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The Australian Mathematical Society

Gazette

David Yost and Sid Morris (Editors)
Eileen Dallwitz (Production Editor)

Gazette of AustMS, School of SITE
University of Ballarat, PO Box 663,
Ballarat, VIC 3353, Australia

E-mail: gazette@austms.org.au
Web: www.austms.org.au/gazette
Tel: +61 3 5327 9086

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The *Gazette* publishes items of the following types:

- 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

Local correspondents submit news items and act as local Society representatives. Material for publication and editorial correspondence should be submitted to the editors. Any communications with the editors that are not intended for publication must be clearly identified as such.

Notes for contributors

Please send contributions to gazette@austms.org.au. Submissions should be fairly short, easy to read and of interest to a wide range of readers.

Please typeset technical articles using LaTeX or variants. In exceptional cases other editable electronic formats such as plain text or Word may be accepted. Please do not use definitions in your TeX files, as they may conflict with our style files. If you find such definitions convenient, please use a text editor to reinstate the standard commands before sending your submission.

Please supply diagrams as vector images (not bitmaps) where possible, as postscript (.ps) or encapsulated (.eps) files. Please supply photos at high-resolution (i.e. at least 400 pixels per inch (16 pixels per mm) at the final size of reproduction. For example, if the image is to be printed at 90 mm wide, it must be at least 1400 pixels wide. If JPEG format is used, images must be created with a high quality factor, i.e. artefacts such as halos of dots or jagged edges should not be obtrusive at high magnification. For more information, see *An Introduction to Computer Images* at delta-intkey.com/www/images.htm.

More information can be obtained from the *Gazette* website.

Deadlines for submissions to 40(5), 41(1) and 41(2) of the *Gazette* are 1 October 2013, 1 February 2014 and 1 April 2014.

Volume 40 Number 4 2013

Editorial

This is the fourth issue of the *Gazette* edited by Sid Morris and me. By now, we seem to be getting into the swing of things.

With another ERA exercise on the horizon, thoughts turn to the measurement of research quality. The presidential column discusses this topic, and compares it with a similar exercise nearly 30 years ago. *Plus ça change* ...

By the time you read this, the federal election will be over, with almost no discussion of the shortage of mathematically qualified professionals, and the effect this has on the economy. Like it or not, the relevance of mathematics to society does not have a high profile, with declining numbers of students taking advanced mathematics in the final years of high school.

Nevertheless we are heartened by some positive news. We must mention the performance of the Australian team at the recent International Mathematical Olympiad in Colombia. In particular, Alex Gunning from Melbourne not only won a gold medal, but achieved a nearly perfect score, coming eighth in the world in this competition. Our congratulations to Alex. A full report on the IMO will appear in the next issue of the *Gazette*.

Congratulations also to Rodney Baxter, for the award of a Royal Medal for his lifetime achievements. As promised in the last issue, we now include a report about this.

The NCMS column includes some suggestions about improving the vitality of mathematics and related topics. Read it and see what you think. The Mathematics of Planet Earth conference did something to raise the profile of mathematics, and highlight its importance to topical matters of practical concern. A detailed report is included in the AMSI news.

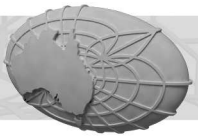
We continue to publish reports of conferences supported in part by AustMS and AMSI. Four such reports appear in this issue.

Sadly, a regular feature is the publication of obituaries of those who have made a significant contribution to Australian mathematical landscape. This time, it is Cheryl Praeger's tribute to Ákos Seress, who passed away in February, aged only 54.

Last but not least, we hope you continue to enjoy our other regular features, the Book Reviews and Puzzle Corner.

David Yost, School of Science, Information Technology and Engineering, University of Ballarat, VIC 3353. Email: d.yost@ballarat.edu.au

David Yost studied at Melbourne University (BSc), ANU (MSc) and Edinburgh (PhD). He has worked full time at La Trobe, ANU, FU Berlin, the University of Extremadura and King Saud University, and been a long-term visitor and sessional lecturer at several other institutions. He has recently notched up ten years at the University of Ballarat, including a three-year stint as Deputy Head of School. Most of his research is in functional analysis, but he has lately been interested in combinatorial geometry.



President's Column

Peter Forrester*

With the dawn of the 'Asian century' firm in my mind, I set out during the break between semesters to the National University of Singapore, to initiate a new collaboration with a recently appointed tenure track assistant professor. The mathematics building appears to be very new. Along the walls of my 5th-floor visitors office were various posters featuring famous mathematicians. The poster right outside my door featured Terence Tao, written as such, with a Chinese translation to the side, and Australia written beneath to form the remainder of the heading. That was great to see. Also, my host is part of the probability group there. The senior member of the group, Professor Louis Chen, was, until recently, the long-serving Director of the Institute for Mathematical Sciences at NUS. He spoke warmly of a number of other Australian mathematical sciences researchers, including Peter Hall, Neil Trudinger and their next visitor, Aihua Xia. Professor Chen and a number of other department members there had just returned from the Asia Mathematical Conference in Busan, South Korea. He conveyed the news that there was talk of the formation of an Asian Mathematical Union. This is of course potentially an important development for the interests of the mathematical sciences in Australia.

Generally visiting overseas institutions one hears, sooner or later, some talk of league tables of universities, or of disciplines within universities. This time last year I had just returned from a visit to a Mathematics Department at a particular university in the US. They had recently appointed a Fields Medalist and I heard it said that the competitiveness of that department in comparative rankings played a factor in this recruitment decision. Other talk I've been privy to has claimed that some universities are using league tables to make decisions about tenure (locally that notion has passed into history — read tenure then as transferring from probation to a continuing position). Specifically, the claim is that candidates are being compared against others recently granted tenure in similarly ranked universities, wherever they may be in the world.

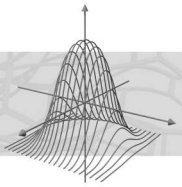
This latter point begs the question as to what qualities are being compared? Here at the University of Melbourne, we are being asked by the Deputy Dean (Research) — who happens to be the outgoing AustMS President, and newly awarded ARC Laureate Fellow, Peter Taylor — for input into specifying research performance measures at the departmental level. Hearing about this, my first reaction was that the ARC has just carried out a rather extensive (not to mention

*Email: President@austms.org.au

expensive) research assessment exercise by way of ERA. But then I was told that locally a measure is being sought which quantifies research performance on a year-to-year basis, and will potentially feed into the annual staff appraisals. My mind cast back to the early days of my career as an academic at La Trobe in the late 80s, and specifically to a document authored by Peter Stacey and Glenn Fulford 'Some thoughts on the measurement of objectives', which was circulated as a discussion paper in response to a document put forward by the Department Head, the late Ed Smith, on meeting departmental objectives. The discussion paper draws on the study 'Quality measures in Universities', produced by Professor Paul Bourke of CTEC in 1986. It suggests the use of a suitable citation index (although not discussing the time lag before this becomes meaningful), peer review (commented to be time consuming), number of dissertations accepted, consultancies, invitations to high-level conferences, membership of learned academies and the award of prizes, amongst other measures. Sounds very familiar — these are essentially the ERA indicators, with one of two additions. With those additions noted, this can by the passage of time be taken as a consensus on the indicators, although they're not all relevant on a per year basis. Personally I'm more in favour of the ERA approach, were 'quality' is sought to be quantified on a time scale of several years. Maybe in the short term, a more modest aim would be to quantify an individual's 'activity level' instead.

I was writing the above on a Saturday afternoon in my office. Returning home, switching on the ABC news with a few minutes to go before the sports report, there was our Chief Scientist Professor Ian Chubb, very much batting for the cause of striving for the highest standards of mathematics (and science) education in our secondary education. This was followed a few days latter by a new Science, Technology, Engineering and Mathematics (STEM) strategy, all of which are very welcome by AustMS.

Peter Forrester received his Doctorate from the Australian National University in 1985, and held a postdoctoral position at Stony Brook before joining La Trobe University as a lecturer in 1987. In 1994 he was awarded a senior research fellowship by the ARC, which he took up at The University of Melbourne. Peter's research interests are broadly in the area of mathematical physics, and more particularly in random matrix theory and related topics in statistical mechanics. This research and its applications motivated the writing of a large monograph 'log-gases and random matrices' (PUP, Princeton) which took place over a fifteen-year period. His research has been recognised by the award of the Medal of the Australian Mathematical Society in 1993, and election to the Australian Academy of Science in 2004, in addition to several ARC personal fellowships.



Puzzle Corner

Ivan Guo*

Welcome to the Australian Mathematical Society *Gazette*'s Puzzle Corner number 34. Each puzzle corner includes a handful of fun, yet intriguing, puzzles for adventurous readers to try. They cover a range of difficulties, come from a variety of topics, and require a minimum of mathematical prerequisites for their solution. Should you happen to be ingenious enough to solve one of them, then you should send your solution to us.

For each puzzle corner, the reader with the best submission will receive a book voucher to the value of $50, not to mention fame, glory and unlimited bragging rights! Entries are judged on the following criteria, in decreasing order of importance: accuracy, elegance, difficulty, and the number of correct solutions submitted. Please note that the judge's decision — that is, my decision — is absolutely final. Please email solutions to ivanguo1986@gmail.com or send paper entries to: Gazette of the Australian Mathematical Society, School of Science, Information Technology & Engineering, University of Ballarat, PO Box 663, Ballarat, Vic. 3353, Australia.

The deadline for submission of solutions for Puzzle Corner 34 is 1 November 2013. The solutions to Puzzle Corner 34 will appear in Puzzle Corner 36 in the March 2014 issue of the *Gazette*.

Notice: If you have heard of, read, or created any interesting mathematical puzzles that you feel are worthy of being included in the Puzzle Corner, I would love to hear from you! They don't have to be difficult or sophisticated. Your submissions may very well be featured in a future Puzzle Corner, testing the wits of other avid readers.

Crowded square

There are four points inside an 8 metres by 8 metres square. Prove that two of those points are at most $\sqrt{65}$ metres apart.

Fraction practice 2

Franny is practising her fractions again. She begins with the numbers

$$\frac{1}{1}, \frac{1}{2}, \ldots, \frac{1}{100}$$

*School of Mathematics and Statistics, University of Sydney, NSW 2006, Australia.
Email: ivanguo1986@gmail.com

This puzzle corner is also featured on the Mathematics of Planet Earth Australia website http://mathsofplanetearth.org.au/

written on the board. At each turn, Franny may erase two numbers a, b and replace them with a single number $f(a, b)$. This is repeated until only one number remains.

(i) If $f(a, b) = ab/(a + b)$, what are the possible values of the final number?

(ii) If $f(a, b) = ab + a + b$, what are the possible values of the final number?

Prickly pair

I am thinking of a pair of positive integers. To help you work out what they are, I will give you some clues. Their difference is a prime, their product is a perfect square, and the last digit of their sum is 3. What can they possibly be?

Tessellation test

Tess is trying to draw an n-sided convex polygon which can be tessellated by a finite number of parallelograms. For which n will Tess be able to succeed?

Diminishing differences

Begin with n integers $x_1, \ldots, x_n$ around a circle. At each turn, simultaneously replace all of them by the absolute differences

$$|x_1 - x_2|,\ |x_2 - x_3|,\ \ldots,\ |x_{n-1} - x_n|,\ |x_n - x_1|.$$

Repeat this process until every number is 0, then stop. Prove that this process always terminates if and only if n is a power of 2.

Solutions to Puzzle Corner 32

Many thanks to everyone who submitted. The $50 book voucher for the best submission to Puzzle Corner 32 is awarded to Dave Johnson. Congratulations!

Telescoping product

Let n be an integer greater than 1. Simplify

$$\frac{2^3 - 1}{2^3 + 1} \times \frac{3^3 - 1}{3^3 + 1} \times \cdots \times \frac{n^3 - 1}{n^3 + 1}.$$

Solution by Jeremy Ottenstein: We begin by noting the following identity

$$\frac{k^3 - 1}{k^3 + 1} = \frac{(k-1)(k^2 + k + 1)}{(k+1)(k^2 - k + 1)} = \frac{(k-1)((k+1)^2 - k)}{(k+1)(k^2 - (k-1))}.$$

Applying to the current problem,

$$\begin{aligned}
&\frac{2^3-1}{2^3+1}\times\frac{3^3-1}{3^3+1}\times\cdots\times\frac{n^3-1}{n^3+1}\\
&\quad=\frac{1(3^2-2)}{3(2^2-1)}\times\frac{2(4^2-3)}{4(3^2-2)}\times\cdots\times\frac{(n-1)((n+1)^2-n)}{(n+1)(n^2-(n-1))}\\
&\quad=\frac{1\times2\times\cdots\times(n-1)}{3\times4\times\cdots\times(n+1)}\frac{(n+1)^2-n}{2^2-1}\\
&\quad=\frac{2}{3}\frac{n^2+n+1}{n^2+n}.
\end{aligned}$$

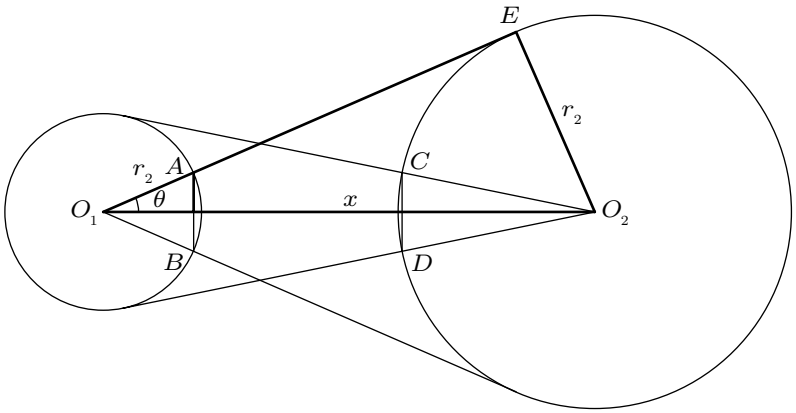
Tangent intersections

Let Γ_1 and Γ_2 be two non-overlapping circles with centres O_1 and O_2 respectively. From O_1, draw the two tangents to Γ_2 and let them intersect Γ_1 at points A and B.

Similarly, from O_2, draw the two tangents to Γ_1 and let them intersect Γ_2 points by C and D.

Prove that $AB = CD$.

Solution by Martin Bunder: Denote the radii of Γ_1 and Γ_2 by r_1 and r_2 respectively. Let the line O_1A be tangent to Γ_2 at E. Furthermore let $\angle O_2O_1E = \theta$ and $O_1O_2 = x$. Refer to the diagram below.



By considering the two right angled triangles involving θ, we have

$$AB = 2r_1\sin\theta = 2r_1r_2/x.$$

Similarly, $CD = 2r_2r_1/x = AB$, as required.

Comment: Fittingly, this result is known as *the eyeball theorem.*

Colour coordination

Submitted by Joe Kupka

I need to hang 20 garments on a clothes line. Each garment requires two pegs. I have 20 green and 20 red pegs. I choose pegs at random. On average, how many garments will have pegs of the same colour?

Solution by Stephen Clarke: We will solve the generalised problem for n garments and n pegs of each colour.

Fix the first peg and suppose it is green. Now consider the possible choices for second peg. Out of the remaining $2n-1$ pegs, $n-1$ of them are green. Hence the probability of the first two pegs being green (knowing that the first one is green) is $(n-1)/(2n-1)$. The same argument can be made if the first peg is red. Therefore the probability of the first garment having matching pegs is $(n-1)/(2n-1)$.

Repeating the argument for each of the n garments, we see that the expected number of garments with matching pegs is $n(n-1)/(2n-1)$. In particular, when $n = 20$, the answer is $380/39$.

Team tactics 2

In a game show, there are three girls, each wearing a blue or a red hat. Each girl can only see the hats of the other two but not her own. Without any communication between themselves, each girl has to choose a real number and whisper it to the host. At the end, the host will add up the numbers chosen by girls wearing red hats, then subtract the numbers chosen by girls wearing blue hats. The girls win if the final answer is positive.

Before the show, the girls try to devise a strategy to maximise their probability of winning.

(i) *What is the maximum probability of winning?*

(ii) *If the girls were only allowed to choose from* $\{-1, 0, 1\}$*, what is the maximum probability of winning?*

Bonus: *If there are seven girls instead of three, and each girl can see the hats of the other six but not her own, how do the answers change?*

Solution: (i) There are $2^3 = 8$ possible scenarios. From the perspective of each girl, her own hat colour is independent of what she observes. So no matter what number she chooses, it has equal chance of being added or subtracted to the total score. Hence the expected total score is 0. In particular, regardless of the strategy chosen, there must be at least one scenario in which the girls lose.

We now construct a strategy which wins in 7 of the 8 scenarios. Since the girls wearing red hats will always see more blue hats than the girls wearing blue hats, it makes sense to choose larger numbers if more blue hats are visible. Suppose each

girl chooses 3^x, where x is the number of blue hats visible. The possible outcomes are

- RRR: total score $= 1 + 1 + 1 = 3$.
- RRB, RBR, BRR: total score $= 3 + 3 - 1 = 5$.
- RBB, BRB, BBR: total score $= 9 - 3 - 3 = 3$.
- BBB: total score $= -9 - 9 - 9 = -27$.

So the girls win if there is at least one red hat. Therefore the maximum probability of winning is 7/8.

Bonus: For 7 girls, the same argument shows that the maximum probability of winning is 127/128. This can be achieved if each girl chooses 7^x, where x is the number of blue hats she sees.

(ii) Again the expected total score is 0. Suppose the girls win in k of the 8 scenarios. Since each winning scenario requires at least 1 point and each losing scenario can be no less than -3 points, we must have

$$k - 3(8 - k) \leq 0 \quad \Longrightarrow \quad k \leq 6.$$

We now construct a strategy which wins in 6 of the 8 scenarios. Suppose each girl chooses 1 if she sees 2 blue hats, -1 if she sees 2 red hats, and 0 otherwise. The possible outcomes are

- RRR: score $= -1 - 1 - 1 = -3$.
- RRB, RBR, BRR: score $= -0 - 0 - (-1) = 1$.
- RBB, BRB, BBR: score $= 1 - 0 - 0 = 1$.
- BBB: score $= -1 - 1 - 1 = -3$.

So the girls win unless all hats are of the same colour. This achieves the maximum winning probability of 6/8.

Bonus: For 7 girls, the same argument shows that the maximum probability of winning is 112/128. The construction achieving this is a little trickier. For brevity, we will simply present the 16 losing scenarios (1 and 0 are used instead of red and blue for clarity):

1111111,	0010111,	1001011,	1100101,
1110010,	0111001,	1011100,	0101110,
0000000,	1101000,	0110100,	0011010,
0001101,	1000110,	0100011,	1010001.

The details of the strategy will be left to the readers.

A sequence of sequences

Let $S_1, S_2, \ldots$ be finite sequences of positive integers defined in the following way. Set $S_1 = (1)$. For $n > 1$, if $S_{n-1} = (x_1, \ldots, x_m)$ then

$$S_n = (1, 2, \ldots, x_1, 1, 2, \ldots, x_2, \ldots, 1, 2, \ldots, x_m, n).$$

For example, the next few sequences are $S_2 = (1, 2)$, $S_3 = (1, 1, 2, 3)$ and $S_4 = (1, 1, 1, 2, 1, 2, 3, 4)$.

*Prove that in the sequence S_n where $n > 1$, the kth term from the left is 1 if and only if the kth term from the right is not 1. (*Hint: *Pascal's triangle.)*

Solution: Upon examining the sequences carefully, one might conjecture that each S_n can be broken into n substrings, such that they exhibit the property of Pascal's triangle, but with concatenation instead of addition.

$$\begin{array}{c} 1 \\ 1,\quad 2 \\ 1,\quad 1,2,\quad 3 \\ 1,\quad 1,1,2,\quad 1,2,3,\quad 4 \\ 1,\quad 1,1,1,2,\quad 1,1,2,1,2,3,\quad 1,2,3,4,\quad 5 \\ \vdots \end{array}$$

In order to prove this, we define the following function on strings:

$$f(x_1, x_2, \ldots, x_m) := 1, 2, \ldots, x_1, 1, 2, \ldots, x_2, \ldots, 1, 2, \ldots, x_m.$$

In particular, the string S_n is defined by $S_n = f(S_{n-1}) \oplus n$ where $\oplus$ represents concatenation. Now for each n, inductively define the sequence of substrings A_{nk} for $k = 1, \ldots, n$ by

$$A_{nk} = f(A_{(n-1)k}), \quad k = 1, \ldots, n-1, \qquad A_{nn} = n.$$

We will prove the following statements by induction on n:

(a) $S_n = A_{n1} \oplus A_{n2} \oplus \cdots \oplus A_{nn}$;

(b) $A_{nk} = A_{(n-1)(k-1)} \oplus A_{(n-1)k}$ for $k = 2, \ldots, n-1$;

(c) For $k = 1, \ldots, n$, A_{nk} has the same length as $A_{n(n+1-k)}$. Furthermore the ith term of A_{nk} from the left is 1 if and only if the ith term of $A_{n(n+1-k)}$ from the right is not 1.

The base cases of $n = 1, 2$ and 3 can be easily verified. Assume the statements hold for S_{n-1} and consider S_n. The first statement (a) follows immediately from the definitions of S_n and A_{nk}.

Now we prove (b), or the 'Pascal's triangle' property conjectured earlier. If $k < n-1$, then

$$\begin{aligned} A_{nk} &= f(A_{(n-1)k}) = f(A_{(n-2)(k-1)} \oplus A_{(n-2)k}) \\ &= f(A_{(n-2)(k-1)}) \oplus f(A_{(n-2)k}) = A_{(n-1)(k-1)} \oplus A_{(n-1)k}. \end{aligned}$$

Otherwise $k = n-1$ and we have

$$\begin{aligned} A_{n(n-1)} &= f(A_{(n-1)(n-1)}) = (1, 2, \ldots, n-1) = (1, 2, \ldots, n-2) \oplus (n-1) \\ &= f(A_{(n-2)(n-2)}) \oplus A_{(n-1)(n-1)} = A_{(n-1)(n-2)} \oplus A_{(n-1)(n-1)}. \end{aligned}$$

In both cases (b) is proven and S_n indeed has the 'Pascal's triangle' property.

It remains to check the symmetry property of the last statement (c). If $k = 1$ or n, then (c) is trivial since $A_{n1} = 1$ and $A_{nn} = n$. If $1 < k < n$, then use (b) to write

$$A_{nk} = A_{(n-1)(k-1)} \oplus A_{(n-1)k}, \quad A_{n(n+1-k)} = A_{(n-1)(n-k)} \oplus A_{(n-1)(n+1-k)}.$$

Then (c) can be reduced to the induction hypothesis on S_{n-1}. This completes the induction.

Finally, to finish the problem, it suffices to note that the required symmetry property of S_n follows immediately from (a) and (c).

Ivan is a PhD student in the School of Mathematics and Statistics at The University of Sydney. His current research involves a mixture of multi-person game theory and option pricing. Ivan spends much of his spare time playing with puzzles of all flavours, as well as Olympiad Mathematics.

Royal Medal for Rodney Baxter

Rodney Baxter FRS, Emeritus Professor at the Mathematical Sciences Institute at ANU, has been awarded the Royal Society's 2013 Royal Medal for 'his remarkable exact solutions of fundamental models in statistical mechanics'.

King George IV founded the Royal Medals in 1825. Each year now, three medals are awarded for the most important contributions in the physical, biological and applied sciences, by citizens or residents of Commonwealth countries and the Irish Republic. Also known as the Queen's Medals, they are awarded annually by the Sovereign on the recommendation of the Council of the Royal Society. The three medals are of silver gilt and are accompanied by a gift of £5 000.

The list of former recipients speaks for itself. Amongst them you will find: Andrew Wiles, Simon Donaldson, Roger Penrose, Abdus Salam, Francis Crick, Michael Atiyah, Subrahmanyan Chandrasekhar, Paul Dirac, Lord Rayleigh, JJ Sylvester, Arthur Cayley, Michael Faraday, George Boole and John Herschel.

Exactly solved models play an important role in equilibrium statistical mechanics, particularly their behaviour near a critical point or phase transition, as this is where previous approximate theories can fail dramatically.

Professor Baxter is single-handedly responsible for solving exactly an impressive collection of two-dimensional lattice models, by generalising the Bethe ansatz method. In particular, the Hard Hexagon Model helps to explain accurately how helium is absorbed into graphite.

He remains active, despite having officially retired from ANU in 2003 after almost 35 years of service. As he said to the ANU Reporter, he was very pleased to receive the news, which he almost mistook for junk mail:

> The news came in the form of a letter from the Royal Society and when I saw it on my desk I just put it in my pocket thinking 'oh, it's just another circulation'. So I was carrying it around for a couple of hours before I actually read it.

The Awards presentation will take place in November, at the Royal Society headquarters in London, where he was admitted as a Fellow in 1982.

Mathematical Theory of Networks and Systems

MTNS 2012, Melbourne, 9–13 July 2012

http://mtns2012.com.au/

Margreta Kuijper*, Iven Mareels* and Doreen Thomas*

Preamble

The conference chairs thank the community for its participation in a successful MTNS 2012 down under in Melbourne. Special thanks to our conference organisers Ms Kim Stevenson and Ms Melissa Greco, and a very special thank you to our local University of Melbourne support provided by Ms Kerry Beachen.

The organisers thank the sponsors: The University of Melbourne, The Melbourne School of Engineering, National ICT Australia, Springer and the Australian Mathematical Society for their generous support.

Overview of the technical program

The 20th MTNS was held in Melbourne, Australia, at the University of Melbourne. Researchers from 34 countries presented their work over a 5-day period.

The actual program contained 4 plenary lectures and 10 semi-plenary presentations, as well as 192 regular presentations (only 6 of these suffered a no-show, and all these were clearly flagged by the presenter). The Uwe Helmke Techfest was held on the second day of the conference. It had 13 presentations that celebrated Uwe's contributions to mathematical systems theory.

There were 2 mini-courses presented: 'Quantum Control' and 'Multi-dimensional Linear Systems Theory'. As usual these mini-courses proved to be very popular with the audience.

Novel additions to MTNS were the panel session on 'Mathematical Network Problems in Mine Planning' and 'The MTNS History Session', which celebrated 40 years of MTNS conferences. Both of these were very popular items in the conference program.

Recommendation: That future MTNS organisers consider the inclusion of panel sessions (such as the 'Network Problems in Mine Planning') that bring together the mathematical community and the practitioners of a particular industrial or applied area for an open discussion on problems of interest.

*The University of Melbourne, VIC 3010.

The review process

The proceedings are available at http://www.mtns2012.conference.net.au. The proceedings contain 95 full papers and 110 extended abstracts.

The full papers were subject to full peer review (and typically received 2 reviews), whereas extended abstracts were only vetted by the program committee chairs for alignment with the conference topics. The acceptance rate for the full papers was just on 70%, whereas the extended abstracts were by and large accepted, their acceptance rate being 90%.

Recommendation: That future MTNS organisers consider maintaining the dual review regime, accepting both moderated extended abstracts and fully refereed papers.

Participating countries

Clearly MTNS down under was a smaller conference, due to the unfortunate coincidence with a number of other important conferences like Sysid, and no doubt due to the travel distance involved.

The number of participants was 220, drawn from 34 participating countries.

Nonlinear Dynamical Systems

La Trobe University

28–30 September 2012

The aim of the workshop was to bring together mathematicians from two areas of research for cross-fertilisation of ideas: researchers in nonlinear systems and integrable dynamics. We invited an excellent variety of keynote speakers in order to attract a range of participants from both schools of research.

Organising committee

- Professor Reinout Quispel (La Trobe University)
- Dr Christopher Ormerod (La Trobe University)
- Dr Sarah Lobb (La Trobe University)
- Dr Dmitry Demskoi (Charles Sturt University)
- Dr Peter van der Kamp (La Trobe University)

Topics covered

- Applications of nonlinear dynamical systems
- Stable and unstable manifolds
- Nonlinear wave equations
- Integrable dynamics
- Hamiltonian and bi-Hamiltonian systems

Special presenters

Dr James Atkinson (University of Sydney, Australia): Dr Atkinson has quickly established himself as an up-and-coming expert in the area of integrability of partial difference equations. He has remarkable insight into the beautiful geometric structures lying behind these systems.

Prof. Andy Hone (University of Kent, UK): Professor Hone has an encyclopedic knowledge of integrable systems. His work has made profound links between arithmetic geometry and integrability, and recently the new theory of cluster algebras.

Prof. Kenji Kajiwara (Kyushu University, Japan): Professor Kajiwara is an internationally renowned expert in integrable nonlinear ordinary and partial difference equations. He is one of the pioneers of the understanding of the group theory of discrete Painlevé equations.

Prof. Bernd Krauskopf (University of Auckland, New Zealand): Professor Krauskopf is an expert in nonlinear dynamical systems, and specialises in the theory of

chaotic dynamical systems. In collaboration with Professor Hinke Osinga, also a participant in this workshop, he has developed cutting-edge algorithmic techniques for computing unstable and stable manifolds.

Prof. Wolfgang Schief (University of New South Wales): Professor Schief is currently Head of the Applied Mathematics Department at the University of New South Wales, and a previous recipient of the prestigious Queen Elizabeth II Research Fellowship. He has done outstanding work on nonlinear wave equations and integrable systems.

Prof. Vladimir Sokolov (Landau Institute for Theoretical Physics, Russia): Professor Sokolov is a leading researcher in the Landau Institute for Theoretical Physics. He is a specialist in integrable 3-dimensional systems of hydrodynamical type and quantum integrable systems, and is a pioneer in the theory of matrix integrable systems.

Prof. Ferdinand Verhulst (Utrecht University, Netherlands): Professor Verhulst is a famous name in mathematics from the Netherlands. He became Professor of Dynamical Systems in 1990 and has founded a publishing company, Epsilon Uitgaven, which publishes books on science and mathematics. He has recently completed a biography of Henri Poincaré.

Report

Nonlinear dynamical systems are inherently interesting objects from both a theoretical and applied viewpoint. Nonlinear dynamical systems appear ubiquitously in natural phenomena; hence, they have applications to many facets of science including the biological, chemical and physical sciences. They are also of mathematical interest in themselves, as the theory incorporates notions from a broad range of mathematical disciplines, such as algebraic geometry, differential geometry, random matrix theory and representation theory.

Nonlinear dynamical systems admit a wide range of dynamical behaviours. From the applied to the abstract, from the chaotic to the solvable, this workshop aimed to facilitate a cross-fertilisation of the various ideas that have been developed across the areas.

This workshop showcased some of the most recent advances in research areas across this spectrum. From the keynote speakers we saw some novel applications of methods for calculating stable and unstable manifolds, the newest integrable discrete dynamical systems and their solutions, applications of nonlinear dynamical systems to differential geometry, and chaotic and integrable dynamics from Hamiltonian systems. The truly exceptional line-up of keynote speakers, aided by major funding from AMSI, AustMS and La Trobe University, was a key factor in the success of the workshop.

From our contributing speakers, we saw applications of nonlinear dynamical systems to mathematical physics, some of the newest methods from geometric integration, new interpretations of the very definition of integrability, advances in the

interplay between partial and ordinary difference and differential equations and systems that break the traditional rules of integrability and may or may not lend themselves to chaotic behavior. This broad range of topics from all speakers is testament to the success of the workshop.

An element of the workshop which proved to be immensely successful was the inclusion of special student talks, which were short talks more appropriate for honors or first year PhD students. The presentations were all excellent and a credit to the students. The talks also served the purpose of being a conversation starter for many of the students to talk to the experts.

One of the key successes of the workshop was to bring experts from around the globe to La Trobe to interact with up-and-coming researchers in the field. About one third of the participants were students and there were just about as many postdoctoral participants. As a result of this meeting, we saw free-flowing exchange of interesting ideas during the exchanges in the conference and in the tea breaks. This was continued outside the workshop, hence, the workshop also strengthened our ties with leading international researchers.

Organisers' opinion of success

We had a wonderfully successful line-up of keynote speakers, spanning the full range of nonlinear dynamical systems that we sought to represent. The keynote addresses were all of an excellent quality, and the special public lecture by Professor Ferdinand Verhulst was especially well received.

In terms of the aim of providing a platform for young researchers to engage with established researchers, we had great success. There were many interactions between students, early career researchers and the established experts in the field.

There was a good level of intermixing between people with interests in chaotic systems and those with interests in integrable systems, hence, regarding cross-fertilisation of ideas, there was some measure of success. This could have been improved further by a greater presence from those interested in chaotic systems.

There were aspects of the conference that could have been improved, namely the timing and the representation. The timing was difficult, as the one week in semester break is not uniformly placed across Australian universities. Holding the workshop on a Saturday was also a slight deterrent, as was the fact that it was the weekend of the AFL Grand Final. More people may have attended if we had chosen a time after semester. Secondly, there was a large representation of researchers primarily interested in integrability. While one cannot predict the precise mix of participants, perhaps a more even mix of keynote speakers would have made the workshop more attractive to non-integrable people. A few people needed to pull out at the last minute due to illness and family circumstances, which also had an effect on the balance of interests.

Appendix 1: Event feedback

While we did not formally ask participants to provide us with feedback, we did get some comments informally about the conference

- the student talks were fantastic
- the schedule and timings of the talks were good
- there could have been more people studying more chaotic nonlinear dynamical systems
- some of the talks were not aimed at a general enough audience.

On the more administrative side

- the accommodation on campus was great
- it can be difficult to get to La Trobe
- Melbourne was colder than people had expected
- catering was great.

AMSI workshop on Graph C^*-algebras, Leavitt path algebras and symbolic dynamics

R. Hazrat* and A. Sims**

The program

The workshop on Graph C^*-algebras and Leavitt path algebras was held at School of Computing and Mathematics, University of Western Sydney, 11–14 February 2013. The workshop was organised by R. Hazrat (UWS) and A. Sims (UOW) and was funded primarily by the Australian Mathematical Sciences Institute, with further support of the Australian Mathematical Society and University of Wollongong.

The aim of the workshop was to bring together Australian and international experts to develop the emerging connections between the traditionally disparate fields of abstract algebra and C^*-algebras and symbolic dynamics. The total of 19 talks were delivered, among them, 3 introductory talks by Gene Abrams (Colorado) on Leavitt path algebras and 3 parallel introductory talks by David Pask (Wollongong) on graph C^*-algebras. There were 25 participants, 10 of them overseas participants from China, New Zealand, Spain and USA.

The homepage of the workshop will be maintained at https://sites.google.com/site/amsiuws2012/home/, where all the presentations and notes are now online.

Talks

The following talks were delivered. For the abstracts and the complete beamer presentations, see the webpage of the workshop.

1. *Gene Abrams (Colorado)*

   Leavitt path algebras: Introduction, motivation, and basic properties
   Leavitt path algebras: Algebraic properties
   Leavitt path algebras: Some (surprising?) connections

2. *David Pask (Wollongong)*

   An introduction to graphs C*-algebra: Lecture 1
   An introduction to graphs C*-algebras: Lecture 2
   An introduction to graphs C*-algebras: Lecture 3

3. *Pere Ara (Barcelona)*

   Leavitt path algebras and graph C*-algebras of separated graphs

*University of Western Sydney, Parramatta Campus, Rydalmere, NSW.
Email: R.Hazrat@uws.edu.au
**School of Mathematics and Applied Statistics, University of Wollongong, NSW 2522.
Email: asims@uow.edu.au

4. *Enrique Pardo (Cadiz)*
   Symbolic dynamics in the classification of Leavitt path algebras: An overview
5. *Gonzalo Aranda Pino (Malaga)*
   Kumjian–Pask algebras of higher-rank graphs
6. *Mercedes Siles Molina (Malaga)*
   Centers of graphs algebras
7. *Iain Raeburn (Otago)*
   Actions and coactions of groups on graph algebras
8. *Astrid an Huef (Otago)*
   KMS states of C*-algebras of finite graphs
9. *S. Paul Smith (Washington)*
   Graded modules over path algebras of finite directed graphs, and Leavitt path algebras
10. *Aidan Sims (Wollongong)*
    Higher-rank graphs and C*-algebras
11. *Roozbeh Hazrat (Western Sydney)*
    Weighted Leavitt path algebras
12. *Lisa Orloff Clark (Otago)*
    Groupoids and Leavitt path algebras
13. *Michael F. Whittaker (Wollongong)*
    KMS states for self-similar actions
14. *Adam Rennie (Wollongong)*
    Aspects of Hochschild and cyclic homology for graph algebras

Participants

List of participants

An asterisk indicates a student participant.

Gene Abrams (Colorado); Pere Ara (Barcelona); Gonzalo Aranda Pino (Malaga); Lisa Orloff Clark (Otago); James East (Western Sydney); Attila Egri-Nagy (Western Sydney); Murry Elder (Newcastle); Andrew Francis (Western Sydney); Dean Kurtis Garden* (UNSW); Volker Gebhardt (Western Sydney); Roozbeh Hazrat (Western Sydney); Mitchell Hawkins* (Wollongong); Astrid an Huef (Otago); Hui Li* (Wollongong); Enrique Pardo (Cadiz); David Pask (Wollongong); Iain Raeburn (Otago); Adam Rennie (Wollongong); Stuart Serdoz* (Western Sydney); Mercedes Siles Molina (Malaga); Aidan Sims (Wollongong); Adam Sierakowski (Wollongong); S Paul Smith (Washington); Guoping Tang (Beijing); Michael F. Whittaker (Wollongong).

Australian Mathematical Sciences Student Conference

Australian National University

15 –17 July, 2013

The AMSSC 2013 Organising Committee*

The second Australian Mathematical Sciences Student Conference (AMSSC) was held at the Australian National University (ANU) from 15 to 17 July. The aim of the conference was to provide a relaxed environment in which graduate students of the mathematical sciences, from all over Australia, had a chance to meet and share their work, and to provide a platform for possible future collaboration.

AMSSC 2013 participants (photos by Lashi Bandara)

The event attracted 75 student participants from across the country, with attendees from as far as Perth, Adelaide, Toowoomba and Hobart. The 61 student presentations covered a broad range of topics, from invariants of supermanifolds to the effect of climatic and oceanographic variables on penguin survival. The organisers were impressed with the volume of material that included original research. While most of the attendees were PhD students, there were 20 honours and masters students at the conference, many of whom also presented talks.

Several academics were generous in giving their time to support the conference, particularly our guest speakers Assoc. Prof. Mary Myerscough (University of Sydney), Prof. Mathai Varghese (University of Adelaide), and Dr. Marty Ross (Mathematical Nomad), all of whom took time out of their busy schedules to make the trip to the bush capital. Mary gave a presentation of her work in modelling the

*Email: amssc@anu.edu.au.


Plenary lectures given by Assoc. Prof. Mary Myerscough and Dr. Marty Ross

behaviour of social insects; Mathai talked about index theory and his work developing fractional index theory; and Marty gave an entertaining exposition on the art of communicating mathematics. In addition, as part of the 2013 year of the Mathematics of Planet Earth, a public lecture was delivered on the Monday evening by Dr. Steve Roberts (ANU). Steve described the mathematical modelling of floods and tsunami waves, and at the same time gave insights into his experiences as a leading developer of the hydrodynamic modelling software ANUGA.

Women in mathematics drinks

Recently, a Women in Mathematics group was founded, as part of the AustMS, to promote gender equality in the mathematical sciences. On the Tuesday afternoon of the conference, an informal gathering between members of the group and conference participants was held. The group discussed gender issues as well as potential paths to solutions. The general discussion covered a broad range of issues,

and while it was widely accepted that a substantial shift, both inside and outside of the mathematics community, will be required to overcome the gender divide in mathematics, it is clear that some basic efforts can be made to improve the situation in the here and now. About 20–25 people attended; the overall sentiment was that the discussion had been fruitful and interesting.

Matthew Tam receiving one of the best talk awards

At the end of the conference, three participants were awarded prizes for presenting excellent talks. One of the prizes was dedicated to the best talk from the special stream 'Mathematics of Planet Earth', and the other two prizes were awarded to the best talks from the remaining participants. Billie Ganendran (ADFA) was awarded the Mathematics of Planet Earth prize for her talk entitled 'Effect of climate and oceanographic variables on survival of Little Penguins in South-Eastern Australia', while Matthew Tam (University of Newcastle) and Daniel Mansfield (UNSW) were awarded the remaining prizes for their respective talks 'Douglas–Rachford for Combinatorial Optimisation' and 'Non-singular dynamics and average return time'. Each of the award winners received a prize of $250, sponsored by the Modelling and Simulation Society of Australia and New Zealand. Congratulations to Billie, Matthew, and Daniel!

Finally, the organisers would like to thank our sponsors: AMSI, AustMS, CSIRO, Mathematics of Planet Earth Australia, the Modelling and Simulation Society of Australia and New Zealand, the ANU College of Physical and Mathematical Sciences, and the ANU Mathematical Sciences Institute. Without their generous assistance, the conference would not have been possible. We especially thank the Australian Mathematical Society for their valuable financial and technical support. While this is only the second instalment of the AMSSC, the organisers sincerely hope that this event will become a regular addition to the Australian mathematical sciences calendar. We hope that the success of this year's conference will help to attract similar support for next year's organisers.

The AMSSC 2013 Organising Committee: Alex Amenta, Lashi Bandara, Rachel Blakers, Chris Bourne, Koen van den Dungen, Mat Langford, Stephen McCormick, Matthew Randall, Chaitanya Shettigara, Griff Ware.

Ákos Seress

24 November 1958 – 13 February 2013

(Photograph courtesy of Mrs Sherry Seress)

It is with deep regret that we mark the passing of our colleague and friend Ákos Seress. He lost his brave battle with an aggressive form of cancer, and died in February. Ákos Seress was an outstanding mathematician whose work had a major impact on Group Theory and Combinatorics.

Ákos Seress is best known for his achievements in algorithmic group theory, and this was the theme of his invited lecture at the 2006 Madrid International Congress of Mathematicians. He is famous for his definitive monograph on permutation group algorithms, the culmination of both a series of joint papers on the subject with Babai and Luks, and also his pioneering implementations of these fast algorithms in the GAP computer system. Ákos Seress also made major contributions to the theory underpinning matrix group algorithms, including the statistical theory of finite simple groups. His vision of a flexible group computational system that adapts to different kinds of group representations was realised in a system developed with Neunhöffer, now available in GAP, and presented at ISSAC 2006 (International Symposium on Symbolic and Algebraic Manipulation).

Ákos's recent work on Majorana algebras provides a stunning example of the fundamental breakthroughs he regularly achieved by combining his exceptional computational and theoretical skills. (The Majorana algebras generalise the Griess–Norton algebra, the automorphism group of which is the Monster, the largest sporadic simple group.) Ákos's paper *Construction of* 2*-Closed M-Representations* received the Distinguished Paper award at ISSAC 2012 and was described in the accompanying citation as a paper 'of an outstanding groundbreaking importance' that 'marks a turning point in Majorana Theory'.

Ákos was born and educated in Budapest and it is not surprising that his first research interest was combinatorial mathematics. Indeed his Erdős number is one — witnessed by his joint paper with Erdős in 1986. Ákos wrote his PhD thesis in 1985 in Combinatorics at Ohio State University under the supervision of Dijen Ray-Chaudhury, and remained there on the faculty at OSU, becoming professor in 2000.

Ákos had worked with many mathematicians in the Centre for the Mathematics of Symmetry and Computation (CMSC) at the University of Western Australia on regular research visits for more than a decade before his Australian Research Council Professorial Fellowship allowed him to become a full-time member of the CMSC from July 2010. Since then Ákos collaborated and published with almost all members of the CMSC, and we miss immensely his friendship and our enthusiastic mathematical interactions with him. It was at the CMSC that Ákos began his collaboration with Harald Helfgott, which led to his publication in the Annals of Mathematics of a long-sought bound on the diameter of the alternating and symmetric groups, a tour de force in the study of the geometry of finite simple groups. There will be numerous joint papers with Ákos Seress appearing for years to come.

It is with great sadness that we say farewell to our friend and colleague Ákos Seress. Our condolences go to his wife Sherry and his son Laszlo, who quickly became part of the CMSC community at UWA. Ákos will be remembered by the many mathematicians around the world with whom he came into contact.

Cheryl E. Praeger, University of Western Australia.
Email: cheryl.praeger@uwa.edu.au

Lift-Off Fellowship report Geodesics: a natural breeding ground for geometrical problems

O.J. Garay and M. Pauley*

For centuries geodesics have been the breeding ground for many mathematical problems. In our research, we have exploited once more their unlimited generosity in several different ways [1], [2] but here, to keep ourselves within the limits of a short report, we mention just two of them.

Let Σ be a smooth surface in 3-dimensional Euclidean space. Allow a particle on Σ with some initial position and velocity to move under no forces except the minimum required to keep it constrained to Σ. The trajectory it follows (both forwards and backwards in time) is called a *geodesic*. For example, the geodesics of a sphere are its great circles.

Lorentzian manifolds are the natural ambient spaces for the study of relativity. Geodesic motion can be extended to Lorentzian manifolds in equivalent different ways. For instance, they are constant speed curves which are critical for the curve energy. But also, they can be seen as trajectories of particles traveling with vanishing acceleration.

Moreover, geodesics provide solutions for other classical variational problems as, for example, the elastica problem. According to D. Bernoulli's model (1742) an elastica is a minimizer of the bending energy of the curve and geodesics are the obvious examples since they are absolute minimizers. Elasticae in ambient spaces of constant curvature have been well studied since the Euler solution for the plane elastica problem (1744). However, in non-constant curvature ambient spaces, the elastica problem is much more difficult to deal with and very little is known about it.

We have studied a generalized elastica problem for clamped curves which are constrained to lie on a surface of a 3-dimensional space with constant curvature (surface constrained problem). We were particularly interested in the total curvature energy, for which the curves are related to Plyushchay's model for relativistic particles. We observe that a geodesic of a surface need not be a critical curve for the surface constrained problem and then we find the differential equation to be satisfied for a critical geodesic. In order to find explicit solutions, we construct surfaces locally foliated by geodesics satisfying such a differential equation.

Suppose Σ is locally parameterised as $\Sigma(u, v)$. If, for each u, the curve $v \mapsto \Sigma(u, v)$ is a geodesic, we say that the family of these curves forms a *foliation by geodesics*.

*Institute for Applied Geometry, Johannes Kepler University, Altenberger Straße 69, A-4040 Linz, Austria. Email: Michael.Pauley@jku.at

For example, if you remove the north and south pole of a sphere, the lines of longitude form a foliation of the resulting surface by geodesics (see Figure 1). All surfaces can be locally foliated by geodesics.

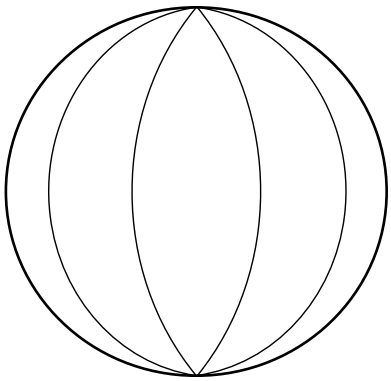


Figure 1. Foliation of a surface by geodesics.

Returning to our problem, one may prove that if a geodesic is critical for the surface constrained relativistic particle model then it must have constant torsion. So we wish to construct examples of surfaces locally foliated by geodesics with constant torsion (we measure torsion in the ambient 3-dimensional space). The partial differential equations which arise from this problem have many solutions, but giving explicit examples is not so simple. We restricted our attention to the surfaces which can be described with a geometrically simple construction.

In Euclidean space, curves with zero torsion are planar. So, one special case consists of surfaces in Euclidean space that have a foliation by planar geodesics (an example is the foliation by lines of longitude in Figure 1). All such surfaces can be locally described by the following construction. Let δ be a curve in 3-dimensional Euclidean space and let γ be a curve in the Euclidean plane. At any point p along δ, we can copy γ somewhere into the normal plane to δ at p. If we choose one copy for each p in a smooth way, they will come together to form a surface Σ, except possibly at points where δ curves so sharply that the copies of γ start to overlap. Everywhere else, the curves form a foliation of Σ by planar curves, although they are not necessarily geodesics.

The trick now is to choose the family of copies in a way that twists as little as possible — then the copies of γ will be geodesics in Σ. This construction can be given in terms of the torsion and the normal and binormal vectors of δ. See Figure 2. The copies of γ form a foliation of Σ by planar geodesics.

We found related results for surfaces in the 3-sphere and hyperbolic 3-space, and some special cases for nonzero constant torsion. We also give some results concerning the elastica constrained problem [1].

In [2] we study another question, related to the characterization of geodesics as trajectories of vanishing acceleration. Amongst other results, we prove that unit speed curves in Riemannian manifolds with vanishing higher order accelerations

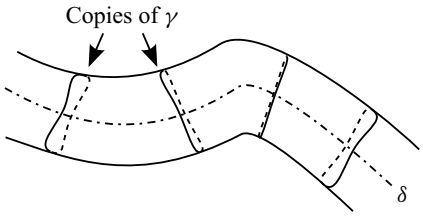


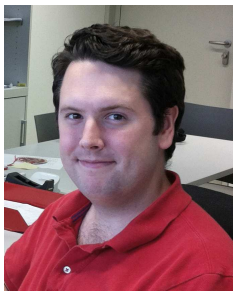
Figure 2. A construction in Euclidean space.

have to be geodesic, as expected. Surprisingly enough, we show that this is not true in Lorentzian spaces of arbitrary dimension, but it remains valid in Lorentzian surfaces. This is a neat difference between Riemannian and Lorentzian behaviour.

Acknowledgements. MP is grateful to the AustMS for the Lift-off Fellowship, and to OJG for hosting him at the University of the Basque Country and for the collaboration on these problems.

References

[1] Garay, O.J. and Pauley, M. (2013). Critical curves for a Santaló problem in 3-space forms. *J. Math. Anal. Appl.* **398**, 80–99.
[2] Garay, O.J. and Pauley, M. Non-geodesic particle trajectories with vanishing higher accelerations. To appear in *J. Geom. Phys.*



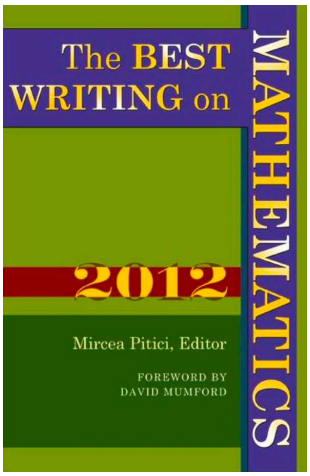
Michael did his undergraduate and PhD studies in pure mathematics at the University of Western Australia. He earned his PhD in 2011 for his thesis, *Cubics, Curvature and Asymptotics*, supervised by Winthrop Professor Lyle Noakes. During the Lift-Off Fellowship, Michael visited Prof Óscar Garay at the University of the Basque Country in Spain. He has since worked as a consultant in discrete event simulation, and is now a postdoc at Johannes Kepler University in Austria, where his work is related to isogeometric analysis.

Book Reviews

The Best Writing on Mathematics 2012

Mircea Pitici, Editor
Princeton University Press, 2012, ISBN 978-0-691-15655-2
Distributed in Australia by Footprint Books

This anthology of popular articles with a mathematical theme is the third in a series edited by Mircea Pitici, who teaches maths and writing at Cornell University. Like its predecessors, the articles were originally published in generalist journals such as *Science*, *Nature*, *New Scientist*, or *Scientific American* or in specialist mathematics, mathematical history, philosophy or education journals or simply in blog posts. They are divided equally among purely mathematical exposition, unusual applications, history of mathematics and mathematics education.



What does good writing on mathematics mean? According to Pitici, it signifies a short, jargon-free article aimed at a lay audience which explains some easily understood mathematical problem.

For example, the scientific journalist Brian Hayes, writing in *The American Scientist*, explains why the volume $V(n)$ of the unit ball in n dimensions increases monotonically with n till $n = 5$ and then decreases monotonically, approaching zero as n increases. A standard mathematics text would accomplish this by defining Lebesgue measure in n-dimensional Euclidean space and calculating $V(n)$ by integration. Instead, Hayes begins with a formula for $V(n)$ found in *Wikipaedia* and points out that the volume given by this formula depends on the ratio of π^n to $n!$ and hence could be expected to increase and then decrease. But Hayes also presents an intuitive geometrical argument for this phenomenon. The ball (or rather a half-sized copy) sits inside a cube of side and hence n-dimensional volume 1, touching all $2n$ facets. So while the region of the cube occupied by the ball is concentrated near the $2n$ facets, the region of the cube not occupied by the ball is concentrated near the 2^n corners. As n increases, this empty region rapidly overwhelms the occupied region, accounting for the short rise and then dramatic decrease in volume.

One of the deepest results in the book is a short chapter by Terry Tao, originally from his blog which has been anthologised elsewhere, on *Structure and Randomness in the Distribution of Primes*. Tao succinctly describes profound theorems by Vinogradov on the lower bound of the set of odd numbers which are the sum of 3 primes, the distribution of primes implied by the Riemann Hypothesis, and his own recent paper with Ben Green on primes in arithmetic progression.

Several articles discuss the 'unreasonable effectiveness of mathematics' in explaining the physical, biological and social world. The foremost is a foreword, written specifically for this volume by David Mumford, on the relation between pure and applied mathematics. Another fine example is an article from *Scientific American* by mathematical physicists John C. Baez and John Huerta explaining how quaternions and octonians are used in string theory and M-theory to describe the interactions of vectors and spinors. Others deal with applications to photography, music and dance.

About a quarter of the articles are about mathematical philosophy and mathematics education, from primary to university level. To my mind, they are the least satisfactory aspects of the book, containing no surprising insights.

More successful are the biographical studies, including G.L. Alexanderson on Jean Bernoulli's researches on the cycloid, Charlotte Simmons on Augustes de Morgan's relationship with Hamilton, Boole and others, F.Q. Gouvea on Cantor's surprising discovery of the equal cardinality of all real vector spaces up to countable dimension, and a historical perspective by G. Bruno, A. Genovese and G. Improta on routing problems from the Königsberg Bridges to the Travelling Salesman.

Popular writing is not as widespread in mathematics as it is in other sciences; for example there are best-sellers by Oliver Sacks in neuroscience, Jared Diamond in anthropology, Steven Hawking in physics and Simon Winchester in geology. This series serves to partially fill this gap.

Phill Schultz
School of Mathematics and Statistics, The University of Western Australia, Crawley, WA 6009, Australia. Email: phill.schultz@uwa.edu.au

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NCMS News

Nalini Joshi*

'The Mathematical Sciences in 2025': a report of the US National Research Council

The US National Academies Press published the report 'The Mathematical Sciences in 2025' earlier this year.[1] This was a serendipitous discovery, as it happened around the same time as the call for submissions to the Decadal Plan for Mathematical Sciences in Australia. The report makes eight recommendations, which are listed below. Whilst the funding for and support for mathematical sciences is very different between USA and Australia, we share similar concerns, hopes and ambitions. In this column, I would like to ask you to consider the report's recommendations and whether they are equally important for the Australian context.

The concerns of this report overlap with many of the themes of the Decadal Plan. I was pleased to read statements such as these:

> In order for the whole mathematical sciences enterprise to flourish long term, the core must flourish. This requires investment by universities and by the government in the core of the subject.
>
> (from the Summary, p. 2)

The overview to the report describes the vitality of the US mathematical sciences as 'excellent'. Chapter 4 reports that there are eight institutes of mathematical sciences funded by the National Science Foundation in the US, not including various others such as the Clay Mathematics Institute, the Simons Center for Geometry and Physics and the Kavli Institute for Theoretical Physics. Such sentiment and level of funding is very different to the current state of concern expressed by many of us about the mathematical sciences in Australia. A major issue of concern, for example, is the decrease in the number of departments of statistics in Australia. Two of the recommendations below refer to 'mathematics and statistics departments' in the US. It is sobering to reflect that in Australia there are only two departments of statistics left from about twenty or so that operated in the mid 1990s.

The report contains six chapters in addition to the summary and six appendices. The actions are encapsulated in eight recommendations, which are quoted below

*Chair, National Committee for Mathematical Sciences, School of Mathematics and Statistics F07, The University of Sydney, NSW 2006, Australia. Email: nalini.joshi@sydney.edu.au

This article will also appear in the newsletter of the Statistical Society of Australia Inc.

[1]This report can be downloaded freely, after registration, from the National Academies Press at http://www.nap.edu/catalog.php?record_id=15269.

along with additional information (in italics) needed to make them self-contained for this column.[2] As you read each recommendation, I would like to encourage you to try imagining the corresponding actions in Australia, with commensurate bodies such as the Australian Research Council replacing the National Science Foundation. What would your reactions to such recommendations be if they were to appear in the Decadal Plan? I would love to know your thoughts. (Please feel free to email me.)

- Recommendation 3-1 (p. 68): The National Science Foundation should systematically gather data on such interactions (*i.e. data on graduate student training that crosses discipline boundaries with mathematics*) — for example, by surveying departments in the mathematical sciences for the number of enrollments in graduate courses by students from other disciplines, as well as the number of enrollments of graduate students in the mathematical sciences in courses outside the mathematical sciences. The most effective way to gather these data might be to ask the American Mathematical Society to extend its annual questionnaires to include such queries.
- Recommendation 3-2 (p. 69): The National Science Foundation should assemble data about the degree to which research with a mathematical science character is supported elsewhere in the Foundation. (Such an analysis would be of greatest value if it were performed at a level above DMS (*i.e. Division of Mathematical Sciences*).) A study aimed at developing this insight with respect to statistical sciences within NSF is under way as this is written, at the request of the NSF assistant director for mathematics and physical sciences. A broader such study would help the mathematical sciences community better understand its current reach, and it could help DMS position its own portfolio to best complement other sources of support for the broader mathematical sciences enterprise. It would provide a baseline for identifying changes in that enterprise over time. Other agencies and foundations that support the mathematical sciences would benefit from a similar self-evaluation.
- Recommendation 5-1 (p. 127): Mathematics and statistics departments, in concert with their university administrations, should engage in a deep rethinking of the different types of students they are attracting and wish to attract and must identify the top priorities for educating these students. This should be done for bachelors, masters, and PhD-level curricula. In some cases, this rethinking should be carried out in consultation with faculty from other relevant disciplines.
- Recommendation 5-2 (p. 127): In order to motivate students and show the full value of the material, it is essential that educators explain to their K–12 and undergraduate students how the mathematical science topics they are teaching are used and the careers that make use of them. Modest steps in this direction could lead to greater success in attracting and retaining

[2]Each recommendation has a number referring to the chapter in which it is made. I have also supplied the page number on which each recommendation can be found.

students in mathematical sciences courses. Graduate students should be taught about the uses of the mathematical sciences so that they can pass this information along to students when they become faculty members. Mathematical science professional societies and funding agencies should play a role in developing programs to give faculty members the tools to teach in this way.

- Recommendation 5-3 (pp. 127–128): More professional mathematical scientists should become involved in explaining the nature of the mathematical sciences enterprise and its extraordinary impact on society. Academic departments should find ways to reward such work. Professional societies should expand existing efforts and work with funding entities to create an organizational structure whose goal is to publicize advances in the mathematical sciences.
- Recommendation 5-4 (p. 137): Every academic department in the mathematical sciences should explicitly incorporate recruitment and retention of women and underrepresented groups into the responsibilities of the faculty members in charge of the undergraduate program, graduate program, and faculty hiring and promotion. Resources need to be provided to enable departments to monitor and adapt successful recruiting and mentoring programs that have been pioneered at many schools and to find and correct any disincentives that may exist in the department.
- Recommendation 5-5 (p. 144): The federal government should establish a national program to provide extended enrichment opportunities for students with unusual talent in the mathematical sciences. The program would fund activities to help those students develop their talents and enhance the likelihood of their pursuing careers in the mathematical sciences.
- Recommendation 6-1 (p. 152): Academic departments in mathematics and statistics should begin the process of rethinking and adapting their programs to keep pace with the evolving academic environment, and be sure they have a seat at the table as online content and other innovations in the delivery of mathematical science coursework are created. The professional societies have important roles to play in mobilizing the community in these matters, through mechanisms such as opinion articles, online discussion groups, policy monitoring, and conferences.

The report goes into much more detail in its two hundred or so pages. There are also focused topics encapsulated in 'Boxes'. For example, Box 5-1 'Mathematical Circles: teaching students to explore' describes a longstanding, engaging initiative in mathematical outreach. The appendices describe past strategic studies, such as the David report of 1990 which 'led to striking increases in federal funding for mathematical sciences for a few years' (pp. 155–156). Chapter 2 'Vitality of the Mathematical Sciences' provides a very thoughtful description and exploration of current and recent advances and strengths in the mathematical sciences, ranging from the topology of three-dimensional spaces to compressed sensing.

In the Decadal Plan, we need actionable goals as well as aspirational statements. For example, if Recommendations 5-1, 5-3 and 5-4 were adopted in the Decadal

Plan, I would have urged the addition of specific pathways that would fund and enable academic departments to implement 'deep rethinking', rewards for outreach and recruitment initiatives.

In the Australian context, we also need actions that will bring mathematical sciences to the level of vitality that the USA and other western countries enjoy. My hope is that after the first Decadal Plan is put into action, the next one will be able to start from a baseline of revitalised mathematical sciences in Australia.

Nalini Joshi is the Chair of Applied Mathematics at The University of Sydney and was the President of the Australian Mathematical Society during 2008–2010. She was elected a Fellow of the Australian Academy of Science in 2008, became the Chair of the National Committee of Mathematical Sciences in 2011, and was elected to the Council of the Australian Academy of Science in 2012.

AMSI News

Geoff Prince*

Communiqué from the participants of the Maths of Planet Earth Conference

Global challenges: The vital role of maths and stats

This week, mathematicians, statisticians and scientists from the public and private sectors gathered to discuss many of the critical challenges facing our planet.

Although the time scales of these challenges are often very different, they are all materially and intellectually urgent. Along with our physical, biological and social knowledge of the planet, our mathematical skills are indispensable to progress.

The conference, led by the Australian Mathematical Sciences Institute (AMSI), brought together five government agencies, along with national and international researchers, government departments and centres of excellence.

Over five exciting days discussing new ideas, research and collaboration allowed us to examine the vital role of mathematics and statistics in areas such as

- Delaying the onset of Alzheimer's disease
- The detection of cells in terrorist networks
- Building the next generation of climate change models
- Managing the toughest biosecurity standards in the world
- Bullet-proofing the global financial system
- Modelling natural disasters to reduce human casualties

Some of the challenges we worked on are of humanity's own making and some are not, but collectively they affect our lives and those of our fellow species.

Earth system science, sustainability, financial risk modelling and management, climate change science, data mining, biosecurity, natural disaster mitigation, social policy — each of these areas is under intense development. Yet the fundamental role played by the mathematical sciences is generally unknown. Perhaps this is because the words 'mathematics' and 'statistics' do not appear once in the names of these areas, and the mathematical scientists who work in these areas are known by other titles.

The public, those learning mathematics in schools and universities and those making public policy must be made aware that mathematical scientists are pivotal to innovation.

Why is this important? Because without recognising the role of the mathematical sciences in meeting these challenges, we threaten the future supply of mathematically capable professionals able to work on current and future global challenges.

*Australian Mathematical Sciences Institute, Building 161, c/- The University of Melbourne, VIC 3010, Australia. Email: director@amsi.org.au

Australia cannot afford this loss of capacity.

We, the delegates in attendance, wish to make two important points to the Australian community:

> We will strive for a safer and better understood planet through the development and application of mathematical and statistical research. As a community of scientists and professionals we have the principal responsibility for the public awareness of our work, so important for the inspiration of tomorrow's researchers.
>
> Australian policy makers and governments must address declining interest in advanced mathematics and statistics in our schools and universities. All Australian children deserve to have qualified maths teachers and they should be engaged with the work that mathematically capable professionals perform, especially that which has an immediate and material benefit to the planet.

Conference partners and sponsors

I was a Monash undergraduate and took out a La Trobe PhD in 1981 in geometric mechanics and Lie groups. This was followed by a postdoc at the Institute for Advanced Study in Dublin. I've enjoyed teaching at RMIT, UNE and La Trobe. My research interests lie mainly in differential equations, differential geometry and the calculus of variations. I'm a proud Fellow of the Society, currently a Council and Steering Committee Member. I became AMSI director in September 2009.

News

General News

AMSI vacation scholarships

Applications for the 2013/2014 AMSI Vacation Research Scholarships are now open online: www.amsi.org.au/VRS

Scholarships:

- are available Australia wide
- pay a student stipend of $450/week for six-weeks
- give students the opportunity to present at CSIRO's Big Day In — February 2014
- offer fully funded travel and accommodation to the Big Day In.

This scholarship program is open to 2nd- and 3rd-year students attending university with an AMSI member (list of members can be found at http://www.amsi.org.au/members).

Please let students and colleagues know about this opportunity.

CSIRO restructure

On 1 July, a new CSIRO research Division was formed by the integration of two Divisions within the Information Sciences Group: Mathematics Informatics and Statistics and the ICT Centre. The new Division is called CSIRO Computational Informatics (CCI). Key drivers for its formation are an evolving ICT and mathematical sciences landscape and the opportunity to create an effective capability hub.

The new Division's Chief, Dr Bronwyn Harch, said the change is a response to the fact that advances in digital technologies have triggered an explosion in the volume, velocity and variety of data and information now available. These data and information have to be generated, captured, transmitted and analysed, and the new Division will drive this research in CSIRO.

The new Division's formation will enable CSIRO to remain globally competitive in key research areas across its portfolio of research in order to transform the information and decision making workflows of industry, government and the innovation sectors. It will help CSIRO tackle major national challenges such as productivity decline and an ageing population.

Dr Harch will ensure the Division is known both for its excellent science and impact, and for its culture of collaboration. She extends an invitation to all CSIRO industry and research partners to connect and work with her and members of the Division.

Here are a few facts and figures about CCI:

- Name: CSIRO Computational Informatics
- Chief: Dr Bronwyn Harch
  http://www.csiro.au/people/Bronwyn.Harch.aspx
- Personnel: Approximately 440 people located on 11 sites in 7 capital cities
- Outputs: Predecessor Divisions have given us innovations like WLAN wireless technology, disease surveillance tools and software, 2D and 3D imaging technologies, sensor networks for farms, autonomous systems, risk analysis tools and maths-based computational models of fluids.

Please contact Bronwyn Harch (Chief), Paul Barnett (Strategic Advisor) or David Williams (Group Executive, Information Sciences) if you have any questions about our new Division.

Griffith University joins AMSI

Griffith University has now joined the Australian Mathematical Sciences Institute, as an Associate Member.

More mathematicians in the media

Dr Tim Garoni discussed how maths could reduce the time drivers are stuck in traffic. See http://www.sbs.com.au/news/article/1779191/Comment-Stuck-in-traffic-Maths-can-get-you-on-your-way.

Prof. Paul Cally discussed NASA's Voyager 1 and 2 spacecrafts on ABC1 radio. See http://www.abc.net.au/catalyst/stories/3785357.htm.

A/Prof. Steve Siems was in the media discussing a recent study that found increased atmospheric aerosols were linked to a weakening global water cycle. See http://www.theage.com.au/environment/weather/fall-in-aerosol-use-to-bring-more-rain-to-wet-zones-20130701-2p7l2.html.

Dr Jonathan Keith was in the media for his coverage on his fire ant work and for getting a paper accepted in the prestigious Proceedings of the National Academy of Sciences (PNAS). See http://theconversation.com/eradicating-the-red-imported-fire-ant-by-numbers-16118.

Swinburne restructure

Following a restructure of faculties to be implemented at the start of 2014, Swinburne University of Technology will have a Department of Mathematics within the School of Science and in the Faculty of Science, Engineering and Technology. This shows the emphasis Swinburne is placing on STEM subjects, including mathematics.

Completed PhDs

RMIT

- Dr Majda Idlango, *Differential equation population models in a slowly varying environment*, supervisors: John J. Shepherd and John A. Gear.

UNSW

- Dr Christopher Pardy, *Mutual information as an exploratory measure for genomic data with discrete and continuous variables*, supervisor: Susan R. Wilson.

University of Sydney

- Dr Natalie Aisbett, *Gamma-polynomials of flag homology spheres*, supervisor: Anthony Henderson.

University of Western Australia

- Dr Wei Jin, *Finite s-geodesic transitive graphs*, supervisors: Cheryl Praeger, Alice Devillers and Cai Heng Li.
- Dr Brendan Florio, *The generation and interaction of convection modes in a box of a saturated porous medium*, supervisors: Thomas Stemler, Kevin Judd and Neville Fowkes.

Awards and other achievements

Monash University

- A/Prof Steve Siems/Dr Hamish Ramsay/Prof Michael Manton and Prof Christian Jakob/Prof Michael Reeder have had two successful ARC Linkage grants submitted from the School of Mathematical Sciences (from two submissions).
- Dr Christoph Federrath has won the 2013 Faculty of Science Excellence in Research Award by an Early Career Researcher.

University of Adelaide

- Dr Olumide Adisa received 'The Outstanding Professional Achievement Award' for Young African Australians at the African Australian National Awards Night at the Parliament House in Canberra for 'exceptional achievements and remarkable contributions to Australia and Africa through education, research and science'.
- Dr Joshua Ross is a Tall Poppy Award winner.

University of South Australia

- Professor John Boland was awarded the best paper prize at the International Conference of Energy Meteorology, Toulouse, 25–28 June, 2013 for his presentation 'Climate statistical analysis for energy meteorology'.

University of Sydney

- David Ivers was awarded funding in the University's Sydney Research Networks Scheme (http://sydney.edu.au/news/research_support/2379.html?newscategoryid=215&newsstoryid=11733).
- Mary Myerscough was awarded a Thompson Fellowship for 2014 (http://sydney.edu.au/research_support/funding/sydney/thompson.shtml).

University of Wollongong

- 2013 Vice Chancellor's Awards for Research Excellence:
  - Award for Research Culture: A/Prof David Pask;
  - Award for Outstanding Achievement in Research Partnership: Prof Brian Cullis and his research partner Grains Research Development Corporation.
- ARC Linkage project:
  - Prof Brian Cullis, Dr Alison Smith and Dr Haydn Kutchel, were awarded $554 336 for their project entitled 'Genomic selection: a new frontier for higher rates of genetic gain in wheat'.
  - Former PhD student Dr Duangkamon Baowan has received the 2013 Young Thai Scientist of the Year award for her work on mathematical modelling in nanotechnology.

Appointments, departures and promotions

LaTrobe University

- Dr Thi Dinh Tran started a full time one-year Research Officer Level A position in July.
- Dr Theodoros Kouloukas will commence a full time six-month Research Officer Level A position in August.

Both will be working with Professor Quispel.

Monash University

- Dr Pascal Buenzli commenced on 1 July as Lecturer in the School. Pascal's areas of interest include mathematical and computational biology, cell population models, mechanobiology, cancer models, complex systems, statistical mechanics, fluctuation-induced phenomena (Casimir force).
- Dr Ingrida Steponavice commenced on 1 July as Research Fellow in the School. Ingrida's research interests include multiobjective optimisation,

robust optimisation, optimal design, simulation-based optimisation, multicriteria decision making. She is also interested in model predictive control, surrogate modeling, evolutionary algorithms, and optimisation applications in energy.
- Dr Enrico Carlini commenced on 5 August as Senior Lecturer in the School. Enrico's research interests include Polynomial Algebra, Waring Problems, Higher Secant Varieties and Special Subvarieties of Algebraic Varieties.

University of Adelaide

- Mathai Varghese has been appointed Elder Professor of Mathematics.
- Danny Stevenson has been appointed as Senior Lecturer.
- Peter Hochs has been appointed as Lecturer.
- Hang Wang has been appointed as Lecturer.

UNSW

- Professor Igor Shparlinski has joined the Department of Pure Mathematics. Professor Shparlinski was previously at Macquarie University.

University of Newcastle

- Dr Mumtaz Hussain has joined the University of Newcastle as a Research Associate.
- Wadim Zudilin has been promoted to Professor.
- Dr Francisco Aragon has left the University of Newcastle for an appointment in Luxembourg.

University of South Australia

- Dr Amie Albrecht has been appointed as Lecturer (Level B, continuing) in the School of Information Technology and Mathematical Sciences.

University of Southern Queensland

- Dr Nathan Downs joined the School of Agricultural, Computational, Environmental Sciences (formerly known as the Department of Mathematics and Computing, name change as of 1 July) on 1 July 2013 as a full-time associate lecturer in mathematics. Nathan has a PhD from USQ in Applied Physics (UV Sciences).

University of Sydney

The following staff members have joined the School of Mathematics and Statistics

- Nicola Armstrong: Lecturer in Statistics
- Martina Chirilus-Bruckner: Lecturer in Applied Mathematics
- Peter McNamara: Research Fellow
- Milena Radnovic: Research Fellow
- Andrew Papanicolaou: Lecturer in Applied Mathematics
- Alan Stapledon: Postdoctoral Fellow working
- Geoffrey Vasil: Lecturer in Applied Mathematics
- Oded Yacobi: Lecturer in Pure Mathematics.

University of Western Australia

- Professor Cai Heng Li has been promoted to Winthrop Professor.
- Dr Luke Morgan commenced as a Research Associate.
- Dr Simon Smith commenced as a Research Associate on an ARC Discovery Early Career Research Award.

University of Wollongong

- Prof Graham Williams has been appointed Associate Dean (Education) of the Faculty of Law, Humanities and The Arts.
- The School of Mathematics and Applied Statistics is one of seven schools in the new Faculty of Engineering and Information Sciences.

New Books

University of Western Australia

- Fu, X.C., Small, M. and Chen, G.R. (2014). *Propagation Dynamics on Complex Networks: Models, Methods and Stability*. John Wiley.

Conferences and Courses

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

Australian-Japanese Workshop on Real and Complex Singularities

Date: 9–13 September 2013
Venue: University of Sydney
Web: www.maths.usyd.edu.au/u/laurent/RCSW

AMSI-Mahler Lecture Tour

Date: 23 September – 11 October 2013
Venue: various
Web: http://www.amsi.org.au/index.php/component/content/article/275-uncategorised/1098-amsi-mahler-lecturer-2013

For more information, please visit this website, or see the advertisement on p. 267.

AMSI workshop on Infectious Disease Modelling

Date: 25–27 September 2013
Venue: Newcastle, Australia
Web: http://carma.newcastle.edu.au/meetings/indimo/

For more information, please see the conference website, or *Gazette* 40(3), p. 232.

Annual Conference of the Australian Mathematical Society

Date: 30 September – 3 October 2013
Venue: University of Sydney
Web: www.maths.usyd.edu.au/u/austms2013/index.html

The conference will take the usual format, with a welcome reception and registration and women's dinner on the Sunday evening, 29 September; official opening on Monday morning; a mathematics education afternoon for teachers on Tuesday, followed by a public lecture by Sommer Gentry; the Annual General Meeting on Wednesday afternoon, 2 October, followed by the conference dinner that evening.

The conference is expected to close by 6pm on Thursday 3 October. Note that, as part of his Mahler tour, Akshay Venkatesh will also deliver a Public Lecture that evening ('Two centuries of prime numbers').

The Annual Early-Career Workshop will be held on the Saturday before the Conference, in Leura in the Blue Mountains. If you have registered for the ECW then you will shortly be receiving email communications from the organisers about accommodation and other details.

The plenary talks include:

- Natashia Boland (Hanna Neumann Lecturer, University of Newcastle, Australia), 'Integer programming: trends and recent advances'
- Robert Bryant (University of California, Berkeley/MSRI, USA), 'Progress in the geometry of differential equations'
- Nicolas Champagnat (Université de Lorraine, Nancy/INRIA Nancy, France), 'Deterministic and stochastic approaches to study evolutionary branching in adaptive dynamics'
- Markus Hegland (ANZIAM Lecturer, Australian National University), 'Computational mathematics, challenges and opportunities'
- Anthony Henderson (University of Sydney, Australia), 'A partial history of the Schur functor'
- Donghoon Hyeon (Pohang University of Science and Technology,South Korea), 'Log minimal model program for the moduli space of curves'
- Iain Johnstone (Stanford University, USA), 'Random matrices in statistics: testing in spiked models'
- Mattias Jonsson (University of Michigan, Ann Arbor, USA), 'Non-Archimedean geometry'
- Masatoshi Noumi (Kobe University, Japan), 'Discrete Painleve equations and special functions'
- Claus M. Ringel (University of Bielefeld, Germany), 'Hidden symmetries of root systems'
- Akshay Venkatesh (Mahler Lecturer, Stanford University, USA), TBA
- Stephen Boyd (Planet Earth Plenary Speaker, Stanford University, USA), 'From embedded real-time to large-scale distributed'
- Sommer Gentry (early career lecturer, United States Naval Academy, USA), 'Faster, safer, healthier: adventures in operations research'.

The following Special Sessions are planned as part of the conference:

- Algebra
- Calculus of variations and PDE
- Combinatorics
- Computational mathematics
- Differential geometry and its applications
- Dynamics and operator algebras
- Topics in dynamical systems
- Financial mathematics
- General 3 talks
- Geometric analysis
- Topological methods in applied PDEs
- Geometry and topology
- Group actions
- Mathematics in biology and medicine
- Mathematics education
- Mathematical physics
- Number theory
- The optimization of planet Earth
- Plenary
- Probability and statistics

More complete information regarding the conference may be found at the conference website.

Number Theory Down Under

Date: 5 October 2013
Venue: University of Newcastle
Web: http://carma.newcastle.edu.au/mcoons/DUNT.html

This is a one-day workshop. Please visit the website for more information.

Representation Theory in Geometry, Topology, and Combinatorics

Miniworkshop, date: 28–31 October 2013
Conference, date: 4–7 November 2013
Venue: The University of Melbourne
Web: http://www.ms.unimelb.edu.au/~mlanini/RepTheoryConference/

Miniworkshop speakers:

- Martina Lanini (Melbourne) 'A short course for graduate students in research in algebra'
- Joan Licata (ANU) 'A short course for graduate students in research in topology'
- Liz Vivas (IMPA, Brazil) 'A short course for graduate students in research in analysis'.

Conference speakers:

- Dave Anderson (IMPA, Brazil)
- John Bamberg (UWA)
- Alice Devillers (UWA)
- Ben Elias (MIT, USA)
- Alexander P. Ellis (Oregon, USA)
- Stephen Griffeth (Talca, Chile)
- Anthony Henderson (Sydney)
- Daniel Juteau (Caen, France)
- Masoud Kamgarpour (University of Queensland)
- Nicolas Libedinsky (Santiago, Chile)
- Joan Licata (ANU) Scott Morrison (ANU)
- Peter McNamara (Sydney)
- Peng Shan (Caen, France)
- Valerio Toledano Laredo (Northeastern University, USA)
- Geordie Williamson (MPI Bonn, Germany).

Please visit the website for more details.

Phylomania 2013

Date: 6–8 November 2013
Venue: University of Tasmanina
Web: http://www.maths.utas.edu.au/phylomania/phylomania2013.htm

Phylogenetics is concerned with the problem of reconstructing the past evolutionary history of organisms from molecular data, such as DNA, or morphological characters. There is ongoing interest in the further development of the mathematics that underlies computational phylogenetic methods. Hidden from view, in the software packages used by biologists, are algorithms performing statistical inference using Markov models on binary trees. The mathematics involved represents a unique confluence of probability theory, discrete mathematics, statistical inference, algebraic geometry, and group theory. There are many important theoretical problems that arise, such as statistical identifiability of models, consistency and convergence of methods. These problems can only be solved using a multidisciplinary approach. Phylomania brings together phylogenetic researchers with a strong theoretical leaning, with the aim of discussing some of the more pressing problems.

Special Event

We are delighted that the Australian Mathematical Sciences Institute (through the Mathematics of Planet Earth program) are sponsoring Mike Steel to give a public talk on the 'Mathematical Challenges in Finding the Tree of Life' on the evening of Wednesday 6 November. The talk will be held in the Stanley Burbury lecture theatre at the Sandy Bay campus, with drinks and finger-food from 7pm onwards.

Confirmed speakers:

- Mike Steel, University of Canterbury, Christchurch, NZ
- David Penny, Massey University, Palmerston North, NZ
- David Liberles, University of Wyoming, Laramie, United States.

DELTA 2013

Date: 24–29 November 2013
Venue: The Pavillion, Kiama, NSW
Web: www.delta2013.net

For more information, please see the conference website, or *Gazette* 40(1), p. 74.

Recent Developments of Nonlinear Partial Differential Equations

Date: 25–29 November 2013
Venue: Australian National University
Web: http://maths.anu.edu.au/events/recent-developments-nonlinear-pdes

This conference is a major event in the 2013 ANU special year on nonlinear partial differential equations. We focus on new developments in several themes of nonlinear PDEs and their applications, which include variational theory of nonlinear equations arising in mathematical physics, fully nonlinear equations arising in geometry and optimal transportation, and evolution equations arising in fluid mechanics, and other nonlinear problems in affine and conformal geometry. This conference will bring together leading international researchers and provide opportunities for Australian researchers, in particular junior researchers, to catch up with recent developments and exchange ideas with overseas experts.

Invited speakers

- Ben Andrews (CMA, ANU)
- Henri Berestycki (EHESS, France)
- Stefano Bianchini (SISSA, Italy)
- Xavier Cabré (ICREA and UPC, Barcelona)
- Daomin Cao (Chines Academy of Science)
- Monica Clapp (Universidad Nacional Autónoma de México)
- Florica Cirstea (University of Sydney)
- Norman Dancer (University of Sydney)
- Manuel Del Pino (University of Chile)
- Yihong Du (University of New England)
- Lawrence Craig Evans (University of California at Berkeley)
- Alberto Farina (University of Picardie)
- Changfeng Gui (University of Connecticut)
- Francois Hamel (University d'Aix-Marseille)
- Minchun Hong (University of Queensland)
- Seick Kim (Yonsei University)
- Ki-ahm Lee (Seoul National University)
- Changshou Lin (National Taiwan University)
- Guozhen Lu (Wayne State University)

- Nikolai Nadirashvili (University d'Aix-Marseille)
- Ludovic Rifford (University of Nice)
- Susanna Terracini (University of Turin)
- Edriss Titi (UC Irvine)
- Laurent Veron (Université François-Rabelais)
- Zhi-Qiang Wang (Utah State University and Nankai University)
- Juncheng Wei (University of British Columbia)
- Zhouping Xin (Chinese University of Hong Kong)
- Shusen Yan (University of New England).

ACWO2013: The 6th Australia-China Workshop on Optimization: Theory, Methods and Applications

Date: 28–30 November 2013
Venue: University of Ballarat
Web: http://www.ballarat.edu.au/schools/school-of-science-and-technology/research/conferences-and-workshops/the-6th-australia-china-workshop-on-optimization-theory,-methods-and-applications

This workshop aims to bring together experts from Australia, China, the Pacific region and around the world in the area of optimization theory, methods and applications. It will provide an opportunity for meeting and exchanging recent research findings and discussing possible collaboration and joint projects.

Researchers in these areas, including students, are welcome to attend this workshop. There are no registration fees.

Keynote speakers

- Professor Pascal Van Hentenryck (NICTA,The University of Melbourne)
- Professor Kok Lay Teo (Curtin University)
- Professor Xinmin Yang (Chongqing Normal University, China)
- Professor Joe Dong (The University of Sydney)
- Professor Duan Li (The Chinese University of Hong Kong)

Further details are available at the website.

EMAC 2013: 16th Engineering Mathematics and Applications Conference

Date: 1–4 December 2013
Venue: Queensland University of Technology, Brisbane
Web: www.emac2013.com.au

For details, please see the conference website, or *Gazette* 40(2), p. 148–149.

MODSIM2013: International Congress on Modelling and Simulation

Date: 1–6 December 2013
Venue: Adelaide Convention Centre, South Australia
Web: http://mssanz.org.au/modsim2013

For more information, please see the website, or *Gazette* 40(2), p. 149.

Complex Analysis and Geometry

Date: 2–5 December 2013
Venue: University of New England, Armidale, NSW
Web: http://www.amsi.org.au/index.php/events-mainmenu/forthcoming-events/165-events/science-events-2013/1129-complex-analysis-and-geometry-workshop

This workshop is aimed at sharing ideas and discussion of recent results in complex analysis and differential geometry. Over the four days, the workshop will focus on para-complex notions and results of Kähler and CR-geometry and their applications in fluid mechanics, meteorology, image recognition and economics via the Monge–Kantorovich mass transport problem.

By restricting to special structures with symmetries, we expect to gain new insights, which also improve our understanding of more general structures. It will provide early career researchers with a valuable forum to showcase and obtain feedback on their work from leading researchers in the field and gain insights into the open challenges.

The following research questions will be addressed

- clarification of the relation between CR-Geometry and the Monge-Ampere equation
- explicit computability of Cartan connections for CR-manifolds of codimension
- the rigid-sphere-problem, that is the explicit description of real hypersurfaces in complex space that are equivalent to a hypersphere and have a transversal shift symmetry
- CR-manifolds of infinite type
- study of totally geodesic submanifolds of solvable metric Lie groups, in particular, the question when such submanifolds are subgroups.

Keynote speakers at the workshop include

- Professor Dmitri Alekseevsky, Masaryk University Brno, Czech Republic
- Professor Kang-Tae kim, POSTECH, Korea
- Professor Bernhard Lamel, University of Vienna.

Registration details to be released soon.

BioInfoSummer: AMSI Summer Symposium in Bioinformatics

Date: 2–6 December 2013
Venue: WEHI, Melbourne
Web: http://www.amsi.org.au/index.php/research-a-higher-education-mainmenu/workshop-programs/forthcoming-workshops/165-events/science-events-2013/1103-bis13

BioInfoSummer is a major annual bioinformatics educational and outreach event in Australia, bringing together in excess of 150 biologists, statisticians and bioinformatics professionals.

Bioinformatics creates biological information and knowledge by the acquisition, archiving, integration, analysis and interpretation of biological data. Biotechnology, drug development, medicine, cancer research, agriculture and plant science are just a few of the many areas in which bioinformatics is having a massive impact.

The program covers state-of-the-art technologies used in medical and biological research and also teaches fundamentals of data analysis. Many prominent researchers, both national and international will give lectures in the program.

Daily themes are

- Monday 2 December: Introduction to Biology and Bioinformatics
- Tuesday 3 December: Evolutionary Biology
- Wednesday 4 December: Systems Biology
- Thursday 5 December: Next Generation Sequencing
- Friday 6 December: Coding and Algorithms for Bioinformatics

Student travel awards are available.

37ACCMCC: 37th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing

Date: 9–13 December 2013
Venue: University of Western Australia
Web: http://37accmcc.wordpress.com
Contact: Director: Professor Gordon Royle (37accmcc at uwa.edu.au)

For more information, please see the conference website, or *Gazette* 40(2), p. 149.

Mathematical Modelling and Numerical Solutions

Date: 9 or 16 December 2013
Venue: Wagga Wagga, NSW
Web: http://www.amsi.org.au/index.php/events-mainmenu/forthcoming-events/

This event will be advertised on the website soon.

Limits to Growth

Date: 11–12 December 2013
Venue: University of New South Wales
Web: http://mathsofplanetearth.org.au/events/limits-to-growth-beyond-the-point-of-inflexion/

Call for abstracts: Fluids in New Zealand 2014

Date: 29–31 January 2014
Venue: University of Auckland, New Zealand
Web: homepages.engineering.auckland.ac.nz/~jden259/FiNZ2014

Registration is now open for the 2014 Fluids in New Zealand Workshop. The second workshop, organised by the University of Auckland on behalf of the NZ Fluid Mechanics community, will be held at the University of Auckland. The workshop

aims to bring together fluid mechanists from all backgrounds and specialisations to discuss their recent research in a friendly and collaborative setting. Registration is free.

Confirmed keynote speakers are Professor Roger Nokes (University of Canterbury) and Dr Geoff Willmott (Callaghan Innovation).

For more information, please see the conference website.

ANZIAM 2014

Date: 2–6 February 2014
Venue: Millennium Hotel, Rotorua, New Zealand
Web: http://anziam2014.auckland.ac.nz

For more information, please see the website, or *Gazette* 40(3), p. 234.

GAGTA8: Geometric and Asymptotic Group Theory with Applications

Date: 21–25 July 2014
Venue: Newcastle, Australia
Web: https://sites.google.com/site/gagta8/

GAGTA conferences are devoted to the study of a variety of areas in geometric and combinatorial group theory, including asymptotic and probabilistic methods, as well as algorithmic and computational topics involving groups. In particular, areas of interest include group actions, isoperimetric functions, growth, asymptotic invariants, random walks, algebraic geometry over groups, algorithmic problems and their complexity, generic properties and generic complexity, and applications to non-commutative cryptography.

Vale

Dr Laci Kovács

With deep regret we inform members that Dr Laci Kovács of the ANU passed away on 28 July, after a massive heart attack.

László György Kovács joined the Department of Mathematics in the Research School of Physical Sciences of the Australian National University in 1963. He retired around 2001 and continued as a visiting fellow. He was an active and inspirational group theorist who supervised 18 graduate students and encouraged many other students and colleagues.

A full obituary will appear in a later issue of the *Gazette*.

Peter Pockley

With regret we inform members that Peter Pockley, the very early founder of the ABC Science Unit in the 1960s, died peacefully on 11 August. Jan Thomas tells us that he was a great friend of mathematical sciences, responsible for considerable

media exposure, who helped her and others within the Society learn more about how to use the media and communicate with wider audiences.

Several obituaries have already appeared online:
http://www.abc.net.au/radionational/programs/scienceshow/peter-pockley/4899976,
http://www.australasianscience.com.au/article/issue-july-and-august-2013/vale-peter-pockley.html,
http://forensicsfossilsfruitbats.wordpress.com/2013/08/12/vale-peter-pockley/,
http://blog.physicsworld.com/2013/08/13/australian-science-communicator-peter-pockley-dies/,
http://www.honeysucklecreek.net/news/Peter_Pockley.html.

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.

Marzieh Akbari; K.N. Toosi University of Technology, Iran; 1 March to 1 October 2013; UWA; Cheryl Praeger

Dr Tarje Bagheer; University of Copenhagen, Denmark; 14 February 2012 to 13 February 2014; UMB; Craig Westerland

Toralf Burghoff; University of Jena, Germany; 2 April 2013 to 31 March 2014; UOM; Kostya Borovkov

Prof Xiaodong Cao; Cornell University; 14 to 22 October 2013; Pure; USN; Zhou Zhang

Prof Arjeh Cohen; Eindhoven University of Technology; 1–13 November 2013; MAGMA; USN; John Cannon

Prof Robert Coquereaux; Centre de Physique Theorique; 4–17 November 2013; Pure; USN; Ruibin Zhang

Prof Ian Grojnowski; Cambridge, Massachusetts; 8 August to 23 September 2013; Pure; USN; Gus Lehrer

Prof Satoshi Koike; Hyogo University; 23 August to 26 September 2013; Pure; USN; Laurentiu Paunescu

Dr Jean Lasserre; LAAS-CNRS Toulouse; (21–30 September 2013; UNC

A/Prof Oleg Lisovyi; Laboratoire de Mathematiqes et Physique Theorique; 13 November to 18 December 2013; Painleve theory; USN; Nalini Joshi

Dr Lingzhou; Yangzhou University, China; 26 March to 25 September 2013; non-linear PDE; UNE; Yihong Du

A/Prof Mihai Mihailescu; University of Craiova; 11 September to 11 October 2013; PDE; USN; Florica Cirstea

A/Prof R Joel Moitsheki; University of the Witwatersrand; 15 October to 5 November 2013; applied non-linear PDEs, symmetry analysis; USA; Bronwyn Hajek

Prof Masatoshi Noumi; 26 September to 4 October 2013; Applied; USN; Laurentiu Paunescu

Xiao-Long Peng; Shanghai University; September 2012 to September 2013; UWA; Michael Small

Prof Szymon Peszat; 29 August to 11 September 2013; Fin maths; USN; Ben Goldys

Prof Andreas Prohl; 25 September to 3 October 2013; Fin Maths; USN; Ben Goldys

Adjunct Professor Bill Smyth; 5 August to 27 September 2013; UWA; Gordon Royle

Xiaoran Sun; Harbin Institute of Technology; October 2012 to September 2013; UWA; Michael Small

Sara Taskinen; University of Jyväskylä, Finland; January to December 2013; robust multivariate analysis and applications in ecology; UNSW; David Warton

Michael Tse; Hong Kong Polytechnic; 11 July to 17 September 2013; complex systems; UWA; Michael Small

A/Prof Jerome Vetois; University of Nice; 20 August to 11 September 2013; PDEs; USN; Florica Cirstea

A/Prof Yuezhu Wu; Changsu Institute of Technology; 1 October 2013 to 30 September 2014; Lie superalgebras; USN; Ruibin Zhang

Dr Shona Yu; University of Leeds; 18 July to 24 September 2013; algebra; USN; Alexander Molev

Binzhou Xia; Peking University; 1 September 2012 to 20 March 2014; UWA; Cai Heng Li

Assoc Prof Jin-Xin Zhou; Beijing Jiaotong University; 16 November 2013 to 16 November 2014; UWA; Cai Heng Li

Special Interest Meetings

Applications are now considered twice a year, at the start of June and the start of December. The next two closing dates are 4 December 2013 and 6 June 2014.

If funding is being sought from both AustMS and AMSI, a single application should be made at http://www.amsi.org.au/component/content/article/881.

If funding is not being sought from AMSI, please use the application form available at http://www.austms.org.au/Special+Interest+Meetings and send it to the secretary, Associate Professor Peter Stacey, Department of Mathematics and Statistics, La Trobe University, Victoria 3086 (email: Secretary@austms.org.au).

Lift-off Fellowships

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

The fellowship rules, application form and details of past fellowship holders can be found at http://www.austms.org.au/Lift-Off+Fellowship+information.

Peter Stacey
AustMS Secretary
Email: P.Stacey@latrobe.edu.au

Peter Stacey joined La Trobe as a lecturer in 1975 and retired as an associate professor at the end of 2008. Retirement has enabled him to spend more time with his family while continuing with some research and some work on secondary school education. He took over as secretary of the Society at the start of 2010.

The Australian Mathematical Society

President:	Professor P.J. Forrester	Department of Mathematics and Statistics University of Melbourne Vic 3010, Australia. p.forrester@ms.unimelb.edu.au
Secretary:	Dr P. Stacey	Department of Mathematics and Statistics La Trobe University Bundoora, VIC 3086, Australia. P.Stacey@latrobe.edu.au
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Business Manager:	Ms May Truong	Department of Mathematics Australian National University ACT 0200, Australia. office@austms.org.au

Membership and Correspondence

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

Local Correspondents

ANU:	K. Wicks	Univ. Adelaide:	T. Mattner
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RMIT Univ.:	Y. Ding	Victoria Univ.:	A. Sofo
Swinburne Univ. Techn.:	J. Sampson		

Publications

The Journal of the Australian Mathematical Society

Editors: Professor J.M. Borwein and Professor G.A. Willis
School of Mathematical and Physical Sciences
University of Newcastle, NSW 2308, Australia

The ANZIAM Journal

Editor: Professor A.P. Bassom
School of Mathematics and Statistics
The University of Western Australia, WA 6009, Australia

Editor: Associate Professor G.C. Hocking
School of Chemical and Mathematical Sciences
Murdoch University, WA 6150, Australia

Bulletin of the Australian Mathematical Society

Editor: Associate Professor Graeme L. Cohen
Department of Mathematical Sciences
University of Technology, Sydney, NSW 2007, Australia

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

The Australian Mathematical Society Lecture Series

Editor: Professor C. Praeger
School of Mathematics and Statistics
The University of Western Australia, WA 6009, Australia

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

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