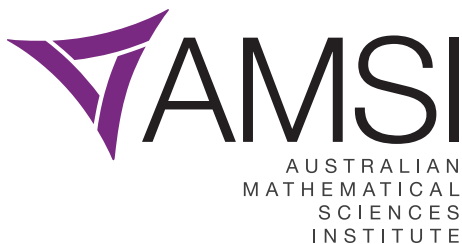




2015/16

AMSI Vacation Schools & Scholarships

Participation Strategy Implementation



Australian Government
Department of Education and Training

AMSI Vacation Schools & Scholarships

Participation Strategy Implementation

2015-16

Introduction	3
Program Participation	4
Gender	5
Choose Maths	6
ATSI & SES	9
Outreach	10
Media	13
Advocacy	15





Introduction

This document provides an update on the successful implementation of the Participation Strategy for the AMSI Vacation Schools and Scholarships Project 2012-2016 and should be read in conjunction with the annual stage reports for the project.

Program Objectives

Short-term

- Male and female participants should reflect the current cohort of enrolled mathematical sciences undergraduate and postgraduate students.
- Participants of Aboriginal and Torres Strait Islander (ATSI) descent should reflect the current cohort of enrolled mathematical sciences undergraduate and postgraduate students.
- Participants from low socio-economic status backgrounds should reflect the current cohort of enrolled mathematical sciences undergraduate and postgraduate students.

Long-term

- Male and female participants are approximately equal in number and of a high calibre.
- Significant increases in participation of high calibre persons of Aboriginal and Torres Strait Islander (ATSI) descent.
- By the year 2020 at least 20% of participants will be from low socio-economic status (SES) backgrounds.

Overall participation in the AMSI Vacation Schools and Scholarships project exceeded targets across all components of the program.

The BioInfoSummer symposium in particular enjoyed highly successful participation, with growth across all years of the project and significantly exceeding target.

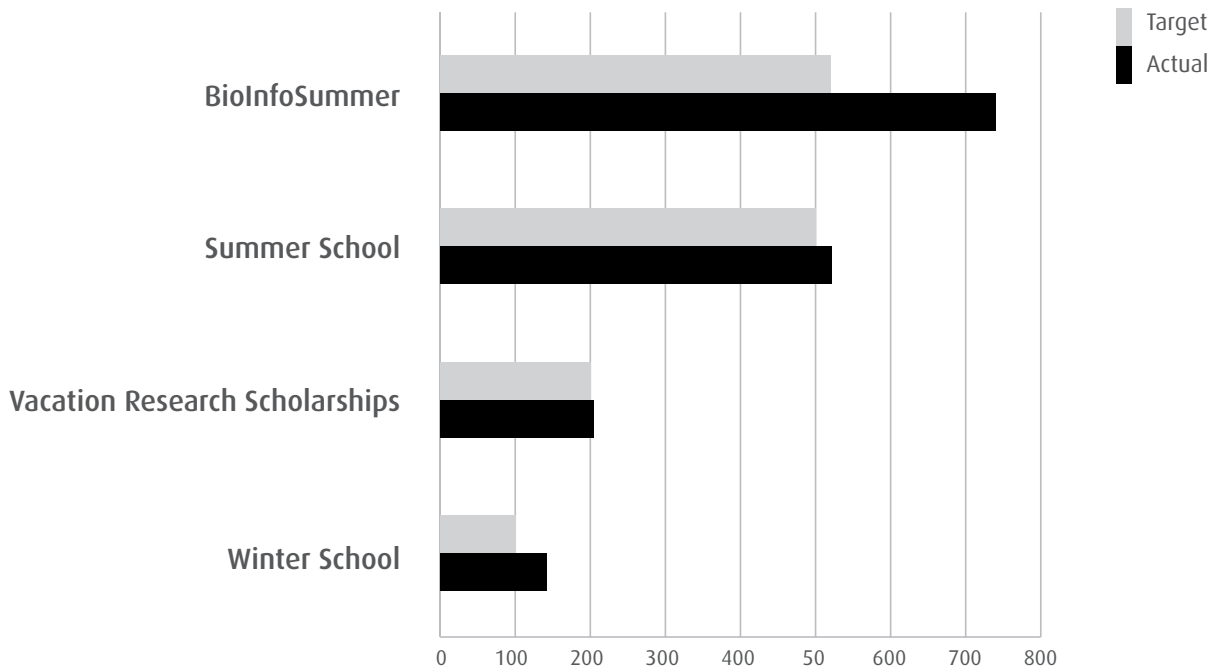
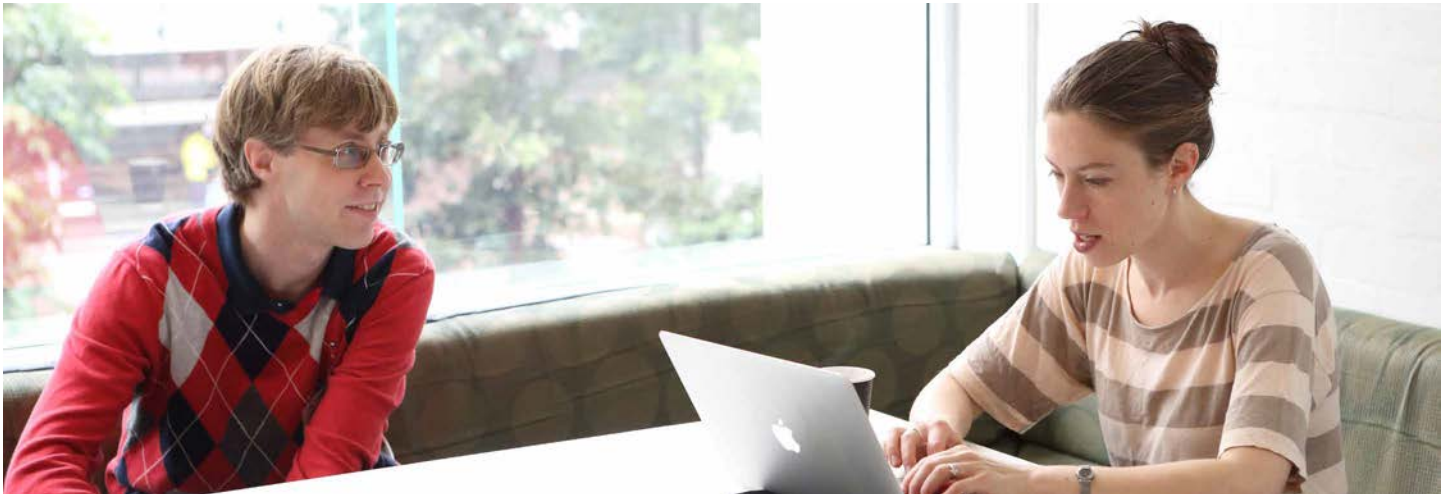


Figure 1: Total participation target against actual, across the Vacation Schools and Scholarships project 2012-16.





FYiMaths

AMSI was involved in the First Year in Maths Project which built academic networks, connections between tertiary and secondary mathematics education, and developed information and resources to improve retention of mathematical sciences students in the first year of university.

The first year of university is a pivotal experience in a student's transition from high school to university, and is strongly influenced by their interactions with their teachers and other students, in addition to the content and learning environment of the subjects they study.

In mathematics, there is often a significant gap between students' mathematics education at school and expectations of them at university. The role of the first-year subject and program coordinator in assisting the transition from high school to university is an important part of the support structure that universities provide to ensure students succeed. As the numbers of mathematics graduates in Australia continues to decline, it is important that university faculties maximise the opportunities to support first-year students and encourage their progress in the discipline.

Improving retention in the first year will help to increase female participation in the mathematical sciences.

fyimaths.org.au

Women in Mathematics Events

AMSI has had a partnership with the Women in Mathematics Special Interest Group of the Australian Mathematical Society for a number of years, and this partnership continues to go from strength to strength.

Under this partnership agreement, a Women in Mathematics event is embedded in the Vacation Schools programs. These events are open to both women and men, and raise awareness of issues faced by women in the mathematical sciences and help create a national support network.

- Summer School Women in Maths afternoon
- Winter School Women in Maths Networking event
- BioInfoSummer Women in Science event

AMSI continues to work with the Women in Mathematics Group to identify and remove barriers to female speaker and student participation in AMSI events.

Female Role Models

AMSI has continued to actively create female role models and the Choose Maths project will allow us to further expand work in this area through the Inspiring Women in Mathematics Network.

A partnership between AMSI and the BHP Billiton Foundation to increase the representation of girls and women in the field of mathematics was launched in April 2015.

The program increases the impact and reach of AMSI’s activities to address the pipeline issues from primary school, into secondary school and through to university and the workplace. Increasing awareness of the value of mathematics to careers and lifestyle, especially for women, is a program highlight. The program also has a high impact in the long-term on Australian student enrolments in undergraduate, honours and PhD mathematical sciences programs, and will significantly increase participation in the AMSI Higher Education programs.

Choose Maths works with students, parents and teachers over five years through a program of professional development, awareness and reward to turn around community attitudes to participation in mathematics, especially for girls and young women. The program will build self-sustaining education communities where girls and young women share equally in the rewarding careers and rich life experiences that mathematics offers.

choosemaths.org.au

“Any increase in STEM participation is good news but an increase in female representation is especially valuable because of the undeniable benefits of diversity”

Andrew Mackenzie,
Chief Executive Officer, BHP Billiton



Choose Maths Grants

Recognising the need to build professional networks and research collaborations as being vital for a successful academic career, Choose Maths Grants are designed to provide financial support for Australian female mathematical sciences students and early career researchers to assist their attendance at the AMSI Vacation Schools events, by funding their registration, travel, accommodation and/or assist with caring responsibilities.

Mathematics-Ready Teacher Professional Development

AMSI works on the ground in 120 Australian schools throughout the life of Choose Maths. The program is based on AMSI's existing highly successful cluster arrangement, where a secondary school and its feeder primary schools are formed into a professional development group working with an AMSI specialist to focus on enhancing content knowledge.

- Teacher Support
- Schools Visits
- Professional Development
- Teacher Resource Portal

Inspiring Women in Mathematics Network

A network of role-models will be established to inspire school girls and young women to seek the opportunities mathematics offers.

- A community of high achieving women
- Young women connecting with women working in STEM through shadowing opportunities
- Scholarships to AMSI Summer/Winter schools
- Career events at AMSI member universities
- Maths and Biology Initiative



Awards for Excellence in Teaching & Learning of Mathematics

Choose Maths will reward students, teachers and schools who are highly successful in motivating, inspiring and preparing students, particularly female students, through gender-sensitive teaching of mathematics.

- Annual Teacher awards for successful mentoring of girls
- Student awards for outstanding communication of the value of mathematics

National Mathematics Career Awareness Campaign

A nationwide awareness campaign to educate and excite the public with the knowledge of the importance of mathematics and an understanding that mathematics enhances career options and is a critical choice pathway to STEM.

- Posters
- Brochures
- Videos to illustrate practice
- Website
- Radio and print advertising
- Social media



Female Participation

In the final year of the project (2015/16), the percentage of female participation was higher than previous years for each element of the Vacation Schools and Scholarships project, with the exception of the Winter School.

The decline in female participation for the 2015 Winter School can be explained by poor female representation in the particular area of mathematics that was featured at the school, thus affecting the cohort of students that would be likely to attend.

Participation in BioInfoSummer 2015 was near equal, with 46% female and 54% male.

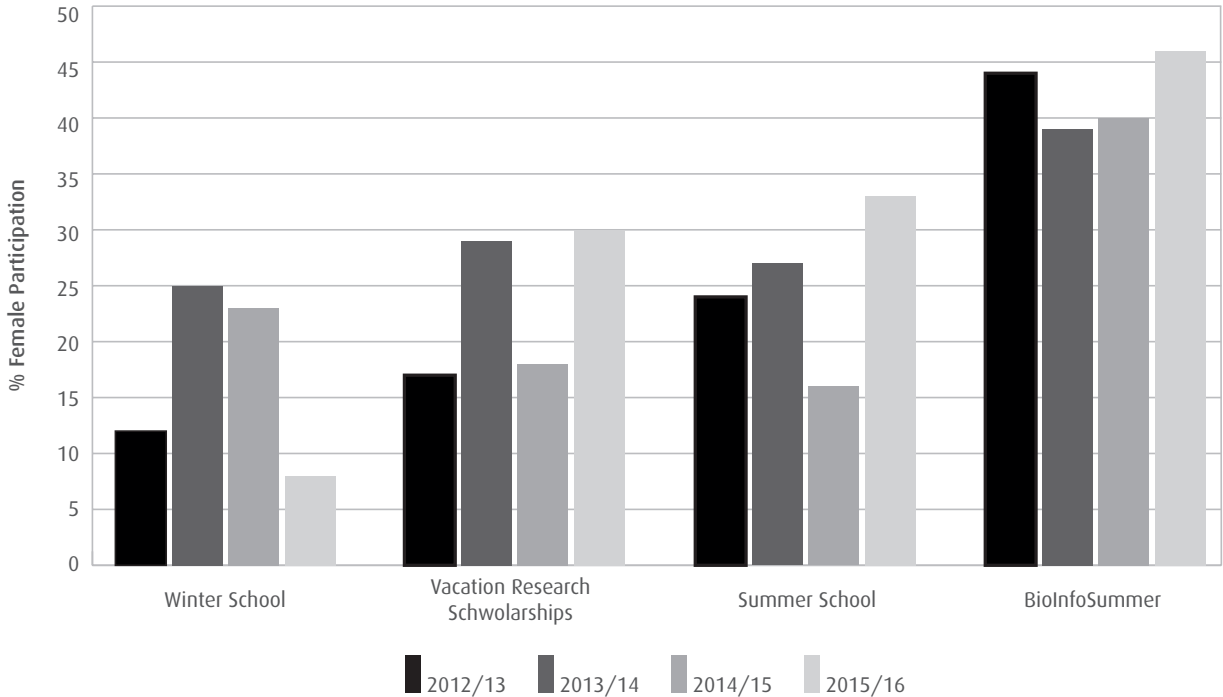


Figure 2: Female participation in the Vacation Schools and Scholarships project by program and financial year.

The Choose Maths project significantly increases the reach of the AMSI Schools program to regional areas. While the target group is girls of primary and secondary school age and first year university students, it is inevitable that a program that enhances the mathematics experience of girls will also have positive impacts on all students in the schools in which we operate.

Through the project AMSI will be working in some of the same schools as the CSIRO-BHP Billiton Aboriginal and Torres Strait Islander science, technology, engineering and mathematics (STEM) project.

AMSI also continues to provide teacher professional development to regional and rural schools through its partnership in the Regional Universities Network pilot project. This project aims to overcome barriers hampering mathematics and science education in rural, regional and remote Australia, to address the needs of teachers and students in these areas. This project is funded under the

Government's Australian Mathematics and Science Partnership Program (AMSPP).

While AMSI programs have an impact on ATSI and low SES participation in the mathematical sciences, a well-funded coordinated national strategy is required in order to significantly increase participation.

ATSI Participation

The Vacation Schools and Scholarships project 2012-2016 aimed to have at least one ATSI participant per year, in line with ATSI representation in the mathematical sciences student cohort. Participants self-declare their ATSI status at the time of registering for the programs.

The ATSI target was achieved in the first year of the project, and exceeded in subsequent years. It must be noted that the high numbers of students identified as ATSI in 2014/15 and 2015/16 were for the AMSI Summer Schools for both years, which included international students who may not have fully understood the question upon registration.

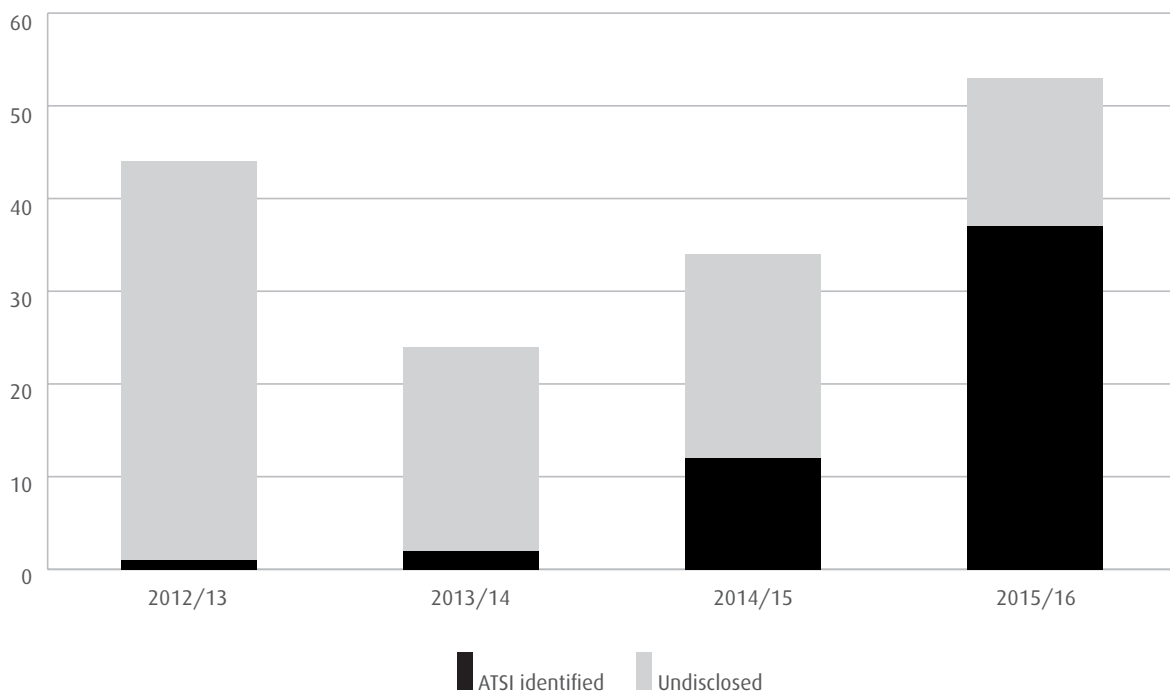


Figure 3: Participants who have identified as being of Aboriginal & Torres Strait Islander (ATSI) descent in the Vacation Schools and Scholarships project 2012-2016.

Participants who have chosen not to disclose their ATSI status are included in this graph, whilst non-ATSI students are not shown.

Public Events

A comprehensive program of outreach events ran throughout the Vacation Schools and Scholarships project. Public lectures linked to the AMSI Vacation Schools have been a staple, and have been successful to increase public awareness of both the event and the role of the mathematical sciences.

Highlights in 2015/16 included:

The Glass Bead Game

Professor Arun Ram of The University of Melbourne delivered the public lecture for the 2015 AMSI Winter School in conjunction with BrisScience. In his talk, Arun took the audience on a virtual tour of a toy store for pleasant games with glass beads, athletic games skiing the moguls, and violent games where everything gets smashed. He spoke of crystals and hurricanes and a few polynomials. The aim of his talk was to tell some stories related to current research in symmetry.



Active & flexible bodies moving with(in) fluids

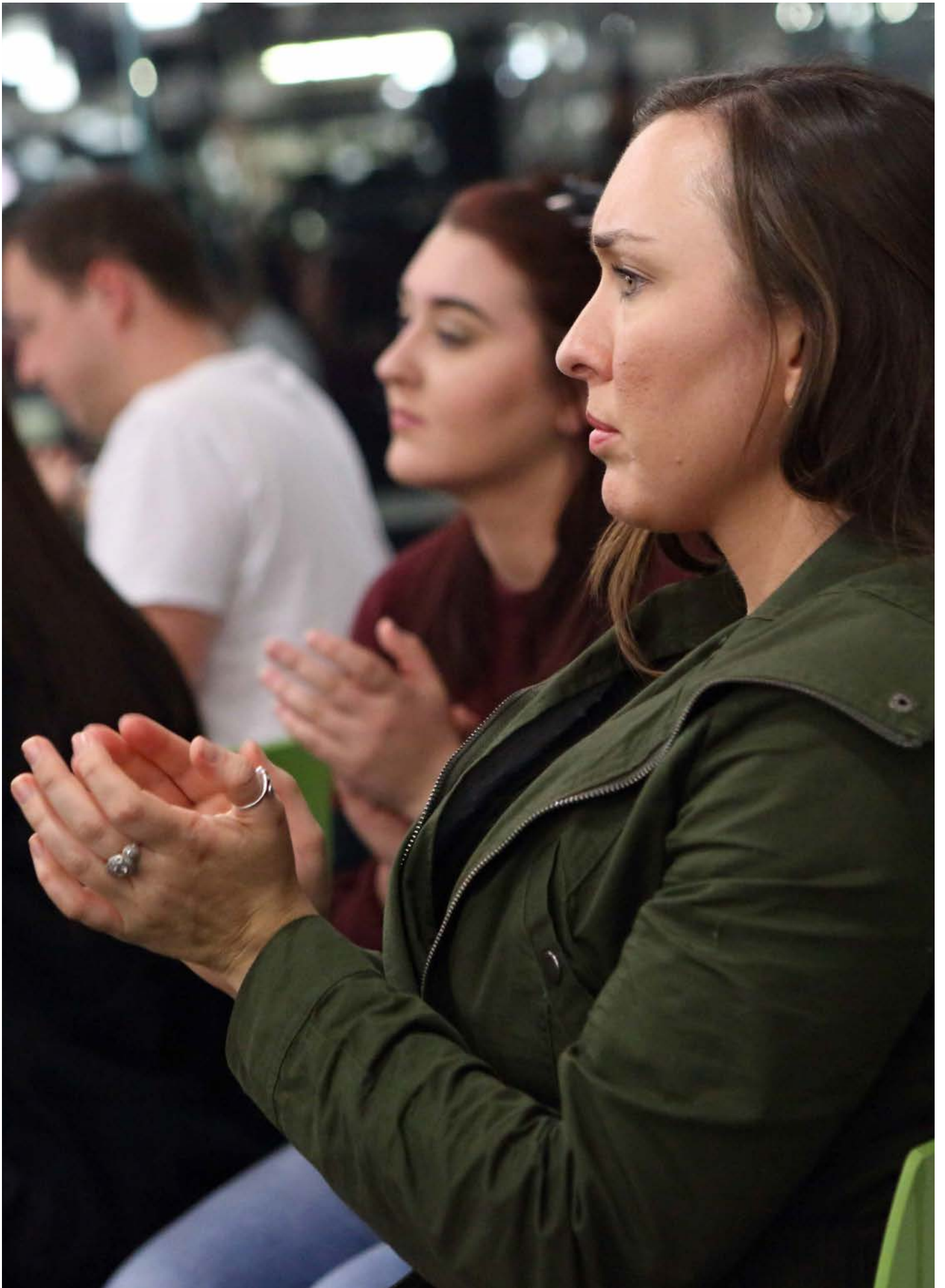


Professor Michael Shelley, Co-Director of the Applied Mathematics Laboratory at The Courant Institute of Mathematical Sciences, New York University, was the AMSI-ANZIAM Lecturer for 2015. In his public lecture he discussed the fluid-structure interactions ranging from those we can directly see — like flapping flags and flying birds — to those we cannot, such as the collective behaviours of swimming microbes and the transport of structures in biological cells.

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

Margaret Wertheim, an internationally noted science writer and exhibition curator delivered a public lecture for the 2016 AMSI Summer School. She discussed the story of hyperbolic space in a multifaceted talk bridging the domains of mathematics and culture. This generated some media interest, with interviews on the ABC Morning Show and ABC Radio (774). Margaret also published an article for The Conversation following the public lecture.







Careers Awareness

Career Information - Maths Ad(d)s

Maths Ad(d)s is a booklet in which job advertisements are gathered with the common theme of mathematics and statistics, but the actual jobs vary across a very broad spectrum. They give an overview of the variety of possible careers available to prospective university students after graduation if they include mathematics or statistics in their degree.

In its 18th Edition, *Maths Ad(d)s* 2015/16 was circulated electronically to all schools across Australia, and sent to all AMSI member universities for distribution to senior secondary students at their Open Days and to their undergraduate students.

Aside from job advertisements, *Maths Ad(d)s* features student profiles from the AMSI Vacation Schools and Scholarships project and includes profiles of mathematicians and statisticians.

Website – Maths Ad(d)s: Careers Powered by Maths

The AMSI Careers website brings together career profiles, videos and other career awareness resources developed by AMSI throughout the years into one place for students, teachers and parents to easily browse and access information about careers in mathematics.

careers.amsi.org.au

Careers Events

Embedded in the flagship event programs, careers events are held to increase the awareness and promote career opportunities within the mathematical sciences discipline.

Career Panels are hosted at BioInfoSummer and the Vacation Research Scholarship mini-conference (Big Day In) and were very popular with participants in 2015/16, with student and panel engagement on question and answer sessions.

A Careers Afternoon is showcased at the annual AMSI Summer School. This popular event provides students the opportunity to listen to talks from employers of mathematical sciences graduates about opportunities in a range of industries.

The Careers Afternoon also includes a networking session where employers and students have the opportunity to connect one-on-one. For students this is a good chance to ask questions, whilst for employers it is a valuable recruitment tool.

AMSI Summer School 2016 included representatives of the Australian Signals Directorate, Optiver, PwC and the Reserve Bank of Australia in addition to government agencies.

AMSI in the Media



AMSI has seen a significant growth in the number of news articles featured in both local and national media coverage, across different channels and platforms, including print newspaper and online website articles, social media posts, and radio interviews. The number of news articles featured in the media has experienced exponential growth during the Vacation Schools and Scholarships project, with 7 articles in 2013/14, featuring 24 in 2014/15, and most recently, 46 articles in the 2015/16 project years.

This success results in the increased reach, awareness, and profile of AMSI's Research and Higher Education program, including the AMSI Vacation Schools and Scholarships project. The release of the 2015 Discipline Profile of the Mathematical Sciences and its accompanying policy recommendations in August 2015 contributed to the increase in media attention, with coverage across multiple forms of media in Australia.

AMSI's website features a collection of news articles and features AMSI in the News. To find out more about the coverage and reach of AMSI, or to read some of the articles, please visit the website.

amsi.org.au/category/amsi-in-the-news/

Opinion Pieces

Opinion pieces are an effective method of promoting the Vacation Schools and Scholarships program and Australian research and issues affecting the mathematical sciences.

In 2015/16 the following opinion pieces were arranged with ABC Science, linked to AMSI programs:

- From triangles to computer graphics – Joan Licata and Anthony Licata, The Australian National University
- Social networks: What makes you you, and will you get the flu? – Stephen Davis, RMIT University

Site: ABC

NEWS LOCATION: Melbourne, Vic

Just In Election 2016 Australia World Business Sport Analysis & Opinion Fact Check Programs More

Science News

Social networks: What makes you you, and will you get the flu?

ABC Science · Stephen Davis
Updated 12 Jan 2016, 12:32pm

Dr Stephen Davis explains how complex networks shape everything from our political opinions to how likely you are to catch or spread the flu.

Are you really you? I mean, is it really you who determines your political opinions, your religious beliefs and your perception of what a normal healthy weight is, or is it your social context whereby your perception of what is normal and right is dictated by your friends and family?

The answer is that your social network probably plays a much larger role than you realise.

For example, studies have shown that diseases such as obesity spread through human social networks much like a virus does.

PHOTO: Your social network probably plays a much larger role than you realise (Getty Images)

MAP: Australia

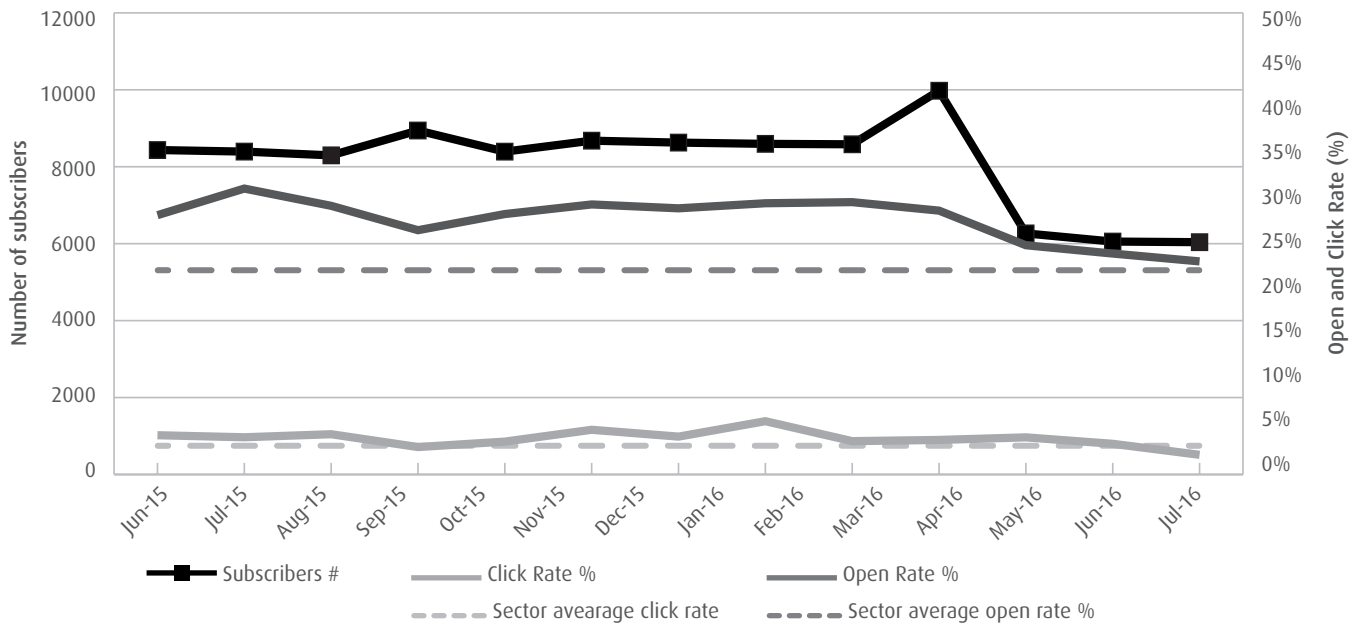


Figure 4. Research & Higher Education e-news subscriber numbers and open/click rate statistics, June 2015 to June 2016.

Benchmark averages for the Education and Training industry sector available at <https://mailchimp.com/resources/research/email-marketing-benchmarks> (5 July 2016).

E-News

Subscriber numbers to the monthly Research & Higher Education e-news are steady and consistently enjoy healthy open rates, averaging 27.79% over the past year. The e-news advertises AMSI programs and events, and its format includes links to quirky maths problems or topical stories of interest. The e-news increases engagement with the mathematical sciences and the AMSI Vacation Schools and Scholarships program.

research.amsi.org.au/news/e-news

Social Media

AMSI's growing social media presence has allowed us to increase our reach to Australian and international audiences, bringing greater awareness to the mathematical sciences, while providing a medium for AMSI to promote its initiatives, such as the AMSI Vacation Schools and Scholarships, directly to segments of its target audience.

Facebook groups have also contributed to increased engagement, and provide another networking opportunity for students participating in the AMSI Summer and Winter Schools, fostering a collegial and friendly environment.

facebook.com/discoveramsi

twitter.com/discoveramsi

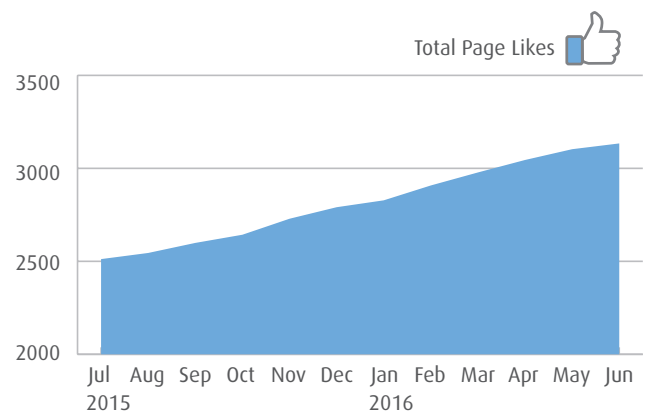
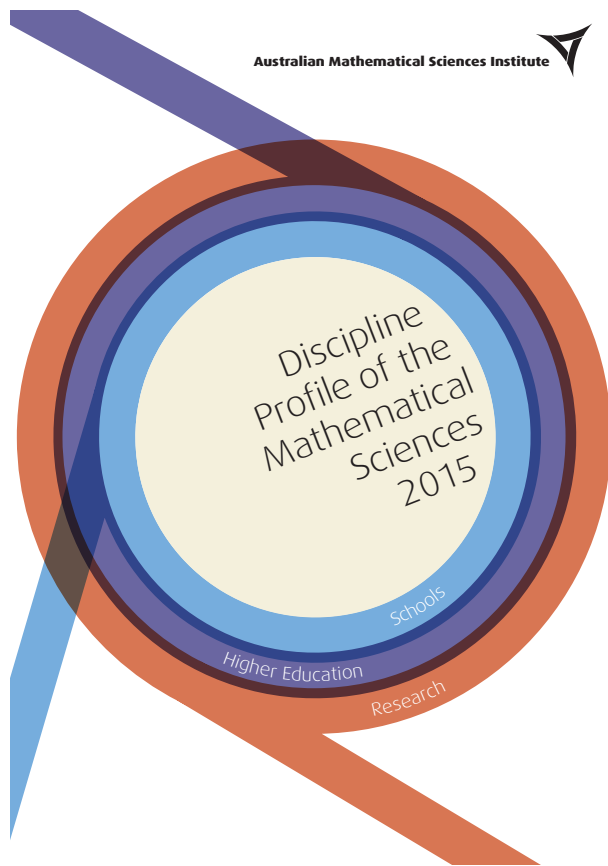


Figure 5. AMSI Facebook page "likes" from 1 July 2015 (2,512 likes) to 30 June 2016 (3,174 likes).



Australian Mathematical Sciences Institute



Discipline Profile

The fourth edition of the *Discipline Profile of the Mathematical Sciences* was released in August 2015. This publication highlights trends as they apply to school education, higher education, research and research training, and career prospects for graduates.

Broadly, the 2015 data shows that the demand for mathematical and statistical skills at all levels far outstrips supply. In particular, declining interest in advanced mathematics courses at Year 12 poses an immense challenge to securing Australia's future skills base.

Each year the discipline profile is accompanied by a publication of policy measures that identifies key priorities for government intervention and actions for peak bodies (commercial, educational, scientific and technological) to undertake.

Policy Measures

Australia's international competitiveness, security, population health and climate stability requires the workforce to be mathematically literate. AMSI's policy measures document has been structured to address the challenges apparent from the data in the 2015 discipline profile.

AMSI recognised four distinct priorities:

- Restore university maths prerequisites from their historic low and turn around declining school mathematics enrolments.
- Train the unqualified teachers of school mathematics and secure the supply of future maths teachers.
- Increase the number of girls studying maths and women employed in the quantitative professions.
- Boost the engagement of Australian business with mathematical sciences research.

The *Discipline Profile of the Mathematical Sciences*, AMSI's policy recommendations, and other AMSI publication documents can be downloaded from the AMSI website.

amsi.org.au/publications

VISION FOR A MATHS NATION

This is an exciting time in Australia for the mathematical sciences, and for science, technology and engineering. We have before us the Chief Scientist's proposal for a comprehensive plan for STEM — *Science, Technology, Engineering and Mathematics: Australia's Future* — and a government which is responding to it. The next 12 months will tell if we can shrug off a history of piecemeal policies and programs tied to the electoral cycle. Will we move forward in a strategic way that connects long term strategies for innovation and competitiveness, education and training, research and international engagement, all underpinned by a commitment to STEM, or fail where our competitors are succeeding?

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

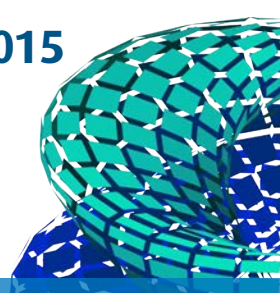
PRIORITY B
Train the unqualified teachers of school mathematics and secure the supply of future maths teachers

PRIORITY C
Increase the number of girls studying maths and women employed in the quantitative professions

PRIORITY D
Boost the engagement of Australian business with mathematical sciences research

Research
Australian Mathematical Sciences Institute

Winter School 2015 on Algebra, Geometry & Physics




29 June – 10 July 2015
The University of Queensland

Introductory and advanced courses in:

<p>Geometric Representation Theory Assoc. Prof. Anthony Henderson, The University of Sydney Dr Masoud Kamgarpour, The University of Queensland Dr Tony Licata, The Australian National University</p>	<p>Moonshine Conjectures and Vertex Operator Algebras Prof. Terry Gannon, University of Alberta Dr Nora Ganter, The University of Melbourne Prof. Geoffrey Mason, University of California, Santa Cruz</p>
<p>K-Theory and its Applications Dr Vigleik Angelveit, The Australian National University Dr Pedram Hekmati, The University of Adelaide</p>	<p>Moduli Spaces in Symplectic Geometry Dr Joan Licata, The Australian National University Dr Brett Parker, The Australian National University</p>

Full travel grants available!

In collaboration with the MSI Special Year 2015 in Geometry and Physics



www.amsi.org.au/WS

Bio INFO 15 Summer

THE UNIVERSITY OF SYDNEY
7 – 11 DECEMBER 2015


INTRODUCTION TO
BIOLOGY & BIOINFORMATICS

EPIGENOMICS


TRANSLATIONAL
GENOMICS

PROTEOMICS & METABOLOMICS

SYSTEMS BIOLOGY,
NETWORKS & DATA INTEGRATION



REGISTER NOW:
WWW.AMSI.ORG.AU/BIS



Research
Australian Mathematical Sciences Institute


Research
Australian Mathematical Sciences Institute

AMSI 16 Summer School IN THE MATHEMATICAL SCIENCES

RMIT University
4-29 January 2016

REGISTER TODAY : WWW.AMSI.ORG.AU/SS

<p>STOCHASTIC MODELLING Giang Nguyen, The University of Adelaide</p>
<p>LINEAR CONTROL THEORY & STRUCTURED MARKOV CHAINS Yoni Nazarathy, The University of Queensland</p>
<p>CONIC PROGRAMMING Vera Rocha, RMIT University</p>
<p>MODERN NUMERICAL METHODS FOR DIFFUSION EQUATIONS ON GENERIC GRIDS Jerome Bruneau, Monash University</p>
<p>DESIGN & ANALYSIS OF EXPERIMENTS Stelios Georgiou, RMIT University</p>
<p>COMPLEX NETWORKS Stephen Davis, RMIT University</p>
<p>CALCULUS OF VARIATIONS: THEORY & PRACTICE Julio Clinton, The Australian National University & Jiequn Han, Monash University</p>
<p>PROJECTIVE GEOMETRY John Kewson, The University of Western Australia</p>



Research & Higher Education
Australian Mathematical Sciences Institute

IN YOUR 3RD YEAR OF MATHS AND STATS?

Find out what it's like
to be a researcher!


2015/16

AMSI VACATION RESEARCH SCHOLARSHIPS


Get funding to complete a six-week summer research project under the guidance of a supervisor!

SCHOLARSHIPS:

- Australia wide
- \$450/week for six-weeks
- Present at AMSI's Big Day In
- Fully funded travel and accommodation
- Open to intending honours and masters students



APPLY TODAY: WWW.AMSI.ORG.AU/VRS



AMSI WINTER SCHOOL 16
ON BIOLOGICAL & ENVIRONMENTAL MODELLING
 4-15 JULY | THE UNIVERSITY OF QUEENSLAND

$$\frac{\partial p}{\partial t} = f(x) + \alpha \frac{\partial^2 p}{\partial x^2}$$

OUR "SECOND BRAIN": MODELLING ITS DEVELOPMENT & DISEASE
Kerry A Landman, The University of Melbourne

USING A.I., NETWORKS THEORY & BUTCHERS PAPERS TO CONSERVE SPECIES
Eve McDonald-Madden, The University of Queensland

THE MATHEMATICAL MODELLING OF CHEMOTAXIS
Graeme Pettet, Queensland University of Technology

MATHEMATICAL APPROACHES TO CONSERVATION BIOLOGY
Hugh Possingham, The University of Queensland

THE DYNAMICS OF CALCIUM: THE INTERACTION OF MODELLING & EXPERIMENTS
James Sneyd, The University of Auckland

In the twenty-first century, modelling is a crucial research tool for studying complex phenomena and processes.

Our impressive line-up of speakers will build your knowledge of models, algorithms, theoretical analysis tools and topical applications, from molecular biology through to ecosystems analysis.

FULL TRAVEL GRANTS AVAILABLE!

REGISTER AMSI.ORG.AU/WS **AMSI RESEARCH**

AMSI 16 BIOINFO SUMMER
 28 NOV - 2 DEC
 THE UNIVERSITY OF ADELAIDE

AMSI BIOINFOSUMMER introduces bioinformatics to students, researchers & professionals working in mathematics, statistics, IT, medical sciences, biological & chemical engineering

INTERNATIONAL SPEAKERS:
ONLY ALTER The University of Utah
SIMON ANDERS Institute for Molecular Medicine Finland
MINGYAO LI University of Pennsylvania
STEPHEN TURNER Pacific Biosciences
XIA YANG University of California, Los Angeles

THEMES:
 INTRODUCTION TO BIOINFORMATICS
 ANALYSIS OF HIGH DIMENSIONAL DATA
 RNA SEQ EXPERIMENTAL DESIGN & ANALYSIS
 USING LONG READ SEQUENCING FOR WHOLE GENOME ASSEMBLY
 CODING FOR BIOINFORMATICS

REGISTER:
AMSI.ORG.AU/BIS

AMSI RESEARCH

IMAGE: OVERLAYS BETWEEN KNOWN BIOLOGICAL PROCESSES BY KEELI PETERY (BARCELONA, SPAIN)

AMSI SUMMER SCHOOL 17
IN THE MATHEMATICAL SCIENCES
 9 JAN - 3 FEB 2017
 THE UNIVERSITY OF SYDNEY

CATEGORY THEORY & COMPUTER SCIENCE
 Richard Garner & Dominic Verity, Macquarie University

COMPUTATIONAL BAYESIAN STATISTICS
 Scott Sisson, The University of New South Wales

COMPUTATIONAL MATHEMATICS
 Markus Hegland, The Australian National University

GEOMETRIC GROUP THEORY
 Lawrence Reeves, The University of Melbourne
 & Anne Thomas, The University of Sydney

HARMONIC ANALYSIS
 Pierre Portal, The Australian National University

MATHEMATICAL BIOLOGY
 Mary Myerscough, The University of Sydney

MATHS & STATS OF BIG DATA
 Kerrie Mengersen, Queensland University of Technology

OPTIMISATION
 Michelle Dunbar, The University of Sydney

REGISTER:
AMSI.ORG.AU/SS **AMSI RESEARCH**

AMSI VACATION RESEARCH SCHOLARSHIPS 2016/17

GET A TASTE FOR RESEARCH THIS SUMMER!

APPLY FOR AN AMSI RESEARCH SCHOLARSHIP

AMSI.ORG.AU/VRS

Australian Government Department of Education and Training

Australian Mathematical Sciences Institute

Research & Higher Education
Building 161, c/- The University of Melbourne,
Victoria 3010 Australia

events@amsi.org.au
www.amsi.org.au

