NEWSLETTER

OF THE

N E W   Z E A L A N D   M A T H E M A T I C A L   S O C I E T Y

Contents

PUBLISHER'S NOTICE

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was edited by Miguel A Moyers González and Phillip L Wilson. Editorial enquiries and items for submission to this journal should be submitted as plain text or LaTeX files with "NZMS newsletter" in the title of the email to phillip.wilson@canterbury.ac.nz. LaTeX templates are available upon request from the editors.

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The newsletter is available at: nzmathsoc.org.nz/?newsletter

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EDITORIAL

Welcome to 2018!

It is the first issue of the year and you will note that we have a new column called Education. The very first piece was written by Sione Ma'u and Cami Sawyer, both members of the executive committee of the NZMS Education group. The aim of the column is to help raise the awareness of maths education in the community and about maths education in general in NZ. The column will try to bring together the point of view of different sectors, such as secondary and tertiary. The Education column is on page 5.

You will also note that Mathematical Miniature by John Butcher is missing in this issue. John needed to have a break but we hope we will have the column again in the near future.

Please note that the AGM minutes can be found in the section NZMS Notices on page 30.

On a lighter note, 2018 is a big sports events year. After one of the most successful Commonwealth games NZ has ever had, it is time for the FIFA World Cup. Use all your statistical skills and predict the countries in the final, and the score. Unfortunately, the only prize will be the honour of being named the "predictor victor(s)" in the next editorial. Submit your teams and score to us before June 14, 2018.

Miguel Moyers and Phil Wilson

PRESIDENT'S COLUMN

I would like to take this opportunity to thank Astrid an Huef for her excellent leadership of the New Zealand Mathematical Society during her term as President in 2016 and 2017. A notable achievement of Astrid's term was the establishment of the Nominating Committee, the purpose of which is to help ensure that a wide and diverse range of members of the NZ mathematics community are considered for mathematics prizes and awards, and for positions of responsibility within the NZ mathematical community. In addition to driving this important initiative, Astrid has taken care of the many other duties of the President with tact, patience and good humour. Fortunately for the Council, we will be able to tap into Astrid's good sense for a while longer, as she is Vice-President for 2018.

While the Nominating Committee has a role in helping find good nominees for NZMS awards and prizes, equally important is the role of individual members of the Society, who can nominate others or apply themselves. I draw your attention to the NZMS Notices starting on page 27 of this Newsletter, which contains calls for nominations for Fellowship of the NZMS, nominations/applications for the NZMS Research Award, applications for the NZMS Early Career Research Award and nominations for the Kalman Prize. There is also a call for applications for financial assistance, including student travel grants.

The 2018 Forder Lecturer is Valerie Isham, from University College London, who will tour New Zealand in April and May this year. I am grateful to Mick Roberts for coordinating Valerie's tour. The Forder Lectureship is a reciprocal arrangement between the New Zealand Mathematical Society and the London Mathematical Society, with a UK-based mathematician visiting NZ in even-numbered years and a NZ-based mathematician visiting the UK (as the Aitken Lecturer) in odd-numbered years. The 2019 Aitken Lecturer will be Bakh Khoussainov from the University of Auckland.

For some time, abstracts of recent NZ PhDs have been published in the Newsletter, but this has not been a consistent practice across all the NZ universities. If you have recently completed your PhD or are the supervisor of a recent graduate, please consider sending a copy of the abstract of the PhD to your local correspondent (as listed on page 2 of this Newsletter) who can forward it to the Newsletter editors. In addition, the Bulletin of the Australian Mathematical Society tries to publish abstracts of Australasian PhDs; if you send an abstract to the NZMS Newsletter, it will be forwarded to the editor of the Bulletin for publication. This provides a nice opportunity for the work of PhD students to gain a higher profile in both NZ and Australia. Abstracts are welcome for theses across the mathematical sciences, including pure and applied mathematics, probability and mathematical statistics, mathematical physics, mathematical computer science, and mathematics education.

Vivien Kirk

EDUCATION

Introduction

In our last committee meeting the NZMS Education group decided that it would be a good idea to establish an Education column in the NZMS newsletter that presents a variety of perspectives. Our first column features *Time for Change* by Cami Sawyer, starting on page 6. To put this initiative into historical context, I went through back issues of the newsletter to see what had gone before. Quite a lot has been written on Maths Education over the years, and some of this material might be relevant today.

John C Turner submitted an item to the December 1978 newsletter after he was asked to "breathe life into the Society's subcommittee on Mathematics Education" (which consisted, it seems, of himself and Kevin Broughan). He wrote:

> *I begin with the presumption that all members of the Mathematical Society are interested in at least some aspects of mathematics education. To declare a total lack of interest in the subject would be tantamount to a declaration of indifference to the process of reproduction of our species. And surely an interest in reproduction is present in us all!*

John Turner was correct: I have personally observed that mathematics education is one of those things that stirs up mathematicians in academia. Everyone has an opinion on it. Mathematicians complain to each other about the awful maths level of undergraduate students entering university, and wonder what they actually learned at school. They get into endless discussions over what, how, and how much to teach these students. Mathematics education keeps a lunchtime conversation going, creates an email chain a mile long, and drags a Department meeting on for another hour. So there should be plenty of material for upcoming columns.

Education supplements for the NZMS newsletter were produced for a number of issues in the 1980s. An NZMS committee on Education has existed on and off over the years; and in its current incarnation as the NZMS Education Group, since 2013.

Tertiary (in particular, undergraduate) mathematics looms large, but whatever we do at this level, improvements at secondary and primary school would be far more effective for us — if only they were made. Our links to these sectors must be constantly maintained. A review of the secondary mathematics curriculum for NCEA (National Certificate of Education Achievement) is scheduled for 2018. Now is as good a time as any to rebuild our influence upstream.

To this end, in November 2017 the Education Group started a dialogue towards creating a shared vision of NZ Secondary School Mathematics for the 21st Century. (If you would like to contribute online, the links at nzmathsoc.org.nz/?education still work.) In addition to addressing current problems, our vision should also anticipate developments in science and technology. Forty years ago, the computer was starting to take off. In a speech as NZMS President to the Royal Society on 30 April 1980, John Turner speculated on the future:

> *They [students] will all still, of course, have to do a certain amount of mathematics as is currently taught. But in the 21st century even that will be taught differently. For every school, down to primary level, will have microprocessors with colour graphics in every classroom; and parents and their children will have hand-held computers in their homes. Who will need to know about logarithms then?*

Sione Ma'u, NZMS Education Group

Time for Change

The future is here! Every student has access to powerful graphing and algebraic manipulation tools. It is no longer an issue of access or equity. Do we have the mathematics curriculum to meet it?

What tools do you use to do the mathematics in your work or in your life? If you want to understand how a function behaves do you reach for pen and paper, a graphics calculator, or a computer? If a student asks you about mathematics that is not in your field, do you go to your library, a colleague, or a computer? The last time you travelled overseas, did you convert currency with a basic calculator or with an app?

The other day my daughter asked me how to charge her graphics calculator, purchased for NCEA mathematics. All the other technology she uses, she plugs in. Calculators are out of date, clunky, and overpriced, yet exams are often written assuming students have access to them. Their only advantage is that they do not allow students to access the internet and all its amazing tools. It is a shame that we make students and families pay \$20–\$120 for obsolete single function devices. NZ's school mathematics curriculum is still teaching students how to take care of their horses instead of teaching them to drive the car that everyone with access to the internet can harness.

The NZ Statistics Association has an active Education Group that has worked to formulate and lobby for a paradigm shift in statistics education. These changes were implemented in the 2007 (current) NZ Curriculum. They have also worked to provide teacher professional development and resources for implementing these changes that were unified by the use of the PPDAC (Problem-Plan-Data-Analysis-Conclusion) cycle, and moved students from performing basic calculations and drawing plots to asking investigative questions, reasoning about graphical representations, as well as interpreting and understanding data using technology. The importance of statistics and the changes to statistics have been shepherded into the curriculum already. We need to provide the same care, attention, and updating of the mathematics curriculum.

What should the maths curriculum for students be in the 21st century? Do students, teachers, and citizens see mathematics as useful, important, and interesting? At the NZMS Colloquium in December we asked you what mathematics means to you. Below is a representation of the responses we got.
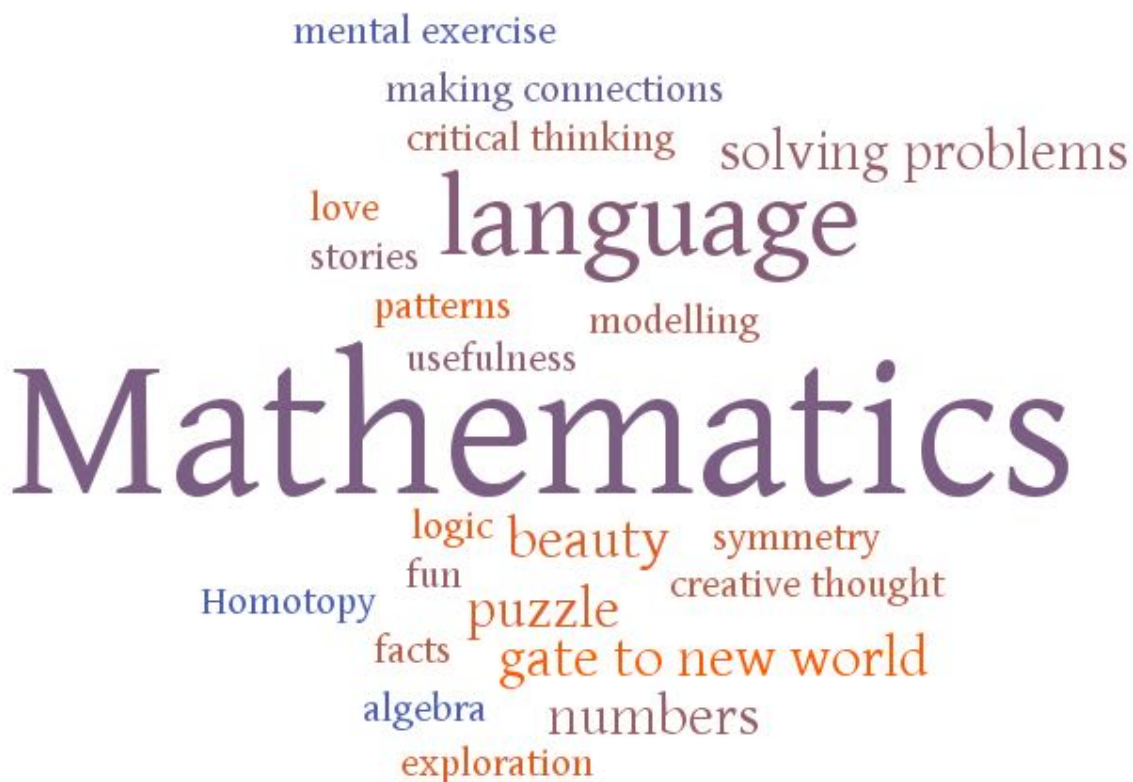
Do you think this is what general society would say? Many students are turned off by maths at school. In Year 11 all students take a maths/stats course, but by Year 13 less than 40% of these students are still taking a maths or stats course. This is not just happening in NZ. In his review of post-16 mathematics in the UK, Sir Adrian Smith wrote:

With the exception of mathematics degrees, more than 40% of English 19 year olds studying STEM subjects in UK universities do not have a mathematics qualification beyond GCSE (year 11). This increases to over 80% for students on non-STEM degree courses, many of which have a significant quantitative element. A lack of confidence and anxiety about mathematics/statistics are problems for many university students; and many have done little or no mathematics pre-university for at least two years.

His report also talks about the situation for students who do not attend tertiary education:

There is strong demand for mathematical and quantitative skills in the labour market at all levels and consistent under-supply.

Renowned British mathematician Keith Devlin, who works at Stanford University and writes a blog for the Mathematical Association of America, categorises the 'four faces of mathematics':

1. Mathematics as computation, formal reasoning, and problem solving;

2. Mathematics as a way of knowing;

3. Mathematics as a creative medium;

4. Applications of mathematics;

and states that our current school education only concentrates on the first face. Can we create a curriculum that helps students have a mastery of the mathematics they need to use in their lives, the workplace, or for further education, but that also helps them to develop a deeper understanding of mathematics and all of its faces, using online tools and apps?

It is going to take a dedicated group to address these issues. Give your input and help us to lead this change. Start by signing up for the NZMS Education Group mailing list at nzmathsoc.org.nz/?education, and we will begin to build the vision for change.

Cami Sawyer, NZMS Education Group

Suggestions for further reading and references

1. Keith Devlin's blog:
   devlinsangle.blogspot.co.nz/2018/03/how-todays-pros-solve-math-problems_9.html

2. Devlin, K. (2000). The four faces of mathematics. In M. Burke & F. Curcio (Eds.), *Learning mathematics for a new century* (pp. 16-27). Reston: National Council of Mathematics Teachers.

3. Sir Adrian Smith, Review of post-16 mathematics in UK written for Department for Education and HM Treasury:
   gov.uk/government/uploads/system/uploads/attachment_data/file/630488/AS_review_report.pdf

4. Podcast on the economics of graphing calculators:
   npr.org/sections/money/2018/03/12/592962844/hurricane-joseph-the-calculator-that-time-forgot

CYBERMATH

We focus (yet again) on a few developments in scholarly publishing, with a strong mathematical flavour. One is the establishment in late January 2018 (by me, with help from Jonathan Klawitter and Dmitri Zaitsev) of the Free Journal Network `freejournals.org`. We are all familiar with "diamond" open access journals, with no author fees, typically run by volunteer academic labour. Examples include Electronic J. Combinatorics, Australasian J. Combinatorics, New York J. Math., NZ J. Math.. Such journals are often of a very good standard as far as editorial processes go, but sometimes lack a few desirable features (e.g. DOIs, mobile-readable websites), can be seen as wasteful of researcher time, and are run on very low budgets (typically zero, with subsidy from a university providing the website). The FJN has been established to help promote such journals, attract small amounts of funding to fund luxuries such as those described above ($\varepsilon \gg 0$ in this case), and allow sharing of best practices. We intend it to act as a whitelist for people searching for well run, ethically acceptable journals with reasonably high standards. So far there are 22 member journals of which 14 are in mathematics. Many of the latter were mentioned in the August 2017 column. One of these is Algebraic Combinatorics, the thriving new incarnation of J. Algebraic Combinatorics (see more on this below).

Of course, there are hundreds of mathematics journals that fall under the "diamond" label (many but certainly not all can be found in the Directory of Open Access Journals `doaj.org`). However FJN has some formal requirements, namely that members satisfy the Fair Open Access Principles `fairopenaccess.org`. These recently formulated principles are intended to formalise the intuitive idea of journals that run like those mentioned above, with no financial barriers to authors or readers, and community control of the journal. Some diamond journals (for example Annales de l'Institut Fourier and Acta Mathematica) have copyright transfer agreements that are inconsistent with FOAP, but are otherwise fine. Many diamond journals are very small, regional or otherwise not high priority for FJN to invest effort into. The ultimate aim of FJN is to build a portfolio of open access journals that is strong enough that libraries will pay to support them by redirecting subscription funding, so we can compete head-on with Elsevier, Springer, et al.

Readers with suggestions for journals to consider for membership should contact `info@freejournals.org`.

Another recent project is the establishment (with Dmitri Zaitsev) of an online forum Publishing Reform `gitlab.com/publishing-reform/discussion/issues` (there is also a private strategy forum). The idea is to centralize discussions and collaborate on useful documents and concrete actions to improve journal publishing. Mathematicians are again well represented here, including Günter Ziegler, negotiator with Elsevier for DEAL in Germany; Martin Grötschel, President of Berlin-Brandenburg Academy of Sciences and Humanities; and Timothy Gowers, Fields Medallist and Elsevier boycott initiator.

I recommend that readers check out the discussion site above and contribute as they see fit. More details about the ecosystem of community-controlled journals can be found in an article I recently wrote, to appear in August 2018 Notices of the American Mathematical Society.

Speaking of Elsevier, negotiations in Germany are dragging on, with no end in sight. The slightly bizarre spectacle of institutions agreeing to cancel access to journals and refusing to pay, but Elsevier providing access for

free (presumably for fear of researchers working out just how easily they can cope without a subscription) shows just how dysfunctional the journal publishing market is. I have heard rumours that the Australia/NZ negotiations with Elsevier have also stalled, over the issue of nondisclosure agreements.

In Europe in particular there is substantial government support for the idea of open access, but almost without exception the wrong choices are being made over and over, and legacy publishers (presumably because they can pay lobbyists) are being given unfair advantages.The latest missteps are a Call for Tenders for the European Open Research Publishing Platform, which excludes organisations not already having a turnover of at least 1 million euros, and the EU Open Science Monitor giving Elsevier a contract to monitor the progress of open science.

Finally, the flipped journal Algebraic Combinatorics, published by Centre Mersenne, is thriving, having published 12 papers since January and having had 140 submissions at time of writing (anecdotal evidence from one editor-in-chief is that the quality has risen since the breakaway from Springer). An analysis of the board of the zombie Journal of Algebraic Combinatorics shows exactly what is going on. Springer apparently intends to capitalise on the reputation of the journal, built up over 25 years by the editorial board that has departed, by using new editors and ignoring what they do. A systematic look at MathSciNet shows that the editor-in-chief, advisory editors and editorial board of JACo (14 people in total) altogether have fewer papers published in the field of algebraic combinatorics (AMS classification 05E primary/secondary) than does almost any one individual editor of AlCo, and about one-third as many as just one of those editors.

As Marcus Tullius Cicero apparently ended his speeches in the Roman Senate by calling for he destruction of Carthage, I call here for zombie JACo to die, and the big publishers to be abandoned until they actually provide service at reasonable price, and start to care about quality. These issues are too important to ignore — do something about it (ask me how if you don't know)!

Mark C. Wilson

MATHEMATICAL MISEPONYMY

Benford's Law

The law may be stated thus:

> In a large table of natural numbers spanning several orders of magnitude the frequency of the first significant digit being n is $\log_{10} \frac{n+1}{n}$.

The large table might consist of areas of countries (please yourself whether you measure all the areas in square kilometres, square miles or any measure of area you might have invented for your own use), river lengths (unfortunately Wikipedia's list of New Zealand's twenty longest rivers is not large enough and does not span enough orders of magnitude, not to mention its inaccuracy), a collection of numbers in tax returns (don't bother to fake your tax returns and especially if you don't pay heed to this law!) and so on. As we see in the table below, which shows the expected frequencies predicted by the law, numbers beginning with 1 are much more likely than numbers beginning with 9 irrespective of the order of magnitude.

leading digit	frequency
1	0.3010
2	0.1761
3	0.1249
4	0.0969
5	0.0792
6	0.0669
7	0.0580
8	0.0512
9	0.0458

It seems that the earliest reference to this law is the paper [3], which begins with the following sentence:

> That the ten digits do not occur with equal frequency must be evident to any one making much use of logarithmic tables, and noticing how much faster the first pages wear out than the last ones.

At the risk of insulting younger readers and boring older readers I shall say a bit about the logarithmic tables to which Newcomb[1] refers (skip this paragraph if you expect to be insulted or bored!). I did not encounter mathematics until secondary school but spent lots of my primary school time practising complicated arithmetic: adding together long lists of multidigit numbers, multiplying and dividing multidigit numbers and calculating to a few significant digits the square roots of multidigit numbers, all just using pencil and paper. At secondary school I was introduced to logarithm tables, which were used to calculate products and quotients of numbers by exploiting the fact that the logarithm function is an isomorphism from the group of positive numbers under multiplication to the group of all numbers under addition: if you want to multiply together a bunch of numbers you add together their logarithms then take the so-called antilogarithm (the inverse isomorphism) of the sum to get the product of the original numbers. These tables worked in base 10 so only needed to present logarithms of numbers from 1 to 10 (and anti-logarithms of numbers 0 to 1). Of course the accuracy of the answer will depend on the number of digits used in approximating the various numbers arising: after all, 'most' natural numbers have irrational logarithms. My books of logarithms (and other tables) have only 4-digit accuracy so both the logarithm and antilogarithm tables just occupy two facing pages and Newcomb's observation does not apply. For more accuracy 7-figure tables were also published, occupying many pages[2], and it would most likely have been such tables to which Newcomb was referring.

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[1]There is a sort of New Zealand connection to Newcomb: one of his grandsons was Hassler Whitney, a leading US topologist, who visited his NZ daughter a number of times and took the opportunity to visit the University of Auckland. One day I hosted him for lunch and, by then in his 80s, he told me of his morning run when he set out to run around the Auckland Domain but didn't remember his map properly so ended up running up the 200m high Mt Eden. He also told me that not long before that he had run 12 and a half times round a 2-mile track but his legs refused to allow him to run any further: so close to a marathon!

[2]For example [4] contains 431 pages, though it also includes trigonometric tables.

Coming back to the quote from [3], the point is that folk using the books of logarithm tables were wanting to multiply many more numbers with first significant digit 1 than with first significant digit 9: numbers beginning with 1 naturally arise more often than numbers beginning with 9. This shouldn't be too surprising: likely you would encounter almost as many numbers between, say, 1000 and 1099 as between 900 and 999 so surely lots more between 1000 and 1999 than between 900 and 999.

Almost sixty years after Newcomb, in [1] Benford discussed the same phenomenon at much greater length and it is Benford's name that is attached to the law. Benford gives a table summarising observations from twenty different sources, from Geography, Physics and Sport to such abstractions as various powers of some natural numbers and even street addresses of American men of Science. Since then a number of different justifications have been given for the validity of the law, from mathematical to a New Zealand grown statistical explanation, [2].

David Gauld

References

[1] Frank Benford, *The law of anomalous numbers*, Proceedings of the American Philosophical Society, **78**(1938), 551–572.

[2] Rachel Fewster, *A simple explanation of Benford's Law*, The American Statistician, **63**(2009), 26–32.

[3] Simon Newcomb, *Note on the frequency of use of the different digits in natural numbers.*, American Journal of Mathematics, **4**(1881), 39–40.

[4] Hen. Sherwin (ed), *Sherwin's mathematical tables, contriv'd after a most comprehensive method...*, Mount and Page, London, 1742.

PROFILE

Matt Visser

Professor Matt Visser is very well-known internationally for his contributions to general relativity, gravitation, and quantum field theory in curved spacetime.

Matt completed his undergraduate degrees at Victoria University of Wellington before heading to the University of California, Berkeley, as a Fulbright-Hays Scholar in 1978. His PhD thesis completed in 1984 was on *"Aspects of Supersymmetry Breaking"*, under the supervision of Professor Mary K Gaillard. He remained in the USA for his postdoctoral career, on a trajectory that took him to the University of Southern California, Los Angeles 1984–1987 and Los Alamos National Laboratory 1987–1989. In January 1990 he moved to the University of Washington, St Louis, Missouri, where he worked for over 12 years before returning to Victoria University of Wellington in July 2002. Matt was initially appointed as Reader, and soon promoted to Professor four years later.

Matt has made numerous contributions on supergravity, black holes, Hawking evaporation (of black holes), gravitational thermodynamics, cosmology, brane worlds, quantum gravity and in fact anything to do with gravity that is worth doing! But he is perhaps best known for his work in two fields: (i) wormholes; and (ii) analogue models of gravity.

Wormholes are hypothetical solutions of the gravitational field equations which connect different asymptotic regions, providing shortcuts in space-time. If they existed, then of course they would be great for interstellar travel. However, they are the stuff of science fiction on account of the fact that to hold the throat of a wormhole open one generally needs forms of matter that violate energy conditions in general relativity. The energy conditions — another of Matt's interests — tell us what we might expect of physically reasonable matter: its energy density should be positive (so that a lower bound ground state exists), its equation of state should be such that the speed of sound is no greater than the speed of light, etc.

Although long-lived wormholes which violate the energy conditions seem to be forbidden in the real Universe, in quantum gravity there is a chance that we might violate energy conditions for small time intervals as allowed

by the uncertainty principle. This makes wormholes objects of interest for quantum gravity, and also for the fundamental problems relating to causality since wormholes generically allow for the possibility of closed timelike loops, that is: time machines!

Stephen Hawking had a famous "chronology protection conjecture" to deal with all the issues raised by closed timelike loops in general relativity. At Stephen's 60th birthday symposium in January 2002, Matt was invited to speak on *"The quantum physics of chronology protection"* as the acknowledged world leader on this topic.

Matt's book *"Lorentzian Wormholes: From Einstein to Hawking"*, published in 1996 and publicity from the 1996 BBC Horizon documentary *"The Time Lords"*, have also meant that Matt has had more than his fair share of crackpots to deal with. This included one individual who e-mailed him to say: *"Professor Visser, I need help. Space aliens are communicating with me through wormholes embedded in my brain."* And who can forget the phone calls from Leon, the anti-Christ, based somewhere in Australia.

The other topic on which Matt is possibly the world's best expert is analogue gravity: seeking physical systems, including fluids and condensed matter systems such as Bose-Einstein condensates, where one can investigate physical processes which are analogous to those of quantum fields in curved spacetime: Hawking evaporation, or particle production in an expanding universe. In the case of Hawking evaporation one requires a condensed matter system in which there are distinct causal domains due to the finite speed of sound, analogously to black hole horizons originating from the finite speed of light. While Matt has pioneered the mathematical physics and the analytic techniques used in this field, it has now matured to the extent that laboratory experiments are being performed.

Matt has written a lot about black holes, including the Kerr geometry. Matt's introductory chapter for the *"The Kerr Spacetime"* (2009), (which he and I co-edited along with Susan Scott), is by now the first port of call for many graduate students embarking on their study of these intriguing objects. Gravitational waves have now been detected from black hole mergers, ushering in a new era of gravitational wave astronomy. The contributions of many black hole physicists and mathematicians, including Matt, are going to be central in this new age of discovery.

Matt is a prolific researcher with over 200 published journal articles. He was elected a Fellow of the Royal Society of New Zealand in 2006, a Member of the Foundational Questions Institute (FQXi) in 2007, a Fellow of the American Physical Society in 2009, and a Fellow of the New Zealand Institute of Physics (NZIP) in 2011. He has held four Marsden grants as Principal Investigator, and a James Cook Fellowship of the RSNZ 2012–2013. He was awarded the Dan Walls Medal of the NZIP in 2013, its highest honour. Matt has also served on the editorial boards of *Journal of Physics A* (2008–2014), *Proceedings of the Royal Society A* (2012–2015), and *Physical Review Letters* (2012–current), and is the moderator of gr-qc at arxiv.org — an important service to the community that he has performed for over 20 years.

Following Stephen Hawking's passing last month, the world is now remembering his legacy. Many questions Hawking investigated in quantum gravity and cosmology are still open and still very challenging. Matt Visser is one of those at the forefront of probing our understanding of the fundamental mathematical physics of how and why the Universe works the way it does.

David L. Wiltshire

LOCAL NEWS

AUCKLAND UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING, COMPUTER AND MATHEMATICAL SCIENCES

Staff news

Dr Xinfeng (Edwin) Ruan is a newly appointed Postdoctoral Research Fellow in the School of Engineering, Computer & Mathematical Sciences at Auckland University of Technology (AUT) in February 2018. Edwin has been doing research in the area of Quantitative Finance, which is an interdisciplinary area between Finance and Applied Mathematics. His research interests are distributed in the fields of equilibrium asset pricing, empirical asset pricing, derivatives pricing and asset allocation. Before joining AUT, he obtained a PhD in Finance from University of Otago, New Zealand, a MSc in Operations Research & Management from Southwestern University of Finance and Economics (SWUFE), China and a BSc in Materials Science & Engineering from Zhejiang Sci-Tech University (ZSTU), China.
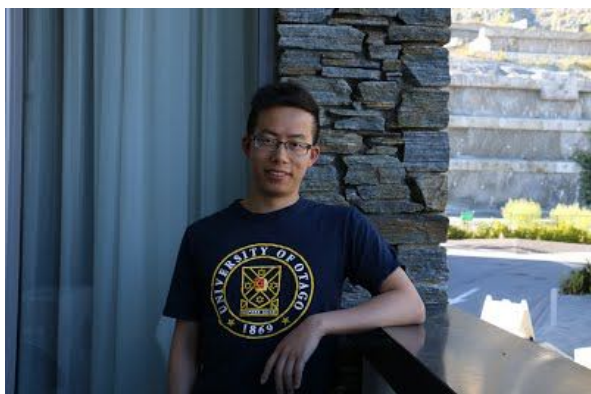
Figure 1: Xinfeng Ruan

Events

On 23–24 November, the Mathematical Science Research Group (MSRG) organized the 2017 AUT Mathematical Sciences Symposium. This is a joint effort of Professors Jiling Cao and Jeffrey Hunter, with the assistance of Drs Sarah Marshall, Nuttanan Wichitaksorn and Wenjun Zhang. The Symposium focused mainly on some areas in Applied Mathematics and Analytics/Statistics. The main purpose of this event is to develop and promote opportunities for AUT academic staff working on these areas to collaborate with colleagues from other universities. It was an remarkable success with many favourable comments from the external participants.

The 3rd Australasian Conference on Wave Science has taken place at the Department of Mathematical Sciences at AUT in February 2018. This is a biennial meeting of mathematicians, engineers and physicists who work on various wave phenomena. The conference provides a forum for contemporary research on wave science to be disseminated between the different branches of wave theory and its applications. It promotes interdisciplinary collaborations between Australasian wave scientists, and with international researchers. The conference was attended by 50 people, six of which were invited speakers. The three day event was received well by the participants and a success.

Recently a group of 10 researchers from four New Zealand tertiary institutions led by principal investigator Associate Professor Sergiy Klymchuk started working on a national project funded by a $198,205 grant from the New Zealand Council for Educational Research. The project title is "Investigating the Impact of Non-routine Problem Solving on Creativity, Engagement and Intuition of STEM Tertiary Students". AUT is the leading organisation and 4 members of the team are members of the AUT's STEM Tertiary Education Centre (STEM-TEC). The project aims to investigate the creative thinking skills and engagement of STEM students as a result of solving non-routine problems during their learning. Their learning will be enhanced by the addition of non-routine problem solving activities. Learners' creativity, engagement and intuition will be analysed to evaluate the effect of this innovative practice. It is anticipated that wide implementation of this learning enhancement would improve the employability of STEM students since innovative and creative thinking is a workplace requirement.

Travel and Conference Participation

Dr Kate Lee took a research leave for June to December, 2017. She visited the University of Oxford in UK and Université Paris-Dauphine in France. She gave an invited talk at the 2017 International Workshop on Objective Bayes Methodology (10–13 December 2017) in Austin, USA.

In February 2018, Dr Nuttanan Wichitaksorn had a research visit to Thailand. During the visit he presented his research findings at a press conference on projection of public health expenditure in Thailand, which was organized by Thailand Development Research Institute. He also had a chance to discuss and form a possible research collaboration with researchers from Faculty of Engineering and Graduate School of Commerce at Burapha University, a public university, in Thailand.

Visitors

Professor Marc Paolella (Department of Banking and Finance, University of Zurich) visited the Depart-

ment of Mathematical Sciences in March 2018. Professor Paolella worked with Dr Nuttanan Wichitaksorn on copula-based portfolio optimization problems.

Associate Professor Hao Chang (School of Science, Tianjin Polytechnic University, China) visits the Department of Mathematical Sciences from March to September 2018. Associate Professor Chang is going to work with Professor Jiling Cao and Dr Wenjun Zhang using mathematical models for asset allocation problems.

Wenjun Zhang

UNIVERSITY OF AUCKLAND

DEPARTMENT OF MATHEMATICS

The QS World University ranking of universities is one of the most reputable of such rankings. The QS list for March 2018 ranks 504 prominent universities around the world (ranking also their faculties and departments). The University of Auckland is the only New Zealand university listed in the top 100 universities, being ranked 82nd (equal with The University of Sheffield). In Natural Science, the University of Auckland is ranked as 113th (equal with University of Amsterdam and Waseda University). Eleven of our science subjects are ranked top in New Zealand, with eight subjects ranked in the top 100 worldwide. In particular, our Department of Mathematics is ranked as 45th (equal with City University of Hong Kong and The University of Sydney).

Steven Galbraith and his co-authors Christophe Petit and Javier Silva received the award for best paper at ASIACRYPT 2017, with their paper "Identification protocols and signature schemes based on supersingular isogeny problems".

Pedram Hekmati has received a Marsden Fast Start grant (17-UOA-061) of $345,000 for his project on twisted K-theory, higher geometry and operator algebra. The aim of this project is to develop new theory and techniques, linking twisted K-theory to higher geometry and operator algebras. The growing importance and topicality of these areas can be seen by the number of international workshops and conferences organised around its theme. The problems which Pedram and his team aim to address include categorification of the Freed-Hopkins-Teleman theorem, and development of the theory of higher twistings of K-theory using higher geometry and operator algebras. Anticipated outcomes are fundamental advances in knowledge in mathematical physics and enhancement of New Zealand's international mathematical reputation. Pedram comments that "Being awarded this grant means that I will be able to undertake research on a very exciting mathematical topic, and contribute to reinforcing the collaborative linkages between New Zealand and Australia".

Vivien Kirk has been recognized for her work in mentoring young mathematicians and physicists, by the Miriam Dell Excellence in Science Mentoring Award from the Association for Women in the Sciences (AWIS).

Dr Igor Kontorovich has been promoted to SL1, and Rachel Passmore has been promoted to PTF4.

Claire Postlethwaite was awarded the J. H. Michell Medal by ANZIAM for "outstanding new researchers who have carried out distinguished research in applied or industrial mathematics."

Jared Hockly is the successful applicant for the 2018 Teacher Fellowship in the Department of Mathematics.

A meeting on "Groups and Geometry" (organized by Jeroen Schillewaert) was held on January 23 to 26, and attended by about 30 people. Annalisa Conversano (Massey University) gave a 30-minute talk on Semi-algebraic groups, Marston Conder gave a lecture on Edge-transitive graphs and the answer to a 1967 question by Folkman, Michal Ferov (University of Technology, Sydney) gave a 30-minute talk on Primitives in free groups are text-sensitive languages, Scott Harper (University of Bristol, PhD student) gave a 30-minute talk on Uniform Domination for Simple Groups, Martin Liebeck (Imperial College) gave a lecture on Algorithms and Strong Approximation, Gaven Martin (Massey University, Albany) gave three lectures on The Geometry and Arithmetic of Kleinian Groups, Eamonn O'Brien gave the Colloquium Talk on Algorithms for linear groups, James Parkinson (University of Sydney) gave three lectures on Buildings, Hecke algebras, and random walks, Colin Reid (University of Newcastle) gave a lecture on Separability and commensurated subgroups, Tobias Rossmann (Postdoctoral Fellow, University of Auckland) gave a lecture on Growth in Nilpotent Groups, Gunter Steinke (University of Canterbury) gave a lecture on Projective planes, Laguerre planes and generalized quadrangles that admit large groups of automorphisms, and George Willis (University of Newcastle) gave three lectures on Totally-disconnected locally-compact groups and geometry.

Professor Nick Trefethen FRS, University of Oxford, visited the department from 25 November to 9 December 2017, as the inaugural Michael Erceg Senior Visiting Fellow, supported by the Margaret and John Kalman Charitable Trust. As part of this visit, Prof. Trefethen gave the Michael Erceg Public Lecture on "Discrete or Continuous?" He further gave a seminar presentation on "Random Functions, Random ODEs, and Chebfun" and provided a hands–on computer workshop with "A Tour of Chebfun" to demonstrate the computational efficiency and accuracy of his code Chebfun, which is code for numerical computing with functions based on piecewise Chebyshev polynomial interpolation (see `chebfun.org` for details). He

also gave a plenary presentation at the 2017 NZMS Colloquium.

The Department of Mathematics is very pleased to host Prof. László (or Laci) Babai, who is the George and Elizabeth Yovovich Professor of Computer Science and Mathematics at the University of Chicago. His first visit to New Zealand is as Michael Erceg Senior Visiting Fellow from March 11 to 25, a fellowship generously supported by the Kalman Foundation. Laci's research interests are wide. They include complexity theory, algorithms, combinatorics, discrete mathematics, asymptotic group theory, and interactions among these, many motivated by questions arising in the theory of computing. He is the author of about 200 very-highly cited papers published in leading international research journals and conference proceedings in computer science and mathematics. His intellectual contributions have had enormous impact: these include the introduction of interactive proof systems, and the concept of Las Vegas algorithms. A Fellow of the American Academy of Arts and Sciences, he is the recipient of distinguished international prizes: these include the 2016 Dijkstra Prize in Distributed Computing; the 2015 Knuth Prize "for his fundamental contributions to theoretical computer science, including algorithm design and complexity theory"; and the 1993 Gödel Prize. In November 2015 Babai announced a major and unexpected breakthrough: the Graph Isomorphism Problem can be solved in quasi–polynomial time. This work on a long-standing major problem has attracted much international attention. During his visit, he will give four related lectures on graph isomorphism.

The University of Auckland was very well represented at the 2018 ANZIAM Conference, held from 4th to 8th February in Hobart, Tasmania. There were presentations by Bernd Krauskopf, Hinke Osinga, Steve Taylor, as well as Dion O'Neale (Physics) and a plenary talk by 2017 J.H. Michell medallist Alys Clark (Auckland Bioengineering Institute); by postdocs Andrus Giraldo, Andrew Keane, Soizic Terrien; and PhD students Ielyaas Cloete, Cris Hasan, Elle Musoke, Robert Otupiri, Nathan Pages, Tertius Ralph, Anand Rampadarath, Elias Vera Siguenza, David Waters, and Xueshan Yang, as well as Te Punaha Matatini students (Physics) Caleb Gemmell and Demival Vasques Filho. The award ceremony at the conference dinner was a highlight: Claire Postlethwaite was awarded the 2018 J.H. Michell medal and Elle Musoke received an honourable mention for the T.M. Cherry Student Prize for best student talk.

Marston Conder has had a busy time recently. Conference invitations and research visits saw him make six overseas trips between July and January (to Iceland, Slovenia, Slovakia, the UK, Mexico, the USA, Canada, China, Australia and back to China), with two conferences also in Wellington and Nelson in between. In particular, he was the main organiser of two workshops at Banff (Canada) and Sanya (China), and co-organiser of two others (at the MATRIx facility in Australia and the NZMRI summer meeting in Nelson). Also he's been actively helping the TEC prepare for the next PBRF Quality Assessment Round later this year, in his role as one of the three Moderators. Research highlights have included finding the answer to a 1967 question by Folkman about the valency to order ratio for semi-symmetric graphs (resulting from some joint work with Gabriel Verret), a 2001 question by Siran, Tucker and Watkins about the existence of surfaces carrying all 14 types of edge-transitive maps, and a concrete new construction for infinitely many chiral polytopes of given rank greater than 4.

Recent visitors include: Dr Ana Amador (University of Buenos Aires), Dr Iztok Banic (University of Maribor, Slovenia), Prof. Jussi Behrndt (TU Graz), Dr Maxime Bergeron (University of Chicago) Prof. Len Bos (University of Verona), Prof. Jim Brennan (University of Kentucky), Dr Howard Cohl (National Institute of Standards and Technology, USA), Dr Anneleen De Schepper (Ghent University), Prof. Yvo Desmedt (University of Texas, Dallas), Prof. Stephen Doty (Loyola University, Chicago), Dr Leo Ducas (CWI, Amsterdam), Prof. Piotr Faliszewski (Krakow University), Prof. Yanquan Feng (Beijing Jiaotong University), Dr Markus Grassl (Max Planck Institute for the Science of Light, Erlangen), Prof. Shih–Chang Huang (National Cheng Kung University), Dr Kenneth Johnson (Pennsylvania State University), Prof. Ruth Kellerhals (Université de Fribourg, Switzerland), Dr James Kennedy (University of Lisbon), Dr Le Hai Khoi (Nanyang Technological University), Prof. Martin Liebeck (Imperial College), Prof. Gregor Novak (United States Air Force Academy), Prof. Kasso Okoudjou (University of Maryland), Dr Alejandra Ramos Rivera (University of Primorska, Slovenia), Prof. Colva Roney–Dougal (University of St Andrews), A–Prof. Jan Sieber (University of Exeter), Dr Sonja Stimac (University of Zagreb), Prof. Don Taylor (University of Sydney), Dr. Hendrik Van Maldeghem (Hood Fellowship Public Lecture, Ghent University), Dr Magali Victoor (Ghent University), Dr Jurij Volcic (Ben Gurion University, Israel), Dr Zoran Vondracek (University of Zagreb, Dr Arik Wilbert (University of Melbourne), and Prof. Josiane Zerbia (INRI Sophis Antipolis, France).

Garry J. Tee

UNIVERSITY OF WAIKATO

DEPARTMENT OF MATHEMATICS AND STATISTICS

The Kalnins Fest

The *6th annual meeting of the Australian and New Zealand Association of Mathematical Physics* was held

at the University of Auckland in January/February. The 2nd February was dedicated to a celebration of the career of Professor Ernie Kalnins in an event titled *Harnessing hidden symmetry — geometry and super-integrable systems.* It was a well attended joyous occasion with notable visitors, such as Ernie's long-time coworker, Willard Miller from the University of Minnesota. Talks also were given from participants from Germany, Canada, NIST, as well as Australia and New Zealand.

New administrator appointed

We welcomed, at the start of February, our new departmental administrator, Rachael Foote. Previously she was a faculty of Computing and Mathematical Sciences/Science and Engineering receptionist and, before than, University of Waikato College Hall student support. Rachael's contact email is `rachael.foote@waikato.ac.nz` and telephone 07-838-4713.

Rachael Foote.

Arriving and going

We also welcomed the second child of Shruti and Chaitanya Joshi, a daughter Mira on 18th March. Both mother and daughter are doing well. We said farewell to Ian Hawthorn off to New York City with the Hamilton Civic Choir to perform in Carnegie Hall. The choir will join with others from different countries to sing works by the famous Norwegian composer Ola Gjeilo of the Juliard School of Music in Manhattan. The choir will also sing in the cathedrals St John the Divine and St Patrick.

Tim Stokes has a period of study leave, but is currently here in Hamilton. He has already visited colleagues at University of Tasmania, Western Sydney University and La Trobe University in Australia (giving talks at the latter two), and will shortly visit colleagues in the UK at York University, UCL and Heriot Watt University (giving talks at each), and then finally Murdoch University in Australia.

Display cabinets

Block G is now festooned with display cabinets showing books and journal article covers published by CMS faculty members, and student achievements. Most members have supplied a copy of their work, and the cabinet is full, so there will be competition for space!
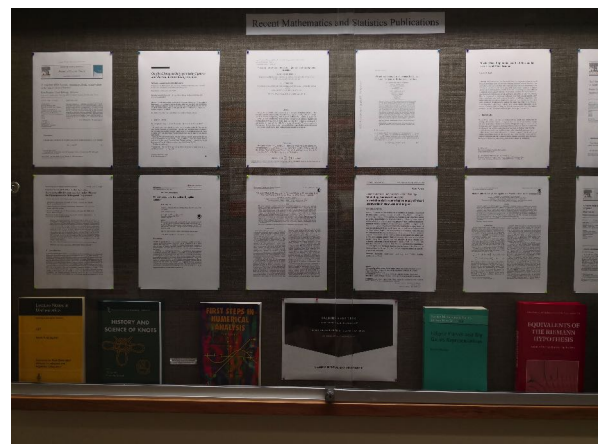
Display cabinets.

New faculty foundations paper

As part of a University wide process, a required paper at year one is being offered by the Faculty of Computing and Mathematical Sciences, this year for the first time. It called Foundations of Computing and Mathematical Sciences, and is meant to cover some topics regarded as essential and not included in the regular program, such as reasoning and academic integrity. The mathematics and statistics contributions include how to survive and do well at university (Lyn Hunt), basic mathematical notation (Nick Cavenagh), history of mathematics (Daniel Delbourgo and Chaitanya Joshi), mathematics of design (Ian Hawthorn) and mathematical software (Bob Durant and Yuri Litvinenko). In addition there are contributions from Computer Science staff.

Kevin Broughan

MASSEY UNIVERSITY

INSTITUTE OF FUNDAMENTAL SCIENCES

FOXTON FIZZ, 5th edition. This annual meeting on computational and applied mathematics was organised by Prof. Robert McLachlan in Foxton Beach, New Zealand, from the 14th to the 18th of February. The workshop included talks, scientific discussions, and working sessions in small groups. Many members of the EU CHiPS (Challenges in Preserving Structure) consortium participated in the workshop.

Participants at Foxton Fizz.

Visiting under the EU CHiPS program are Klas Modin and Milo Vivani, from Chalmers University, Sweden during February and March, and Elena Celledoni, Brynjulf Owren, and Ben Tapley from NTNU, Norway during April and May.

Robert McLachlan and Christian Offen spoke at ANODE 2018 in Auckland. John Butcher presented Robert McLachlan with his copy of the (now rare) 1957 "Data Processing and Automatic Computing Machines" conference proceedings, on condition that he provide a scan to anyone interested. This is now available at `massey.ac.nz/~rmclachl/DPACM/`. Amongst the authors are James Wilkinson and Maurice Wilkes (both Turing Award winners), Sir Tom Cherry, and Sandy Douglas. John Butcher has a paper in here too; his second published paper. Of particular interest is the paper by Robin Merson, "An operational method for the study of integration processes". The story of this paper and its significance is told in "Butcher series: A story of rooted trees and numerical methods for evolution equations", Asia Pacific Mathematics Newsletter, vol. 7 no. 1, 2017, `asiapacific-mathnews.com/07/0701/0001_0011.pdf`, which also includes an appreciation of John Butcher's early work from 1963 to 1972. At the end of each paper, the discussion that followed has been transcribed. This makes an interesting snapshot of contemporary views of computing and numer-

ical analysis in 1957. In the discussion of John's talk, Maurice Wilkes asked a technical question, to which John replied, "I have looked at this point, but for the minute I have forgotten what I decided."

Richard Brown

INSTITUTE OF NATURAL AND MATHEMATICAL SCIENCES

Congratulations to *Alexander (Sasha) Melnikov* who received the Massey University Early Career Award. Sasha joined Massey in 2015, and has produced remarkable results in a short time in the field of computability theory with applications in algebra. He has several research topics, including a new approach to computable analysis via non-standard computation models and a new subject of "primitive recursive" algebra. He has published more than 20 research papers in international journals in two years, including the Journal of Algebra, and solved technical problems in the field, including a 60-year-old problem posed by Maltsev. Sasha celebrated by travelling to Palmerston North to receive the award at the University's Research Awards Dinner. Our Head of Institute *Dianne Brunton* received the University's Individual Research Supervisor Medal at the same event.

On 7 December *Alona Ben-Tal* attended a symposium for creating a new cardiovascular centre in Auckland. The meeting was by invitation only and included around 40 physiologists, engineers and clinicians mostly from Auckland University and the Auckland District Health Board. Alona was the only mathematician. The day included talks on how the centre for Brain Research was formed, what it means to have a university centre and Māori cardiovascular health issues. There were also 28 "rapid fire" talks of 3 minutes each (including one from Alona), and group discussions on the vision and the way forward for the centre.

Winston Sweatman was the only New Zealand participant at the Australian 2018 Mathematics-in-Industry Study Group (MISG 2018) in Adelaide during 29 January–2 February. He was a moderator on a project "Optimising Carcase Cuts in the Red Meat Industry".

Carlo Laing, Mick Roberts, Winston Sweatman and *Graeme Wake* attended ANZIAM 2018 in Hobart on February 4–8. All gave contributed papers. Mick was elected to the ANZIAM executive, and Carlo re-elected to the committee of the Mathematical Biology Special Interest Group.

Mick Roberts was at the Mathematisches Forschungsinstitut Oberwolfach from February 18–24, taking part in the workshop "Design and Analysis of Infectious Disease Studies". He then spent February 26–March 9 as Simons Visiting Professor at Utrecht University in the Netherlands. The SVP scheme funds

participants in Oberwolfach workshops from outside Europe to spend time at a university within Europe. At Utrecht he worked with long-term collaborator Hans Heesterbeek, who is also AI on the Marsden project "Biodiversity and the ecology of emerging infectious diseases". While there they corrected the proofs of their twenty-third joint publication, and set the ball rolling on the Marsden research.

On 27 February, *Alona* gave a public lecture entitled: "Take a deep breath and don't miss a beat: The benefits of mathematical modelling", as part of the Fascination Science Public Lecture Series 2018 held at Massey University. The talk attracted over 100 people and was well received.

In March *Alona* travelled to Johns Hopkins University In Baltimore, USA, where she was an invited visitor at the lab of Prof Yannis Kevrekidis. On her way to Baltimore she stopped in Houston and worked with colleagues there for a week. While in Baltimore she attended one day of a two-day meeting on multi-scale modelling held at the National Institute of Health (NIH).

Congratulations to *Dr Graeme O'Brien* who successfully defended his PhD on "Random discrete groups", supervised by *Gaven Martin*, which was passed without emendation. All formalities now complete, we should see him graduate in May!

Shaun Cooper

VICTORIA UNIVERSITY OF WELLINGTON

SCHOOL OF MATHEMATICS AND STATISTICS

We have been pleased to welcome several new staff members. In January, Professor Stephen Marsland took up a chair in mathematics and data science, heading south from Massey, Manawatu. Dr Yuan Yao joined us as a lecturer in statistics, moving to Wellington from Hong Kong. Dr Hongyang Yu started as a post-doctoral fellow in April, working with Richard Arnold and Ivy Liu on their Marsden-funded project, 'Dimension reduction for missed-type multivariate data'. We are looking forward to the arrival in early May of Dr Nirosha Priyadarshani, post-doctoral fellow working with Stephen Marsland on his Marsden-funded project, 'AviaNZ: Making Sure New Zealand Birds Are Heard', and collaborating with Isabel Castro at Massey University.

Ivy Liu is currently on research and study leave, spending time in Beijing and Barcelona, the latter with former post-doctoral fellow Daniel Fernandez, before returning to her role as Deputy Head of School in July. Meantime, Richard Arnold has taken on the deputy head of school role before he too takes well-earned

RSL, initially in Scotland, pursuing projects in statistical geoscience with Andrew Curtis and Peter Jupp, before also heading to Barcelona and then, supported by a Fulbright Scholarship, spending four months at the Institute for Integrating Statistics into the Decision Sciences at George Washington University. Professor Estate Khmaladze will also be taking RSL in the second half of the year with multiple stays in Vancouver (University of British Columbia), Tilburg University in the Netherlands, ETH Zurich and finally at the Georgian National Academy and Tbilisi State University in his home country.

We are also very pleased to have two returning alumni visiting. Dr Lizzie Burslem, currently at Northwestern University, is with us for the first half of the year. Lizzie is making a significant contribution to our teaching programme in both the foundational 'Introduction to Mathematical Thinking' and our introductory calculus courses. Professor Philip Stamp, University of British Columbia, is visiting Professor Matt Visser for the same period.

Congratulations to Professor Noam Greenberg on being made a Fellow of the Royal Society of New Zealand towards the end of 2017. This is just reward for the ground-breaking and deep research that Noam undertakes. Noam is cited for "research[ing] the computable contents of mathematics and algorithmic randomness. He has developed a new research programme in 'higher' randomness, in which computability is used to give a hierarchy of randomness: the more complex the tests, the higher the degree of randomness that is required to pass these tests". It is a pleasure to acknowledge Professor Mark McGuinness's appointment as Chair of ANZIAM in February, while Mark has also taken on the role of Convenor of the MINZ Reference Group, with oversight of the MINZ study groups' future in New Zealand. Dr Steven Archer has been awarded a Te Rautaki Maruako Tutor Excellence Award by Victoria University of Wellington. The awards are new this year and are awarded to at most one tutor in each Faculty, so Steven is the inaugural awardee for the Faculty of Science. The award recognises Steven's "exceptional commitment to teaching excellence and students' overall learning and wellbeing". Everyone who has worked with Steven, staff and students alike, will instantly recognise the justice of this award.

Warm congratulations also to Lisa Orloff Clark for her award of the NZ Mathematical Society's Kalman Prize for 2017, for her article 'Simplicity of algebras associated to etale groupoids', with Jonathan Brown, Cynthia Farthing and Aidan Sims, which appeared in Semigroup Forum in 2014.

Professor Astrid an Huef is a PI on a newly-established Australian Research Council Discovery Project, along with colleagues Professors Aidan Sims (Wollongong) and Stuart White (Glasgow). The 3-year

project aims to develop new methods for understanding regularity properties of operator algebras.

Andrew Probert successfully completed his PhD 'Chordality in Matroids: In Search of the Converse to Hlineny's Theorem', under the supervision of Geoff Whittle. Will Critchlow has also successfully defended his PhD thesis entitled 'Randomness in classes of matroids', supervised by Dillon Mayhew.

The school's Annual Secondary Teacher Symposium, 'Do the mahi, get the taui', was held in December with the theme of encouraging Māori and Pasifika student success. We are grateful to the 56 teachers and staff who were able to attend despite the weather on the day, especially the speakers and workshop coordinators, panel members and to Kelsey Firmin, John Haywood, Adam Day and Steven Archer whose contributions in setting up and running the event were invaluable.

Visitors and seminars

Andrew Marks (UCLA) is visiting Adam Day; Jorg Brendle (Kobe University) is visiting Noam Greenberg; Huanhuan Li (Western Sydney University): Graded homology of étale groupoids; Andrea Morello (UNSW): Schrödinger's cat is alive and means business.

Peter Donelan

UNIVERSITY OF CANTERBURY

SCHOOL OF MATHEMATICS AND STATISTICS

A number of congratulations are in order for major achievements of staff in the School.

Brendan Creutz received the 2017 NZ Mathematical Society Early Career Research Award at the Colloquium in December. The award is based on Brendan's best three research articles, and recognises his outstanding work on local-global questions on diophantine equations, in particular his resolution of a 50 year old question of Cassels and the development of novel computational techniques to study the arithmetic of algebraic curves and surfaces.

Also in December *Jeanette McLeod* and *Phil Wilson* were successful in the latest round for the Unlocking Curious Minds contestable fund. This grant will enable them to run a series of workshops aimed at teachers and school children, and to offer more Maths Craft days. Maths Craft is an amazing and unique approach to teaching maths in New Zealand. It is leading to improvements in mathematical thinking and confidence for students, teachers, and the general public. Visit the Maths Craft website: `mathscraftnz.org`

Jennifer Brown was awarded the Campbell prize of the New Zealand Statistical Association in December.

This prize is awarded according to the following criteria: (i) publication of an exceptional body of original statistical research undertaken within NZ; or, (ii) a prolonged and outstanding contribution to statistical education; or, (iii) playing a key role in consulting on major, innovative research projects that has direct relevance to NZ; or, (iv) making a leading contribution to the promotion of statistics within NZ over a sustained period. Jennifer will have ticked all of these boxes.

In February Jennifer has been made a Senior Fellow of The Higher Education Academy (HEA). The HEA is a UK based organisation which champions teaching excellence in the UK and in other countries. And in March Jennifer was successful with a research grant submitted with colleagues from the University of Adelaide and the National University of Laos. The grant from the Academic Consortium for the 21st Century is their Special Project Fund. The title of the grant is "Promoting the uptake of modern sampling theory in agriculture research and extension applications".

Mike Steel has been elected as a distinguished Fellow of the International Society for Computational Biology (ISCB) in February. The citation is for "outstanding contributions to mathematical and computational phylogenetics, and for service to the academic evolutionary biology research community".

The ISCB is a large international body that runs leading bioinformatics conferences and is active in mainstream journals such as Bioinformatics. Fellowships are awarded for "outstanding contributions to the fields of computational biology and bioinformatics". Since 2010, only around eight people have been elected each year, based on nominations by ISCB members and peer review. With nearly all ISCB Fellows based in North America, Europe or Asia, Mike appears to be the first New Zealander to receive this award and possibly the first Fellow elected from the Southern Hemisphere. He will be part of the ISCB Fellow class that increases now to 67 members. Mike will be recognised for his contributions to computational biology and bioinformatics at the ISCB's annual international conference on Intelligent Systems for Molecular Biology (ISMB) in Chicago, Illinois, 6–8 July, 2018.

Also in February *Hannes Diener* finished the process of "habilitation" at the University of Siegen in Germany. He now has the degree "Dr. habil.". A habilitation is a higher doctorate that generally is a prerequisite in many European countries to conduct independent university teaching and to apply for professorships. The degree is conferred for a habilitation thesis based on independent scholarship (at a considerably higher level than for a PhD thesis) and after a public lecture. The title of his habilitation thesis is "Constructive Reverse Mathematics". Only a few select candidates are encouraged to proceed to habilitation after their PhD. After the conclusion of his habilitation in Germany Hannes

even managed to be back in Christchurch for the start of teaching.

Daniel Gerhard received the College of Engineering Emerging Researcher Award 2017 in March. The award recognises that Daniel has shown expertise in a wide range of topics in applied statistics with a large number of international collaborators. He has made a significant contribution to the statistical literature on theoretical developments in methodology in dose response and hierarchical modelling. His recent research is part of a large MBIE grant, constructing Bayesian networks for using image analysis to predict grape yield in the New Zealand wine industry.

Congratulations to each and everyone of our awardees.

At the end of December *Penelope Goode* resigned from her role as School administrator and PA to the Head of School. Penny had been with us for eight years. At the end of February *Helen Rowley* filled the vacant position and is now our new Senior School Administrator. Helen had been with us since 2013 in the role as School Administrator.

In February the School welcomed Erskine Fellow Frank D'Amico from Université de Pau et des Pays de l'Adour (UPPA), France. His research interests are in new methodologies for survey design and environmental monitoring. His research has broad applications including in climate change, natural ecosystems, and biodiversity. During his eight-weeks-long visit Frank has been teaching into one of our main 200-level statistics courses, STAT201 Applied Statistics. This is his second visit as an Erskine Fellow, the first one was in 2012. Frank has been hosted by *Jennifer Brown*.

Günter Steinke

UNIVERSITY OF OTAGO

DEPARTMENT OF MATHEMATICS AND STATISTICS

Congratulations to two recipients of prizes at the 2017 joint conference of the International Association of Statistical Computing, Asian Regional Society (IASC-ARS) and the New Zealand Statistical Association (NZSA), which was held in Auckland in December. *Matthew Schofield* received the Littlejohn research award, which recognises excellence in research. Our PhD student *Timothy Bilton* was judged joint winner of the student prize for his talk "Genetic map estimation using hidden Markov models in the presence of partially observed information".

Dominic Searles has taken up his position as a Lecturer at the Department. Dominic studied mathematics at the University of Auckland and then completed his PhD at the University of Illinois at Urbana-Champaign

in 2015. Afterwards, he was a Postdoc at the University of Southern California. He and his family have now decided to come back to New Zealand and have swapped the Californian sun for the more moderate Dunedin climate. Dominic's research is in algebraic combinatorics with a focus on Schubert calculus. A warm welcome to you, Dominic.

Dominic Searles.

Our PhD students *John Holmes* and *Johannes Mosig* completed outstanding PhD thesis (see the abstracts below), which were added to the Division of Sciences' list of Exceptional PhD Theses. A thesis is of exceptional quality when all three examiners agree that the thesis is of an exceptional standard in every respect — research content, originality, quality of expression and accuracy of presentation — and is amongst the top 10% of theses examined. Well done, John and Johannes. All the best for your future!

Visitors

Cornelia Schneider (University of Erlangen-Nuremberg) visited for three weeks, hosted by *Petru Cioica-Licht*. Cornelia and Petru worked together on the embedding of weighted Sobolev spaces into Besov spaces. This is relevant for the analysis of numerical methods for stochastic PDEs.

Abstracts of PhD theses

John Barrett Holmes, University of Otago

Supervisors: Richard Barker, Ken Dodds, Michael Lee, Matthew Schofield

Date: 2018

Title: **Modelling strategies to improve genetic evaluation for the New Zealand sheep industry**

The question of how best to optimise the accuracy of genetic evaluation for livestock populations has been given new life by the advent of genomics. Therefore we will investigate methods of evaluating and/or improving the accuracy of genetic evaluation in ways applicable to genotyped populations, while trying to maximise computational efficiency. We will explore modelling strategies with utility outside animal breeding, including examples of these potential non-animal breeding applications.

Pei Luo, University of Otago

Supervisor: Matt Parry

Date: 2018

Title: **Semiparametric dispersal kernels in stochastic spatiotemporal epidemic models**

The dispersal kernel plays a fundamental role in stochastic spatiotemporal epidemic models. By quantifying the rate at which an infectious source infects a susceptible individual in terms of their separation distance, the dispersal kernel is able to account for the observed spatial characteristics of an epidemic. The aim of this thesis is to construct a dispersal kernel which belongs to a semiparametric family. We introduce a new concept called the natural bridge basis in order to build the semiparametrized dispersal kernel. We use data from a citrus canker epidemic in Florida to illustrate and examine our approach. We find features of the semiparametrized dispersal kernel which were not previously evident in parametrized dispersal kernels.

Johannes Mosig, University of Otago

Supervisors: Vernon Squire, Fabien Montiel

Date: 2018

Title: **Contemporary wave-ice interaction models**

Sea ice is an important indicator and agent of changes in the global climate system. The ice is affected by waves that travel into the Marginal Ice Zone (MIZ) and cause floes to raft, deform and, potentially, fracture. The resulting change in the floe size distribution (FSD) influences the melting and freezing. Simultaneously, the ice floes affect the propagation of ocean waves. The motivation to study wave–ice interaction is therefore twofold: it plays a role in understanding climate change, and it is vital to wave forecasting models that have to be accurate to ensure the safety of research expeditions, coastal communities, etc. In the present thesis we investigate various models of ocean wave propagation in ice infested seas.

We distinguish between three classes of models: "floe models", "effective medium models", and "transport equation models", each of which assume a different set of fundamental degrees of freedom. Our goal is

to systematically explore existing models of each type and extend them to advance our understanding of wave-ice interactions.

Jörg Hennig

OBITUARIES

GORDON HOOKINGS, 28/10/1920–1/12/2017

Gordon (left) with Marin Segedin. *Photo: Godfrey Boehnke, 2008.*

Gordon Hookings was an Associate Professor in the Department of Mathematics at the University of Auckland, having joined the Department as a Senior Lecturer in 1948, with promotion to Associate Professor in 1967, and retiring in 1986. He served as Head of Department on a number of occasions, including 1967–9 and 1981.

Born in Napier in 1920, he completed an MSc with First Class Honours in Mathematics at Auckland in 1941. Any future career was put on hold as he served his country in a scientific capacity during the Second World War, mostly in the UK. After his military service he completed a second Masters degree at Cambridge, UK. He then returned to NZ to teach in the Department of Mathematics at what was until 1961 Auckland University College, in the Applied Mathematics area.

Like a few other early members of the Mathematics Department, Gordon served a term as President of the Auckland University College Tramping Club.

Upon his retirement Gordon was delighted to get involved in the formation of the NZ Mathematical Olympiad Committee (NZMOC) in 1986. He was the foundation Secretary of the NZMOC, serving for about twenty years in that role. He was the instigator of the NZMOC Certificate Programme — a training programme by correspondence, before the Internet was around — that ran for about a decade. So he was often in the Department after his retirement attending to these duties, and being a constant member of the Maths Department lunchtime bridge group.

Gordon had another passion in life, and that was gliding. He and a friend imported the first glider into NZ in the late 1940s, and they became early members of the NZ Gliding Association. While Gordon often talked about gliding especially when asked, one thing he never mentioned was his unmatched success in this sport. In 17 different years Gordon was the NZ gliding champion. He also held several NZ gliding records over the years. When he retired from competitive gliding he became a referee for NZ Gliding, and an official of the World Gliding Championships for more than a decade.

He combined his interests in Mathematics and gliding by teaching a course on aerodynamics, a course taken by one of us when a student at Auckland. (The day I[DBG] enrolled in this course I sought advice from members of the Mathematics and Physics Departments to help me decide whether to concentrate my studies in Mathematics or Physics: I didn't take Gordon's advice, which was to concentrate on Physics.)

In the late 1980s Gordon received the award of an MBE for services to gliding and mathematics.

A tribute to Gordon on his retirement, including an earlier photo of Gordon and prepared by Don Nield, appeared in the NZMS Newsletter in December, 1985 at `massey.ac.nz/~wwifs/mathnews/centrefolds/35/Dec1985.shtml`. Photos were also taken at the Department's celebration of Gordon's 90th birthday, and can be seen here: `math.auckland.ac.nz/wiki/Staff_news`.

David Gauld and Ivan Reilly

REPORTS ON EVENTS

ANZIAM-Hobart 2018

In February this year, due to the generous support of the New Zealand Mathematical Society Travel Grant, I was able to attend the ANZIAM 2018 conference. This year ANZIAM was hosted by the University of Tasmania, in Hobart, and consisted of seven invited plenary speakers as well as a large variety of presentations from attendees spanning many mathematical disciplines.

During the conference I was able to present my PhD research "Modelling Surtseyan Ejecta". This presentation was well received, leading to conversations with interested audience members. This conference also allowed me the opportunity to have many interesting conversions with academics and students from both Australia and New Zealand about their research and advice for after I have completed my PhD.

I am grateful to the New Zealand Mathematical Society for all the generous support I have received.

Emma Greenbank (Victoria University of Wellington)

First Mirzakhani Hui

The first Mirzakhani Hui: Lower North Island Women in Mathematical Sciences Conference was held on the 12th and 13th of December in 2017. The meeting brought together 20 women involved in mathematics, physics, physical chemistry, statistics, and computer science in the Palmerston North and Wellington regions. These women were researchers and teachers from universities and industry, from a variety of stages of their careers from post docs through professor. The conference involved a series of workshops centred around establishing and fostering a culture of support for female mathematicians and scientists, as well as planning ways to encourage younger women into the professions.

There is an ongoing problem with recruitment and retention of women in mathematical sciences through to postgraduate research degrees and then to research positions. Those women that do undertake degrees in the mathematical sciences frequently report feeling isolated and somewhat discouraged by the lack of women peers and role models. The conference provided an opportunity for women in these areas to network with a diverse group of women, many that they have not met before, who live geographically close to them. Through this we established a community across institutions, that we plan to foster, in order to mentor women in the mathematical sciences at all career stages.

The Hui was organised by a team of scientists from Massey University and Victoria University of Wellington. They named the Hui in honour of Maryam Mirzakhani, the distinguished Iranian mathematician who passed away in 2017. She was the first female winner of the Fields Prize, the most prestigious prize in mathematics.

The organisers of the Hui gratefully acknowledge funding from the MacDiarmid Institute, the Institute of Fundamental Sciences at Massey University, the School of Mathematics and Statistics at Victoria University of Wellington and the New Zealand Mathematical Society.

Cami Sawyer (Massey University)

Dunedin Maths Craft Day 2018

Maths Craft New Zealand's first ever event in Dunedin was held on Sunday 11th February in the Otago Museum, and was a big success. Approximately 1,000 visitors explored maths through craft at six craft stations, and by attending three free public lectures (the Otago Museum reckon 350 visitors to a day-long event counts as a success). The craft stations were staffed by our team of volunteers drawn from University of Otago students and staff, from local school teachers, and from a growing pool of experienced volunteers from previous Maths Craft New Zealand events. These volunteers guided our visitors through the maths and the craft at the stations, which were on Möbius strips, mathematical colouring and drawing, knitted knots, Menger cubes, origami, and string art. The day-long event was open from 10am to 5pm on Sunday, and combined hands-on craft with public lectures given by New Zealand mathematicians.

We were delighted to once again see a common feature at our events: young and old working together and talking through the maths they were doing with their hands. Our friendly and keen volunteers were always on hand

to help, both at the stations and at craft tables, where they circulated with advice, encouragement, and materials. Periodically during the day, the Museum demonstrated their superconducting Möbius strip, with a block of dry ice levitating above — and then below! — a large Möbius strip track it raced around.

Three free public lectures were held in the Barclay lecture theatre adjacent to the Maths Craft space. The talks were given by New Zealand mathematicians, and were attended by dozens of people of all ages. Associate Professor Clemency Montelle of the University of Canterbury gave an exciting talk on the topology of clothing which included cutting up clothes in the name of mathematics, and turning a rectangle of cloth into a versatile garment — the sari. Ms Elizabeth Chesney, a university student and retired schoolteacher from Christchurch, talked about knitting mathematical knots. Finally, the University of Auckland's Professors Hinke Osinga and Bernd Krauskopf gave a wonderfully entertaining and insightful talk about chaos, crochet, and mathematical sculpture.

We received a lot of positive feedback at the event, which was repeated in the responses in our surveys, with 92% of respondents saying they "loved it", 92% saying that they learned something, and over 97% saying they would "definitely" do something like it again. We were pleased to read comments like "[I learned] that maths can be fun" and "maths without numbers!". The survey responses show that we appeal to maths fans and maths phobes alike, with only 54% arriving at the event saying that they "like maths". The best news is that by the end of the event 80% of respondents say that they like maths, with no-one saying that they dislike it. The Museum were also very happy with the event, and we look forward to developing this relationship still further in the future.

We gratefully acknowledge the support of the New Zealand Mathematical Society in bringing this event to Dunedin for the first time.

Jeanette McLeod and Phil Wilson (University of Canterbury)

GENERAL NOTICES

MINZ2018

Graeme Wake

NZMS NOTICES

Calls for nominations for NZMS Awards and Fellowships

The NZMS recognises excellence in mathematical research and service to the NZ mathematical community through awards and an accreditation (fellowship) scheme.

The NZMS is aware that some members of the NZ mathematical community are under-represented in past awardees and fellows. To help us address this problem, the Council asks that you all actively encourage eligible colleagues from under-represented groups, especially women and those of Māori ethnicity, to apply for these awards and/or offer to nominate them.

Below are calls for nominations for the specific awards and for NZMS fellowships, along with their deadlines. Further details on all the awards, including past recipients, eligibility, and how to nominate someone (or self-nominate), can be found at: nzmathsoc.org.nz/?awards. Fellowship information and application forms can be found at: nzmathsoc.org.nz/?accreditation.

2018 NZMS Early Career Research Award

This award was instituted in 2006 to foster mathematical research in New Zealand and to recognise excellent research carried out by early-career New Zealand mathematicians. Applicants should be within seven years of confirmation of PhD, but an appropriate adjustment to this time period can be made to take into account an interrupted career pattern. **The candidate will be judged on their best three published research outputs and a two-page CV. Research outputs could include publications in books, journals, other peer-reviewed venues, or other types of high quality mathematical research.** To be eligible, the candidate must be a current member of the NZMS, and must have completed a significant part of their research in New Zealand.

All nominations and applications should be sent by email to the NZMS President, Assoc Prof Vivien Kirk (v.kirk@auckland.ac.nz) by 31 August 2018. Submissions should state clearly that they are for the NZMS Early Career Award, and should follow the guidelines at nzmathsoc.org.nz/?awards.

2018 NZMS Research Award

This annual Award was instituted in 1990 to foster mathematical research in New Zealand and to recognise excellence in research carried out by mathematicians in New Zealand. **This Award is based on mathematical research published in the last five calendar years (2013–2017). This could include research published in books, journals, other peer-reviewed venues, or other types of high quality mathematical research.** This assessment period may be adjusted to take into account an interrupted career pattern. To be eligible for the Award, a candidate must be a current member of the NZMS and must have been a resident of New Zealand for the last three years.

All nominations and applications should be sent by email to the NZMS President, Assoc Prof Vivien Kirk (v.kirk@auckland.ac.nz) by 31 August 2018. Submissions should state clearly that they are for the NZMS Research Award, and should follow the guidelines at nzmathsoc.org.nz/?awards.

2018 Kalman Prize for Best Paper

The Kalman Prize for Best Paper was instituted in 2016 to recognise excellence in research carried out by New Zealand mathematicians. The Prize will normally be awarded annually for an outstanding and innovative piece of research in the mathematical sciences published by a member or members of the NZMS. **The Prize is for a single publication of original research, which may be an article, monograph or book, having appeared within the last 5 calendar years: 2013–2017.** The value of the Prize is $5000. The Prize is generously funded by the Margaret and John Kalman Charitable Trust, and recognises the significant contributions to mathematics in New Zealand made by Professor John Kalman.

All nominations and applications should be sent by email to the NZMS President, Assoc Prof Vivien Kirk (v.kirk@auckland.ac.nz) by 31 August 2018. Submissions should state clearly that they are for the Kalman Prize for Best Paper, and should follow the guidelines at nzmathsoc.org.nz/?awards.

Fellowships of the NZMS

The New Zealand Mathematical Society, like many other societies, has an accreditation scheme. In particular, members may be recognised with the award of Fellowship of the NZMS. The NZMS would encourage members to consider applying, and to encourage and nominate their colleagues who meet the criteria. Some people are unsure what is involved. Here are the complete criteria, all three of which are to be satisfied.

1. Shall normally have been a Member of the NZMS for a period in excess of three years.

2. Shall have had the qualifications of an Accredited Member for a period in excess of three years (i.e. have completed a postgraduate degree in mathematics at a recognised university or other tertiary institution, or shall have equivalent qualifications, and shall have been employed for the preceding three years in a position requiring the development, application or teaching of mathematics.)

3. Shall have satisfied criteria 3.1 or 3.2, and 3.3 or 3.4 or 3.5:

    3.1 have demonstrated a high level of attainment in mathematics;

    3.2 have demonstrated a high level of responsibility in mathematics;

    3.3 have made a substantial contribution to mathematics;

    3.4 have made a substantial contribution to the profession of mathematician;

    3.5 have made a substantial contribution to the teaching or application of mathematics.

Members' applications are encouraged before 1 June 2018.

Next deadline for applications for Financial Assistance — 15 May

The NZ Mathematical Society has quarterly deadlines for financial assistance applications. Applications must be made well in advance (at least one month before the funded activity, but the earlier the better) and retrospective applications will not be considered. The deadlines for applications for 2018 are: 15 February, 15 May, 15 August, and 15 November. You will hear back from the Council within a month of the deadline. The types of grants are as follows.

NZMS Student Travel Grants

The NZMS invites applications from students for financial support for the presentation of research at conferences, attending workshops, and developing new collaborations. Typical grants for travel within NZ and Australia are in the range $200–$600. For travel further overseas, larger grants may be considered. To be eligible, a student must be based at an institution in New Zealand and be active within the New Zealand mathematical community. NZMS Student Travel Grants can contribute to costs including: flights, conference registration, accommodation, and travel-related costs associated with family responsibilities.

NZMS Student Travel Grants are generously supported by an annual grant from the Margaret and John Kalman Charitable Trust.

NZMS Financial Assistance

The NZMS invites applications for financial assistance with the costs of mathematical research-related activity. Any research-related activity will be considered. For example: hosting mathematical visitors; organising conferences, workshops, or outreach activities; and conference attendance, including costs associated with family responsibilities.

Further information and application details can be found on the NZMS website: nzmathsoc.org.nz/?assistance.

Unconfirmed minutes of the 43rd Annual General Meeting of the NZMS

University of Auckland, 5th December 2017, SLT1.

Present: Boris Baeumer, Alona Ben-Tal, John Butcher, David Bryant, Shaun Cooper, Brendan Creutz, Tom ter Elst, Luke Fullard, Rod Gover, Astrid an Huef (Chair), Vivien Kirk, Bernd Krauskopf, Mark McGuinness, Sione Ma'u, Rua Murray (Minutes), Dion O'Neale, Hinke Osinga, Mike Plank, Iain Raeburn, Aleksei Rasskazov, Nicolette Rattenbury, Catherine Hassell Sweatman, Winston Sweatman, Melissa Tacy, Rachael Tappenden, Steve Taylor, Ilija Tolich, Chris Tuffley, Bruce van Brunt, Graeme Wake, Graham Weir, Phil Wilson, Fahreem Zaidi.

Apologies: Andrea Babylon, Marston Conder, Peter Donelan, David Gauld, Emily Harvey, Stephen Joe, Carlo Laing, David Simpson, James Sneyd.

Meeting opened 5.02 pm.

1. Minutes of the 42nd Annual General Meeting were accepted.
   (Moved from Chair, passed.)

2. Matters Arising. None.

3. President's report. Astrid an Huef read her report (as tabled).
   The President's report was accepted. (Rua Murray / Bernd Krauskopf, passed.)

4. Treasurer's report. The Treasurer's report was tabled and spoken to by Bruce van Brunt. Subscription and donation income is favourable to previous years. Interest income was down due to lower interest rates. Newsletter income was up, and costs were down. The 2018 budget makes provision for similar items to previous years, but also for the NZMS Colloquium Lecturer. A member queried how the deficit allowed for in the 2018 budget would be funded. The Treasurer noted that expenditure forecasts are generous, income forecasts are conservative, and that previous surpluses mean that the Society has a considerable buffer. The Treasurer's report was accepted. (Moved from Chair, passed.)

   The Council recommends increasing membership subscriptions by approximately 10% to compensate for the aggregated 12% CPI increases since the last increase. Proposed fees from 1 Jan 2018 (with early payment discount): Ordinary Member $88 ($82), Student Member $18 ($16), Overseas Student $44 ($41), Reciprocal Member $44 ($41). (Moved from Chair, passed unanimously.)

   Bruce van Brunt has finished his second term including two years serving as Treasurer. The Society thanks him for all his work.

5. Appointment of auditors. The current auditor, Nirmala Nath from the School of Accountancy, Massey University, to be re-appointed as Auditor. (Moved from Chair, passed).

6. Membership Secretary's report. Was presented (as tabled) by Astrid an Huef, and motion to accept. (Moved from Chair, passed.)

7. Election of councillors to fill three vacancies:

   (a) Florian Beyer and Rua Murray have finished their first terms; the Society thanks them for their service.

   (b) There were 3 nominations for Council: Rua Murray (Vivien Kirk/Astrid an Huef), Florian Beyer (Emily Harvey/Astrid an Huef), Kevin Broughan (Vivien Kirk/Sean Oughton).

   (c) After a call for nominations from the floor, no further nominations were forthcoming. The three were declared elected.

8. Forthcoming colloquia:

   2018 The 2018 Colloquium will be held at the University of Otago, 4–6 December with reception on Monday, 3 December.

   2019 Massey University Manawatu will host in 2019.

   2020/21 To be determined.

   2022/23 Possible Joint AMS/NZMS meeting — Auckland or VUW to host?

9. Report on NZ Journal of Mathematics was tabled by Tom ter Elst. Report accepted (Moved from Chair, passed.)

10. Report from the NZMS Education Group, tabled and spoken to by Sione Ma'u. The president commended the NZMS Education Group on their activities this year, especially the developing relationship with NZAMT. A member noted that pre-tertiary mathematics teachers are now eligible for the Prime Minister's Science Prize for teaching. The NZMS Education Group report was accepted. (Moved from Chair, passed.)

11. Update on Forder, Aitken, and Maclaurin lecturers. As in President's report (Ken Ono was the 2017 Maclaurin Lecturer, Valerie Isham will be the 2018 Forder Lecturer).

12. General business.

    (a) The teacher day at the colloquium has been free for teachers in the last few years. Should there be a one-day registration option for those who are not Secondary Teachers who want to attend only the teaching day? Discussion occurred about the options for charging (free/day rate/full fee). A suggestion was made that the Education Day could be a useful professional development opportunity for teachers.

    (b) Phil Wilson and Miguel Moyers-González will serve a third year as Newsletter Editors. New editors will be needed from 2019.

    (c) The Council announced that a fee will no longer be charged for Fellowship Applications.

    (d) The Outgoing President, Astrid an Huef, recorded her thanks to members of the Society who had assisted with various matters during her tenure as President. The meeting recorded its thanks for Astrid's service as President.

Meeting closed 6.00 pm.

Rua Murray

NEW AND NOTABLE TITLES FROM SIAM

Linear Algebra and Matrices

Shmuel Friedland and Mohsen Aliabadi

This introductory textbook grew out of several courses in linear algebra given over more than a decade and includes such helpful material as constructive discussions about the motivation of fundamental concepts; many worked-out problems in each chapter; and topics rarely covered in typical linear algebra textbooks.

2018 • xvi + 285 pages • Softcover • 978-1-611975-13-0 • List $69.00 • SIAM Member $48.30 • OT156
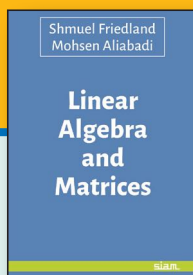
Numerical Methods for Conservation Laws: *From Analysis to Algorithms*

Jan S. Hesthaven

Computational Science and Engineering 18

This book offers the first comprehensive introduction to modern computational methods and their analysis for hyperbolic conservation laws, building on intense research activities for more than four decades of development. It discusses classic results on monotone and finite difference/finite volume schemes, but emphasizes the successful development of high-order accurate methods for hyperbolic conservation laws.

2017 • xvi + 570 pages • Softcover • 978-1-611975-09-3 • List $89.00 • SIAM Member $62.30 • CS18
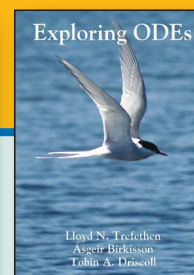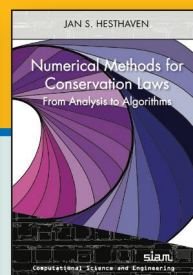
Exploring ODEs

Nick Trefethen, Ásgeir Birkisson, and Tobin A. Driscoll

Exploring ODEs is a textbook of ordinary differential equations for advanced undergraduates, graduate students, scientists, and engineers. It is unlike other books in this field in that each concept is illustrated numerically via a few lines of Chebfun code. There are about 400 computer-generated figures in all, and Appendix B presents 100 more examples as templates for further exploration.

2018 • viii + 335 pages • Hardcover • 978-1-611975-15-4 • List $64.00 • SIAM Member $44.80 • OT157

Fundamentals of Numerical Computation

Tobin A. Driscoll and Richard J. Braun

This is an advanced undergraduate-level introduction to the mathematics and use of algorithms for the fundamental problems of numerical computation: linear algebra, finding roots, approximating data and functions, and solving differential equations. The authors have developed an online resource that includes well-tested materials related to every chapter. Among these materials are lecture-related slides and videos, ideas for student projects, laboratory exercises, computational examples and scripts, and all the functions presented in the book.

2017 • xxx + 553 pages • Hardcover • 978-1-611975-07-9 • List $104.00 • SIAM Member $72.80 • OT154

Formulation and Numerical Solution of Quantum Control Problems

Alfio Borzì, Gabriele Ciaramella, and Martin Sprengel

Computational Science and Engineering 16

This book provides an introduction to representative nonrelativistic quantum control problems and their theoretical analysis and solution via modern computational techniques. This self-contained book covers the formulation, analysis, and numerical solution of quantum control problems and bridges scientific computing, optimal control and exact controllability, optimization with differential models, and the sciences and engineering that require quantum control methods.

2017 • x + 390 pages • Hardcover • 978-1-611974-83-6 List $99.00 • SIAM Member $69.30 • CS16

An Introduction to Data Analysis and Uncertainty Quantification for Inverse Problems

Luis Tenorio

Mathematics in Industry 03

This book bridges applied mathematics and statistics by providing a basic introduction to probability and statistics for uncertainty quantification in the context of inverse problems, as well as an introduction to statistical regularization of inverse problems. The author covers basic statistical inference, introduces the framework of ill-posed inverse problems, and explains statistical questions that arise in their applications.

2017 • x + 269 pages • Softcover • 978-1-611974-91-1 List $69.00 • SIAM Member $48.30 • MN03