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Gazette

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- Classroom notes on presenting mathematics in an elegant way
- Items relevant to mathematics education
- Letters on relevant topical issues
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- Reports on the business and activities of the Society
- Staff changes and visitors in mathematics departments
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Editorial

David and I welcome you to the July issue of the *Gazette* of the Australian Mathematical Society.

I began the Editorial in the March issue of the *Gazette* by saying that 2020 was a very difficult year for all humanity. Unfortunately 2021 is proving to be no better despite the slowly growing availability of vaccines. The Delta variant of COVID-19 has reduced the effectiveness of the vaccines and is much more transmissible. The speed of transmission has made it very hard for contact tracers to get ahead of any outbreak. As Victoria has shown, and NSW has not yet understood, going early and hard is the best way to attack an outbreak. At the time of writing, half of all Australians are under lockdown. And as yet there is no evidence that NSW is getting on top of its outbreak.

COVID-19 has hit all parts of the economy and the Federal Government is to be commended in stepping in with massive financial support. But no significant assistance has been given to Australian universities. As a result, universities have had to come up with a very different business model. When I wrote in March, this had resulted in over 17,000 university staff losing their jobs. This has continued in 2021 with staff cuts which have been savage.

In this issue Ole Warnaar, in his President's Column, focusses on the draft proposal for a revised Australian Curriculum from Foundation to Year 10. Ole lists some of the most notable and perhaps contentious aspects of the proposed Curriculum for Mathematics. Amongst these are "The delayed treatment (or elimination) of what many of us would consider basic mathematics skills." I encourage you to read his President's Column.

In the 1970s La Trobe University mathematics departments introduced the so-called blackboard tutorial room. Rather than a tutor standing at the front of the room and giving a mini-lecture and writing solutions on the blackboard, there were blackboards on every wall in the tutorial room and students were expected to work on a set of exercises on her/his blackboard and the tutor moved around the room providing assistance. The idea is that you learn mathematics by doing it rather than by watching it done. Over time blackboards were replaced by whiteboards and this boardroom approach to tutorials was taken up by other Australian universities. With the onset of COVID-19, teaching and learning went online. In this issue in Classroom Notes, John Banks, Paul Fijn, Robert Maillardet, Anthony Morphett, Rosie Pingitore, Alba Santin Garcia and TriThang Tran describe how the University migrated boardrooms to online learning. This is significant since as we all know tutorials are a very important part of learning mathematics.

Deborah Jackson, Secretary, AustMS, reminds us about the application deadlines for Lift-off Fellowships and Walter and Lyn Bloom Travelling Fellowships. She also advises us of the AustMS members who have been accredited as Fellows (FAustMS).

Tom Keegan tells us in his article what is planned at MATRIX for 2021 and beyond. In particular he mentions significant funding opportunities.

Anthony Henderson updates us of the planned activities of The Sydney Mathematical Research Institute (SMRI). He also reminds us that some of the activities mentioned may be postponed, so please check the SMRI website for the latest information. Anthony also advises us that Geordie Williamson has returned to the helm of SMRI.

Once again Peter Higgins challenges and entertains us with Puzzle Corner.

The Editors of the *Gazette* are interested in establishing an article in each issue on our ECR (Early Career Researchers) in mathematics. Each article would be written by an ECR discussing anything relevant to ECR. If you would like to serve as editor for such articles or are an ECR and would like to contribute an article, please send an email to gazette@austms.org.au

As usual the News section contains the happenings, promotions, comings and goings and planned conferences at Australian universities.

We include in this issue activities of, and sponsored by, AMSI and advertisements of new books published by the American Mathematical Society.

Finally there is mention of the Australian Mathematical Society Lecture Series, which is a series of books published for AustMS by Cambridge University Press. The Series began in 1985. New submissions for this Series are sought. Graeme Cohen's book in this Series has now been republished, with permission of course, by the Harbin Institute of Technology Press in China. (It is curious, perhaps only to me, that I was Editor-in-Chief of this series for its first decade and Harbin was the city where my grandparents met, married, lived for a decade and began their family.)

We wish you an interesting read of this issue and that you all stay safe.

Sid Morris, Adjunct Professor, La Trobe University;
Emeritus Professor, Federation University Australia.
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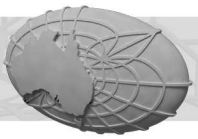
Sid Morris retired after 40 years as an academic. He received BSc (Hons) from UQ in 1969 and PhD from Flinders in 1970. He held positions of Professor, Department Head, Dean, Deputy Vice-Chancellor, CAO and CEO. He was employed by the universities: Adelaide, Ballarat, Flinders, Florida, La Trobe, UNE, UNSW, UQ, UniSA, Tel-Aviv, Tulane, Wales, and Wollongong. He was Editor of *Bull. AustMS* and *J. Research & Practice in IT*, and founding Editor of *AustMS Lecture Series* and *J. Group Theory*. He has been on the AustMS Council for 25 years and its Vice-President. He received the Lester R. Ford Award from the MAA. He has published 170 journal papers and 4 books for undergrads, postgrads and researchers, plus 2 online books, 1 translated into 8 languages and supplemented by YouTube videos and a Facebook group of 10,000 members. In 2016 he was ordained as a Rabbi. In 2020 he published the 4th edition of his 1,000-page book *The Structure of Compact Groups*. He enjoys spending time with his three grandchildren.



President's Column

Ole Warnaar*

In June 2020, the Australian Curriculum, Assessment and Reporting Authority (ACARA) was tasked by the State and Territory Education Ministers to review the current Foundation to Year 10 Australian Curriculum. The last time the Australian Curriculum was reviewed was in 2014, with the current Curriculum adopted in 2015. According to a statement published on the ACARA website:

> Our program of research has benchmarked the Australian Curriculum against the curricula of Singapore, Finland, British Columbia and New Zealand, and we sought feedback from state and territory jurisdictions through our annual monitoring process.
>
> This work found that the Australian Curriculum is consistent with some of the best curricula internationally and is well-regarded by teachers across the country; but that it needs refining, updating and 'decluttering' to better support teachers.

In April this year ACARA released a draft proposal for a revised Australian Curriculum — which includes Mathematics — and currently the document is in a consultation phase which closes the 8th of July (a date that will have passed before you get a chance to read this column). In a document "What has changed and why?", see https://www.australiancurriculum.edu.au/media/7120/ac_review_2021_mathematics_whats_changed_and_why.pdf, ACARA comments on the main changes to Mathematics. They in particular write:

> A key criticism of the current F–10 Australian Curriculum: Mathematics is that the proficiency strands are separated from the content and are presented with little direction as to what a teacher is expected to do with them. This has resulted, in many cases, in implementation of the Australian Mathematics curriculum that focuses primarily on factual mathematical knowledge and associated procedures, without sufficient attention to other essential mathematical proficiencies. A key proposed change is to streamline the structure of the F–10 Australian Curriculum: Mathematics by removing sub-strands and separate proficiency strands and, instead, organising essential content in six clear strands — number, algebra, measurement, space, statistics, and probability — and embedding the interrelated proficiencies within those strands.

It is fair to say that the proposed Australian Curriculum for Mathematics has received some very mixed reviews from within the mathematics community, and the proposal certainly appears to go well beyond its stated aim of updating, refining and decluttering. Despite some clear positives, such as the inclusion of problems with an Indigenous perspective in data analysis, it is quite a complex document, couched in jargon, and whether the stated aim of providing more clarity has been achieved is questionable. From the personal feedback I have received from many

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AustMS members, some of the most notable and perhaps contentious aspects of the Curriculum for Mathematics are:

1. The conflation of 'curriculum' with 'pedagogy'. There is a strong emphasis on learning mathematics through exploration and enquiry. Although exploration, discovery and enquiry-based learning should have their place in the curriculum — it is certainly how most readers of the Gazette would practice Mathematics — it is not clear if enquiry-based learning is the most effective approach to achieving basic numeracy and problem solving skills.
2. The delayed treatment (or elimination) of what many of us would consider basic mathematics skills. Most noticeable is that multiplication tables do not feature in the new curriculum until Year 4 (age 8 to 9). This may for example be compared with the current curriculum of Singapore which includes the multiplication tables of 2, 3, 4, 5 and 10 at the 'Primary Two' level. Also the absence of linear equations prior to Year 8, and the actual elimination of linear equations whose solution requires algebraic fractions from the Year 10 curriculum is cause for concern. This is a curriculum that purports to put more focus on problem solving, but appears to eliminate some of the most indispensable problem solving tools.
3. The current curriculum consists of the three main strands "Number and Algebra", "Measurement and Geometry", and "Statistics and Probability", with a further subdivision into 13 sub-strands. The 13 sub-strands may indeed be seen as cluttered, but the six new strands Number, Algebra, Measurement, Space, Statistics, and Probability are suggestive of a separation of topics that most of us would view as intrinsically intertwined. ACARA claims "The six strands reflect well-understood and internationally recognised organisers for essential mathematical content." It would certainly appear that among many AustMS members these well-understood and internationally recognised organisers are in fact news.
4. It has been remarked that the new curriculum is quite utilitarian. Giving children a better understanding of the utility of mathematics is of course important. We are all familiar with the "what is this good for?" or "when will I ever use this?" type questions when it comes to mathematics, and exposing primary and secondary school students to real-world problems that can be analysed or even solved using mathematics should indeed be a key aim of the new curriculum. However, as it stands not enough effort has been made to try to convey the intrinsic beauty of mathematics and the enjoyment one can derive from learning and understanding new mathematical concepts. (The same criticism could certainly also be levelled at the current curriculum.) In the previously-mentioned Singapore curriculum there is an "attitudes statement" referring to aspects of mathematics learning. These include statements such as "beliefs about mathematics and its usefulness" but also "interest and enjoyment of learning mathematics" and "appreciation of the beauty of mathematics". It is difficult to quantify how such positive attitudes towards mathematics influence effective teaching of the subject, but they certainly reflect a view that mathematics can be so much more than just a necessary but difficult chore.

5. This is not about the curriculum per se, but many of you have remarked that unless issues around a lack of qualified mathematics teachers and out-of-field teaching are addressed, even the best curriculum in the world will not prevent Australia from further sliding down the PISA (Programme for International Student Assessment) or TIMSS (Trends in International Mathematics and Science Study) rankings. It is certainly a positive development that Alan Tudge, Minister for Education and Youth, has acknowledged some of the most recent TIMSS data, released on the 25th of May. This data shows that no more than 16% of Australian Year 4 students have a mathematics teacher with a major in Primary Education and Mathematics. This alarming statistic should be compared to the international average, which is reported to be 32% among the 64 countries participating in TIMSS. The same TIMSS data also highlights the severe shortage of specialist mathematics teachers in Australia.

It is really to be hoped that the Federal and State and Territory Governments take some decisive action to tackle this problem. Minister Tudge has stated that "[...] the current review of the National Curriculum must focus on lifting standards in maths and science." Let us hope statements such as these will be backed up by new policy initiatives designed to grow significantly the pool of qualified mathematics teachers. If not, there is little prospect that the standards in Mathematics and Science in Australia will indeed be lifted.

Ole Warnaar is Chair and Professor of Pure Mathematics at the University of Queensland. His research interests include algebraic combinatorics, number theory and the theory of special functions. He currently serves on the MATRIX advisory board, AMSI scientific board and is the chair of the organising committee of the Simon Marais Mathematics Competition. Ole is a Fellow of the Australian Academy of Sciences, Fellow of the Australian Mathematical Society, and joint recipient of the 2020 George Szekeres Medal. In his spare time he coaches judo and enjoys rock climbing, running, hiking, reading and art house movies.

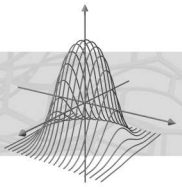
AUSTMS LECTURE SERIES IN CHINA

The Australian Mathematical Society Lecture Series is a series of monographs and textbooks published at various times since 1985, when Neil Cameron's 'Introduction to Linear and Convex Programming' appeared. Sid Morris had led the Society's planning of the concept, in consultation with Cambridge University Press, and was Editor-in-Chief for the first ten years. Twenty-eight titles have appeared to date.

Number 17 in the series, Graeme Cohen's 'A Course in Modern Analysis and its Applications' was published in 2003 and has this year been reprinted in association with the Harbin Institute of Technology Press for 'the People's Republic of China (excluding Hong Kong, Macau and Taiwan)'. Apparently, no other books in the series have been similarly co-published.

According to its Preface, Cohen's book 'is designed for students who are majoring in some area of mathematics but who do not necessarily intend to continue their studies at a graduate level.' Furthermore: 'Future teachers of high school mathematics should be given an introduction to the mathematical future as much as they must be given some knowledge of the mathematical past; students of mathematical engineering, biology or finance may need to read current literature without desiring to contribute to it.' The chapters begin with metric spaces (following a detailed 'Prelude to Modern Analysis'), introduce topological spaces and normed vector spaces, and end with Hilbert space and generalised Fourier series. The Chinese edition includes a translation of much of the Preface and chapter titles, and a few pages of additional exercises and solutions in Chinese, but the body of the book is a complete reprint, in English, of the original.

The Lecture Series is always keen to receive proposals or submissions. These can be sent to the current Editor-in-Chief, Gary Froyland, at lectureseries@austms.org.au.



Puzzle Corner

Peter M. Higgins*

Welcome to Puzzle Corner 68 of the Gazette of the Australian Mathematical Society. In this first section I will introduce "Differentiation by Inversion". After that I will give a solution to Puzzle Corner 67 on "Inverting a derivative".

I would be happy to receive your solution to Puzzle Corner 68 not later than August 30, 2021. The email address for solutions is austmspuzzles@gmail.com. Any particularly interesting solutions will be mentioned in the next Puzzle Corner.

◇ ◇ ◇ ◇ ◇ ◇

Ansatz is an odd looking and esoteric word. It is German in origin and the Oxford dictionary gives a wonderfully clear definition: an assumption about the form of an unknown function which is made in order to facilitate solution of an equation or other problem. It's useful to have a word for that.

And it is definitely relevant to this month's problem, which continues the theme of novel differential equations. First, an easy question.

Problem 1. Find all functions that have the property that their derivative equals their reciprocal.

Problem 1 gives us all functions where the derivative comes from taking the algebraic inverse. But what happens if we ask for the functional inverse instead, which we now do.

Problem 2. Find a real solution to

$$f'(x) = f^{-1}(x).$$

The educated guess to go with is to assume that a solution has the form $f(x) = Ax^k$. Trying this ansatz is not merely wishful thinking. The reason why this may be a suitable form is that the functions that feature in the equation, $f'(x)$ and $f^{-1}(x)$, have the same form. Our equation will then translate into an equation in the parameters (A and k), the hope being that this will reduce the differential equation to a relatively simple algebraic one that we may solve. It does work, but the answer is surprising. Not something you would ever guess.

Problem 3. Check that your solution satisfies the equation.

And this last problem is of course routine, but is a little trickier that you would expect.

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Problem 'Inverting a Derivative' from Puzzle Corner 67

Almost everyone knows that $\frac{dx}{dy} = 1/(dy/dx)$, but what about second derivatives? Does this simple reciprocal relationship persist?

Problem 1. Find the corresponding relationship between $\frac{d^2x}{dy^2}$ and $\frac{d^2y}{dx^2}$.

And so it's not so simple with second derivatives. But then mathematicians, being as we are, are duty bound to ask the question:

Problem 2. For what functions is it true that

$$\frac{d^2x}{dy^2} = 1/\frac{d^2y}{dx^2}?$$

Solution

In response to this problem we received a solution from Dr Alan Jones which we provide below. Thanks to Alex Bishop for composing a draft of these solutions.

Problem 1. We begin by rewriting the derivative d^2y/dx^2 as

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\frac{dy}{dx}. \tag{1}$$

Using the chain rule we rewrite the derivative on the right-hand side of (1) as

$$\frac{dy}{dx}\frac{d}{dy}\frac{dy}{dx}. \tag{2}$$

We may then use the rule $dy/dx = (dx/dy)^{-1}$ to rewrite (2) as

$$\frac{dy}{dx}\frac{d}{dy}\left(\frac{dx}{dy}\right)^{-1}. \tag{3}$$

From (3) we then see that

$$\frac{d^2y}{dx^2} = -\frac{dy}{dx}\frac{d^2x}{dy^2}\left(\frac{dx}{dy}\right)^{-2}.$$

Then, again from $dy/dx = (dx/dy)^{-1}$, we have the equalities

$$\frac{d^2y}{dx^2} = -\left(\frac{dx}{dy}\right)^{-3}\frac{d^2x}{dy^2} \quad \text{and} \quad \frac{d^2y}{dx^2} = -\left(\frac{dy}{dx}\right)^{3}\frac{d^2x}{dy^2}. \tag{4}$$

Problem 2. Suppose that $y(x)$ has the property that

$$\frac{d^2y}{dx^2} = \left(\frac{d^2x}{dy^2}\right)^{-1}. \tag{5}$$

We then see that this is equivalent to

$$\frac{d^2y}{dx^2}\cdot\frac{d^2x}{dy^2} = 1. \tag{6}$$

From (4) we see that

$$\frac{d^2x}{dy^2} = -\left(\frac{dy}{dx}\right)^{-3}\frac{d^2y}{dx^2},$$

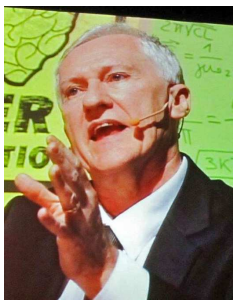
and thus we may rewrite (6) as

$$\left(\frac{d^2y}{dx^2}\right)^2 = -\left(\frac{dy}{dx}\right)^3.$$

Alan Jones then gave the family of hyperbolae

$$(x-a)(y-b) = 4$$

as solutions to this second order differential equation. Thus, this family of hyperbolae satisfy the differential equation given in (5).



Peter Higgins is a Professor of Mathematics at the University of Essex. He is the inventor of Circular Sudoku, a puzzle type that has featured in many newspapers, magazines, books, and computer games all over the world. He has written extensively on the subject of mathematics and won the 2013 Premio Peano Prize in Turin for the best book published about mathematics in Italian in 2012. Originally from Australia, Peter has lived in Colchester, England with his wife and four children since 1990.

Active learning groupwork based online tutorials

John Banks, Paul Fijn, Robert Maillardet, Anthony Morphett, Rosie Pingitore, Alba Santin Garcia and TriThang Tran*

Abstract

Pre-COVID, we used 'whiteboard tutorials' in most of our large undergraduate mathematics and statistics subjects. Whiteboard tutorials take place in a classroom with whiteboards (or blackboards) around all the walls, and students work together in small groups on mathematical tasks at the boards. The classes are a form of active learning, helping students to develop skills such as group work and communication, and provide a valuable social element to students' University experience. In this paper, we describe a model for online 'whiteboard' tutorials which preserves many of the strengths of the pre-COVID whiteboard tutorial model in an entirely online environment. We discuss some challenges with the model and possible mitigations.

Keywords: active learning; online learning; online whiteboard; group work

What makes a good small group class in mathematics and statistics?

"The only way to learn mathematics is to do mathematics" Paul Halmos

What makes a 'good' small group class in mathematics and statistics? A 'good' class must juggle effective learning techniques while also meeting broader needs of the institutional and social context. Active learning is known to be an effective learning technique for STEM students [1]. Another important element for learning is feedback, "one of the most powerful influences on learning and achievement" [2]. Broader needs include institutional graduate attributes or informal 'employability skills' which students are expected to develop over the course of their degree, or addressing sector-wide issues such as challenges with student engagement and transition [3]. Meeting these needs might mean providing opportunities for students to develop communication or group work skills, and to make social connections with their peers.

One popular and effective model of small group (tutorial) teaching and learning in mathematics and statistics that achieves this is the 'board tutorial' [4]. Board tutorials take place in classrooms with whiteboards or blackboards around all the walls. Though they vary somewhat between institutions and between subjects, a typical board tutorial runs thus: at the start of class, students form into groups of 2–3 students. Each group chooses a board. The tutor gives them a sheet of previously unseen questions and the students work collaboratively in their group on the questions, writing out their solutions on the boards (Figure 1). Students learn from their groupmates, while also developing communication skills as they explain their thinking to their groupmates, and teamwork

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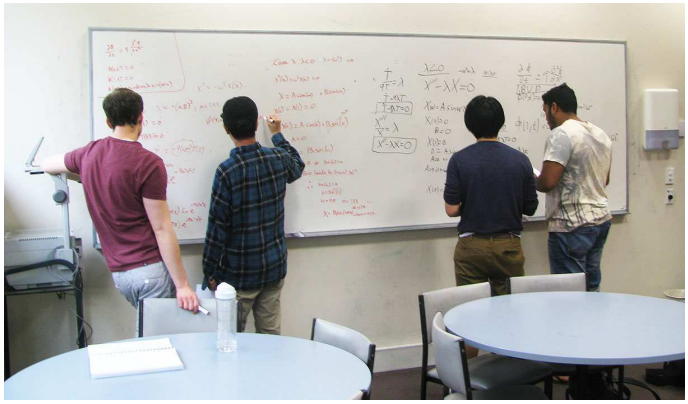

Figure 1. Students working in groups in a board tutorial
Photo credit: Christine Mangelsdorf

skills as they collaborate. The tutor circulates around the room and gives feedback to each group as they work. The tutor can potentially give feedback on dimensions such as written communication and problem solving as well as mathematical correctness. Since every group's work is visible to all, if a group is stuck and the tutor is busy, they can also peek at a neighbouring group's board for a hint to get them unstuck. The tutor can also see at a glance around the room how each group is progressing.

The 'board tutorial' is an example of active learning — students are actively engaging with mathematics for most of the class time as they work through the questions. Students receive immediate feedback on their work, both from their peers and from their tutor. Students also have the opportunity to develop generic skills including communication and group work. There is also a strong social aspect — students meet classmates, connect with peers and make new friends; all of which contribute to a positive university experience.

Before the COVID-19 pandemic of 2020, we had used this model for all tutorials in most of our large undergraduate first and second year mathematics and statistics subjects at The University of Melbourne. The model is also used at a number of other Australian institutions [4]. It was very successful, inevitably getting excellent feedback from students and being popular amongst tutors and lecturers.

Adapting the model to entirely online teaching

In early 2020, two weeks into our academic year, we were forced by the COVID-19 pandemic to move all our teaching online. In this section, we describe a model of 'online whiteboard tutorial' that we developed which potentially preserves many of the strengths of the board tutorial model.

Our model uses a combination of a videoconferencing platform such as Zoom (https://zoom.us), and an online collaborative whiteboard such as Miro[1] (https://miro.com). Zoom allows students to meet in a virtual meeting, where they can speak to each other

[1]The choice of Zoom and Miro is not essential and the model could be used with other platforms such as Microsoft Teams (https://www.microsoft.com/en-au/microsoft-teams/group-chat-software).

and see each other's faces (if they have microphones and cameras turned on). It also allows the tutor to divide the class into 'breakout rooms', where sub-groups of the class can meet separately. Miro is a collaborative online whiteboard, where multiple users can annotate a shared virtual whiteboard, seeing each other's updates live.

At the start of class, the students and tutor join a Zoom meeting. After introducing the class, the tutor gives students a link to a collaborative online whiteboard with the week's questions pre-loaded. The board has about 6 copies of the questions and spaces for answers, each copy in adjacent columns (Figure 2 and Figure 3).

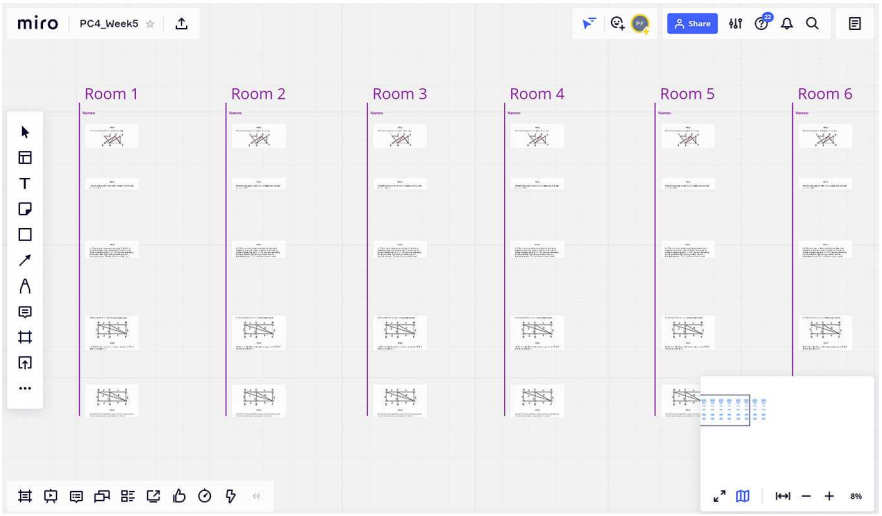

Figure 2. Excerpt of a set of board tutorial questions zoomed out

The tutor then forms students into breakout rooms of about 3 students. Students load the online whiteboard in their web browser and zoom in on the column corresponding to their breakout room, i.e. students in breakout room n navigate to column n of the virtual whiteboard. The students then collaborate in their groups on the questions, talking to each other over Zoom while working out their solutions in their group's column on the online whiteboard (Figure 4).

The tutor can move between breakout rooms and whiteboard columns to give each group feedback.

This model potentially preserves many of the strengths of the pre-COVID board tutorial. Students are still engaged in active learning, working in groups, collaborating on mathematics. There is still a social element where students can chat informally in the breakout room while working. The tutor still provides feedback on their work at the time they are doing it (or just minutes after). Students can still peek at the neighbouring group's work by panning across on the online whiteboard for a hint to help get unstuck. The tutor can also zoom out to see all columns at once, for an overview of how each group is progressing. The model also has some additional benefits. Students can bookmark the whiteboard for a permanent record of their work in the class, which they can refer back to when studying for the exam. Students can stay in the breakout room and keep working on the whiteboard after the end of class if they wish, whereas in a physical classroom they would have to vacate for the next class. The boards also potentially provide a ready corpus for education research.

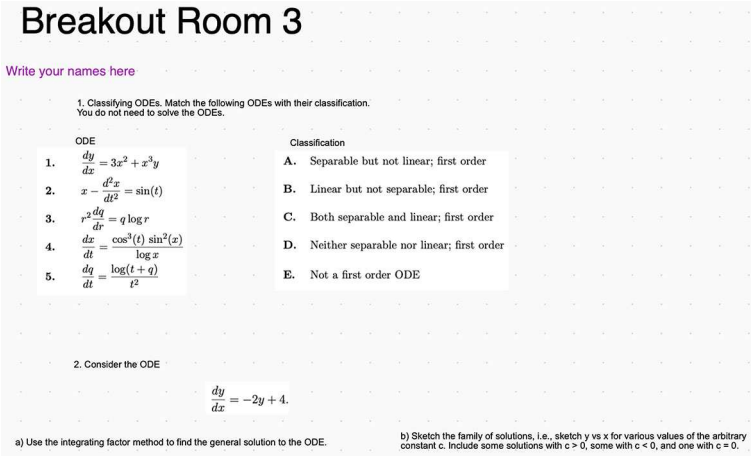

Figure 3. Excerpt of a set of board tutorial questions zoomed in

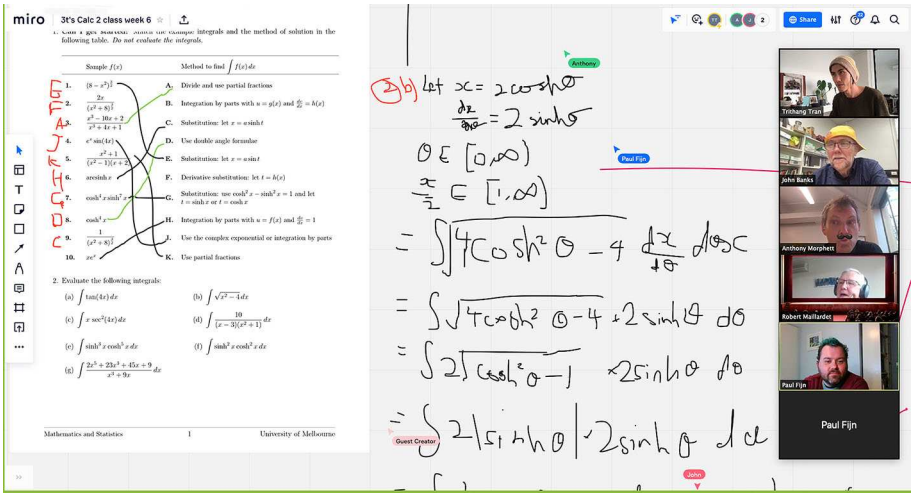

Figure 4. Working on an online whiteboard while in a Zoom breakout room.

Challenges and potential mitigations

The model described above can exhibit many of the advantages of the in-person board tutorial. It is not without challenges though. We discuss some challenges and possible mitigations. These can have important equity dimensions as students face differing financial, availability of suitable home/study space and location-based (e.g. internet restrictions) challenges.

First is access to technology. Online whiteboards are very easy to use for students with a touchscreen device and stylus, such as an iPad, which allows them to handwrite mathematics on screen. For students without such a device though, it is considerably harder to handwrite mathematics. This can be partly mitigated through question design: question types such as matching, give an example, or identifying features on a graph can

be readily answered by students using just a mouse and keyboard. Designing boards to start with one or more of these questions each week allows students without a tablet device to still contribute early on in the class. If there are only a small number of students with tablet devices, the tutor can carefully allocate breakout rooms so that each breakout room has one student with a tablet who can do the writing for questions requiring mathematical calculations. There are also inexpensive technology options such as external graphics tablets, which allow students to handwrite on an online board and can cost as little as AUD$50.

Regardless of someone's access to hardware, there is also the learning curve associated with mastering a new software tool. In the first class of the semester, we often start with an 'orientation board' which steps students through basic functionality of the online whiteboard — zooming, panning, drawing, etc. We find it helps to start the semester with an orientation or revision tutorial which is ostensibly about revision but where the main focus is on mastering the technology. Some students spend much of the first class just mastering the tools, but the payoff is that they are better able to participate in future weeks. Tutors too face challenges with access to and mastery of technology. We mitigated this by loaning iPads to any of our tutors who did not already have a suitable device, providing training on how to use the technology, and holding informal 'debrief' sessions where tutors could share ideas and help each other solve issues.

Another challenge with the online model is student engagement. Our in-person board tutorials are typically bustling with energy as students quickly embrace the groupwork and peer learning. In contrast, we find it takes considerably more effort from the tutor to engage students in the online mode. Students are often reluctant at first to turn on their video cameras and microphones, or slip easily into working independently and separately rather than in collaboration. While this remains a challenge, one approach we've taken is to try to establish a common tutorial 'culture' throughout our school — a set of shared understandings about expectations and behaviours in tutorials. We reinforce certain key messages, such as the importance of having your camera turned on in tutorials, to students through various channels such as LMS announcements before the start of semester and reinforcement of the message from lecturers and tutors in the early classes.

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Communications

2021 Australian Academy of Science Fellows

In May, the Australian Academy of Science elected four mathematical scientists as Fellows. Our congratulations to all of them! Their citations follow.

Professor Yihong Du (The University of New England)

Yihong Du is internationally renowned for his contributions to the theory of nonlinear elliptic and parabolic partial differential equations and their application in chemical reaction theory and population dynamics. He is a pioneer and leader in the use of nonlinear free boundary problems to model spreading phenomena and has resolved long standing problems on sharp thresholds, boundary blow up, bifurcation and multiplicity. His papers have been highly influential. He has also made significant contributions to the advancement of science through mentoring, conference organisation and service on committees and panels.

Professor Rob Hyndman (Monash University)

Rob Hyndman is one of the world's most recognised applied statisticians, and is internationally acknowledged for his research in time series forecasting. Time series data are endemic in many fields of science and business but forecasting is notoriously challenging. Hyndman co-developed fundamental state space theory for these data that underpin the most widely used time series methods in the field. His methods for automatic forecasting, forecast reconciliation, functional time series, feature-based analysis and computational time series, have had an enormous influence on the field. His textbooks and software have transformed the capability of many organisations to make accurate predictions.

Professor John Sader (University of Melbourne)

John Sader's development of pioneering measurement techniques has revolutionised the characterisation of materials using the Atomic Force Microscope (AFM). His scientific contributions are widely used and have enabled breakthrough discoveries in materials science at the molecular and atomic scale. The Sader Method is an international standard for AFM force calibration as is the Sader-Jarvis Method for atomically resolved AFM force measurements. These methods appear in textbooks and are used in commercial instruments. He has also made important contributions across an array of fields, including nanomechanics, plasmonics, rarefied gas dynamics and fluid-structure interactions ranging from nano- to macro-scales.

Professor Gordon Smyth (Walter and Eliza Hall Institute of Medical Research)

Gordon Smyth is a statistician and bioinformatician who is known for his work on statistical computing and statistical modelling. He has long-standing interests in nonlinear estimation, dispersion estimation and algorithm development. He has made influential contributions to the analysis of genomic data, especially to linear modelling and empirical Bayes methods for the analysis of gene expression experiments. Together with collaborators, he has used genomic data to make important discoveries of relevance to breast cancer, malaria and other diseases.

Queen's Birthday Honours 2021

Two Australians have become Members of the Order of Australia for services related to mathematics. Our congratulations to both of them.

Emeritus Professor Doreen Thomas AM (University of Melbourne) for significant service to tertiary engineering education and research, and to women.

Dr John Leslie Bennett AM (formerly Chief Executive of the Office of the Board of Studies NSW, and Conjoint Professor of Education at the University of New South Wales) for significant service to education, to mathematics, and to curriculum standards.

MATRIX

Tom Keegan*

MATRIX Reloaded

MATRIX is looking forward to restarting its residential face-to-face research programs by hosting 11 programs in the second half of 2021. Australian-based participants can meet as before while new high resolution cameras will allow overseas researchers to also participate as long as international border restrictions are in place.

In September, MATRIX will be hosting Australia's first all-women residential research program in the mathematical sciences. This research program, titled "Women in Geometry, Analysis and Topology", is led by Julie Clutterbuck (Monash University), Melissa Tacy (University of Auckland) and Vanessa Robins (The Australian National University).

For further details:
https://www.matrix-inst.org.au/events-01/programs/page/2/

MATRIX Collaborations

Over the past year MATRIX has used the lull in face-to-face activities to build new international partnerships such as the tandem workshops with the Mathematisches Forschungsinstitut Oberwolfach (MFO) and the Simons Foundation, and is reaffirming its partnerships with the Mathematical Sciences Research Institute (MSRI) in Berkeley as well as with the South Korean Institute for Basic Science (IBS). Domestically MATRIX has started a PhD symposium series together with AMSI as well as a MATRIX-SMRI research symposium built around a distinguished researcher or publication.

New MATRIX-Simons Collaborative Fund

MATRIX has launched a new fund to enhance knowledge sharing with external partners. The fund is made available by a generous grant from the US-based Simons Foundation. Research programs with financial support from business, industry, government, funding bodies or donors will be eligible to receive matched funding up to $20,000.

For further information:
https://www.matrix-inst.org.au/collaborative-fund-guidelines/

*MATRIX, Creswick, http://www.matrix-inst.org.au/

Call for Research Programs and Tandem Workshops

MATRIX Research Programs

Bring researchers from across the world together to pursue mathematical research within a beautiful Australian bushland setting!

MATRIX provides funding for 20 participants per residential research program in 2022/2023; up to AUD $18,000 per week for accommodation and catering. Research programs are for 1–4 weeks in duration.

The Scientific Committee meets twice per annum to consider research program proposal submissions. MATRIX also accepts one-page Expressions of Interest (EOIs) at any time during the year.

Further details:
https://www.matrix-inst.org.au/guidelines/

Closing date: Tuesday, 31 August 2021

MATRIX-MFO Tandem Research Workshop (2023)

MATRIX and the Mathematical Research Institute Oberwolfach (MFO), Germany, invite proposals for a tandem workshop taking place **simultaneously** at MATRIX and MFO in the week of **5–11 March 2023**.

At each institute 10–20 participants are possible, who can interact in the usual intense way locally and in addition share a certain number of joint lectures/discussions via zoom (for example Oberwolfach 9–11 am could match up with MATRIX at 5–7 pm). Talks given outside this time slot can be recorded via zoom for viewing by participants at the other institute, but not publicly.

Further details:
https://www.matrix-inst.org.au/matrix-mfo-tandem-workshop-2023-guidelines

Closing date: Tuesday, 31 August 2021

Funding Opportunities to Support Research Programs/Workshops

A range of funding opportunities is available to support your research program/tandem workshop at MATRIX. This includes the new MATRIX-Simons Collaborative Fund grant scheme — apply via your research program/tandem workshop proposal.

MATRIX Contact

If you have any questions, please contact Joy Lukman (MATRIX Programs Coordinator) at office@matrix-inst.org.au

Upcoming Research Programs

MATRIX looks forward to a busy second half of 2021, with 11 programs planned:

https://www.matrix-inst.org.au/events-01/programs/

- Integrability and Combinatorics at Finite Temperature
- Structured Random Matrices in Down Under: New Developments and Applications
- Women in Geometry, Analysis and Topology
- Invariants and Structures in Low-Dimensional Topology (MATRIX-MFO)
- Rough Wave Equations (MATRIX-MFO)
- Cell Motility in Dynamic Environments
- Mathematics of Tissue Dynamics
- Isoperimetric Inequalities in Geometric Partial Differential Equations
- Groups and Geometries
- Quantum Curves, Integrability and Cluster Algebras
- SMRI-MATRIX Workshop with Martin Hairer (Part II): Stochastic Analysis for Randomly Evolving Surfaces

PhD Student Online Research Symposia

Seven MATRIX-AMSI symposia are being run by and for PhD students in 2021, with a focus on advancing research through collaboration and building peer networks.

https://www.matrix-inst.org.au/events-01/phd-student-symposia/

Online Seminar Series

MATRIX hosts monthly online seminars. For information on upcoming seminars and access to recordings of past seminars, visit:
https://www.matrix-inst.org.au/events-01/online-seminars/

Further Information

MATRIX is a national partnership between the University of Melbourne, Monash University and the Australian National University, with the University of Queensland and the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS) as Associate Members.

Comments, suggestions and requests are always welcome. Please send these, as appropriate, to:

Director: Jan de Gier (jdg@matrix-inst.org.au)

Deputy Directors: David Wood (davidw@matrix-inst.org.au)
Peter Bouwknegt (peterb@matrix-inst.org.au)

Support team: Tom Keegan (Executive Officer) (tomk@matrix-inst.org.au)
Joy Lukman (Programs Coordinator) (office@matrix-inst.org.au)

Website: https://www.matrix-inst.org.au
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LinkedIn: https://www.linkedin.com/in/matrix-australia/

Tom Keegan is the Executive Officer of MATRIX. He has worked in research and graduate research management in the university sector in Victoria for the past 16 years. He provides expertise in managing high-level strategic initiatives, resources and operational planning for MATRIX. Tom is a member of the Australasian Research Management Society (ARMS) and former member of the ARMS Victoria-Tasmania Chapter Executive. https://www.linkedin.com/in/tomkeegan2/

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2021 SCIENTIFIC EVENTS

INDIGENISING UNIVERSITY MATHEMATICS
CARMA, THE UNIVERSITY OF NEWCASTLE
20 SEPT

NUMBER THEORY DOWN UNDER 9
THE UNIVERSITY OF SYDNEY
27 SEPT

MATHEMATICS OF TISSUE DYNAMICS
MATRIX
27 SEPT

MATHEMATICS OF SEA ICE & ICE SHEETS 2021
UNIVERSITY OF SOUTHERN QUEENSLAND
10 NOV

WORKSHOP ON THE INTERSECTIONS OF COMPUTATION & OPTIMISATIONS
AUSTRALIAN NATIONAL UNIVERSITY
22 NOV

AMSI AMSI.ORG.AU/SCIENTIFIC-WORKSHOPS


AMSI
22
SUMMER
SCHOOL
IN THE MATHEMATICAL SCIENCES
UNIVERSITY OF TECHNOLOGY SYDNEY
CELEBRATING
20 YEARS
OF AMSI SUMMER SCHOOL
SAVE THE DATE
10 JAN – 4 FEB 2022
AMSI
SS.AMSI.ORG.AU

The Sydney Mathematical Research Institute

Anthony Henderson*

Note: The SMRI offices are temporarily closed because of the Sydney lockdown. Some of the activities mentioned below may be postponed, so please check the SMRI website for the latest information.

International mobility is such a cherished part of Australian life, perhaps especially for mathematicians, that to see it frozen so rapidly in the early months of 2020, and then to realize that the thaw will be slow and hesitant, struck many of us hard. In this respect, the most promising development of the first half of 2021 was the opening of the Australia-New Zealand travel bubble, which will hopefully remind both countries of the virtues to be found in our near neighbourhood.

We are therefore delighted to reopen the SMRI International Visitor Program with a special trans-Tasman stream. Researchers in the mathematical sciences at New Zealand universities can now apply to us for funding for visits to Australia to work with colleagues here. Please encourage any potential collaborators from New Zealand to take advantage of this scheme: full terms and conditions, and details on how to apply, can be found on our website https://mathematical-research-institute.sydney.edu.au.

Meanwhile it has been heartening to see the blossoming of hybrid seminars and workshops, which capture some of the benefits of bringing local audiences together while involving remote participants online. We are still in the experimental phase of this format, but it seems probable that some of its characteristic features, such as scheduling fewer talks and more opportunities for discussion, will permeate events in general as organizers reassess how best to use the precious time that travellers can spend on site.

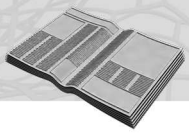
SMRI is pleased to be associated with a number of hybrid workshops being held at the University of Sydney in the second half of 2021, in which speakers coming from other Australian universities are supported by the SMRI Domestic Visitor Program. After the Computational and Algorithmic Topology Sydney (CATS) workshop in July 2021, the next such events will be the annual Number Theory Down Under meeting and a joint workshop with the University of Münster on motivic techniques in representation theory, both in the semester break week starting on 27 September. We encourage all Australian mathematicians to explore how they can benefit from the SMRI Domestic Visitor Program, whether their visit to Sydney is tied to a workshop or not: again, see our website.

*Sydney Mathematical Research Institute, University of Sydney.
Email: anthony.henderson@sydney.edu.au

As always, we are greatly indebted to the donors who provide the bulk of SMRI's funding: the Simon Marais Foundation, the Hooper-Shaw Foundation, and Dr Philipp Hofflin and Dr Rebekah Jenkin. We thank them particularly for the faith they have shown in SMRI amid all the recent changes to our activities, by not just continuing but increasing their philanthropic funding to a level of $1M per year.

Finally, congratulations to SMRI Director Geordie Williamson, who recently became the first mathematician working in Australia to join the editorial board of the famed journal *Inventiones Mathematicae*. Geordie has now returned to the helm of SMRI after the conclusion of his remote directorship of a Special Year at the Institute for Advanced Study, and we are eagerly awaiting his upcoming public lecture in Sydney featuring some of his recent discoveries.

Anthony Henderson is currently the Executive Director of the University of Sydney Mathematical Research Institute, which he helped to establish in 2018. After obtaining his PhD from the Massachusetts Institute of Technology in 2001, he returned to the University of Sydney as a postdoctoral researcher and has worked there ever since. For his publications in geometric and combinatorial aspects of representation theory, Anthony was awarded the Christopher Heyde Medal in 2011 and the Australian Mathematical Society Medal in 2012. He also received a Faculty of Science Citation for Excellence in Teaching in 2009, and his Honours-level lecture notes on Lie algebras were published by Cambridge University Press in 2012. He is a founding Director of the Simon Marais Mathematics Competition for undergraduates in the Asia-Pacific region.



News

General News

LEGO® animations in Linear Algebra

Dr Emily Cook (Swinburne University of Technology) has produced Stop-motion LEGO® animations in Linear Algebra.

The output is four videos shared on YouTube and the Adobe Education Exchange: visit https://www.youtube.com/channel/UCVpSicvR9kovrEJ12FRPp3g.

This may be interesting for members, especially those teaching Linear Algebra.

OPTIMA: Training Centre in industrial optimisation

OPTIMA is the new ARC Training Centre working in industrial optimisation. It is a collaboration between The University of Melbourne, Monash University, ten industry partners and three international partner universities.

The OPTIMA website is now live https://optima.org.au/.

They invite everyone to take a look to get to know their people, their projects and their industry partners.

Girls do the maths

The School of Mathematics and Statistics at UNSW Sydney hosted the 16th annual Girls Do the Maths workshop in dual modality: face-to-face on June 10th and online on June 17th. The face-to-face event attracted over 230 female high school students from 21 schools across New South Wales, and almost 300 students participated in the online version. The events were the result of incredible teamwork, which involved about 30 members of staff and 30 under- and post-graduate students working together as partners. More information about the event can be found at https://www.maths.unsw.edu.au/news/2021-06/girls-do-the-maths-2021.

Completed PhDs

Australian National University

- Dr Shuaige Qiao, *Bubble tree compactification of instanton moduli spaces*, supervisors: Bryan Wang, Brett Parker, Andrew Hassell, Xu-jia Wang.
- Dr Michael Asher, *Surrogate groundwater models*, supervisors: Barry Croke, Anthony Jakeman, Luk Peeters.
- Dr Rommel Real, *Convergence results for variational regularization and Landweber iteration under heuristic rules*, supervisors: Qinian Jin, Stephen Roberts, Markus Hegland.

Griffith University

- Dr Patrick Marchisella, *Reasoning with plausible causal knowledge*, supervisors: Peter Johnston and David Billington.

Murdoch University

- Dr Shaymaa Mukhlif Shraida, *A dynamical study of saline plumes in desalination outfalls*, supervisors: Graeme Hocking and Mark Lukas.

Swinburne University of Technology

- Dr Luca Maffioli, *Equilibrium entropy and nonequilibrium distribution functions of atomistic fluids*, supervisors: Billy Todd, Federico Frascoli, Nathan Clisby (Swinburne), and Lamberto Rondoni (Politecnico di Torino).

University of Sydney

- Dr Edward Kim, *A generalized hedging and pricing theory under multiple funding curves, collateralization and counter party credit risk*, supervisor: Marek Rutkowski.
- Dr Eric Hester, *Modelling fluid-solid interactions*, supervisor: Geoffrey Vasil.

Awards and other achievements

Australian National University

- Lindon Roberts was awarded the 2021 IMA Leslie Fox Prize for Numerical Analysis. This biennial prize was established in 1985 by the Institute of Mathematics and its Applications in honour of mathematician Leslie Fox (1918–1992), and honours 'young numerical analysts worldwide'.

University of Southern Queensland

- Professor Yury Stepanyants has received a $5,000 grant from AMSI for the International workshop on Mathematics of Sea Ice and Ice Sheets in November; see the conference section for further details.

Appointments, departures and promotions

Griffith University

- Dr Nathan Garland has been appointed as Lecturer (Level B) in Applied Mathematics.
- Associate Professor Tim Gould has been promoted to Associate Professor (Level D).

Swinburne University

- Dr Ant Edwards (currently a senior lecturer) has been appointed as Associate Dean Education of the School of Science, Computing and Engineering Technologies, starting from 1 July.

University of the Sunshine Coast

- Dr Lauren Thorton has accepted a position as Lecturer in Mathematics at USC.

Conferences and Courses

Conferences and courses are listed in order of the first day.

Information given here is the most up to date supplied to us at the time of going to press. Thanks to the ongoing disruption caused by CoViD-19, you should check the relevant webpages, or contact the organisers directly, for updates.

MATRIX is planning almost a dozen research programs/workshops in the remainder of this year. Please see the listing in Tom Keegan's article in this issue, or visit https://www.matrix-inst.org.au/events-01/programs/page/2/ for further details.

Indigenising University Mathematics

Date: Monday 20 September to Tuesday 21 September 2021
Venue: Wollotuka Institute, University of Newcastle
Web: https://carma.newcastle.edu.au/events/events-print.php?n=1225

This national and international two-day symposium will address the pressing challenge of how to Indigenise mathematical practice at Universities, both in education and research. The methodology is of collaboration and sharing of knowledge and worldviews from within both Indigenous cultures and the cultures of mathematics and its allied disciplines.

The symposium will be organised around a collection of interconnected themes, each chaired by a partnership of Indigenous and non-Indigenous practitioners. These include: Indigenous Mathematics, Re-imagining the living present, Traditional Knowledge, Country, Language and Oral Traditions, and Love and Pedagogy. The symposium will also launch a call for contributions to a book on the same topic.

The physical location of this blended face to face and online symposium is significant. The Birabahn building of the Wollotuka Institute blends indoor and outdoor spaces, inviting new perspectives, whilst also having the capabilities for an international video-linked conference.

Number Theory Down Under (NTDU9)

Dates: 27–30 September 2021
Venue: The University of Sydney
Web: https://www.maths.usyd.edu.au/NTDU9/

The ninth annual event promotes Number Theory in Australia. It brings together Australian and international number theorists to share ideas, pursue collaborative work and establish connections to other fields of mathematics such as Additive Combinatorics, Ergodic Theory and Homogeneous Dynamics, Arithmetic Geometry, Arithmetic Dynamical Systems, as well as more applied areas, such as Cryptography.

The main objective of the conference is to develop coherent plans for future development of Number Theory in Australia and its impact on other fields, and thus gaining a better understanding of the possibilities for further progress.

The conference should provide leading number theorists, early career researchers (ECRs) and students an ideal opportunity to interact, to present their recent results and to work on concrete research problems. We will have distinguished plenary speakers from Australia and overseas and Australian and NZ keynote speakers. There will also be sessions for contributed talks, as well as dedicated sessions for students to present short updates on their research.

The presentation and discussion of open problems have been major components of the conference in previous years. Attendees have set challenges to one another during talks at the conference: this has led to the publication of articles and an increase in collaboration. While 'Number Theory', as a Special Interest Group within the AustMS, is still at its formative stage, its membership is increasing each year. This reflects the growing (though still small) number of academics in the Australian community. NTDU9 will enable members of this burgeoning group to present their most recent work and to collaborate on open problems. One of the main goals of the conference this year will also be to search for new links between Number Theory and other areas of mathematics.

Registration (now open at the website) is free unless you wish to attend the conference dinner. The deadline for those who want to give a talk, or request financial support, is 1 September.

Representation theory's hidden motives

Date: 27 September to 1 October 2021
Venue: Münster, Sydney and online
Web: https://www.uni-muenster.de/MathematicsMuenster/events/2021/mrt-2021.shtml

In recent years, motivic techniques have been applied in several branches of representation theory, for example in geometric and modular representation theory. The goal of this workshop is to bring together researchers in these areas in order to foster new synergies in topics such as foundational aspects of the theory of motives,

Tate motives on varieties of representation-theoretic origin, motivic aspects of the Langlands program, and motives of classifying spaces.

The workshop will take place in parallel at the Westfälische Wilhelms-Universität in Münster and at the Sydney Mathematical Research Institute. It can also be attended online.

Workshop participation is free of charge, but registration via the website is required.

Mathematics of Tissue Dynamics

Dates: 27 September to 1 October 2021
Venue: MATRIX Residential Research Program, Creswick
Web: https://www.matrix-inst.org.au/events/mathematics-of-tissue-dynamics/

The organisers are currently not accepting any more in-person participants, as they are full, but would welcome online participation. Details of the program and online registration can be found at the website.

WIMSIG 2021 (Women in Mathematics Special Interest Group)

A Celebration of Australian Women in Mathematical and Statistical Sciences

Date: Friday 1 October 2021
Web: https://www.austms.org.au/WIMSIG-conference-2021

To suit the challenging environment created by the pandemic, the 2021 WIMSIG Conference (postponed from 2020) will be a one-day conference involving local "hubs" in each state capital, where participants can meet in person (in a suitably socially distanced way). Talks will be broadcast to the hubs, with invited speakers delivering their talks either at one of them or online. These hubs will participate in centralised activities including keynotes and a discussion panel, as well as some local activities.

There will also be parallel sessions with talks taking place at each hub, but not broadcast to the others. The organising committee hopes that this format will allow participants to experience some of the networking and social benefits of a face-to-face meeting, while keeping everyone safe.

Given the impact of the pandemic on women in mathematics, we have made this event free, making it accessible to everyone. We warmly encourage women to attend this event. More information will be posted on the conference webpage in due course. Meanwhile, if you are interested in volunteering to organise the conference at your hub, please contact the organisers.

Organising Committee

- Jessica Purcell (Monash), Chair
- Joanne Hall (RMIT), Secretary
- Sevvandi Kandanaarachchi (Monash), Treasurer
- Amy Glen (Murdoch), Web Editor
- Jennifer Flegg (Melbourne)
- Jessica Kasza (Monash)
- Christina Kazantzidou (QUT)

International Workshop on the Mathematics of Sea Ice and Ice Sheets

Dates: 9–12 November 2021
Venue: USQ Toowoomba campus and online via Zoom
Web: https://usq.edu.au/study/faculty-events/2021/11/Workshop_on_Mathematics_of_Sea_Ice_and_Ice_Sheets

The cryosphere is one of the critical components of the Earth's climate systems, and it has been the subject of significant transformation in recent years in response to climate change. There are several mathematical challenges to modelling this system, and the Workshop aims to bring other researchers who are experts in the mathematical modelling of ice sheets and sea ice, two related by separated parts of the cryosphere.

This workshop is supported by grants awarded by the Australian Mathematical Sciences Institute (AMSI) and the Australasian Fluid Mechanics Society (AFMS).

Workshop on the Intersections of Computation and Optimisation

Dates: 22–25 November 2021
Venue: Blended format, involving ANU; see below
Web: http://mocao.org/WICO/
Mirror: https://maths.anu.edu.au/news-events/events/workshop-intersections-computation-and-optimisations

The Special Interest Group MoCaO (Mathematics of Computation and Optimisation) is planning a new workshop, sponsored by ANU, UNSW and AMSI.

This workshop intends to bring together researchers from the areas of computation, optimisation, computing sciences and engineering interested in the cross-fertilization of ideas around the following theme.

Optimisation often faces unique issues when there is a need to efficiently compute. On the other hand, computational techniques at times utilise optimisation within their algorithms. Both areas fundamentally need to understand approximation in all its facets which is also fundamental to computation as are the associated notions of convergence. Indeed, recent research has blurred the boundaries between optimisation (continuous and discrete), computation and areas of computing science. The area of machine learning has crept into relevance everywhere. Recently research has turned to its use in computational techniques including the enhancement optimisation algorithms and the cycle of cross fertilization of ideas continues.

We intend to run the workshop in a blended format, involving a face to face component which will be held at the ANU mathematics school in conjunction with a simultaneous/parallel online format to which both groups of participants will engage. Some keynotes will present in person (streamed online from ANU) and others will engage totally online in a remote format. We encourage local and international participants to take part in the online workshop. In addition to their keynote presentations, keynotes who will be invited to give a lectorial-discussion session that will promote research questions and engage emerging researchers in these areas.

Mathematica Solis et Terrae

Dates: 2–3 December 2021 (rescheduled)
Venue: Australian National University, Canberra
Web: https://maths.anu.edu.au/news-events/events/math%C4%93matica-s%C5%8Dlis-et-terrae-australian-academy-science-elizabeth-and-frederick

This event was originally scheduled in the MSI Special Year 2020 – Mathematical Physics calendar but has been rescheduled to 2021 due to COVID-19.

The rapid progress and expansion of computational power will soon reach the exascale, and provide the computing power to solve a new class of problems. The enabling science of high-performance computing is computational mathematics: permitting solution to high dimensional problems, improving the efficiency of calculation, and robustly quantifying uncertainty.

The rapid progress and expansion of computational power will soon reach the exascale, and provide the computing power to solve a new class of problems. The enabling science of high-performance computing is computational mathematics: permitting solutions to high dimensional problems, improving the efficiency of calculation, and robustly quantifying uncertainty.

This two-day research conference will bring together a diverse group of disciplines to share challenges and explore synergies in high performance computing simulation in various fields . It will cover topics in numerical analysis (e.g. Galerkin methods, spline-based techniques, sparse-grids, uncertainty quantification and matching layers), and applications in solid Earth (geophysics), land-atmosphere carbon exchange (earth systems science), and solar and astrophysics.

Registration and abstract submissions for contributed talks and student posters will open soon.

65th Annual Meeting of the Australian Mathematical Society

Dates: Monday to Friday 6–10 December 2021
Venue: University of Newcastle
Web: https://austms.org.au/event/austms-2021/

Plenary talks

- Gang Tian (Peking University, China, and Princeton University, USA)
- Zeev Rudnik (Tel-Aviv University, Israel)
- Emily Riehl (Johns Hopkins University, USA)
- Robyn Araujo (QUT)
- Joaquim Serra (ETH Zurich, Switzerland) [ECR lecturer]
- Chris Matthews (UTS) [Dr Mandawuy Yunupingu lecturer]
- Susan Scott (ANU) [ANZAMP lecturer]
- Jennifer Flegg (Uni Melbourne) [ANZIAM lecturer]

For enquiries please contact Florian Breuer: florian.breuer@newcastle.edu.au

The 43rd Australasian Combinatorics Conference (43ACC)

Dates: 13–17 December 2021
Venue: The University of Melbourne
Web: http://43acc.ms.unimelb.edu.au

Due to COVID-19 and related restrictions, the conference will now be run via Zoom. Researchers in any area of discrete mathematics and its applications are warmly invited to attend and give talks.

Key dates

- Early bird registration ends 31 October 2021
- Registration ends 21 November 2021
- Abstract submission ends 21 November 2021
- Online registration will be available in due course.

International Congress of Mathematicians

Dates: 6–14 July 2022
Venue: Saint Petersburg, Russia
Web: https://icm2022.org

Registration is now open.

IAEA Technical Meeting on Energetic Particles and Theory of Plasma Instabilities in Magnetic Confinement Fusion (EPPI2022)

Dates: 21–24 November 2022
Venue: Australian National University
Web: https://maths.anu.edu.au/news-events/events/iaea-technical-meeting-energetic-particles-and-theory-plasma-instabilities

EPPI2022 is being organized by the International Atomic Energy Agency, hosted by the Government of Australia through the Mathematical Sciences Institute of the Australian National University.

The purpose of the event is to provide a forum to discuss the status of experimental and theoretical work on suprathermal electrons and ions, as well as to discuss theoretical and computational physics issues relevant to burning plasmas in magnetic confinement fusion research.

The meeting will consist of invited and contributed oral presentations, a poster session and a summary session.

Lift-off Fellowships

Members are reminded of the Society's Lift-off Fellowships which provide short-term support, including living expenses and travel grants, for students who have recently submitted for examination a PhD thesis in the mathematical sciences.

The fellowship rules, application form and details of past fellowship holders can be found at https://austms.org.au/awards-grants/awards/lift-off-fellowships/lift-off-fellowships-information/.

If you will soon complete a PhD, or have a student who will soon complete a PhD, please keep the scheme in mind.

Walter and Lyn Bloom Travelling Fellowships

The **Walter and Lyn Bloom Travelling Fellowships** aim to assist early career mathematicians to spend research time overseas, to present papers at National and International Conferences and to make and maintain international contacts . The Fellowships are funded annually by Walter and Lyn Bloom.

Applications for the Walter and Lyn Bloom Travelling Fellowship should be emailed directly to the committee at bloom@austms.org.au by **3 November 2021**.

Prospective applicants should follow the application procedures given at https://austms.org.au/awards-grants/awards/walter-and-lyn-bloom-travelling-fellowships/.

AustMS Accreditation

The following members have been accredited as Fellows (FAustMS):

- Associate Professor Warren Moors of the University of Auckland,
- Professor Yihong Du of the University of New England.
- Professor John Sader of the University of Melbourne.

Deborah Jackson AustMS Secretary
Email: Secretary@AustMS.org.au

Deborah Jackson (née Trueman) is a lecturer at La Trobe University. She began her academic career at Monash University and then moved to Swinburne University. After several years back at Monash, she joined La Trobe in 2010. Deborah was honorary Chair of the Victorian Algebra Group from 1996 to 2003 and its Secretary from 1994 to 1995. Deborah took over as Secretary of the Society in September 2019.

The Australian Mathematical Society

Membership and Correspondence

Applications for membership, notices of change of address or title or position, members' subscriptions, correspondence related to accounts, correspondence about the distribution of the Society's publications, and orders for back numbers, should be sent to the Treasurer. All other correspondence should be sent to the Secretary. Membership rates and other details can be found at the Society web site: www.austms.org.au.

Local Correspondents

Publications

The Journal of the Australian Mathematical Society

Editor: Professor Jon Berrick
Sydney Mathematical Research Institute (SMRI)
The University of Sydney, NSW 2006, Australia

The ANZIAM Journal

Editor: Professor Andrew Bassom
School of Mathematics and Physics
University of Tasmania, Australia

Editor: Professor Graeme Hocking
School of Chemical and Mathematical Sciences
Murdoch University, WA 6150, Australia

Bulletin of the Australian Mathematical Society

Editor: Professor John Loxton
Western Sydney University, Penrith, NSW 2751, Australia

The *Bulletin of the Australian Mathematical Society* aims at quick publication of original research in all branches of mathematics. Two volumes of three numbers are published annually.

The Australian Mathematical Society Lecture Series

Editor: Professor Jacqui Ramagge
School of Mathematics and Statistics
The University of Sydney, NSW 2006, Australia

The lecture series is a series of books, published by Cambridge University Press, containing both research monographs and textbooks suitable for graduate and undergraduate students.

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