The Australian Mathematical Society
Gazette

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• Reviews of books, particularly by Australian authors, or books of wide interest
• Classroom notes on presenting mathematics in an elegant way
• Items relevant to mathematics education
• Letters on relevant topical issues
• Information on conferences, particularly those held in Australasia and the region
• Information on recent major mathematical achievements
• Reports on the business and activities of the Society
• Staff changes and visitors in mathematics departments
• News of members of the Australian Mathematical Society

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For more information, visit www.austms.org.au/gazette.
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Sid and I welcome you to another issue of the Gazette.

Today performance targets and metrics are regarded in many sectors as an essential management tool. This occurs not just in higher education, which we are most familiar with, but in business, finance, health, public service, almost everywhere. Measurement has undoubtedly played an essential role in the development of the physical sciences since the seventeenth century. But the further one moves from mathematics and physical sciences, the less meaningful some measurements seem to be. Do the performance metrics in use in various fields measure inputs or outcomes? Do decisions based on such metrics lead to rational outcomes? In particular, do they encourage strategies aimed at better measurements rather than productive effort? Are measurements made originally to provide confidential feedback and guides for improvement now being used as a form of evaluation with possibly punitive outcomes? In this issue, Heiko Dietrich and Daniel Matthews contribute an eloquent discussion of the appropriateness of various metrics for mathematical research.

The need to equip the future Australian workforce with STEM skills is another topic that never goes away. Needless to say, our secondary school system should play a part in this. However the number of students taking more advanced mathematics in high school continues to decline. This is in no small part due to the persistent idea that students choosing easier courses will ‘benefit’ by getting a higher ATAR ranking. This is an example of a strategy designed to produce a better measurement leading to a perverse outcome. The myth that this strategy is even effective is debunked by Nicola Armstrong, who contributes the NCMS column this time. As she writes, “we, as a community/society, need to address this misconception”.

Science and Technology Australia, which represents more than 70,000 Australian scientists and technologists through its 50+ member organisations, recently issued a statement addressing the issue of STEM skills and calling for science to be a priority platform for the major parties’ campaigns in the next federal election. This was signed on behalf of the Australian Mathematical Society by president Kate Smith-Miles. Kate reports on this and other meetings in her column, in particular the Women in Optimisation panel discussion at the AMSI Optimise conference which took place in June.

AMSI is a major contributor to mathematics conferences around Australia. This time, their regular column is written by Simon Clarke, who reports on the 2018 Summer School. This annual four-week residential school enables honours and postgraduate students to “come together, take advanced courses, meet and socialise with their contemporaries and be exposed to mathematical sciences beyond
the confines of their institutions”. This year it attracted 168 participants. Likewise, in the occasional column from ANZAMP, Jon Kress reports on their most recent and their next conference. Jan de Gier gives a comprehensive list of upcoming programs at MATRIX in his report. Other upcoming conferences which may interest members are listed in the News section, along with updates and items of interest from departments around the country.

In the Talking Teaching column, Birgit Loch discusses at length the worrying issue of contract cheating. On a more positive note, Heather Lonsdale reports in detail on three mathematicians who won Australian Awards for University Teaching.

Asperger’s Syndrome may be more common in Mathematics Departments than in the general community. Peter Donovan presents an interesting account of this condition.

We include an obituary of Tom Horner, who gave many years of service to the University of Wollongong.

Last but not least, let us mention Peter Higgins’ ever interesting Puzzle Corner.

We hope that you find some entertaining and thought provoking reading in this issue.

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David Yost is a graduate of the University of Melbourne, the Australian National University and the University of Edinburgh. He has lived in eight countries and ten cities, returning to Australia in 2003, where he has now completed 15 years at Federation University Australia and its predecessor institution, the University of Ballarat, including a three-year period as Deputy Head of School. While most of his research is in functional analysis, he has lately been interested in convex geometry.
Kate Smith-Miles*

It’s been a busy couple of months involving quite a few trips to Canberra to represent the Society at various multi-society meetings. I was lucky to be the winner of a random draw to fund my travel expenses to attend the Science Technology Australia (STA) Forum for CEOs and Presidents of their member societies. I’d like to thank STA, not only for their financial support, but for hosting a very interesting day of discussions about how STA can better support their member societies, and how we can all work together to add power to a collective voice to raise the profile of the needs of our sector as we approach a federal election. A joint communiqué was issued that day that I was pleased to sign on behalf of the Australian Mathematical Society. It urges political candidates to address the following issues in the lead up to the next election: a whole-of-government plan for science and technology; a strategy to equip the future Australian workforce with STEM skills; strong investment in both basic and applied research; creating policy informed by the best available evidence. The full communiqué can be read at https://scienceandtechnologyaustralia.org.au/stem-leaders-forge-path-to-stronger-australian-science-and-technology/. Other recent Canberra trips included a meeting of the Australian Academy of Sciences National Committee for the Mathematical Sciences, where I presented the AustMS response for how we will contribute to the implementation of the Decadal Plan for the Mathematical Sciences, in partnership with other groups such as AMSI, AAMT, SSAI, etc. We are also at the early stages of exploring how best AustMS can partner with other societies and organisations to strengthen our collective operations research capability, coordinated by Defence agencies. So a recurring theme at the moment is exploring how our society interacts with other like-minded groups to deliver something greater than the sum of our parts. I believe these are important outcomes to pursue.

Speaking of operations research, I was fortunate to participate in AMSI Optimise this week at the University of Melbourne. As I type, I have just returned to my office from moderating a wonderful panel discussion on Women in Optimisation. I’d like to devote the remainder of this column to share with you what was so remarkable about this discussion, rather than recounting more details of trips to Canberra on society business! The panel comprised three generations of women who have worked in optimisation: Alison Harcourt (University of Melbourne); Maria Antónia Carravilla (University of Porto); and Marie-Ève Rancourt (HEC Montréal). We discussed their career journeys with an emphasis on why they chose to work in optimisation, how their path to success was supported, what barriers they encountered, and how support structures have made a difference or might have made a difference if they had been in place. It was fascinating to hear about

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their unique journeys, but also to discover the commonality of their quest to use their mathematical talents to create social impacts.

While each of the panellists had remarkable stories, I would like to draw special attention to Alison Harcourt (née Doig). Hers is an amazing story that has not received the recognition and celebration that it deserves. Recent media attention stemming from the AMSI Optimise event highlighting her remarkable career is a good first step! (see https://www.theaustralian.com.au/higher-education/maths-pioneer-alison-harcourt-sees-progress-for-women/news-story/331d4be5bbe9827760464419eb30510d).

Alison is a pioneer in the field of operations research, having co-authored the seminal paper:


This ground-breaking paper is well known to researchers in operations research since it proposed a method for solving integer programming problems which later became known as the “branch-and-bound” method. It underpins much of modern day optimisation software packages that provide efficient solutions to challenging combinatorial optimisation problems ranging from logistics and transportation, to scheduling, telecommunications, and even cancer radiotherapy treatment planning. This seminal paper has almost 3000 Google Scholar citations! Most people are not aware that it was authored by two women since their first names are never identified on the paper.

Alison co-authored the paper while working in London as a research assistant to Ailsa Land at the London School of Economics. She was offered the position based on the quality of her University of Melbourne Masters thesis on integer linear programming in the mid-1950s. Alison never enrolled in a PhD, had career interruptions for child-raising and, by the mid-1960s, returned to the University of Melbourne to take up a position as a Senior Lecturer in Statistics. She found it difficult to continue her integer programming research having been away from the field for a while, lacking nearby collaborators who understood the emerging field, and without opportunities to spend time visiting those at the forefront of the field overseas. Meanwhile, her talents were in high demand as a statistical collaborator, and she went on to have an amazing career as a statistician. Alison’s statistical analyses have had profound impacts influencing government policy. Just a couple of examples of this include the first attempts to estimate poverty in Australia (informing the Royal Commission of Inquiry into Poverty); and statistical analysis of bias that lead to an amendment of the Commonwealth Electoral Act in 1984 which introduced a “double randomisation” method for allocating positions of

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1 I note that all of the other papers in that issue were authored by men, and all listed their first names, except for the Indian econometrician A.L. Nagar. This “JK Rowling” phenomena is still quite common today, no doubt due to concerns about unconscious bias that experimental studies have unfortunately confirmed to exist. See an interesting discussion at https://blogs.scientificamerican.com/unofficial-prognosis/study-shows-gender-bias-in-science-is-real-heres-why-it-matters/.
political parties on ballot papers (still used today). She was also foundation secretary of the Victorian branch of the Statistical Society of Australia (1963–1967), and has written several books and journal articles. She formally retired in 1994 but continues to share her passion for teaching as a sessional tutor in mathematics and statistics at The University of Melbourne at the age of eighty-eight!

I wonder how many of Alison’s current and former students realise what a pioneer she is? At the time I was learning about the branch-and-bound method as a University of Melbourne undergraduate mathematics student around 1990, Alison was working in the Statistics Department. I am embarrassed to say that I had no idea that the famous Land and Doig (1960) paper was co-authored by someone in the building and that both were women! I wonder what a difference that would have made to me and the few female students I studied with. Having access to such an amazing female role model could possibly have offered inspiration and support that was unfortunately rather scarce at the time.

I’d like to think that things are getting easier for women starting their careers in this generation, and I hope this is true. In Alison’s generation there was little by way of support for women whose careers were interrupted, and certainly no consideration of the phrase “relative to opportunity”. I consider myself very fortunate that my career trajectory was not too disrupted by child-rearing—thanks to the luxury of having family nearby to assist with childcare, and a supportive husband who allowed his career to take a back seat to help with child-rearing responsibilities. While I took a break from attending international conferences for about five years, I have been able to return to the international
research scene over the last decade with this family support. But this minimal impact on my career trajectory has been my good fortune, not because of a system that was working to make sure that I could reach my potential. These days there are many more systemic efforts to level the playing field and support women more effectively to minimise the impact of career interruptions: the ARC’s Relative to Opportunity guidelines for research performance assessment; various mentoring schemes specifically for women; more publicity for women as role models (via the AMSI CHOOSEMATHS program, STAs Superstars of STEM, ARC Georgina Sweet Awards to name just a few examples); and grants such as the AustMS Anne Penfold Street Awards to enable those with carer responsibilities to attend conferences more easily. I hope these strategies are making a difference, so that there will be many more women whose pioneering work we will celebrate in years to come. In the meantime, please join me in acknowledging the remarkable achievements of Alison Harcourt (née Doig).

Kate Smith-Miles is a Georgina Sweet Australian Laureate Fellow, and Professor of Applied Mathematics at The University of Melbourne. She is also a Chief Investigator in the ARC Centre of Excellence in Mathematical and Statistical Frontiers (ACEMS). She was previously Head of the School of Mathematical Sciences at Monash from 2009—2014, and Head of Engineering and IT at Deakin from 2006–2009. Kate is a member of the ARC College of Experts, Chair of the Advisory Board for the AMSI CHOOSEMATHS program, serves on the MATRIX Advisory Board, and is a member of the Federal Government’s Knowledge Nation 100 group. She is a Fellow of the Australian Mathematical Society, and Fellow of Engineers Australia. She was awarded the Australian Mathematical Society Medal in 2010 and the EO Tuck Medal from ANZIAM in 2017.
Asperger’s Syndrome and Mathematics Departments

My background is 50 years experience as a PhD in Mathematics and over 70 years experience with Asperger’s syndrome. But I have no professional qualifications whatsoever in Psychology or Psychiatry. In particular, the ‘halving every fifteen years’ rule mentioned below is based on a sample of two. The opinions expressed here are not necessarily those of the Australian Mathematical Society or the Editors of this Gazette.

This is an effort to explain some aspects of a distinctive minority characteristic which is strongly associated with being male and correlates considerably with ability in the physical sciences. Asperger’s syndrome occurs with a range of degrees of severity and is no doubt modified by the upbringing an individual receives from his (85%) or her (15%) parents. The visible symptoms include physical and social gaucheness. Indeed, Asperger’s syndrome may as well be defined for present purposes as exhibition of several of the following in childhood:

(1) Delayed social maturity and social reasoning.
(2) Difficulty making friends and often teased by other children.
(3) Difficulty with the communication and control of emotions.
(4) Unusual language abilities that include advanced vocabulary and syntax but delayed conversation skills, unusual prosody and a tendency to be pedantic.
(5) A fascination with a topic that is unusual in intensity or focus.
(6) An unusual profile of learning abilities.
(7) A need for assistance with some self-help and organisational skills.
(8) Clumsiness in terms of gait and coordination.
(9) Sensitivity to specific sounds, aromas, textures or touch.

Here (4), (5) and (6) are relevant to mathematics in the broad sense mentioned later.

This list is taken from the website of Brisbane clinical psychologist Tony Attwood and used with his permission.

The original work of Johann (Hans) Asperger (1906–1980) was carried out in Vienna in 1943, but limited research shows that it was not taught at the Sydney University Medical School around 1960. General recognition of its existence started evolving in the 1980s. Asperger managed to distinguish the syndrome from the much more serious autism, which will not be discussed here. This text will return to the issue of whether Asperger’s is a medical problem to be treated by
psychiatrists or a non-medical problem to be treated by clinical psychologists or school (or university) counsellors.

There are three reasons why this should be of interest to the readers of this Gazette. Firstly, they may have low-level Asperger’s syndrome without knowing it and so their children and grandchildren need a bit of monitoring for the nine standard symptoms of Asperger’s. Secondly, mathematics departments (including academic staff, students, research staff and IT people, with ‘mathematics’ taken as including physics, computer science and electrical engineering) seem to have been particularly attractive to Aspies. (This abbreviation seems to have entered the vernacular.) So a welfare issue emerges. Thirdly, and more controvursively, this concentration of Aspies may contribute to the imbalance of the sexes in this part of university communities.

I have been fighting Asperger’s for 70 years. It seems to have halved its influence every 15 years. However Shakespeare’s dictum Old men forget (Henry V) reminds us to view such recollections with some caution. The 1950s and 1960s were too early for professional counselling for Aspies during childhood and youth. The principal of my former school has assured me that there are now protocols to identify problems like Asperger’s. There were not in the 1950s though one skilled senior teacher did pick up something and did give a bit of useful counselling. Rightly or wrongly, the phrase ‘autism spectrum disorder’ (pronounced ‘ASD’) often includes Asperger’s.

The following modern contrast is from the Westview School website:

The Westview School is a private school for high-functioning children with autism spectrum disorder from ages 2 to 15 years. Westview is unique in that it is the only school in the greater Houston area — and the country — that specifically serves high-functioning children with autism spectrum disorder. Westview’s challenging, well-rounded curriculum includes a full range of academic programs and a strong emphasis on social communication and social skills. We offer opportunities to pursue the arts, extra-curricular activities and real-world experiences. The enhancement of self esteem and the development of appropriate behavior allow our students to become successful members of the community.

The widely distributed book Asperger’s Syndrome by Tony Attwood has considerable merit. Quite enough of the symptoms described there is compatible with my own experience.

The detective story writer Kerry Greenwood commented on the recent Sherlock Holmes series produced by the BBC, describing the Holmes played by Benedict Cumberbatch as ‘a borderline Asperger’s prodigy, amazingly rude to everyone’. The description of Holmes in the first Conan Doyle story also suggests Asperger’s. Another familiar TV character is Doc Martin, played by Martin Clunes, who is also amazingly rude to everyone.
Initially, his demeanour and his character marked him out in ways that conventional observers regarded as eccentric. He eschewed gossip, he rarely laughed, he evidently preferred his own company, he worked with obsessive energy and appeared indifferent to the judgement of others. Modern psychologists might have regarded his behaviour as symptomatic of a mild form of autism, perhaps Asperger’s syndrome, a disorder which was not formally recognised until some 40 years after the war.

But is Asperger’s a mild form of autism?

An obvious question is do significantly many of the really high achievers in the physical sciences have Asperger’s syndrome to some extent? I don’t know. Can we find out? (Perhaps yes but this would be an expensive research project.)

The play Odd Man Out by David Williamson (Ensemble Theatre, Jan–Mar 2017) was summarised as follows.

Ryan has Asperger’s and . . .
It starts like a fairy-tale romance: Ryan tells Alice she has a beautiful smile, and suddenly he is asking her out. Alice has never met anyone like Ryan before: he’s charming, forthright and painfully truthful. She knows their relationship is moving way too fast, but there is something ridiculously attractive about this straight-talking man. His bluntness may upset her family and friends, but when he asks her to marry him, she finds herself saying yes. As newlyweds, Alice discovers a side of Ryan she never knew existed — and becomes determined to fix his flaws, with hilarious and disastrous results.

The 2012 film Moonrise Kingdom was reviewed by an unidentified ‘SM’ in the SMH (TV) Guide on 11 December 2017. It described the director as “a brilliant, sensitive, masterful and original filmmaker with great empathy for ‘otherness’”. It suggested that the general community now treat Aspies fairly well.

The ABC TV series Australian Story ran in September 2017 an episode on Tony Attwood. He had been a clinical psychologist primarily practising in autism and failed to pick up his son’s Asperger’s problems. (Yes, Asperger’s does have a downside. This can have unfortunate consequences.) Gradually Asperger’s took over as his speciality and he has published three books on the topic, including (as a co-author) Asperger’s and Girls. This last has been read carefully by a suitable contemporary who confirms that it is compatible with her memories of the 1950s. She agreed with the 15-year half-life rule. No doubt old women also forget.

However Attwood’s Asperger’s Syndrome does end on a happy note. ‘In the author’s opinion, they [the Aspies] are a bright thread in the tapestry of life. Our civilisation would be extremely dull and sterile if we did not have and treasure people with Asperger’s syndrome’. Or, to expand the above quote from SM, “Director
Wes Anderson has long been thought of as an Aspie, though he has generally kept his own counsel. He is a brilliant, sensitive, masterful and original filmmaker with great empathy for ‘otherness’.

Attwood’s book on depression is also relevant: much of the above nine-item list is depressing for the young Aspie. Here family and (later) workplace support is desirable.

The book *A Guide to Rosellas and their Mutations* by Russell Pringle (ABK, 2009) is relevant to (5) above. It may be taken as a product of an obsessive, expensive and time-consuming interest in one particular genus of birds. Alternatively it may be taken as a magnificent achievement carried out without any government subsidy. The photographs are little short of sensational.

We consider separately three other distinctive characteristics shown by at most 10% of the population.

**Being an identical twin:** I knew a pair of identical twins born around 1920. They seemed to live normal happy but separate lives. However Jenny Brockie in the long-running SBS TV show *Insight* has interviewed various other pairs of identical twins who have had various degrees of success in developing as separate people instead of quantum entanglements. Fortunately this phenomenon is fairly rare (1 pregnancy in 285 says Google).

**Being left-handed:** Apparently as recently as 1970 some schools tried to coerce young natural left-handers to conform. This had quite serious consequences, as shown in the 2010 film *The King’s Speech*. Should I apologise for using the word ‘gaucheness’ earlier?

**Homosexuality:** The historic understanding and treatment of homosexuality has been somewhere between awful and outrageous. Alan Turing has already been mentioned! There has been substantial progress over the last 50 years in the western countries.

So is Asperger’s a characteristic comparable with any of these three? Does it require counselling for a happier participation in society but is not really a medical problem? And Attwood replies that the Aspies ‘are a bright thread in the tapestry of life’. (I would say this about Russell Pringle.) Any ‘one-size-fits-all’ approach to humanity seems inappropriate. And it seems appropriate for those teaching in schools and mathematics departments to be aware of the issue and to refer students to counselling if appropriate.

Hopefully the ill effects of this natural phenomenon are being reduced by modern counselling of children.

One firm statistic on the balance of the sexes in the mathematical community was released by the French Mathematical Society in March 2017. It covers all pure mathematical employment in French universities and in CNRS units. The proportion of women in these in 2016 was 13.6% and this had scarcely changed over 20 years.
Of course 13.6% looks and is much too low. It lags way behind the general trend towards parity in the modern economies.

Yet Asperger’s will continue as a source of young people, predominantly male, who are attracted to and capable of mathematical thinking. Although precise statistics are not available Asperger’s of itself may make parity unachievable.

The book *The Mathematics of Sex: How Biology and Society Conspire to Limit Talented Women and Girls* by Stephen Ceci and Wendy Williams (Oxford, 2010) does not mention Asperger’s syndrome but would appear to give a very useful summary of and introduction to a substantial literature on its vexed topic. The paper by Baron-Cohen, Wheelwright, Skinner, Martin & Clubley, ‘The Autism-Spectrum Quotient (AQ): Evidence from Asperger Syndrome/High-Functioning Autism, Males and Females, Scientists and Mathematicians’, *Journal of Autism and Developmental Disorders*, 2001 is also of interest. The five authors are respectively Simon, Sally, Richard, Joanne and Emma. 60% female!

This last has been frequently cited ever since 2001.

There is an Autism Research Centre in the Department of Developmental Psychiatry, University of Cambridge, UK. It is working on the link with DNA.

Closer to home is *Autism Spectrum Australia*, which has a useful federal research grant. The website autismspectrum.org.au includes responses to frequently asked questions, including ‘What is autism?’. It does run special educational facilities in various places.

The website canada.ca gives a recent (March 2018) report on autism in Canada.

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Peter Donovan retired from the UNSW School of Mathematics and Statistics in 2003 but has worked on, retaining an office there. He worked with John Mack on WW2 Pacific cryptology, with a joint book being published by Springer. He is currently examining certain aspects of Grothendieck’s SGA5 and SGA6 seminars ‘now the peloton has gone’. Likewise he is examining some old work of Alain Connes. Peter is a grandfather living on Sydney’s North Shore.
Welcome to Puzzle Corner 53 of the Gazette of the Australian Mathematical Society. After the new problem on Russian Roulette I will give a solution of Puzzle Corner 52 in the May issue of the Gazette.

Before giving the problem on Russian Roulette, let’s warm up with a little logical aerobics. In my school days I remember that when my class was lined up by height, I was right in the middle. Much to my chagrin, the girl that I secretly fancied was taller than me and stood 15th in line, from shortest to tallest, while the boy I knew she secretly fancied was in 26th spot. Although not relevant to my chances, I also noticed that this was enough information to infer how many were in our class. How many of us were there?

Now to the topic of the day. The following problems can be solved by infinite geometric series but the answers can be gleaned more directly by exploiting the near symmetry of the situation. In that way they are doubly instructive. The gratuitous gun violence in the setting can easily be replaced by simple die tossing of a six, with the winner enjoying an ice cream. In any event, here goes.

(a) Two players indulge in Russian Roulette, which consists of taking turns in spinning a revolver, with just one of the six barrels loaded, and then shooting themselves. They continue, each giving the barrel a fresh spin each time, until one player or the other succeeds in killing himself whereupon he is declared the winner by the remaining player. What is the probability that the first player ‘wins’ (by shooting himself first)?

(b) Player B, an excellent mathematician who has already figured out the answer to our part (a), complains that the proposed game is not fair as A, the player with the privilege of firing the first shot, has a better chance of ‘winning’. To counteract A’s ‘advantage’, they agree to adopt the Tennis Tie-Break rule that A ‘serves’ the first point, but after that they take turns in having two ‘serves’ each, so that A has the first shot, B the second and third, then A the fourth and fifth, and so on until the inevitable conclusion. How fair now is their game?

Solution to Puzzle Corner 52 on Trivial Identities

The problem was to show that

$$\sum_{(p,q) \neq 1} \frac{1}{2^{p+q} - 1} = 1.$$ 

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The seed of the solution lies in the identity itself for we have a series of positive
numbers that sum to unity and so, collectively, they represent a probability dis-
tribution, which is indeed how I happened to come across this in the first place.
The relevant experiment is the tossing of a fair coin to generate a sample from
random variable $X$, the output of which is the rational number $\frac{p}{q}$, where $p$ and $q$
are the respective lengths of the first and second runs of either Heads or Tails. For
example, if our experiment yielded HHHTH then $X = \frac{3}{7}$, while TTHHHHT
we have $X = \frac{2}{3}$ exactly when the respective run lengths are $pm$ and $qn$ for some
$n \geq 1$. Hence it follows that

$$P\left(X = \frac{p}{q}\right) = \sum_{m=1}^{\infty} \frac{1}{2^{(p+q)m}} = \frac{1/2^{(p+q)}}{1-1/2^{(p+q)}} = \frac{1}{2^{p+q} - 1}.$$ 

Since we are dealing with a probability distribution, the identity now follows from
the fundamental fact that

$$\sum_{\frac{p}{q} \in \mathbb{Q}} P\left(X = \frac{p}{q}\right) = 1.$$

The second version of the series grouped the terms in the sum with common value
of $m = p + q$, $m = 2, 3, \ldots$. The denominator of the $n$th term was $\frac{1}{2^{m+1}-1}$. The
numerator on the other hand was the number of pairs of relatively prime positive
integers $(p, q)$ with $p + q = m = n + 1$. This is just equal to $\phi(m)$, where $\phi$ is
the Euler $\phi$-function, which counts the number of integers less than $m$ that are
relatively prime to $m$. To see this suppose that $p+q = m$. Then any common factor
of two of the numbers $p$, $q$, and $m$, is also a factor of the third so that $(p, q) = 1$
if and only if both $p$ and $q$ are relatively prime with $m$. Hence the number of
admissible solutions to our equation $p + q = m$ is indeed $\phi(m)$.

Therefore we have a second curious version of our identity:

$$\sum_{m=2}^{\infty} \frac{\phi(m)}{2^m - 1} = 1. \quad (1)$$

Let’s now replace the coin by a $k$-die, which is to say a random number generator
on the set $\{1, 2, \ldots, k\}$. For the moment, let $p$ and $q$ be arbitrary positive integers.
The probability that the first two runs have respective lengths $p$ and $q$ is then
given by

$$\frac{1}{k^{p-1}} \cdot \frac{k-1}{k} \cdot \frac{1}{k^{q-1}} \cdot \frac{k-1}{k} = \frac{(k-1)^2}{k^{p+q}}.$$ 

Reverting once again to the condition that $(p, q) = 1$, we now obtain in the same
way as before:

$$P\left(X = \frac{p}{q}\right) = (k-1)^2 \sum_{m=1}^{\infty} \frac{1}{k^{(p+q)m}} = \frac{(k-1)^2}{k^{(p+q)} - 1}.$$
Hence by summing over all rationals we obtain a generalization of (1), which is that for \( k \geq 2, \)
\[
\sum_{m=2}^{\infty} \frac{\phi(m)}{k^m - 1} = \frac{1}{(k-1)^2}. 
\]
This result, stated in this fashion, can be found as Corollary 5.8 in *The Spectra of Lamplighter Groups and Cayley Machines* (2005) by Mark Kambites, Pedro V. Silva and Benjamin Steinberg. However, as Ben pointed out to me, the result is contained in Theorem 309 as given in Hardy & Wright’s classic *Introduction to the Theory of Numbers*, which gives the great man the last say.

A very nice solution using generating functions and the Euler-phi function (with no probability interpretation) was sent in by Michael Nyblom, who tells me he was a student of mine for MA200 at RMIT in 1989. I’m sure he’s right.

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.
In this column, I will touch on the topic of contract cheating. I declare that I will not engage in discussion on best practice in mathematics assessment, nor the educational rationale for or against tests and exams, nor if they are the best form of testing a student’s knowledge and skills and readiness for work.

While I was working on the Classroom Note for an upcoming issue of the Gazette and in particular on the section about how we changed assessment when we blended our subject, I remembered a recent discussion I had only half listened to about contract cheating. What an odd term, I thought back then, and wondered where it had come from and if it only related to cheating where you pay someone to do work for you, e.g. complete an assignment. I was confident that this would not be of much relevance to mathematics teaching as anecdotal evidence suggests that we, more so than other disciplines, continue to rely on invigilated tests or exams to ensure it is the student alone who is doing the work without assistance from others.

A Google search on contract cheating brought a definition: Wikipedia tells us that “contract cheating is a form of academic dishonesty in which students get others to complete their coursework for them by putting it out to tender”. A broader definition not only includes professional online services, but also getting friends, family or other students to complete assessed work, and private tutors. An example very relevant to us is paying someone else to sit an exam for you. My Google search also resulted in a few papers that captured my interest. The first of them was testing my belief in the integrity of invigilated tests and exams, with the title “Rethinking assessment by examination in the age of contract cheating”. In this paper, Thomas Lancaster and Robert Clarke, two experts in the area of academic misconduct through cheating, mount an argument against security of exams by describing the methods of contract cheating used in examinations, as revealed by “contract cheating detectives”. They comment that “a whole industry has been established that enables students to cheat using technology” and provide examples

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of contract cheating requests observed online, e.g. students requesting someone else to sit their exam, or third parties offering to complete an exam for a student, to provide answers to exam questions, or sell or hire technology that will provide students with an advantage during the exam. Other examples are of tutors offering to make exam questions available or modify questions in return for payment.

A recent Australian study on contract cheating was conducted in parallel with staff and student surveys from eight universities and across disciplines. Around 6% of the over 14,000 students who responded admitted to cheating; 3.1% had provided and 2.4% had received exam assistance. While only representing 13.1% of all respondents, the engineering students represented a quarter of the students who declared they were cheating. However, while engineers are required to study mathematics subjects as part of their degrees, we cannot conclude from this that it is mathematics exams in which they are cheating. Of the more than 1100 staff who were surveyed, 7% said exam assistance had occurred in their subjects, with 9% of these having seen it more than 10 times; while 5% had come across exam impersonation in their subjects with 13% of these having seen this more than 10 times! This study included only 2% of participating lecturers from mathematics, which indicates the need for a thorough study into contract cheating for exams in tertiary mathematics education given the prevalence of exams. If this form of academic misconduct is more common than we expected, possible solutions should be investigated which may include checks for identity of a student via fingerprint or iris scanning.

Let me move on to my own experiments with technologies to cheat in exams. I remember when the Apple Watch was first released, just before the semester 1 final exam period in May 2015. I spent a Friday afternoon trying to figure out how to use it to communicate with people outside my room or access helpful material on the watch without this looking too suspicious to those sitting next to me over a drink or two. There were several exciting ways, as long as my phone was within Bluetooth reach. I could also access apps on the watch offline that would show prepared material such as images, formulae and solutions to example problems. That exam period was the first when my university banned not only mobile phones, but all watches from exams.

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I will conclude with this question: How confident are you that your exams are sat by the student enrolled in your class, without bringing in additional unapproved resources, or communicating with the outside world?

Birgit Loch has taught first and second year mathematics mostly to service students at four universities, in traditional, blended as well as online modes for the last 14 years. She has won numerous teaching awards for her use of technologies to engage students, and for convincing her colleagues to reconsider their practice. Her research interests are in technology approaches to teaching mathematics and supporting students in the learning of mathematics, including learning from video, blended learning, and teaching with tablet technology. She has held leadership roles in learning and teaching at three universities. She is currently Acting Associate Pro Vice-Chancellor (Coursework) in the College of Science, Health and Engineering at La Trobe University.
Recognising excellence in university mathematics teaching and learning

Heather Lonsdale*

This article is the first in a series, organised by the AustMS Standing Committee on Mathematics Education, and seeks to recognise contributions to teaching and learning. In particular this article will highlight the work of three mathematicians who were recipients of 2017 AAUT Citations for Outstanding Contributions to Student Learning: Poh Hillock, Deborah Jackson, and Stephen Woodcock.

Introduction

There are a variety of different avenues for teaching staff to seek recognition of their excellence in teaching. Most universities have internal awards at a range of levels, whether university-wide or specific to a faculty or school, and these can provide a chance to achieve recognition of teaching excellence and to further disseminate good practice.

At a national level, the Australian Awards for University Teaching (AAUT) consists of five different award programs [2]. Among these are the Citations for Outstanding Contributions to Student Learning, which are awarded to those who have made a significant contribution to the quality of student learning in a specific area of responsibility over a sustained period. In 2017, three of these citations were awarded in the area of mathematics, and this article will profile each of these recipients.

Poh Hillock, University of Queensland

Citation for Poh Hillock: For a mathematics support program that improves student success by building confidence and fostering hard work and perseverance through participation in a community of practice.

Dr Poh Hillock teaches MATH1051 Calculus & Linear Algebra I, a first-year course that has a yearly enrolment exceeding 1500 students and services more than 45 programs at The University of Queensland. The course has a failure rate of about 20–30% each semester, including many multiple repeaters.

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One of the first projects that Poh was involved in, when she joined UQ in 2012, was a study which documented student errors in an examination. This study led to the development and implementation of the Support Learning Tutorial (SLT), a voluntary weekly tutorial program aimed at students who were at risk of failing MATH1051. By providing targeted, timely and sustained support within a community of practice, the SLT has helped many students overcome learning deficits, improve maths skills and attain high levels of achievement.

Poh’s excellent work has been reflected in the increased pass rates, in particular for repeating students, for attendees at the SLT. In addition to the AAUT citation, Poh’s work with SLT students has also been recognised with a UQ Faculty of Science Teaching Excellence Award (2014), and a UQ Citation for Outstanding Contribution to Student Learning Award (2016). Further details of the support programme can be found in one of Poh’s papers [4], and Poh can be contacted at p.hillock@uq.edu.au.

Deborah Jackson, La Trobe University

Citation for Deborah Jackson: For excellence in the development, teaching and leadership of an innovative Maths Skills Program that addresses diverse student needs in Science, Health and Engineering disciplines.

Dr Deborah Jackson, from La Trobe University, College of Science, Health and Engineering, and the Department of Mathematics and Statistics, has created and delivered the Maths Skills Program. This program offers cross-disciplinary mathematics support for a diverse range of subjects.

Since its pilot in 2010, the program now supports more than 30 subjects each year over six campuses. Maths Skills consists of a set of programs, each designed for a particular discipline and tailored to suit it. Participating disciplines include Chemistry, Biology, Physics, Statistics, Biochemistry and Biotechnology, Nursing, Engineering, Exercise and Sports Biomechanics, Statistics for Psychology, and various mathematics subjects. The program helps students improve their maths confidence, self-assessment, self-regulation and motivation. The Maths Skills program is integrated into the subject which it is supporting and provides students with choices about their learning modes.

Deborah has disseminated her work widely, giving talks in the mathematics education session of AustMS meetings, at First Year in Mathematics network meetings, and at the Australian Conference on Science and Mathematics Education, as well as through published papers ([5], [6]). For more information about the Maths Skills program, please contact Dr Deborah Jackson, d.jackson@latrobe.edu.au.
Stephen Woodcock, University of Technology Sydney

Citation for Stephen Woodcock: For development of curricula and resources to foster enquiry-oriented and research-inspired thinking in the applied mathematical sciences.

Dr Stephen Woodcock has developed a range of resources and classes designed to reduce students’ reliance on rote learning, beginning in their first semester and scaffolded over a sequence of several subjects in a mathematics major. Having noticed students entering undergraduate study with an over-reliance on “pattern learning”, Stephen saw this as an important element of the transition process to university.

Stephen developed problem-based materials and introduced modelling workshops that emphasise the importance of estimation and sense-checking of results. These are aimed to encourage students to make reasoned estimates, and to support those estimates with justification, rather than feeling that their ability is limited to memorising formula, and hence equip them to approach unfamiliar problems.

This program for undergraduate students was recognised by an internal UTS Teaching and Learning Citation in 2015. A discussion of the innovative approach and an evaluation of its impact on student learning was published in the ANZIAM Journal in 2016 [8]. Stephen has also been very engaged in outreach activities, producing plain language explanations of everyday applications of mathematical concepts ([9], [7]). Stephen can be contacted at Stephen.Woodcock@uts.edu.au to discuss his work further.

Award Opportunities

Aspiring teaching award recipients are strongly encouraged to pursue internal award schemes through their universities, and to build towards national awards where possible. Note that the Australian Awards for University Teaching awards will be led by Universities Australia from 2018 onwards [3]. No details are yet available on the process for applying for these awards, which may change under new governance and funding arrangements.

This year the Australian Mathematical Society has launched its Annual Teaching Excellence Awards [1], to be presented at the Annual Meeting for the first time in 2018. There will be two awards, with one reserved for early career academics, and these will provide an opportunity to recognise excellence in teaching in the particular context of mathematics. Further details are available on the AustMS website at http://www.austms.org.au/Teaching+Awards.
References


Performance Targets in Academia and the Mathematical Sciences

Heiko Dietrich* and Daniel V. Mathews**

There is a widespread problem with research assessment in academia. The culture of ‘research metrics’ and ‘performance targets’ increases anxiety, pressure, and insecurity, and “transforms research into an auditable commodity”. The problem is not limited to our discipline of mathematics, or to Australia, but the nature of mathematics, and existing Australian institutions, make some aspects of the problem particularly acute.

In order to address this situation, we have endeavoured to explain the problem as we see it, and propose some reforms and solutions.

Our perspective. The authors are pure mathematicians, but make no claim to represent every mathematician, pure or otherwise. This article is based on our personal experience, numerous discussions with our national and international colleagues, and our reading of various literature (including the listed references). We do not expect that every mathematician would agree with everything in this statement, but we believe that the views expressed here are broadly representative of mathematicians in general, and need to be heard. The main purpose of this note is to initiate a discussion, questioning the status quo and planting seeds for change.

The problem with numbers

Researchers everywhere face constant scrutiny and assessment of their research ‘performance’, through ‘metrics’ such as numbers of publications, numbers of supervised students and numbers of grant dollars awarded. These metrics all have one thing in common: numbers.

As mathematicians, we are very well placed to assess when numbers are appropriate measurements. We assess that numbers are not an appropriate measurement of the research of academics, and in particular of mathematicians. The measurements provided by numbers are usually inadequate, often unhelpful, and sometimes misleading. As the International Mathematical Union has stated:

Nothing (and in particular no semi-automatized pseudo-scientific evaluation that involves numbers or data) can replace evaluation by an individual who actually understands what he/she is evaluating.**

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Moreover, numbers provide a false sense of objectivity and represent an application of commercial practices into academia which is questionable at best:

The concept of ‘auditing’, probably first developed in a business context (accounting and then management), has now permeated many parts of Western societies. It is based on the belief that uniform, comparable, objective, evaluations of almost anything, people, organizations, companies, products etc., are possible. In particular, many funding bodies are now so convinced of the importance and universality of the evaluation of scientific activities that they tend to insist on using their evaluation rules, often based on semi-automatized ‘objective’ criteria such as Key Performance Indicators (KPI), even though most experts agree on the fact that these methods are not well-adapted to science in general, and to mathematics in particular.\(^3\)

Views among mathematicians may vary on the legitimacy of regular performance assessments. Many colleagues might be comfortable with the idea that maintaining an academic position should require ongoing demonstrations of progress (however that can be measured). On the other hand, some might find any such requirements an intolerable imposition. Having essentially no metrics did not prevent other countries (like Germany or France) from developing a strong international presence in research, with world-leading mathematicians.\(^4\)

### Performance targets

Performance targets exist at several Australian universities, but not all. Targets may be in the form of ‘minimum’ requirements or ‘expectations’ as to performance; they may also be ‘aspirational’.

Targets may come in various categories, such as:

- grant income;
- postgraduate students supervised; and
- research outputs, for instance as measured by ‘high-quality’ publications per year.

Of course, other categories are possible, but the above are typical. Academics may also face performance targets regarding their teaching, service, leadership or other aspects of their role. But our focus here is on research performance targets.

**Grant income.** The first and most onerous barrier is the requirement of a minimal level of research income. The numbers might often not be very high, especially relative to other disciplines; but the situation in mathematics, sadly, is such that *any minimum requirement greater than zero dollars is onerous*. For many mathematicians in Australia, especially pure mathematicians, the only significant funding source is the Australian Research Council (ARC). One either has a grant and meets the target, even an ‘aspirational’ one; or one does not have a grant, and fails to meet the minimum target. A vast disproportion between worthy applicants
and available funds means that the success rate is very low (usually around 19% for Discovery projects and 16% for the DECRA scheme, as seen in the 2018 round). Success is skewed towards more senior, established mathematicians with a record of previous grant success, in a self-reinforcing dynamic.

In this context, a lack of funding cannot reasonably be interpreted as an indication of low-quality research. There are many factors that influence whether a grant proposal is successful, but most of these are out of the control of the applicant; and there are more general issues with the ARC grant system, including the following.

- The efficacy of the expert assessment process is questionable. Partly this may reflect the very small number of mathematicians on the College of Experts, but it also reflects the fragmentation of the discipline and the small size of the Australian mathematical community. It can be hard for mathematicians to understand recent results even in adjacent sub-fields; and some fields, though large and important globally, are tiny within Australia. Even excellent assessors may struggle to appreciate the details of every application they are asked to assess.
- The ARC grant system is driven by high quality and impact, but the impact of mathematical research can often be hard to measure. Citation numbers are lower than in other fields, and even top journals have relatively low impact factors (see below under ‘Research Outputs’).
- Since mathematics rarely needs expensive equipment, grant funding in mathematics is largely devoted to paying for travel costs and personnel. Personnel costs, for postdocs or PhD students, make up the bulk of funding. While it can be beneficial to have more postdoctoral researchers and PhD students, they are not usually as crucial as in, for example, laboratory sciences. Moreover, as outlined under ‘Supervision’ below, most mathematicians only have limited capacity to effectively supervise PhDs and postdocs. For example, a full professor who wants to meet ‘aspirational’ targets would likely need a continuous record of significant grant success; this can create a supervision workload which in fact hinders research progress. Given the enormous amount of time and effort required to put together a competitive grant application, and the low likelihood of success, it may often be reasonable for potential applicants to conclude that the cost outweighs the expected benefit.
- A longstanding concern, not limited to mathematics, is that short grants of around 3 years significantly restrict research ambitions by forcing research programmes into incremental short-term outcomes. Many mathematical breakthroughs have required long-term commitment without any guarantee of success, nor any partial outcomes along the way.

These problems derive not only from the specifics of the ARC system but also from the nature of mathematics itself. Often all that is needed to perform research is time, pen and paper, library access, perhaps a computer, and peace and quiet. As the American Mathematical Society states, “many well respected, productive mathematicians receive little or no external support for their research”.

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Despite these issues, we do not want to discourage colleagues from trying their luck: if they require funding for a research project, then it makes sense to apply for a grant. However, our experience is that incentives and rules set from above by university administrators lead to more time spent on grant applications than would be justified by purely academic considerations. At the very least, if university administrators seek to increase grant income and encourage more grant applications, they should expect more successful and unsuccessful applications as a result, and refrain from drawing any inferences of poor performance in the latter case.

**Supervision.** A minimum target for PhD supervision is also problematic and onerous, especially for junior academics. The American Mathematical Society discusses this in a cultural statement:

> In some disciplines, directing dissertations is an integral part of a research program for every scholar, both young and old. In mathematics, however, this is not the case; it is unusual for a young (untenured) mathematician to direct Ph.D. students. As in other disciplines, a pre-tenured mathematician must focus on establishing a research program, including the publication of his or her research. Helping an advisee mature into an original researcher is labor-intensive and, unlike in the laboratory sciences, does not necessarily further the advisor’s own research program. In addition, the advisor provides students with problems which, in many instances, he or she would otherwise solve, publish and receive credit for.\(^7\)

The relationship between a PhD supervisor and student in mathematics is closer to that of master and apprentice, than to that of laboratory scientists. While PhD supervision may certainly be useful and beneficial for some junior academics, in the culture of mathematics it is simply not something that junior academics often do. Setting a minimum target for PhD supervision (especially for junior mathematicians), however, interprets this culture as poor performance. Again, this interpretation is wrong. A lack of PhD students cannot reasonably be interpreted as a failure to perform as a mathematician.

A direct calculation from the Mathematics Genealogy Project suggests that 78% of supervisors in mathematics have 5 or fewer PhD students over their career.\(^8\) Even tenured professors at world-leading institutions have a modest supervision load. A performance target that requires mathematicians to supervise 1–2 PhD students continuously throughout their career is difficult to satisfy for the vast majority of mathematicians, now and historically; such a requirement is in sharp contrast to the culture of supervision in mathematics.

Lastly, when pressure to supervise PhD students leads to accepting unsuitable candidates, this can be detrimental for all concerned.
Research outputs. Numerical targets for papers published are generally less onerous, but can easily become so. In any case, we think any numerical measure is inherently flawed. As the American Mathematical Society states,

publication practices differ from [other scientific] disciplines in several fundamental ways. . . . Mathematicians tend to publish at rates that are modest compared to some other sciences. . . even some of the best young mathematicians publish relatively few papers.  

Indeed, the American Mathematical Society concludes that “when judging the work of most mathematicians, the key measure of value for a research program is the quality of publications rather than rate”.

The problems with such numerical measures are, we think, numerous. Publication rates vary significantly between different mathematical disciplines; a target which might be easy for one researcher to achieve will be unrealistic for another. The best mathematics journals publish far fewer papers per year than top journals in other disciplines. If only ‘high quality’ publications are to be counted, then an official list of ‘high quality’ journals must be maintained, which is difficult since “the mathematical literature is spread among a wider collection of journals than in most related fields”. Being restricted to journals in a given list can hinder collaboration since different institutions may have different lists.

Strong research mathematicians write outstanding research papers. These papers often appear in journals with name recognition, although not always. For example, Professor Ian Agol, at the University of California, Berkeley, was awarded a 2015 Breakthrough prize in mathematics, worth millions of dollars, for his proof of the Virtual Haken Conjecture. The proof was published in the relatively unknown journal Documenta Mathematica. Additionally, strong researchers often publish frequently. But not always. Some of the highest performing mathematicians globally publish at rates that would fail minimum research targets. For example, Andrew Wiles went five years without publishing anything before announcing the proof of Fermat’s last theorem. Fields medalist Maryam Mirzakhani published relatively few papers in her career, with several two-year gaps in publication.

Alternatives

Abolition? Academics are, by their nature, highly motivated. In order to obtain their existing positions they have already achieved research success. It is arguable that performance metrics of the type discussed above do more harm than help, pressuring staff and diverting their efforts into unsuccessful grant applications, short-term incremental research, and bureaucratic requirements, at the expense of bold vision, deep thought, and fundamental breakthroughs. As Philip Moriarty
(Professor of Physics at the University of Nottingham) recently put it:

Here’s my advice to senior university managers: put aside the fixation on flawed metrics and trust your staff. I know — scandalously naive. But try it as an experiment. The vast majority of academics are hard-working and highly motivated: the sector would collapse if we didn’t go the extra mile (one never taken into account by the metrics). If researchers are producing high-quality work, they should be rewarded for doing it as efficiently as possible. They should no longer be coerced into over-egging the pudding to meet targets designed to pocket as much funding from the public purse as possible.¹¹

The abolition of performance metrics, by removing all the difficulties outlined above, would restore some of the freedom that has been lost within the academy in recent times. We believe it would release a vast amount of time currently squandered on fruitless efforts, redirect efforts towards more beneficial ends, and unleash bold new research potential.

However, if abolition is too bold a step in the present political and institutional climate, and regular performance assessments are still to be made, then we make some suggestions below. These suggestions should not only be applied in the discretionary considerations of probation or promotion committees. Academics should not have to place themselves at the mercy of a committee’s benevolence; they should have the security of formal written rules to this effect.

**No minimum targets for grant income and supervision.** As explained above, the present system ensures that many excellent mathematicians will be unable to fulfil minimum targets. There are simply not enough grants or excellent PhD students. A lack of grant income or PhD students does not indicate a failure of research performance. If a minimum target must exist relating to grants, an expectation to apply for grants is more viable.

As a general rule, a researcher should apply for a grant if it is academically appropriate. Training PhD students is an important national priority, but this should not happen at the cost of quality and excessive supervision load. Academics should take on PhD students when they have a suitable project, the time capacity to supervise, and a sufficiently qualified candidate. Supervisors should be able to take the time to develop the research potential of their students, without pressure to continually take on and graduate more students.

**Peer-review over numerical targets.** Above we have identified several problems with numerical targets. The judgment of an expert is a much better alternative. To reiterate the International Mathematical Union,

Nothing (and in particular no semi-automatized pseudo-scientific evaluation that involves numbers or data) can replace evaluation by an individual who actually understands what he/she is evaluating.

As mathematicians, we find the pretence that such numbers present an objective assessment of our research particularly objectionable. It is a travesty of arithmetic.
On a day-to-day basis, supervisors can determine whether an academic is performing well. The existence of research outputs, active collaborations, and seminar talks can easily be observed. For probation and promotion, this process can be formalised with external referees (which happens already in some places).

Using expert review presents some of its own issues—appropriate experts must be found, and their time must not be taken up with evaluating colleagues—but we prefer it to the fake objectivity of numerical metrics.

**Reward rather than punishment.** If numerical metrics must remain, then they are much better used to identify excellence, than to punish those who fall short. Academics often work outrageously long hours, often self-imposed. They are genuinely motivated to apply for research grants when necessary and appropriate, and to publish work in prestigious journals. If they are lucky enough to secure grants, publish papers in top journals, and attract PhD students, they should be rewarded for it. But punishing mathematicians without grants in a system which leaves most mathematicians without grants, or for not having PhD students in a culture where they do not exist, creates undue stress in an already overworked academic environment and is needlessly cruel.

We note that to some extent this already happens: some universities internally reward academics who apply for grants.

**Further indications for excellence.** Some further indications of successful performance by research mathematicians are listed below. They are usually not captured in any numerical assessment system. (We do not suggest that new metrics be invented to capture them!)

- Participation in an international research community by speaking at conferences, workshops, and seminars; invitations to share research internationally.
- Organisation of conferences, workshops, and seminars; attraction of funding to organise conferences and bring strong researchers to the home University.
- Requests to referee and review papers and books, and to sit on editorial boards.
- Receiving awards for achievements.
- Having colleagues who write in support of their research activities upon request. Opinions of experts are solicited for most promotion applications, but are not always required for probation or in cases that merit special attention.

**Conclusion**

It should not be thought that onerous performance metrics have no effect on the quality of research. The effect is quite direct: effort must be diverted into continual, necessarily predominantly unsuccessful, grant applications; students must be attracted and trained; publications must keep ticking over. Longer-term, more fundamental research problems become more risky. Many mathematicians, and especially pure mathematicians, can expect to have zero grant income much of the time.
The situation was epitomised by Peter Higgs. After being awarded the 2013 Nobel Prize in physics for the discovery of his eponymous boson, he declared

Today I wouldn’t get an academic job. It’s as simple as that. I don’t think I would be regarded as productive enough.

Higgs described how he had become “an embarrassment to the department when they did research assessment exercises”, kept on only because the authorities thought he “might get a Nobel prize — and if he doesn’t we can always get rid of him”.

The effect of constant performance assessment on the mental health of researchers should not be underestimated. There have even been extreme cases of suicide tragically exemplifying these issues.

Notes


3 Ibid.

4 List of Fields medalists per country shows that France and Germany are second and fifth, respectively: https://en.wikipedia.org/wiki/List_of_countries_by_number_of_Fields_Medallists.


8 Mathematics genealogy project, ‘Graph structure’, https://genealogy.math.ndsu.nodak.edu/extrema.php. The data includes 229,714 mathematicians as of 18 June 2018. Over 90% of them have 3 or fewer PhD students. There are 55,729 supervisors listed (i.e. who have supervised at least one student) and 43,240 of them have 1–5 students.


10 Ibid.

Heiko Dietrich is a graduate of the University of Braunschweig (Germany). He has held a post-doctoral position at the University of Auckland (New Zealand) and a Marie-Curie Fellowship at the University of Trento (Italy). Between 2014 and 2016 he had an ARC DECRA at Monash University, where he is now a Senior Lecturer in pure mathematics. His research interests are mainly in computational algebra, in particular, group theory and Lie algebras.

Daniel Mathews is a mathematician interested in various flavours of topology, geometry, algebra, combinatorics, and mathematical physics, as well as many social issues. He has been, among other things, a member of the Australian IMO team, a student at the University of Melbourne and Stanford University, a postdoc in Boston and Nantes, a columnist for the AustMS Gazette, an antiwar activist, a non-practising Australian lawyer, and an ARC grant recipient. He is a Senior Lecturer in the School of Mathematical Sciences at Monash.
Our good friend and former and valued colleague, Dr Tom Horner, died after a short illness in April 2018.

Tom Horner was born in Rockhampton in 1932, moved to Lismore at a young age and graduated in 1952 from the University of Sydney with a Science degree with Honours in Mathematics and a Diploma of Education. He was, in 1961, teaching at the then selective Wollongong High School when he was recruited as the second full time staff member teaching mathematics at the Wollongong Division of the University of New South Wales. This was then housed at the Wollongong Technical College.

In 1962 the Division was renamed the Wollongong University College and moved to a new Gwynneville site. Austin Keane, who was appointed as Wollongong’s first Professor of Mathematics in 1964, later became Tom’s PhD supervisor. Tom graduated in 1978 from the University of Wollongong with his PhD thesis entitled “Chebyshev Polynomials in the Solution of Ordinary and Partial Differential Equations”.

Tom was renowned as the department’s best teacher was greatly valued by Engineering honours and graduate students for his help with their numerical mathematics. He was also noted for his mastery of the intricacies of algorithms such as QR.
Tom served as a most effective and considerate Head of the Department of Mathematics during 1987 and 1988. He retired in July 1992 as a Senior Lecturer as one of the longest serving academics (31 years) on the staff of the University and the former Division and University College of UNSW.

One remarkable fact is that in those 31 years he didn’t have one day of sick leave. Also, as noted by Graeme Cohen in his book 2006 book *Counting Australia*, Tom Horner saw the University of Wollongong through all its incarnations.

In 2002, in recognition of his outstanding contributions to computational mathematics, the Department’s (now School’s) computing laboratory was named after Dr Tom Horner. As noted by the Head of the School of Mathematics and Applied Statistics, Professor Song-Ping Zhu, in advising the School of the loss of Tom, “The Horner Lab still serves as an important teaching venue today for mathematics and engineering students who are using the lab to learn any subject that has a mathematical computation component.”

Our sympathy is extended to Tom’s wife, Barbara, their three children, Robyn, Graham and Kathryn, and their families.

Martin Bunder (mbunder@uow.edu.au) and Philip Laird (plaird@uow.edu.au), with thanks to other colleagues in the School.
AMSI Summer School 2018 report

The largest maths event of its kind in Australia, AMSI Summer School is a four-week residential school intended for honours and postgraduate students in the mathematical sciences and cognate disciplines. The fifteenth annual AMSI Summer School was hosted at Monash University’s Clayton campus from 8 January to 2 February 2018.

AMSI Summer School 2018 attracted 168 participants, including 49 women and three Indigenous students. The well-received program comprised the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Lecturer(s)</th>
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<tbody>
<tr>
<td>Iterative Methods for Sparse Matrices</td>
<td>A/Prof. Timothy Moroney, Queensland University of Technology</td>
</tr>
<tr>
<td>Low-Dimensional Topology (sponsored by AustMS)</td>
<td>Dr Daniel Mathews, Monash University</td>
</tr>
<tr>
<td>Mathematical Relativity and Lorentzian Geometry</td>
<td>A/Prof. Todd Oliynyk, Monash University</td>
</tr>
<tr>
<td>Mathematics of Extensional Flows (sponsored by ANZIAM)</td>
<td>Prof. Yvonne Stokes, The University of Adelaide</td>
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<td>Probabilistic Methods and Random Graphs</td>
<td>Prof. Nick Wormald, Monash University</td>
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<tr>
<td>Probability, Complex Analysis and Lattice Models (sponsored by SSA)</td>
<td>Dr Laurie Field, Australian National University</td>
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<tr>
<td>Statistical Machine Learning</td>
<td>Dr Ivan Guo, Monash University</td>
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<td>Topological Data Analysis</td>
<td>Dr Vanessa Robins, Australian National University</td>
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</table>

The AMSI Summer School is one of the premier events on the mathematical calendar for both advanced students and academics in Australia. It enables honours students, postgraduate students and early-career researchers to come together over four weeks, take advanced courses, meet and socialise with their contemporaries and be exposed to mathematical sciences beyond the confines of their institutions. This is especially beneficial for students from smaller institutions. For academics, it is an opportunity to lecture and interact with the brightest students from around Australia.

Each year the Summer School grows larger, and for the 2018 Summer School at Monash University the attendance matched the 2017 Summer School record of

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168 registrations, with 61 attendees enrolling in the course on Statistical Machine Learning. As well as being a focus for domestic students, the Summer School is strongly supported by international students studying in Australia, with 59 international registrations this year. The feedback from international students is that this is a unique opportunity in their studies. This year we also welcomed one student who travelled from Europe. Support to attend the Summer School was provided to 46 students through AMSI Travel Grants and 16 female attendees through Choose Maths Grants.

One of the highlights this year was the engagement of the students, which gave the normally dormant Maths Building an infectious buzz for all of January. Much of the credit must go to the lecturers for their appealing and approachable presentations of advanced mathematics and statistics. Special mention is to be made of Tiangang Cui and Ivan Guo for stepping in at the eleventh hour to run a successful topic on Statistical Machine Learning.

The lectures and support classes for all the topics, which were presented in a variety of formats, were well attended throughout the four weeks, with 82 students sitting the final exam for a topic for credit and one student sitting an exam for interest.

The focal point every day at the Summer School was morning tea where students, lecturers and staff from Monash University were able to meet and chat. Lunch was also lively with a weekly BBQ and LunchMaths lecture. The morning teas and lunches were made possible through the support of Monash University’s School of Mathematical Sciences. The excursions beyond Melbourne on the first two weekends were a particular highlight of the social activities.

Finally, I would like to thank the sponsors, without whom this event would not be possible, and the many people who worked tirelessly in the year-long planning and execution of the Summer School. The Program Standing Committee gave significant thought in choosing a broad range of topics and lecturers, which were relevant, appealing and would complement the programs at students’ home institutions. The record registrations and student engagement attest to the quality of this program. In the latter part of 2018 the Organising Committee swelled to involve at least six people working almost full-time on the preparation of the Summer School. Particular thanks go to Anna Haley and Gertrude Nayak from Monash University, and Geoff Prince, Chloe Pearse and Anna Muscara from AMSI.

Simon Clarke is a senior lecturer in the School of Mathematics at Monash University. His research interests include nonlinear waves, geophysical fluid dynamics and spectral methods, and he has supervised five PhD graduates and one MSc graduate. He has been the director of the ANZIAM conference in 2006 and 2012, the CTAC conference in 2016 and AMSI Summer School 2018.
OPTIMISING MOBILE HEALTH INTERVENTIONS

2018 AMSI-SSA LECTURE TOUR
SUSAN MURPHY
PROFESSOR OF STATISTICS - HARVARD UNIVERSITY

PUBLIC LECTURES
TUESDAY 14 AUGUST 6:30PM
LA TROBE UNIVERSITY
THURSDAY 16 AUGUST 6:30PM
FLINDERS UNIVERSITY
MONDAY 20 AUGUST 6:30PM
MURDOCH UNIVERSITY
WEDNESDAY 22 AUGUST 6:30PM
THE UNIVERSITY OF QUEENSLAND
THURSDAY 23 AUGUST 6:30PM
UNIVERSITY OF TECHNOLOGY SYDNEY

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METABOLOMICS
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PLANTS & ANIMALS
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FUNCTIONAL ANALYSIS
Theo Bühler & Dietmar A. Salamon, ETH, Zurich
Functional analysis is a central subject of mathematics with applications in many areas of geometry, analysis, and physics. This book provides a comprehensive introduction to the field for graduate students and researchers. With 10 to 20 elaborate exercises at the end of each chapter, this book can be used as a text for a course on functional analysis for beginning graduate students.

Graduate Studies in Mathematics, Vol. 191
Jul 2018 472pp 9781470441906 Hardback A$111.00

LECTURES ON NAVIER-STOKES EQUATIONS
Tai-Peng Tsai, University of British Columbia
A graduate text on the incompressible Navier-Stokes system, which is of fundamental importance in mathematical fluid mechanics as well as in engineering applications. The goal is to give a rapid exposition on the existence, uniqueness, and regularity of its solutions, with a focus on the regularity problem.

Graduate Studies in Mathematics, Vol. 192
Jul 2018 224pp 9781470430962 Hardback A$111.00

MATHEMATICAL BIOLOGY
Modeling and Analysis
Avner Friedman, Ohio State University
The fast growing field of mathematical biology addresses biological questions using mathematical models from areas such as dynamical systems, probability, statistics, and discrete mathematics. This book considers models that are described by systems of partial differential equations, and it focuses on modeling, rather than on numerical methods and simulations. The models studied are concerned with population dynamics, cancer, risk of plaque growth associated with high cholesterol, and wound healing.

A co-publication of the AMS and CBMS
CBMS Regional Conference Series in Mathematics, Vol. 127
Aug 2018 101pp 9781470447151 Paperback A$70.00

FREE delivery worldwide at eurospanbookstore.com/ams
AMS is distributed by Eurospan | group
All prices quoted are exclusive of GST
This year marks an important milestone for ANZAMP with the Annual Meeting held in New Zealand for the first time. The meeting, hosted in Takapuna by the University of Auckland, was as vibrant as ever and will undoubtedly strengthen trans Tasman ties in the Mathematical Physics community. Arthur Suvorov from the University of Melbourne won the A.J. Guttmann prize for the best student talk with a talk titled “Isospectral neutron stars”. With about 40% of the ANZAMP membership as student members, and a good student turnout at the conference, the competition was stiff. Both student membership and registration at the Annual Meeting are free.

Next year’s meeting will run from 4 to 7 February in Merimbula on the NSW South Coast. An excellent line up of plenary speakers is planned with the following confirmed: Florian Beyer (Otago), Jean-Sébastien Caux (Amsterdam), Lotte Hollands (Heriot-Watt), Mathai Varghese (Adelaide), and Yupeng Wang (Chinese Academy of Sciences).

This year also saw ANZAMP become the member entity for Australia with the Asia Pacific Centre for Theoretical Physics, strengthening our connections with the region.

The ANZAMP website conference listings show the depth of involvement of ANZAMP members with international meetings, while in Australia, the last year has seen a significant number of Mathematical Physics meetings at MATRIX (Creswick), in particular, Integrability in low-dimensional quantum systems (26 June to 21 July 2017), Combinatorics, statistical mechanics and conformal field theory (29 October to 18 November 2017), Geometric R-matrices: from geometry to probability (18–22 December 2017) and Non-equilibrium systems and special functions (8 January to 2 February 2018).

All of this bodes well for the continued growth of the Mathematical Physics community in Australia and New Zealand. ANZAMP is now well established as a division of the AustMS, thanks to the support of its members and, in particular, the past chair and deputy chair Tim Garoni and Vladimir Mangezeev, who have overseen this transition.

Jonathan Kress is an Associate Professor in the School of Mathematics and Statistics at the University of New South Wales, Sydney, Australia. His PhD was awarded at the University of Newcastle in Australia in 1998 and, after a brief time at the University of Sydney working in solar magnetohydrodynamic, spent two years as a postdoctoral fellow at the University of Waikato, New Zealand, where his current research interest in separation of variables and superintegrability was kindled.

*Chair, ANZAMP. Email: j.kress@unsw.edu.au
Mathematical Research Institute MATRIX

Programs at Australia’s international residential research institute MATRIX aim for strong international participation and/or participation from business and industry. They are different from a talk-intensive conference, since every program has ample time for interaction and doing new research. Anyone can apply to organise a MATRIX program.

As I write this, MATRIX is hosting two exciting research programs in applied mathematics, *On the Frontiers of High Dimensional Computation* and *Month of Mathematical Biology*. A workshop in the latter program is supported by the **Lei Xing Fund**\(^1\) to support interdisciplinary and international collaborative research in the mathematical sciences.

**Upcoming programs**

An exciting mix of programs across all mathematical science is planned for 2018 and 2019.

- **Dynamics, Foliations, and Geometry in Dimension**, 3–14 September 2018
  Organisers: Jonathan Bowden (Monash), Steven Frankel (Yale), Andy Hammerlindl (Monash), Rafael Potrie (Uruguay)

- **Recent Trends on Nonlinear PDEs of Elliptic and Parabolic Type**, 5–16 November 2018
  Organisers: Yihong Du (New England), Daniel Hauer (Sydney), Angela Pistoia (Sapienza, Roma)

- **Functional Data Analysis and Beyond**, 3–14 December 2018
  Organisers: Aurore Delaigle (Melbourne), Frederic Ferraty (Toulouse), Debashis Paul (Davis)

- **Geometric and Categorical Representation Theory**, 10–21 December 2018
  Organisers: Clifton Cunningham (Calgary), Masoud Kamgarpour (UQ), Anthony Licata (ANU), Peter McNamara (UQ), Sarah Scherotzke (Bonn), Oded Yacobi (Sydney)

\(^{1}\)The Lei Xing Fund is a private gift to MATRIX that is used to support interdisciplinary research programs.
• **Topology of Manifolds: Interactions between High and Low Dimensions**, 7–18 January 2019  
Organisers: Jonathan Bowden (Monash), Diarmuid Crowley (Melbourne), Stefan Friedl (Regensburg), Stephan Tillmann (Sydney)

• **Australian-German Workshop on Differential Geometry in the Large**, 4–15 February 2019  
Organisers: Owen Dearricott (Melbourne), Diarmuid Crowley (Melbourne), Thomas Leistner (Adelaide), Yuri Nikolayevsky (LaTrobe), Wilderich Tuschmann (Karlsruhe), Katrin Wendland (Freiburg)

• **Aperiodic Order meets Number Theory**, 25 February – 1 March 2019  
Organisers: Michael Baake (Bielefeld), Michael Coons (Newcastle, Australia), Uwe Grimm (Open University), John Roberts (UNSW)

• **Influencing Public Health Policy with Data-informed Mathematical Models of Infectious Diseases**, 1–12 July 2019  
Organisers: Jennifer Flegg (University of Melbourne), James McCaw (University of Melbourne), Joshua Ross (University of Adelaide), Thomas House (University of Manchester), Ben Cooper (Mahidol Oxford Tropical Medicine Research Unit)

• **International Workshop on Spatial Statistics**, 15–19 July 2019  
Organisers: Tingjin Chu (University of Melbourne), Davide Ferrari (University of Melbourne), Wei Lin (Peking University), Aihua Xia (University of Melbourne)

**Submission**

The MATRIX Scientific Committee selects programs on scientific excellence as well as on the participation rate of high profile international participants and/or business and industry partners, among other criteria.

MATRIX programs tend to have ample unstructured time to encourage collaborative research rather than having a traditional conference format. Longer term programs, lasting three weeks or more, could have an embedded conference or lecture series. Shorter workshops focussing on a special theme are also welcome.
MATRIX offers additional support to participants with families through the MATRIX Family Fund.

The next deadline for program proposals in 2019–2021 will be

**Friday 9th November 2018.**

Guidelines for proposals and expressions of interest (which may be submitted at any time) are available at https://www.matrix-inst.org.au/guidelines.

**MATRIX Annals**

The MATRIX Book Series document scientific activities at MATRIX. The Editorial Board consists of David Wood (Editor-in-chief), Jan de Gier, Cheryl Praeger, and Terence Tao. Articles can be peer-reviewed, containing original results or reviews on a topic related to the program, or non-peer-reviewed expository articles based on talks or activities at MATRIX.

The 2016 MATRIX Annals is now published by Springer:

https://rd.springer.com/book/10.1007/978-3-319-72299-3

Papers in the 2017 MATRIX Annals are posted online at

as they become available.

**MATRIX Minors**

MATRIX Minor programs are self-funded visits to MATRIX to make use of the available office space and facilities at the Creswick Campus outside program times, for example to work intensively in a small group. Such visits are subject to the approval of MATRIX but can be arranged by sending an email request that briefly outlines the proposed research and timings.

**Questions**

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

- **Directors**
  Jan de Gier (jdg@matrix-inst.org.au)
  David Wood (davidw@matrix-inst.org.au)

- **Executive Officer**
  Sally Zanic (sallyz@matrix-inst.org.au)

- **Chair of the Advisory Board**
  Tony Guttmann (guttmann@unimelb.edu.au)
MATRIX is a partnership between Monash University and The University of Melbourne, with the ARC Centre of Excellence for Mathematical and Statistical Frontiers (ACEMS) as an associate member.

Jan de Gier  
Co-Director MATRIX

Professor De Gier’s research interests are in mathematical physics and statistical mechanics, in particular in the theory and application of solvable lattice models as well as special functions in stochastic processes and combinatorics. Jan is a former Editor of the Gazette, organised an AMSI summer school and was inaugural Chair of the Australia and New Zealand Association of Mathematical Physics (ANZAMP). He is currently Head of the School of Mathematics and Statistics at The University of Melbourne and co-Director of MATRIX.
Nicola Armstrong*

There is a persistent belief among high school students, (often extending to their parents and even teachers and counsellors), that the ATAR can be “gamed”, and therefore they should choose easier subjects in order to obtain a higher score overall. This belief is thought to be contributing to the decline in students taking more advanced mathematics in high school.

The Tertiary Institutions Service Centre (TISC) in WA uses a process called Average Marks Scaling (AMS) to scale scores in one course with scores in others. Under this system, all raw course marks (i.e. the combination of exam marks and school based marks) are first standardised to have an average of 60. From these standardised course marks, AMS adjusts scores up or down, depending on the performance of students taking the course in all of their other courses. This generally results in harder courses being scaled up (mean higher than 60) and easier courses being scaled down (mean lower than 60). In 2017, for instance, Methods and Specialist were scaled up to have means of 65.7 and 68.2, respectively; while Applications was scaled down to have a mean of 55.7. The ATAR for each student is then found by first summing their best four scaled scores, yielding a total called the Tertiary Entrance Aggregate (TEA) up to a maximum of 430. This TEA is then used to determine the ATAR.

The introduction of the new curriculum in WA in 2015 saw a reduction in students taking higher level maths as ATAR subjects, and in response to this, additional scaling was introduced for mathematics in 2016 (applied for the first time when calculating ATARs in 2017). In WA, there was already a Language Other Than English (LOTE) bonus that adds 10% of the scaled score in any LOTE course to the aggregate score (TEA). This principle has been extended to mathematics so that 10% of the scaled score for Methods and Specialist is added to a student’s TEA (even if it is not one of their best four courses).

Only time will tell if the introduction of the bonus has any impact on the number of students choosing the Methods and Specialist courses. If successful, other states may wish to consider adopting similar schemes.

When researching what the bonus is, and how the ATAR is calculated, one thing became clear: the process of calculating ATAR rankings is complicated to understand (even for a trained statistician) and therefore is most likely even less intuitive.

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Email: n.armstrong@murdoch.edu.au
for the average member of the population. The persistence of the idea that students should choose easier courses in order to get a higher ranking is in part due to a lack of understanding of how the system works. Regardless of whether bonuses are introduced into other states or not, we, as a community/society, need to address this misconception as it is unfortunately a barrier to student enrolment in advanced mathematics at high school.

Nicola Armstrong is a Senior Lecturer in Mathematics and Statistics at Murdoch University in Perth. She is a member of the AMSI Research and Higher Education Committee and the executive committee of the Australian Bioinformatics and Computational Biology Society (ABACBS) as well as the ECMR representative on the National Committee for Mathematical Sciences. This article could not have been written without the input and discussion of Emeritus Associate Professor Ken Harrison, Chair of TISC’s Joint Scaling Policy Committee.
General News

**Australian National University**


Another distinctive feature is the large collaborative staircase connecting the five levels. Level 1 will be known as the Student Hub, and hosts a number of teaching and learning spaces, a seminar/conference room, computer labs and the Statistical Consultancy Unit (SCU). MSI and the Research School of Computer Science are arranged vertically in wings on Levels 2 to 4 and the Australian Signals Directorate will occupy the whole of Level 5.

Our new address is Building 145, Science Road.

**Completed PhDs**

**La Trobe University**


**Macquarie University**

- Dr Ramon Abud Alcala, *Oplax actions and enriched icons, with applications to coalgebroids and quantum categories*. Supervisors: Stephen Lack (principal) and Ross Street (associate).

**Queensland University of Technology**

University of Canberra


University of New South Wales

- Dr Yuehua (Veronica) Li, *Exploring roles of small-scale thermohaline structure on mixing and transport in the ocean*, supervisor: Trevor McDougall.

University of Sydney

- Dr Shonal Singh, *Spaces of initial values of differential equations with the Painlevé property*, supervisor: Nalini Joshi.
- Dr Thanakorn Nitithumbundit, *EM Algorithms for multivariate skewed variance gamma distribution with unbounded densities and applications*, supervisor: Jennifer Chan.
- Dr Steven Luu, *Exponential asymptotics for discrete Painlevé equations*, supervisor: Nalini Joshi.

Western Sydney University

- Dr Sangeeta Bhatia, *Algebraic models of genome rearrangements via large scale rearrangement events*, supervisors: Andrew Francis (principal), Volker Gebhardt and Mark Tanaka (UNSW).

Awards and other achievements

University of Adelaide

- Mr Michael Hallam won the 2018 Elsevier Young Scientist Award for the best student talk at the IGA/AMSI workshop held 4–8 June, 2018. His talk
was entitled ‘Index theory and applications to positive scalar curvature and related areas’; he also received a cash award of USD 750.

University of New South Wales

- Dr Zdravko Botev received the 2018 Christopher Heyde Medal at the Australian Academy of Science’s annual Science.
- Two of our undergraduate students took out the top prize in this month’s EY Data Science Challenge. Altogether 374 competitors from across the country participated in the challenge, which required them to use their data science and analytics techniques to understand the key drivers and influencers of quality of life measures levels globally, and to predict relationships between macro trends, education and quality of life. Undergraduate students Jacky Koh (Actuarial Studies, majoring in Statistics) and Saksham Yadav (Bachelor of Data Science and Decisions) won cash prizes and EY internships. They were the only undergraduate students among the finalists.

University of Sydney

- PhD students Becky Armstrong and Pantea Pooladvand have been selected to attend the 6th Heidelberg Laureate Forum in September 2018.
- Professor Geordie Williamson has been elected as a Fellow of the Royal Society and a Fellow of the Australian Academy of Science.
- Mary Myerscough and her collaborators were awarded the Society for Mathematical Biology Lee Segel Prize for Best Paper in the Bulletin of Mathematical Biology.

Appointments, departures and promotions

La Trobe University

- Dr Lyndon Walker has resigned.
- Dr Amanda Shaker has been appointed as Lecturer (fixed term).
- Dr Michael Payne has joined the department at the Bendigo Campus.
- Professor Birgit Loch is now Acting Associate Pro Vice Chancellor (Coursework) in the College of Science, Health and Engineering. (Unfortunately, as a result she has had to stand down as Chair of the AustMS Standing Committee on Maths Education.)

Monash University

Two Research Fellows have left:

- Anita Liebenau is now a lecturer at UNSW.
- Michael Payne is now a lecturer at La Trobe University (Bendigo).
University of Adelaide
- Dr Guanheng Chen (from the Chinese University of Hong Kong) has joined the Pure Mathematics department as a Research Associate.

University of Canberra
- Assist. Prof. Sergey Sergeev and Assist. Prof. Scott H. Murray have both departed. The University of Canberra no longer has a Mathematics Department.

University of New South Wales
- Anita Liebenau has been appointed as Lecturer.

New Books
Central Queensland University

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

*For information about MATRIX programs, see the report by Jan de Gier in this issue.*

Joint International Society for Clinical Biostatistics and Australian Statistical Conference
Dates: 26–30 August 2018
Venue: Melbourne Convention and Exhibition Centre, Melbourne
Web: http://www.iscbasc2018.com/

This, the 24th Australian Statistical Conference (ASC) and the 39th conference of the ISCB, promises to be a fascinating meeting as Big Data becomes commonplace, personalized medicine becomes palpable with rapidly advancing ‘omics’ technologies, census-taking faces unprecedented pressures, environmental concerns place ecological research under increasing strain, and online social interaction becomes the norm. Have statistical methods kept pace with societal change?

For further details and updates, please check the website.
Early Career Researchers’ Day (International Society for Clinical Biostatistics and Australian Statistical Conference)

Dates: 30 August 2018
Venue: Melbourne
Web: http://iscbasc2018.com/early-career-researchers-day/

All students and researchers new to the field are welcome to join the Early Career Researchers’ (ECR) Day, during the joint International Society for Clinical Biostatistics and Australian Statistical Conference (see above). The aim of the day is to encourage discussion on how to be a good researcher and how to come up with statistical research projects of ongoing or future interest. For further details and updates, please see the website.

Mini graduate course in stochastic maximal regularity

Date: 22–23 November 2018
Venue: The Australian National University

This mini course will introduce a method in parabolic stochastic PDE, based on techniques and concepts from harmonic analysis and operator theory.

The methods was developed in 2012 by van Neerven, Veraar, Weis, and has been rapidly gaining popularity.

Prerequisites for the course will be some functional analysis (including Hahn–Banach theorem, and weak topologies in Banach spaces), and knowledge of probability (including Ito integral). The course will be taught by Pierre Portal—an early adopter of the method—and/or by Jan van Neerven or Mark Veraar.

Workshop in stochastic maximal regularity

Date: 26–30 November 2018
Venue: The Australian National University

This workshop will bring together experts with diverse backgrounds in analysis, partial differential equations, and probability, working on stochastic differential equations. It will aim to facilitate exchanges of perspectives and techniques between different groups currently using substantially different approaches to solve a range of similar problems.

The Workshop on Nonlinear Waves

Dates: 26–30 November 2018
Venue: University of Southern Queensland, Toowoomba
Web: www.usq.edu.au/nonlinear-waves-workshop

This meeting is dedicated to the 80th Birthday of Professor Roger Grimshaw, Fellow of the Australian Academy of Sciences. Key information is provided in
the website, with more updates to follow in the next months. The deadline for
registration and material presentation is 1 October 2018.

**Computational Techniques and Applications Conference (CTAC 2018)**

**Dates:** 27–30 November 2018  
**Venue:** Newcastle City Hall, Newcastle, NSW  
**Web:** [https://carma.newcastle.edu.au/meetings/ctac2018/](https://carma.newcastle.edu.au/meetings/ctac2018/)

The special themes for the meeting will include computational fluid dynamics, data assimilation, optimisation, inverse problems. It is now open for the registration and abstract submission.

**Confirmed Invited Speakers include**

- Prof Robert Eymard (Université Paris-Est Marne-la-Vallée)  
- Prof Mary Myerscough (University of Sydney)  
- Dr Matthias Kabel (Fraunhofer Institute for Industrial Mathematics)  
- Prof Andreas Prohl (University of Tübingen, Germany)  
- Prof Steve Roberts (Australian National University)  
- Dr Vera Roshchina (University of NSW)  
- Prof Ian Sloan (University of NSW)

**Important dates:**

- Early bird registration closing date: 27 October 2018  
- Registration closing date: 18 November 2018  
- Deadline for abstract submission: 4 November 2018

See the conference website for more information.

**Authentication for the Future Internet of Things**

**Dates:** 28–30 November 2018  
**Venue:** Deakin Downtown, Level 12 Tower 2, 727 Collins Street, Melbourne  
**Web:** [http://www.authiot2018.conferences.academy](http://www.authiot2018.conferences.academy)

Professor Lynn Batten of Deakin University and Dr Leonie Simpson of the Queensland University of Technology are jointly organizing this free workshop. Space is limited to 50 people, so please register (for free) early.

In addition to attending plenary sessions with speakers or demonstrations, each participant will belong to a work-stream listed on the website. The purpose of the work-streams is to identify problems on which the corresponding team will continue to work, resulting in journal publications over the months and years following. Doctoral research students and others with little knowledge of cryptography will be asked to participate in the ‘Introduction to Cryptography’ stream where the focus is on developing skills in this area.

The workshop will focus on identifying low-resource methods for authentication of communications between the devices in current use in the IoT. At the end of the three days, the most feasible ideas for this will be allocated to groups of people to take away for testing, implementation and publishing beyond the workshop dates.
The workshop has acquired special issues of the journals CRYPTOGRAPHY and SENSORS. Keynote speakers are: Hugh Williams, Professor Emeritus, Department of Mathematics and Statistics at the University of Calgary, Canada; Bart Preneel, Professor and Director of the Computer Security and Industrial Cryptography group (COSIC) Katholieke Universiteit Leuven (KULeuven), Belgium; Dr. Veena Pureswaran, Global Electronics Industry Leader at the IBM Institute for Business Value, USA, responsible for developing thought leadership for the industry.

6th Annual Workshop on Integrable Systems hosted by the Integrable Systems Group, University of Sydney

Dates: 29–30 November 2018
Venue: School of Mathematics and Statistics, University of Sydney

Register by emailing the organisers at integrable@maths.usyd.edu.au. Registrations close on 1 November 2018.

WoMBAiT 2018: Workshop on Metric Bounds and Transversality

Dates: 29 November to 1 December 2018
Venue: Deakin University, Melbourne
Web: http://www.wombat.rmitopt.org/

The third Workshop on Metric Bounds and Transversality is dedicated to Alex Kruger.

The workshop is free of charge. Registration should be done at the website.

Workshop on Effective Visualisation in the Mathematical Sciences 3

Dates: December 2018
Venue: Newcastle
Web: https://carma.newcastle.edu.au/meetings/evims3/

EViMS 3 has been postponed to December 2018. It will be held in Newcastle, with the exact location to be decided later. Check the website for updates.

Please contact Juliane Turner (email: Juliane.Turner@newcastle.edu.au, telephone: (02) 492 15483) if you have any questions.

Sixty-second Annual Meeting of the Australian Mathematical Society

Dates: 4–7 December 2018
Venue: The University of Adelaide

Registration is now open at the website.

Important dates:
- Early-bird registration closes: 28 September 2018
- Abstract submission closes: 16 November 2018
• Registration closes: 2 December 2018

For further updates, please see the website.

21st Australasian Fluid Mechanics Conference
Dates: 10–13 December 2018
Venue: Adelaide

Classical and Quantum Three-manifold Topology
Dates: 17–21 December 2018
Venue: Monash University, Clayton
Web: https://sites.google.com/view/cq3dt/home

The last four decades have revealed many deep connections between topological quantum field theory (TQFT), low-dimensional topology, and geometric structures on manifolds, particularly hyperbolic geometry. This conference will further explore and strengthen these connections by bringing together a distinguished international group of researchers working in or at the interface of these subjects.

Confirmed Speakers:
• Francois Gueritaud (CNRS Lille)
• Ingrid Irmer (Technion)
• Efstratia Kalfagianni (Michigan State)
• Rinat Kashaev (Genève)
• Andrew Kricker (NTU)
• Thang Le (Georgia Tech)
• Christine Lee (Texas)
• Joan Licata (ANU)
• Priyam Patel (UCSB)
• Makoto Sakuma (Hiroshima)
• Henry Segerman (Oklahoma State)
• Sakie Suzuki (Kyoto)
• Anne Thomas (Sydney)
• Stephan Tillmann (Sydney)
• Anastasiia Tsvietkova (Rutgers/OIST)
• Roland Van der Veen (Leiden)

The conference will be preceded by a Student Workshop on 14–15 December 2018.

Asia-Australia Algebra Conference
Date: 21–25 January 2019
Venue: Western Sydney University, Sydney, NSW
Web: http://sydneyalgebra.scem.westernsydney.edu.au
The Asia-Australia Algebra Conference will bring together world experts in a wide range of topics related to algebra. The objective of the conference is to promote collaboration between working algebraists in the region.

For registration, please contact Huanhuan Li (h.li@westernsydney.edu.au). The last date for registration is 16 October 2018. The deadline for submitting abstracts is 26 September 2018.

For more information about AAAC, please visit the webpage.

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**Visiting mathematicians**

Visitors are listed in alphabetical order and details of each visitor are presented in the following format: name of visitor; home institution; dates of visit; principal field of interest; principal host institution; contact for enquiries.

**Professor Ramiz Aliquliyev**; Azerbaijan National Academy of Sciences, Baku; November 2018; optimisation; FedUni; Adil Bagirov

**Prof A.A. Ambily**; Cochin University, India; January 2018 to January 2019; path algebras; WSU; Roozbeh Hazrat (r.hazrat@westernsydney.edu.au)

**Prof Wolfgang Arendt**; University of Ulm; 29 October to 30 November 2018; fractional powers of nonlinear operators via the Dirichlet-to-Newmann map; USN; Daniel Hauer

**Dr Jose Manuel Ayala-Hoffmann**; 29 June 2017 to 30 June 2019; UOM; J. Hyam Rubinstein

**Prof Fusheng Bai**; ChongQing Normal University; 13 July to 2 September 2018; optimisation; FedUni; Adil Bagirov

**Dr Udo Baumgartner**; DHBW Lorrach; 1 August to 15 September 2018; USN; Jacqui Ramagge

**Prof Gwyn Bellamy**; Glasgow University; 1 February to 1 June 2019; USN; Oded Yacobi

**Mr Maxime Bombar**; USN; École normale supérieure, Saclay; 8 April to 31 August 2018; information theory and wireless communication; USN; Alexander Fish

**Prof Yann Bugeaud**; University of Strasbourg; 15 February to 15 April 2019; pure; USN; Dzmitry Badziahin

**A/Prof Shanzhen Chen**; Southwestern University of Finance and Economics, China; financial mathematics; 31 July to 28 August 2018; QUT; Fawang Liu

**Xuzhong Chen**; Hunan University; 1 May to 31 August 2018; ANU; Ben Andrews

**Ms Michelle Chu**; University of Texas (Austin); 15 July to 31 August 2018; geometry and topology of 3-manifolds via immersed surfaces and finite covers; USN; Stephan Tillman

**Prof Jerome Coville**; INRA Avignon France; 17 October to 11 November 2018; non linear PDEs of elliptic and parabolic types; USN; Daniel Hauer

**Prof Sergio Cuevas**; National Autonomous University of Mexico; 12 November to 2 December 2018; magnetohydrodynamics; SUT; Sergey Suslov
Ms Li Deng; Central Southern University, China; 21 November 2016 to 20 November 2018; CUT
Prof Galina Filipuk; Warsaw University; 1 April 2019 to 1 July 2019; USN; Nalini Joshi
Prof Wilhelm Passarella Freire; The Federal University of Juiz de Fora, Brazil; 1 August 2018 to 31 July 2019; optimization; USA; Regina Burachik
Prof Massimo Grossi; University of Roma 1; 31 October to 18 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer
Prof Changfeng Gui; University of Texas San Antonio USA; 31 October to 18 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer
Prof Colin Guillarmou; Universite Paris Sud; 10 February 2019 to 12 April 2019; USN; Leo Tzou
Dr Haibin; Qufu Normal University, Rizhao Shandong, China; 5 July to 30 September 2018; CUT
Ms Ilham Harmach; 26 March to 24 August 2018; applied mathematics; USN; Peter Sehoon Kim
Prof Kristen Hawkes; University of Utah; 28 July to 12 August 2018; grandmother hypothesis of evolution of human longevity and on evolution of mating strategies; USN; Peter Sehoon Kim
Dr Hu Zhishui; Uni Science and technology Hefei Anhui China; 1 July to 31 August 2018; threshold effects in nonlinear co-integrating regression and wide other projects such as convergence to stochastic integrals with applications; USN; Qiying Wang
Prof Isabella Ianni; University of Campania Caserta Italy; 31 October to 11 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic types; USN; Daniel Hauer
Prof Edgar Knoblock; Berkeley University; 9 September to 30 November 2018; USN; Geoff Vasil
Takeshi Kurosawa; Tokyo University of Science; 8 March 2018 to 28 February 2019; ANU; Alan Welsh
Shuangling Li; Southwestern University of Finance and Economics, China; financial mathematics; 31 July to 28 August 2018; QUT; Fawang Liu
Prof Ling Shiqing; Hong Kong University; 1 July to 10 August 2018; threshold model with non-stationary time series; USN; Qiying Wang
Prof Liu Weidong; Shangai Jiao Tong University; 15 July to 15 August 2018; USN; Qiying Wang
Prof Juan Enrique Martinez Legaz; Universitat de Autonoma Barcelona; November 2018; optimisation; FedUni; Adil Bagirov
Ms Najmeh Hoseini Monjezi; Isfahan University, Iran; 1 June to 30 November 2018; optimisation; FedUni; Adil Bagirov
Prof Bernhard M"uhlherr; Giessen University; 26 September to 30 November 2018; USN; James Parkinson
Dr Toshio Ohnishi; Kyushu University; August 2018; empirical Bayesian modelling with Tweedie distributions; USC; Peter Dunn
Prof Benedetta Pellacci; 31 October to 11 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer

Prof Angela Pistoia; University of Roma Italy; 31 October to 18 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer

A/Prof Sarith Sathian; Indian Institute of Technology, Madras; 1 May to 31 August 2018; computational nanofluidics using nonequilibrium molecular dynamics techniques; SUT; Billy Todd

Dr Johannes Schleischitz; University of Ottawa; 19 November to 4 December 2018; topics in Diophantine approximation; USN; Dzmitry Badziahin

Professor Henry Segerman; Oklahoma State University; 1 June to 31 December 2018; UOM; Craig HODGSON

Prof Henrik Shahgolian; KTH Sweden; 31 October to 11 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer

Prof Yannick Sire; John Hopkins University Baltimore USA; 31 October to 11 November 2018; recent trends in nonlinear PDEs of elliptic and parabolic type; USN; Daniel Hauer

Prof Philippe Souplet; LAGA Institut Galilee Universite Paris 13; 29 October to 11 November 2018; blow-up problems in nonlocal diffusion problem; USN; Daniel Hauer

Frieder Stolzenburg; Harz University of Applied Sciences, Germany; September to October 2018; temporal data mining; WSU; Oliver Obst

Professor Catharina Stroppel; Bonn University; 1 August to 30 September 2018; USN; Andrew Mathas

Dr Uhi Rinn Suh; KAIST Daejeon; 5–24 August 2018; algebraic structure of particular families of affine W-algebras and superalgebras; USN; Alexander Molev

Dr Jinxue Sui; Shandong Technology and Business University, China; 26 December 2017 to 25 December 2018; CUT

Ms Rahmi Susin; University of Essex and Uni of Indonesia; 13 July to 12 August 2018; bifurcations of nonlinear solitons from linear double well potential NLS equation; USN; Robert Marangell

Vera Vertesi; Massachusetts Institute of Technology; 4 May to 8 August 2018; ANU; Joan Licata

Dr Ke Wang; 2 April to 1 October 2018; USN; Peter Schoon Kim

Professor Yuehua Wu; York University, Canada; 8 July to 28 August 2018; UOM; Guoqi Qian

Prof Zhijyou Wu; ChongQing Normal University; 23 July to 22 August 2018; optimisation; FedUni; Adil Bagirov

A/Prof Junyan Xu; Fuzhou University, China; 1 March 2018 to 29 February 2019; mathematical biology; SUT; Tonghua Zhang

Dr Huijun Yang; Henan University; 20 October 2017 to 19 October 2018; UMB; Diarmuid Crowley
Dr Li Yang; Shandong Technology and Business University, China; 26 December 2017 to 25 December 2018; CUT
Dr Zhang Yonghui; School Economics Beijing; 8–31 August 2018; nonlinear co-integrating regression with panel data; USN; Qiyng Wang
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