mathematics well than teachers with a major or minor in the subject.
- Teachers require professional learning in the development and use of assessment data to support teaching.
- Almost every principal reported that the ChooseMATHS project and work with the Outreach Officers increased teacher confidence in mathematics teaching.



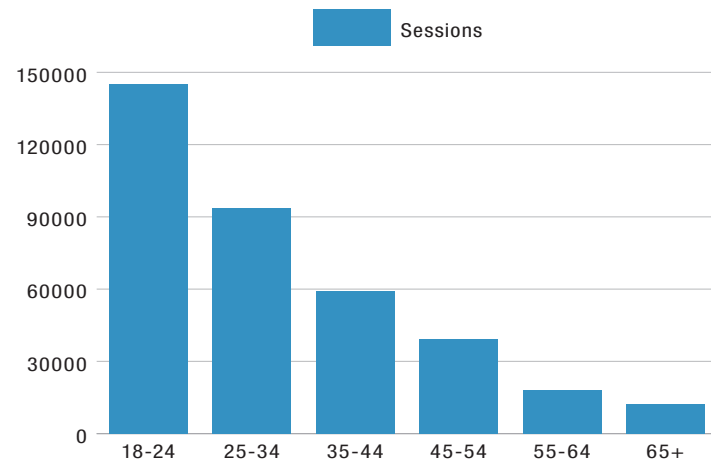
Teacher Resources

Outside the ChooseMATHS project, AMSI Schools has developed a sizeable collection of teacher resources and modules with support from various funding partners. These resources continue to support teachers from Foundation to Year 12 with free mathematics materials.

The AMSI Schools and Calculate websites also 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.

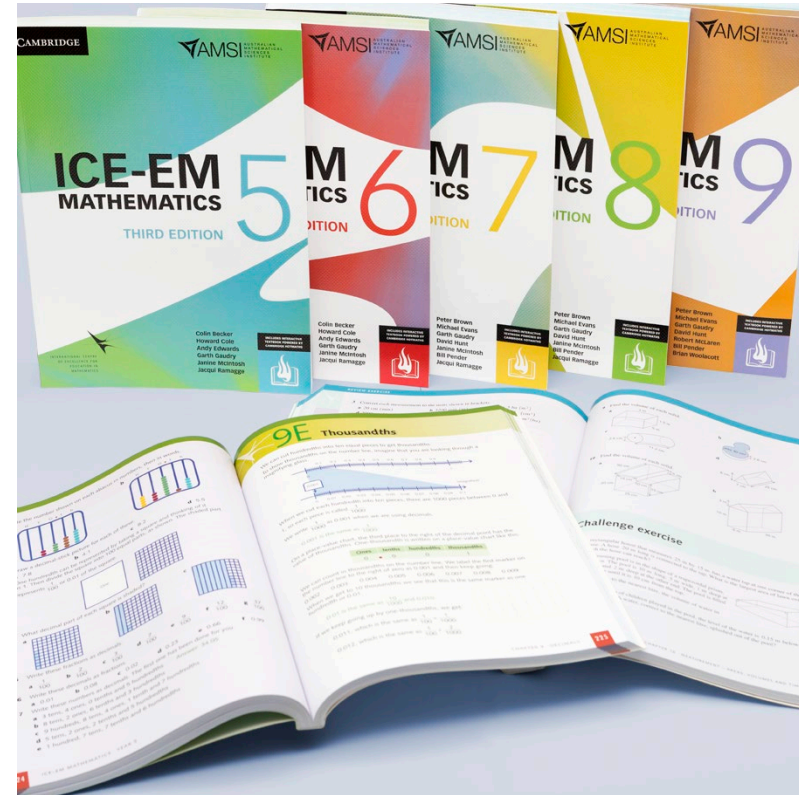
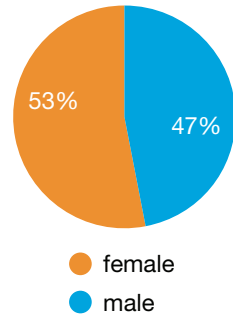
Nationally and internationally popular, AMSI's teacher resources continue to be the most visited part of any AMSI website. In 2020, the majority of Calculate users were female and aged between 18–24 and 25–34.

Calculate users in 2020 — Age groupings



Source: Google Analytics for calculate.org.au

Calculate users in 2020 — Gender split



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, the textbooks include a large online component and sales of the Third Edition continue to do well.

Research & Higher Education

AMSI's Research & Higher Education programs support undergraduate students through to early-career researchers and professionals by supplementing university curricula, providing discipline-specific careers advice, building strong science communications skills, creating networking opportunities and facilitating collaborations.

Featuring training schools, graduate courses, careers events, an internationally recognised scientific workshop program and scholarships, these events set the standard for research-training infrastructure.

Angela Coughlin

Acting National Program Manager — Research & Higher Education
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RHED.AMSI.ORG.AU



2020 Opportunities

Empowering students and researchers to grow and develop their mathematical skills, the AMSI flagship events and sponsored workshops continue to demonstrate their importance in the Australian mathematical sciences landscape.

Providing access to world-class lecturers and researchers, 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.

The impact of the global pandemic saw a reduction in the number of program activities in 2020, with some events having to be postponed.

Providing a Platform for World-Class Talent

The 2020 flagship programs featured experts from all areas of the mathematical sciences delivering presentations, workshops and public lectures.

International guests came from institutions including Bayer AG (Germany), The New Zealand Institute for Plant and Food Research Limited (NZ), Barts Cancer Institute (UK), SciLifeLab (Sweden), Czech Academy of Sciences (Czech Republic), Te Kotahi Research Institute, The University of Waikato (NZ), Keio University School of Medicine (Japan), Nara Institute of Science and Technology (Japan), University of California (USA).

It also presented some unexpected opportunities, however, with the successful transition to a virtual BioInfoSummer conference and the introduction of support options for online workshops resulting in increased accessibility for students and researchers, and participation in the program from a wider audience.

AMSI's Research & Higher Education program activities continue to be supported by our long-term funding partner, the Department of Education, Skills and Employment, as part of the *Securing Australia's Mathematical Workforce 2016–2021* project (extended in 2020 for an additional 12 months through to 2021), allowing AMSI to strengthen program outcomes for participants and contribute to its long-term goal of building Australia's mathematical innovation capacity.

50 national experts and lecturers were also invited to take part in these programs, delivering specialised courses and seminars often unavailable to students in their day-to-day academic studies and activities.

These events were well-attended, with 484 participants across all 2020 flagship events, demonstrating the demand for cutting-edge content in Australia to further enrich their studies.

KEY STATS

484 AMSI flagship event participants

37% of flagship event participants were female

66 students received AMSI Travel Grants and Registration Scholarships

10 sponsored workshops held in 2020

More than **1750** workshop participants

Approx. **28%** of workshop participants were female

48 international workshop speakers



Supporting Inclusivity and Participation

For Australia to reach its full potential, our future mathematical workforce needs to be more diverse.

AMSI Grants and Scholarships address financial and social barriers to participation of currently under-represented groups including female, First Nations and regional, rural and remote students at AMSI events by providing support covering registration fees, travel, accommodation and carer needs. Online participation options further increase the accessibility of AMSI flagship events to those unable to travel.

In 2020, 66 students including 18 women received funding support to assist them to participate in flagship programs and activities. The grants and scholarships were awarded on a competitive basis by the respective flagship event committees.

Each of our 2020 flagship training events featured several program extras that provided participants with the opportunity to expand their professional networks and link up with the wider mathematical sciences community. Activities included opening keynote addresses, Diversity in STEM events, careers sessions, public lectures, event dinners, lunchtime lectures, poster sessions and social events.

AMSI's Diversity in STEM events, held as part of the flagship event programs, included a panel session celebrating achievements and highlighting some of the challenges that hinder diversity and inclusion in the workplace, a presentation on equity and inclusion in bioinformatics, a special lecture on Indigenous perspectives on equity, diversity and data science in genomics as well as a session on inclusion and allyship in STEMM delivered by *QueersInScience*.

The embedded outreach program, popular among event participants, the public and staff from host universities, continues to foster community engagement with the mathematical sciences. Accessible cutting-edge research is shared across a range of outreach initiatives including public lectures, panel discussions, media campaigns, blog posts and speaker and student profiles.

Further value is gained through the filming of our public lectures and sharing on AMSI's YouTube (youtube.com/c/AustralianMathematicalSciencesInstitute) and social media channels.



AMSI Flagship Events

AMSI Summer School 2020

6–31 January, La Trobe University
SS.AMSI.ORG.AU

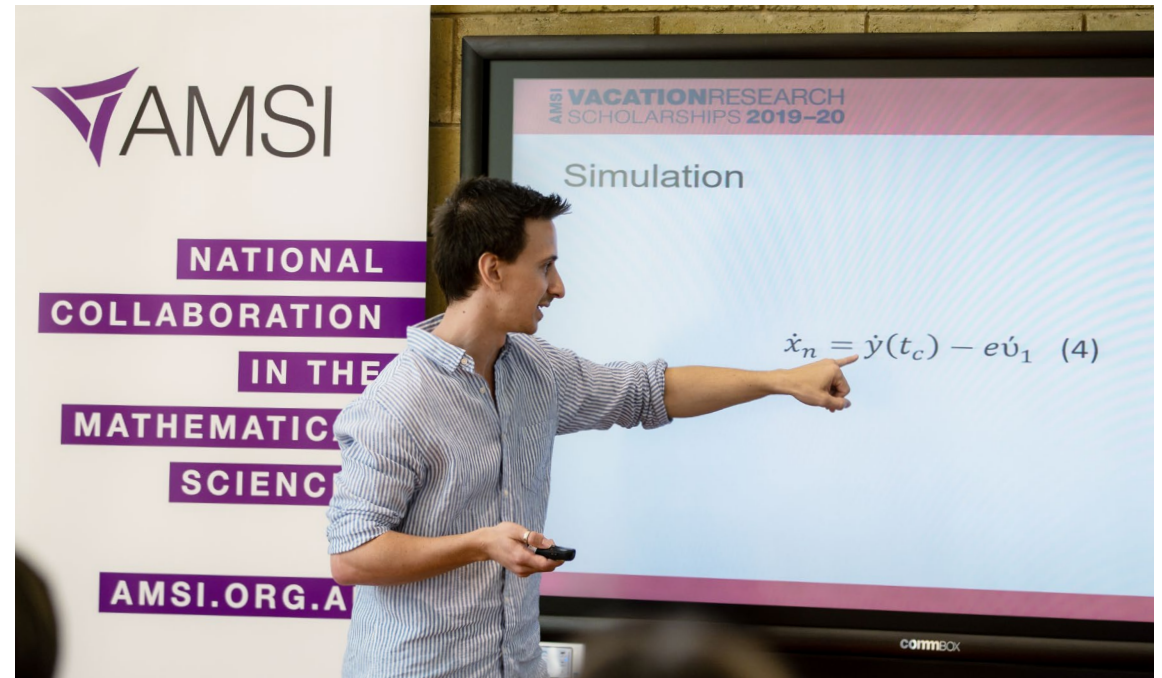
Now in its 18th year, AMSI Summer School has become one of the most important calendar events in Australia for honours and postgraduate students in the mathematical sciences and cognate disciplines. In 2020, the event attracted 163 students from 18 universities representing every Australian state. Under the supervision of national mathematical sciences research leaders, students participated in eight intensive courses covering all aspects of modern mathematical research, from pure and applied mathematics to statistics and cognate quantitative disciplines, to teaching and learning at the tertiary level. The courses, which incorporated lectures, practice classes and computer labs, were delivered over four weeks by 12 experts from five universities around Australia.

Complementing the academic program were social events ranging from the welcome reception and closing dinner to movie nights, sports-centre activities, BBQ lunches, weekend excursions and wildlife sanctuary tours. Public lecturer Professor David Karoly (CSIRO) drew a crowd of about 120 attendees for his talk on climate change modelling.



AMSI Vacation Research Scholarships 2019–20

December 2019 – February 2020
VRS.AMSI.ORG.AU



The 2019–20 Vacation Research Scholarships intake was the second-largest cohort to date. From 104 applications, 69 scholarships were awarded with 66 Scholars from 21 AMSI member universities completing their research projects (three students withdrew due to external circumstances).

Mentored by established researchers at their home universities, Scholars took on six-week research

projects and submitted reports at the end of the project. At the end of the summer, they presented their findings and networked with fellow Scholars at the AMSIConnect student conference held at the University of Melbourne. In addition to presenting their work to their peers, Scholars wrote blog posts outlining their research and results, giving them experience in scientific writing for broader audiences.

AMSI BioInfoSummer 2020

30 November – 3 December,
The Australian National University
BIS.AMSI.ORG.AU

The first iteration of AMSI BioInfoSummer held in 2003 was hosted by the Australian National University, so it was pleasing to see it return to where it all began for the 2020 conference — albeit this time in an online format due to ongoing COVID-19 restrictions.

176 students, researchers and professionals from 45 universities and research institutes participated from their homes and workplaces in a condensed four-day virtual conference program to develop their bioinformatics skills, national networks and employability.

Morning conference presentations were followed by hands-on workshops tailored to various discipline backgrounds. The Fast Forward ePoster presentations proved popular again this year with 16 students and early-career researchers taking up the challenge of sharing their research in under 90 seconds.

Several program extras were held to complement the scientific program including an interactive careers advice panel and an inspiring public lecture from Associate Professor Maui Hudson (Te Kotahi Research Institute, The University of Waikato): *Indigenous Perspectives on Equity, Diversity, and Data Science in Genomics*. Discussions in a dedicated BioInfoSummer Slack channel replaced traditional in-person networking during program breaks.

AMSI ACE Network Honours & Masters Subjects

RHED.AMSI.ORG.AU/ACE

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

The growth of the AMSI ACE Network program continued in 2020, with 17 online honours and masters courses delivered over two semesters and 79 students from 20 AMSI member universities completing ACE subjects.

Semester 1 Subjects

Advanced Data Analysis
Advanced Topics in Cryptography
Applied Mathematical Modelling
Modern Methods of Theoretical Modelling
Networks and High-Dimensional Inference
Nonlocal Diffusion, Theory and Applications
Real Analysis and Measure Theory
Statistical Consulting
Theory of Statistics

Semester 2 Subjects

Advanced Numerical Analysis
Algebraic Number Theory
Complex Analysis
Computational Thinking with Python
Mathematical Biology
Optimisation for Deep Learning
Symmetry of Integrable Equations
Vector Calculus and Mathematical Modelling of Fluid Flows

ACE Network Profile: Kathy Zhou

Kathy Zhou is an analytics honours student at RMIT University, where she studies applied mathematics and statistics, as well as computer science subjects such as machine learning.



When Kathy sought to explore a new area of mathematics not offered at her home university, she turned to the AMSI ACE Network.

“I wanted to challenge myself and gain a deeper understanding of optimisation techniques. It was a subject I had some knowledge in, but from a machine learning perspective. I wanted to learn about the underlying mathematical concepts and algorithms,” Kathy said.

“My experience completing an ACE Network subject was extremely positive.”

“What I enjoyed most about the subject was its emphases on creative thinking. The focus wasn't so much on being able to answer questions correctly but having a creative approach and reflecting on the applied concepts,” said Kathy.

The online format of AMSI ACE Network subjects was also beneficial, with Kathy able to meet students with similar interests from interstate.

“It was nice to mix things up and meet mathematics students outside of my cohort,” Kathy added.

AMSI Sponsored Scientific Workshop Program 2020

AMSI.ORG.AU/SCIENTIFIC-WORKSHOPS
RHED.AMSI.ORG.AU/WORKSHOP-FUNDING

AMSI supports collaborations between Australian and international researchers by funding scientific workshops and conferences.

The effects of COVID-19 were evident in the workshop program, with a notable reduction in the number of applications. Some events were cancelled while others moved online. AMSI provided flexible support to workshop organisers under these changing circumstances. While the traditional funding model funds on the travel and accommodation expenses of international keynote speakers, the adapted scheme also offered support for marketing and expenses related to digital platforms and recording. Though few in number, the 10 workshops were diverse in focus. Topics included oceanography, integrability and statistical ecology.



ANZIAM Early-Career Workshop 2020

AMSI-ANZIAM Early-Career Workshop 2020

1–2 February, ANZIAM

Attendees: 36

AMOS 2020 International Conference on Indian Ocean Meteorology and Oceanography

10–14 February, Australian Meteorological and Oceanographic Society

Attendees: 373

New Connections in Representation Theory

10–14 February, The University of Queensland

Attendees: 45

Baxter2020: Frontiers of Integrability

11–14 February, The Australian National University

Attendees: 51

UWA Maths Union Women in Maths 2020

24 April, The University of Western Australia

Attendees: 35

Number Theory Online Conference 2020

3–5 June, The University of Newcastle

Attendees: 68

International Statistical Ecology Conference (ISEC2020)

22–26 June, The University of New South Wales

Attendees: 861

Mathematics of Sea Ice and Ice Sheets

9–13 November, The University of Newcastle

Attendees: 80

AustMS 2020 Early-Career Workshop

7 December, Online workshop

Attendees: 147

PhD Student Online Symposium: 2020 Australasian Graduate Symposium in Combinatorics

16–18 December, Monash University, University of Melbourne, University of Auckland

Attendees: 58

AMSI thanks the following people for their leadership in 2020: Summer School Director Dr Yuri Nikolayevsky (La Trobe University), BioInfoSummer organising committee Dr Xia Hua, Dr Terry Neeman, Dr Benjamin Schwessinger (Australian National University) Dr Philipp Bayer (University of Western Australia) and Susan Wagner (University of Canberra), ACE Network Director Dr Judy-anne Osborn (University of Newcastle), Research & Higher Education Committee Chair Professor Mat Simpson (Queensland University of Technology) and Scientific Advisory Chair Emeritus Professor Phil Broadbridge (La Trobe University). We also acknowledge the contributions of our committee members, 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 Government Department of Defence, Australian Mathematical Society (AustMS), Australian National University, Australian New Zealand Industrial Applied Mathematicians (ANZIAM), La Trobe University, Optiver, Statistical Society of Australia (SSA)

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.

Parks Victoria and AMSI have established a collaborative relationship to demonstrate the mutual benefits of statistical collaborations in supporting land and conservation management, increase understanding of the role of statistics as part of an evidence-based management and promote and enhance mathematical and statistical sciences.

This agreement, enabled through Parks Victoria's Research Partners Panel, has embedded AMSI statistician Dr Kally Yuen within Parks Victoria's Environmental Research Partnerships and Programs Unit of the Environment and Science Division, 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 units 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 Plant Community Ecologist, Dr Marie Keatley, to plan the survey. The collected data was analysed to determine the current locations of weeds and to assess any changes in the distribution of each weed over the years. Due to COVID-19 preventing a face-to-face presentation in July 2020, Kally presented the results online to scientists in the Environment and Science Division and Park managers. The results generated a lot of interest. Additional analysis was conducted to assess weed abundance in areas with high conservation status and in frequently assessed areas. The data are also being used as a case study to develop a web application tool to display the locations and percentage of plots occupied by individual and all weeds over time in the park. If successful, the tool will be expanded to the parks estate.



Olinda Falls—one of the many scenic areas in Dandenong Ranges National Park. Environmental management work has been conducted over the years to protect native species, both flora and fauna, in the Park. (photo by Ondrej Vujtek, used with permission)

Sallow Wattle Control Monitoring Program in the Grampians National Park

Widespread invasion of Sallow Wattle (*Acacia longifolia* subsp. *longifolia*) in the National Heritage-listed Grampians National Park became a major concern for Parks Victoria following the January 2014 bushfire. A two-year experimental monitoring program was initially established in 2015 through the Victorian Government post-fire recovery fund to ascertain the most effective technique to control the notorious weed. The timely provision of additional State Government funding in 2018 enabled the extension of the monitoring program to study longer-term outcomes. Therefore since 2015, experimental plots have been monitored annually with the interim results informing the current management of Sallow Wattle within the park. In October 2020, Kally met with the study team online to provide an update of the current results and subsequently provided material for capturing data for the final monitoring in November.



Monitoring Sallow Wattle at the Grampians National Park in November 2020. (photo source: Parks Victoria)



Eastern grey kangaroos (photo source: Parks Victoria)

Eastern Grey Kangaroo Abundance Monitoring Program at Serendip Sanctuary

The eastern grey kangaroo (*Macropus giganteus*) population at Serendip Sanctuary has become overabundant, with the potential to lead to animal welfare issues and impacts on vegetation.

Until recently Parks Victoria used a direct animal counting method to monitor the kangaroo population over time. However, recent dense vegetation growth in revegetation areas has made it difficult to spot the animals and hence an alternative method for monitoring was sought. In May 2020, an index based on faecal accumulation counts was proposed by Parks Victoria's Environmental Scientist – Fauna, Dr Naomi Davis, to monitor the species' abundance.

Kally provided advice to the study team on the optimal sample size required to achieve a precise estimate of the overall population abundance and proposed suitable methods of data analysis for the program.

AMSI's APR.Intern Program

Parks Victoria is one of AMSI's long-term APR.Intern industry partners, 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, working with Dr Elizabeth Wright who was the chief investigator of the project. During his six-month internship, Peter designed and conducted a survey to collect relevant data to address the research questions. Kally provided advice to Peter on how some of the data could be analysed.

Upon completion of the internship in May 2020, Peter gave a presentation of his findings online to Parks Victoria. This work demonstrated that research done in parks and reserves across the state makes a substantial economic contribution and provides valuable information to improve understanding of Victoria's biodiversity and how to better manage and protect our natural environment.

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

Tribute to Susan Ruth Wilson

It is with great sadness that we mark the passing of a friend of AMSI and co-founder of the BioInfoSummer initiative, Emeritus Professor Susan Ruth Wilson, during 2020.

**VALE: Emeritus Professor Susan Ruth Wilson
19 March 1948 – 16 March 2020**

Born in Sydney, Susan (Sue) Wilson graduated from the University of Sydney in 1968 with a Bachelor of Science degree with First Class Honours. Her subsequent doctoral thesis at the Australian National University under the supervision of P.A.P. (Pat) Moran entitled *Some Statistical Results in Genetics* (1972) won the 1975 Peter William Stroud Prize. From these beginnings Sue's early research interests spread into biostatistics, population health and bioinformatics—particularly the analysis and interpretation of large-scale genomic data that has become the basis of modern biology.

Following a lectureship at the University of Sheffield in 1972, Sue returned to ANU as Research Fellow within Pat Moran's Department of Statistics, and by 1984 she was elevated to a Senior Fellowship.

Various joint appointments followed between 1988 and 1996 including working with the National Centre for Epidemiology and Population Health (NCEPH) and the Statistics Research Section in the School of Mathematical Sciences—later evolving into the group became the Statistical Science Program in the Centre for Mathematics and its Applications (CMA).

'As a friend of AMSI, Sue was a co-founder of the BioInfoSummer initiative from its launch in 2003 through to more recent presentations (2015) and in giving the opening lecture for 2018.'

Her eminence as both a researcher and in promoting education saw her elevated to Professor Emeritus of Bioinformation Science and Statistical Science at ANU and appointed as an Honorary Professor in the School of Mathematics and Statistics at the University of New South Wales in 2008.

Sue's research collaborators included J.G. Oakeshott (measuring selection on drosophila populations), A. Thorne (physical anthropology), G.K. Ward (radiocarbon dating), J. Cavanaugh (mapping human disease susceptibility genes), P.J. Solomon (modelling and predicting the spread of AIDS in Australia) and C.J. Burden (bioinformatics). She was ultimately published in over 200 peer-reviewed journals. Sue was also the Section Editor for Computation for the *Encyclopedia of Biostatistics* (Wiley, 1995–2004), and Editor for the theme Biometrics in the *Encyclopedia of Life Support Systems* (UNESCO, 2000–2007).

Honours bestowed upon Sue include election as a Member of the International Statistical Institute (ISI, 1979), as a Fellow of the American Statistical Association (ASA, 1991) and as a Fellow of the Institute of Mathematical Statistics (IMS, 1995). Sue was awarded the inaugural E. A. (Alf) Cornish Award by the Australasian Region of the International Biometric Society for her contributions to Biometrics (2011), and Honorary Life Membership of IBS 'for outstanding contributions to the development and promotion of the discipline of Biometry' in 2012. In 2017 Sue was made an inaugural Senior Fellow of the Australian Bioinformatics and Computational Biology Society. She was the Editor of the *Institute of Mathematical Statistics Bulletin* (1993–1997) and President of the International Biometric Society (1998–1999).

Beyond her commitment to AMSI's annual BioInfoSummer Symposia, Sue was highly supportive of early-career researchers, endowing a scholarship for honours students in mathematical biology in memory of her close friend and colleague Hilary Booth, and funding various travel awards to enabling undergraduate students to attend conferences in statistical science.

Australia has lost a highly respected and much-loved pioneer in the teaching and research of bioinformatics.

Sue is survived by her son Jonathan.

With thanks to Alan Welsh and Conrad Burden.



Emeritus Professor Susan Ruth Wilson at the opening of AMSI BioInfoSummer 2018

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 them 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 — APR.Intern
lisa.farrar@aprintern.org.au

APRINTERN.ORG.AU



Former PhD intern Louis Cianciullo is now a full-time software engineer at SPEE3D 3D Printing

The APR.Intern program was delivered in very different circumstances in 2020, due to the global pandemic. Stakeholders responded in various ways, but overwhelmingly, as reflected in broader society; institutions, industry and individuals remained positive. APR.Intern placed 152 interns in 2020, only a slight decrease from the 161 internships executed in 2019, a significant achievement considering the impacts of COVID-19 on our stakeholder groups.

In April, student applications soared by 222 per cent as they turned to internships while their labs were closed. The Program also instituted remote internship arrangements, providing a COVID-safe experience and opening up the catchment of opportunity for both industry and interns to the national stage. The Program gained momentum throughout 2020 and a variation to the government contract in October saw the Program extended and an increase in rebates available to industry to 90 per cent.

APR.Intern had its biggest month ever in October 2020, with 30 executed internships — almost double the previous record in 2019. The pipeline of projects and interns never looked healthier, and the Program ended up delivering 152 internships by December 31.

Interns were placed into a total of 101 businesses in 2020. Of these, 72 (71 per cent) were businesses that were completely new to the Program, representing further expansion into our addressable market.

APR.Intern continues to build new business-university linkages. In 2020, the Program created a total of 134 business-university collaborations; 111 (83 per cent) of these were new collaborations prior to which the business and university had not previously collaborated through the program. Some businesses hosted multiple interns from different universities.

Female participation decreased slightly in 2020 to 45 per cent as our marketing efforts were redirected to pandemic-related communications. However, the Program continued to exceed the target of 12 per cent for regional internship placements with 14 per cent of students placed in 2020 from regional universities.

KEY STATS 2020*

152 interns placed from **18** academic disciplines

101 industry partners across **16** industry sectors

45% female participation rate

34% of internships undertaken by women in STEM

100% of interns placed were domestic students

CUSTOMER SATISFACTION SURVEY RESULTS (2017–2020)

Overall satisfaction with intern program **99%**

Student satisfaction **98%**
(out of 391 respondents)

Academic Mentor satisfaction **100%**
(out of 243 respondents)

Industry Partner satisfaction **99%**
(out of 291 respondents)

50% 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'.*

2020 Highlights



18 large corporate industry partners placed interns in 2020 including AustralianSuper, CSL Innovation, Lockheed Martin, Telstra Corporation and UniSuper.



25 research institutes and government agencies engaged in the Program including the Australian Bureau of Statistics, Academy of Social Sciences Australia, Australian Academy of Science, Bureau of Meteorology and the Department of Industry, Science, Energy and Resources.



49 start-up and SME industry partners engaged interns including Biointelect, Intelicare, MicroTau, Singular Health, and Synchron.



CSL Limited placed its **16th** intern through the program since 2013. Defence, Science Technology (DST) Group placed **20** interns.



A national webinar co-hosted with CSIRO, *Innovating in a Time of Crisis*, discussed the post-pandemic digital economy and why businesses must embrace R&D. More than **380** industry and academic thought-leaders registered for the event.



Over **1000** students registered for the webinar *So, You're Graduating Your PhD in a Pandemic, What's Next?* co-hosted with 'The Thesis Whisperer', Professor Inger Mewburn.



Former intern, Dr Pooia Lalbakhsh, hosted **two** interns in his new role as Chief Scientist at Melbourne-based start-up, Euler Capital.



Many universities now have dedicated content on their websites to advertise APR.Intern opportunities to students, particularly the University of Adelaide, La Trobe University and Queensland University of Technology.



The most engaged universities in 2020 were RMIT University and the University of Adelaide with **15** internships each, followed by the University of Melbourne (**14** internships) and Deakin University (**11** internships).



In the ACT, **seven** ANU students took part in internships in 2020, an increase from two in 2019. A total of **15** internships with ACT-based industry partners were facilitated, up from **four** in 2019.



32 subsidy vouchers were delivered to industry partners through APR.Intern's partnerships, including MTPConnect (**14**), Defence Science Institute (**6**), IMCRC (**4**) and Defence Innovation Network (**4**). This amounted to a total of **\$235,250** in subsidies for businesses to host interns.



APR.Intern won Manufacturing Monthly's *2020 Endeavour Award for Excellence in Manufacturing Skills Development*, recognising the Program's work in the manufacturing sector strengthening industry-university collaboration.

Strategic Partnerships

Ongoing relationships are critical for APR.Intern's sustainability, and have enabled the Program to become embedded not only within universities, but also within organisations that require highly skilled PhD researchers as part of their workforce.

Partnerships with Cooperative Research Centres (CRCs) and Industry Growth Centres were established and have been fruitful, with additional funding for internships made available to industry partners through the MedTech and Pharma Growth Centre (MTPConnect), Innovative Manufacturing CRC (IMCRC) and Food Innovation Australia Limited (FIAL). Program survey data shows that these subsidy vouchers, up to \$10,000 per internship, have been particularly popular with start-ups and SMEs, which benefit greatly from research innovations.

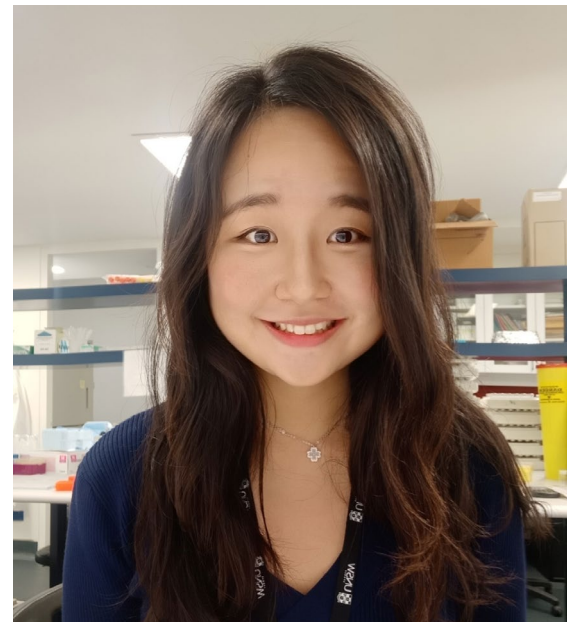
Demand for PhD internships remains strong, and we look forward to continuing to service a broad and growing number of industry partners as well as providing exceptional PhD talent across all sectors and business types. APR.Intern's Business Developers continue to nurture relationships with current industry partners, and field enquiries from new industry partners, university stakeholders and students interested in participating in a new version of an internship Program.

Strategic focus is now on program sustainability, building on the successes of the DESE *National Research Internships Program (NRIP)* funding, and the ongoing importance of PhD internships as a key plank in Australia's efforts to increase and improve research commercialisation; as well as helping to address ongoing issues around female participation rates and equity.



Left - Deakin PhD student, MJ Izadi, interned with one of Australia's oldest engineering and manufacturing companies, Varley Group, that was supported by an IMCRC subsidy. MJ's research at Varley was so significant that he presented the results to Prime Minister Scott Morrison during an official visit in September 2020.

Right - UNSW PhD student Sue Kweon interned with medtech start-up Genepath, supported by a MTPConnect subsidy.



Marketing & Media

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

Throughout 2020, AMSI continued engaging with audiences via a diverse spectrum of channels promoting innovation by our Schools, Research & Higher Education and APR.Intern programs.

Jo Piltz—Marketing & Communications
Coordinator
media@amsi.org.au

AMSI.ORG.AU



Quality media profile

During 2020, a significant shift in AMSI's media relations strategy emphasising qualitative outputs, influence and sustained relationship with media connections was pursued.

This philosophical shift and strategic redirection resulted in AMSI becoming the preferred source of media commentary on all matters mathematical, with various experts being interviewed and quoted by print/digital outlets such as the *Australian Financial Review* and *The Australian*, and electronic media such as the ABC. Such endeavours reinforced AMSI's position as the leading advocate in Australia for the mathematical sciences.

Regardless, AMSI audience reach exceeded 100,000 exposures during the October-December quarter alone. Indicative of this is our November metric quantifying exposure in mass media outlets as being the equivalent of a \$32,271 advertising spend. Our team also conveyed 27 third-party media stories via our AMSI news channel during this quarter, including the announcement of our new Director Professor Tim Marchant joining AMSI in January 2021.

A significant change made during 2020 was adoption of the Isentia media monitoring technology, enabling more accurate assessment of media coverage, impact and effectiveness. We acknowledge the University of Melbourne for its generosity in providing AMSI with access to this platform on a no-cost basis.

Selected media coverage

Maths enrolments at school still as bad as ever

Robert Bolton quoting AMSI's Dr Maaïke Wienk in the *Australian Financial Review* 9 November 2020

6,345 total audience
\$20,135 equivalent exposure value in advertising terms

Calculus ignored even though evidence is we rely on it

Opinion piece by AMSI's Professor Asha Rao and MATRIX's Professor Jan de Gier in the *Australian Financial Review*

6,345 total audience
\$17,837 equivalent exposure value in advertising terms

NSW lifts Australian high school students to world's top 10 in maths, science

Jordan Baker and Natassia Chrysanthos quoting AMSI's Professor Asha Rao in the *Sydney Morning Herald*, *The Age* and Nine Media nationwide

22,813 total audience
\$70,129 equivalent exposure value in advertising terms

'We've bottomed out': HSC maths enrolments flatline over the decade

Natassia Chrysanthos quoting AMSI's Dr Maaïke Wienk in *The Age* 25 October 2020

22,813 total audience
\$81,686 equivalent exposure value in advertising terms

FINANCIAL REVIEW
PLATINUM 70 YEAR

Maths enrolments at school still as bad as ever



Robert Bolton
Education editor

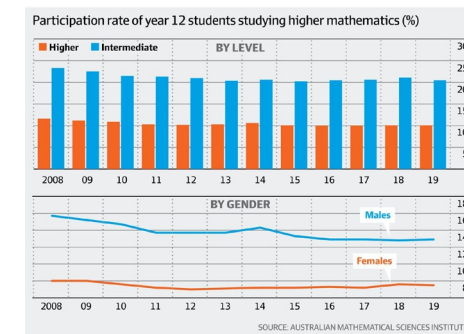
Nov 9, 2020 - 12:01am

[Australia's "maths deficit" at school](#) is deepening and becoming a spiral in which the lack of maths graduates is reinforcing the lack of teachers with specialist training in the subject, according to a new report by the Australian Mathematical Sciences Institute.

Data [just released](#) shows in 2019 only 10 per cent of all year 12 students studied higher maths. That figure had not changed since 2011.

And only 20.5 per cent of all final year students studied intermediate maths. That's the lowest participation rate since 2015 and compares to 22.5 per cent 10 years ago.

And the number of girls studying higher maths was just 7.5 per cent, unchanged since 2010.



Head of advocacy and policy at AMSI Maaïke Wienk said the number of girls taking advanced maths revealed systemic flaws in the education system and came despite women with science and statistical backgrounds who were taking prominent roles in public policy.

Working with members and supporters

During 2020, AMSI proactively engaged with collaborators such as ACEMS, MATRIX, AMT, SSA and the Office of the Chief Scientist, recognising that we collaborate and complement – rather than compete.

AMSI provided briefings, talking points, data and support to members engaging with local media on matters relating to mathematics and statistics. In-house AMSI media training was also accessed by members and collaborators at no charge.

During the COVID-19 crisis, rather than duplicate effort in its digital content offering, AMSI was delighted to work with ACEMS (the ARC Centre of Excellence for Mathematical and Statistical Frontiers) promoting its suite of 'The Random Sample' podcasts.

Positioning and Influence

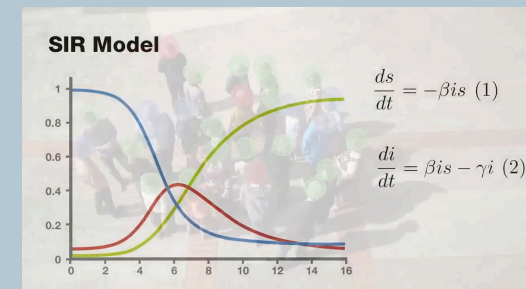
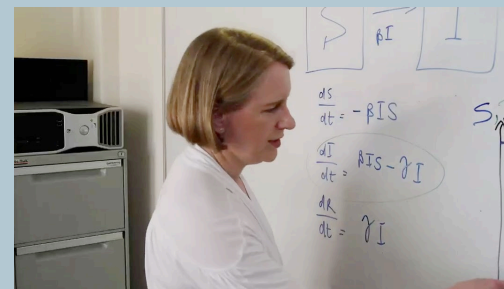
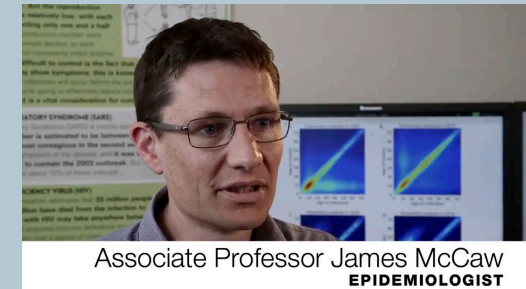
Throughout the year, the Marketing and Communications team provided targeted, relevant materials supporting our leaders, engagement with members, industry and governments. An example of this is the customised profile package reaffirming AMSI's credentials to Victoria's Chief Scientist Dr Amanda Caples, illustrating the commonality of policy and purpose that exists between AMSI and promotion of STEM by government.

The team also delivered key AMSI outcomes such as the 22nd edition of MathsADDS (2020–21) and the seventh iteration of the periodically published AMSI *Discipline Profile*, now branded as the *State of the Mathematical Sciences*, attracting significant media interest, and positioning AMSI as the authority for advocacy and influence across the sector as a whole, and as the 'go-to' source for expert commentary.

The popular MathsADDS title was delivered both digitally and in print to AMSI members for distribution to prospective undergraduate students at open days and events. Endorsements from Australia's Chief Scientist Dr Alan Finkel and Chief Defence Scientist Dr Tanya Munro complement a prologue written by high-profile secondary school educator Eddie Woo. Newly profiled maths practitioners include Jane McCarthy, a data analyst at the ANZ Bank and Jaslyn Gray, an engineer with the Department of Defence.

Third-party media coverage

During 2020, AMSI commenced functioning as a consolidator of third-party news content, delivering 227 news articles for the period. A dedicated repository for Pandemic articles with a mathematical sciences relevance was also established at the outbreak of COVID carrying 64 stories and linking to the AMSI video, *The Spread of Disease*, which acted as a portent and explainer for subsequent epidemiological activity.

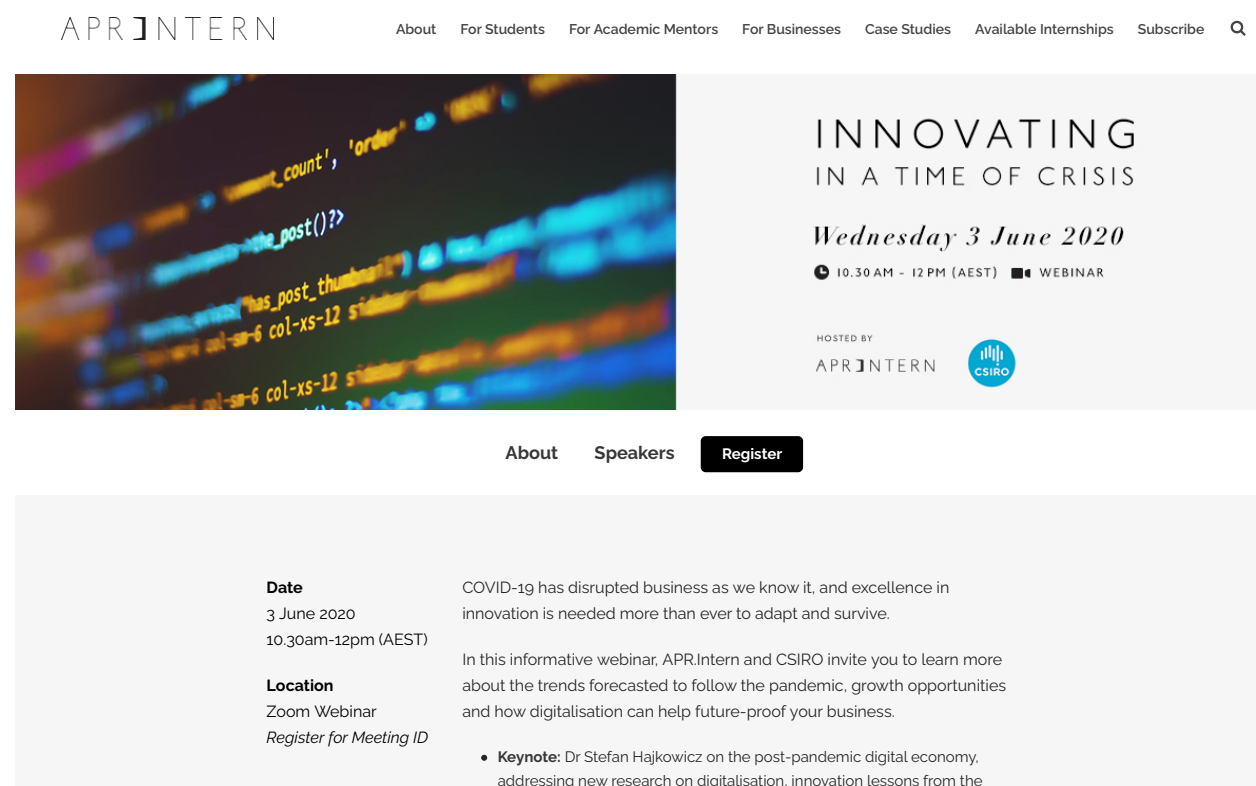


Promoting APR.Intern

AMSI's industry engagement arm and sub-brand, APR.Intern, continued to be conveyed during 2020. APR.Intern's embedded marketing and communications function supported the commercial endeavours of the Program's business development team, facilitating collaborative information seminars online such as *The Future of Business: Navigating Research Partnerships*, co-hosted with CSIRO.

Events for PhD candidates continued to be a popular with an online webinar co-hosted by Professor Inger Mewburn ('The Thesis Whisperer') attracting an audience of 550+ students, testing the capability of webinar software at an early point in lockdown.

Throughout the year, monthly newsletters were distributed to all AMSI members, industry, university, government and student stakeholders. 10 new case studies of PhD placement success stories were also composed during 2020.



The screenshot shows the APR.Intern website for a webinar. The header includes the APR.Intern logo and navigation links: About, For Students, For Academic Mentors, For Businesses, Case Studies, Available Internships, and Subscribe. The main content area features a blurred image of code on the left and a webinar announcement on the right. The announcement is for 'INNOVATING IN A TIME OF CRISIS' on Wednesday 3 June 2020, from 10.30 AM to 12 PM (AEST), hosted by APR.Intern and CSIRO. Below the announcement are links for 'About', 'Speakers', and a 'Register' button. A table below provides details about the webinar.

Date	COVID-19 has disrupted business as we know it, and excellence in innovation is needed more than ever to adapt and survive.
3 June 2020 10.30am-12pm (AEST)	
Location	In this informative webinar, APR.Intern and CSIRO invite you to learn more about the trends forecasted to follow the pandemic, growth opportunities and how digitalisation can help future-proof your business.
Zoom Webinar Register for Meeting ID	
	<ul style="list-style-type: none">Keynote: Dr Stefan Hajkowicz on the post-pandemic digital economy, addressing new research on digitalisation, innovation lessons from the

Social Media

AMSI generated significant social media growth in 2020, with an average audience increase of 24 per cent across all platforms. A social media strategy including organic content and advertising fuelled audience and engagement growth.



@Discover AMSI **2453** followers

@APRInternau **668** followers



/australian-mathematical-sciences-institute

1257 followers

/aprintern **1438** followers



@DiscoverAMSI **5230** followers

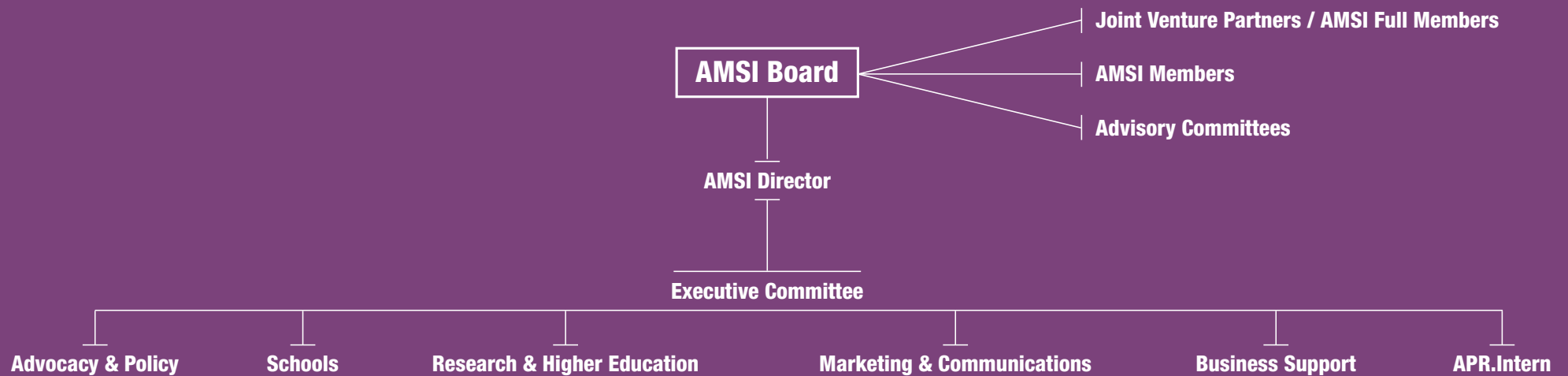
@AMSIchoosemaths **1080** followers

@APR.Intern **753** followers

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 2020, AMSI's full membership totalled 12 universities, including all of the Group of Eight. The University of Melbourne acts as AMSI's lead agent in the JVA. Beyond the full membership, our extended membership is made up of an additional 17 universities, five government agencies and six mathematical and statistical learned societies.

AMSI 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 full members meet at least four times annually, and all AMSI members meet twice per year. This ensures that AMSI's programs are kept 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 (listed on page 38). External advice is provided by five high-profile advisory committees.

AMSI's four portfolio areas are:

- Research & Higher Education
- Advocacy
- Industry engagement
- Schools education

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 2020, scheduled Board meetings were held on the following dates:

Date	Location
Thu 20 February	AMSI
Thu 16 July	Video conference
Thu 24 September	Video conference
Thu 12 November	Video conference

ATTENDANCE:

Dr Adelle Howse (4/4)

Anne Baly (4/4)

Dr Sue Barrell (4/4)

Professor Tim Brown (1/1) until July 2020

Professor Asha Rao (2/2) from August 2020

Mr Joe Forbes (4/4)

Associate Professor Linda Galligan (3/4)

Professor Graeme Hocking (4/4)

Dr Bishnu Lamichhane (4/4)

Professor Aleks Owczarek (2/4)

Professor Robyn Owens (4/4)

Professor Andrew Peele (4/4)

Professor Mat Simpson (3/4)

Committees & Stakeholders

Board Members

Dr Adelle Howse *Chair*

Professor Tim Brown *AMSI Director—until July 2020*

Professor Asha Rao *AMSI Interim Director—from August–December 2020*

Professor Mat Simpson *AMSI Deputy Director (Queensland University of Technology)—until January 2021*

Professor Aleks Owczarek *Lead Agent Representative (University of Melbourne)—until December 2020*

Dr Bishnu Lamichhane *AMSI Full Member Representative (University of Newcastle)*

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

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

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

Professor Robyn Owens *External member (University of Western Australia)*

Professor Andrew Peele *External member (ANSTO)*

Anne Baly *External member (PhillipsKPA)*

Dr Sue Barrell *External member (Science and Technology Australia)*

Joe Forbes *External member (Biarri Commercial Mathematics)*

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 Philip Broadbridge *Chair, AMSI Scientific Advisory Committee*

Professor Peter Forrester *Chair, National Committee for the Mathematical Sciences*

Dr Mark Lawrence *Chair, AMSI Industry Advisory Committee*

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

Professor Ole Warnaar *Australian Mathematical Society*

AMSI Research & Higher Education Committee

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

Professor Tim Brown *AMSI Director until July 2020*

Professor Asha Rao *AMSI Interim Director from August 2020*

Chloe Pearse *AMSI Research & Higher Education Program Manager until August 2020*

Angela Coughlin *AMSI Acting Research & Higher Education Program Manager from September 2020*

Professor Philip Broadbridge *Chair, AMSI Scientific Advisory Committee*

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

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

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

Associate Professor Nicola Armstrong *BioInfoSummer Standing Committee representative, Murdoch University*

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

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

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

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

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

AMSI Scientific Advisory Committee

Professor Philip Broadbridge *La Trobe University—Committee Chair*

Chloe Pearse *AMSI Research & Higher Education Program Manager, ex officio until August 2020*

Angela Coughlin *AMSI Research & Higher Education Program Manager, ex officio from September 2020*

Professor Tim Brown *AMSI Director, ex officio until July 2020*

Professor Asha Rao *AMSI Interim Director, ex officio from August 2020*

Professor Ezra Getzler *Northwestern University*

Professor Elizabeth Mansfield *University of Kent*

Professor Terence Tao *UCLA*

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/University of Zurich*

AMSI Industry Advisory Committee

Dr Mark Lawrence Mark Lawrence Group—*Committee Chair*
Professor Nigel Bean University of Adelaide, *until February 2020*
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 until July 2020*
Gary Hogan APR.Intern Director, *ex officio until August 2020*
Lisa Farrar APR.Intern National Program Manager, *ex officio from March 2020*
Janine Sprakel AMSI Schools and ChooseMATHS Program Manager, *ex officio until October 2020*
Chloe Pearse AMSI Research & Higher Education Program Manager, *ex officio until August 2020*

AMSI Education Advisory Committee

Dr Bob Anderssen CSIRO—*Committee Chair*
Dr Amie Albrecht University of South Australia
Dr Mary Coupland University of Technology Sydney
Dr Michael Evans Senior Consultant, AMSI
Janine Sprakel AMSI Schools and ChooseMATHS Program Director, *until October 2020*
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—*Committee Chair*
Dr Michael Forbes Biarri Commercial Mathematics
Pauline Carter Department of Education and Early Childhood Development
Professor Doreen Thomas University of Melbourne
Bridget McLaughlin Kensington Primary School
Professor Gilah Leder Monash University / La Trobe University
Professor Jennifer Graves AO Distinguished Professor, La Trobe University
Janine Sprakel AMSI Schools and ChooseMATHS Program Director, *until October 2020*
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 in 2020 resulted in an operational surplus, due to a number of factors, including:

- Higher than expected revenue in the APR.Intern program resulting from additional intern placements and new partnership income
- Savings in the Research & Higher Education program due to event postponements and pivot to online program delivery
- Expenditure deferrals to 2021 in the ChooseMATHS program

AMSI's revenue for the year ended 31 December 2020 was \$10,148,611 and comprised:

Membership income (including special levy)	\$ 1,336,689
SAMW grant from Commonwealth	\$ 516,280
BHP Foundation Grant for ChooseMATHS	\$ 2,063,665
APR.Intern (Commonwealth Grant and placement fees)	\$ 5,659,159
Block Grant Funding	\$ 282,690
Publishing and copyright revenue	\$ 110,549
Other income (consulting, sponsorships and interest)	\$ 179,579
Total Income	\$ 10,148,611

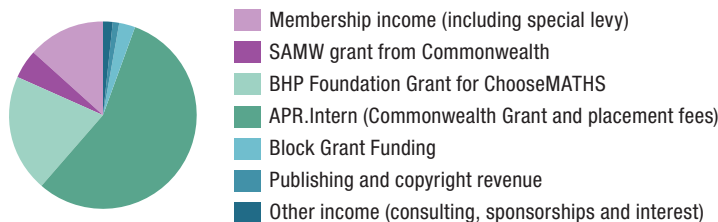
AMSI's expenditure for the year ended 31 December 2020 was \$8,685,141 and comprised:

Directorate - including Governance and Outreach	\$ 684,849
Research & Higher Education	\$ 1,286,527
Schools Program including ChooseMATHS	\$ 1,728,460
APR.Intern	\$ 4,985,305
Total Expenses	\$ 8,685,141

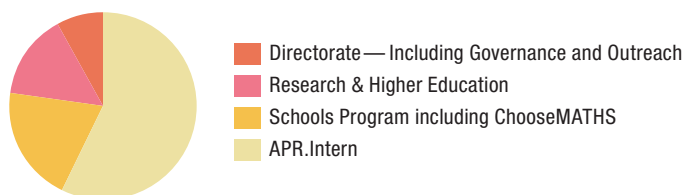
AMSI's Funds on hand as at 31 December 2020 was \$4,545,780 and comprised:

Project 003058—AMSI Core	\$ 3,104,803
Project 003059—SAMW Grant account	\$ (18,101)
Project 099901—ChooseMATHS BHP grant account	\$ 637,726
Project 023324—APR.Intern Income Commonwealth Grant account	\$ 571,332
Project 003065—MTP Connect Intern account	\$ 250,020
Total Funds on hand	\$ 4,545,780

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 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 2020 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 2020 of \$4,545,780 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 2020.

T. R. Marchant

Tim Marchant
AMSI Director

M. Wienk

Maaïke Wienk
AMSI Financial, Policy and Advocacy Manager

Statement of Financial Performance

	2020	2019
	\$	\$
INCOME		
Membership Income		
AMSI Membership Subscriptions	1,336,689	1,264,390
Major Grants		
SAMW grant—Commonwealth Grant for Higher Education	516,280	507,152
ChooseMATHS—BHP Foundation	2,063,665	3,400,000
NRIP—Commonwealth grant and placement fees	5,659,159	3,632,715
Block Grant funding	282,690	250,004
Publishing Revenue —CUP and copyright revenues	110,549	146,838
Other income —includes consulting, sponsorships and interest income	179,579	265,999
Total Income	10,148,611	9,467,098
EXPENDITURE BY PROGRAM		
Directorate —including Governance and Outreach	684,849	960,052
Research & Higher Education	1,286,527	1,549,328
Schools Education —including the ChooseMATHS Program	1,728,460	4,607,857
APR.Intern	4,985,305	5,626,733
Total Expenditure	8,685,141	12,743,970
OPERATING SURPLUS/(DEFICIT)	1,463,470	(3,276,872)
STATEMENT OF FINANCIAL POSITION		
	As at 31	As at 31
	December 2020	December 2019
ASSETS		
	\$	\$
Funds on Hand:		
Project 003058 —AMSI Core	3,104,803	844,734
Project 003059 —SAMW Grant account	(18,101)	-
Project 099901 —ChooseMATHS BHP grant account	637,726	301,631
Project 023324 —APR.Intern Income Commonwealth Grant account	571,332	1,935,945
Project 003065 —MTP Connect Intern account	250,020	-
Net Assets	4,545,780	3,082,310
EQUITY		
Retained income brought forward after prior period adjustments	3,082,310	6,359,182
Total Operating Result (income less expenses)	1,463,470	(3,276,872)
Net Equity	4,545,780	3,082,310

Our Staff

Director's Profile

Professor Tim Marchant—Director, AMSI

Professor Timothy Marchant is Director of the Australian Mathematical Sciences Institute (AMSI) at the University of Melbourne and an Honorary Professor of Applied Mathematics at the University of Wollongong (UOW).

During his career at UOW, Professor Marchant was Head of the School of Mathematics and Applied Statistics 2007–2009 and Dean of Research 2009–2020.

Professor Marchant gained a PhD in Applied Mathematics from the University of Adelaide in 1988 and has published 100 research papers. He has also successfully supervised 20 Masters/PhD students on various topics in Applied Mathematics.

Professor Marchant's research areas include nonlinear optics, nonlinear waves and combustion theory. Professor Marchant is a Fellow and Past President of the Australian Mathematical Society.

He is a past member of the Endeavour Awards selection panel and a current member of the National Colombo Plan selection panel. He is also an editorial board member of the Applied Mathematical Modelling Journal.

Professor Marchant is a member of the Illawarra Bridge Club and speaks intermediate Mandarin.

Executive

Professor Tim Brown Director, AMSI (until July 2020)

Professor Asha Rao Interim Director, AMSI (from August–December 2020)

Professor Tim Marchant Director, AMSI (appointed November 2020)

Leanne Taylor Interim Chief Operating Officer, AMSI (from July–December 2020)

Rod Birch Finance Manager, AMSI (until October 2020)

Janine Sprakel Program Manager, Schools and Program Director, ChooseMATHS (until October 2020)

Chloe Pearce Program Manager, Research & Higher Education (until August 2020) and Acting Marketing & Communications Manager (November 2019–February 2020)

Angela Coughlin Acting Program Manager, Research & Higher Education (from September 2020)

Gary Hogan Director, APR.Intern (until August 2020)

Lisa Farrar National Program Manager, APR.Intern (from March 2020)

Cate Ballard Strategic Development Lead, APR.Intern (until May 2020)

Clint Rodgers Marketing & Communications Manager (from March 2020–January 2021)

Honorary Staff

Dr Michael Evans Senior Consultant

Jan Thomas OAM Research Fellow

Non-Executive

Dr Maaike Wienk Finance, Advocacy & Policy Manager

Jenny Wang Finance Officer

Gayani Gunawardana Administration & Finance Assistant (until December 2020)

Nathan Smith Executive Assistant to the Director (until December 2020)

Marketing & Communications

Clint Rodgers Marketing & Communications Manager (from March 2020–January 2021)

Michael Shaw Art Director & Multimedia Manager

Laura Watson Media Advisor (until February 2020)

Agnes Tam Digital Designer (until December 2020)

Keshan Withanage Web Developer & Data Analytics Officer (until December 2020)

Schools

Janine Sprakel Program Manager, Schools and Program Director, ChooseMATHS (until October 2020)

Leanne McMahon Outreach Officer

Marcus Garrett Outreach Officer (until August 2020)

Michael O'Connor Schools Outreach Project Manager (until December 2020)

Claire Embregts Executive Assistant to Schools Program Manager (until December 2020)

Ning Li Gender Researcher (until March 2020)

Anna Bock Outreach Officer (until December 2020)

Cassandra Lowly Outreach Officer (until December 2020)

Darla Trejo Finance & Admin Officer, ChooseMATHS

Research & Higher Education

Chloe Pearce Program Manager, Research & Higher Education (until August 2020)

Angela Coughlin Acting Program Manager, Research & Higher Education (from September 2020)

Anna Muscara Project Coordinator

Francesca Hoban Ryan Administrative Assistant

Liam Williamson Administrative Assistant

Parks Victoria (Detached Staff)

Dr Kally Yuen Statistician

APR.Intern

Lisa Farrar National Program Manager (from March 2020)

Glen Sheldon Deputy Program Manager

Mark Ovens Business Development Officer

David Beecham Business Development Officer

Justin Mabbutt Business Development Officer

Michael Valentine Business Development Officer (from March 2020)

Alyssa Weirman Business Development Officer (from March 2020)

Laura Carmichael CRM Reporting & Analytics Coordinator

Michael Koczyrkewycz Business Development Officer (until December 2020)

Michaela Murphy Business Development Officer (from March 2020)

Tracey McClurg Business Development Officer

Maria Galanis Business Development Officer (until March 2020)

Margo Brown Senior Program Coordinator

Jo Piltz Marketing & Communications Coordinator

Alex Mullany Project Coordinator

Zak Blayney Administrative Assistant

Sharmeen Hussain Marketing & Communications Assistant (until December 2020)

Sophie Kennedy Executive Assistant to the National Program Manager

Fan Gunawan Finance Officer (until February 2020)



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Australian Mathematical Sciences Institute

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