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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

Contents

PUBLISHER'S NOTICE

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was edited by Steven Archer and printed at Victoria University of Wellington. The official address of the Society is:

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The homepage of the New Zealand Mathematical Society is:
http://nzmathsoc.org.nz/ (Webmaster: bbaeumer@maths.otago.ac.nz)
The newsletter is available at: http://nzmathsoc.org.nz/?newsletter
Editorial enquiries and items for submission to this journal should be submitted as text or LaTeX files to steven.archer@vuw.ac.nz.

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PRESIDENTS COLUMN

The column for this issue will be the Presidents Report for 2012, New Zealand Mathematical Society.

This is my first report as President. Some of the challenges the NZMS faces today can be gauged by reading the previous report by last years President, Charles Semple, who briefly summarised New Zealand mathematics in the first decade of this century. This was a golden decade for NZ mathematics, stimulated in part from the many workshops and other mathematical activities made available through NZIMA funding. A full report by Marston Conder on the very extensive contribution NZIMA has made to NZ mathematics will be published in the December 2012 issue of the Newsletter, so that we can clearly see one of the benchmarks we face as a society.

This year has seen the ending of NZIMA funding, and several obvious opportunities are available to the NZ mathematical community to replace this funding. Individuals could obtain funding from existing COREs, or one or more mathematically-based COREs could be successfully bid. Hopefully the mathematical community will be able to successfully define and contribute to one or more of the Grand Science Challenges being constructed at this time. Another option is private sector funding. While none of these options is easy, the outstanding ability of the mathematical community is clear from the many awards being won by members of the NZMS, and this ability should see continuing success for NZ mathematics.

Membership

Our total membership is 266 (Ordinary: 171, which includes 9 first year free; Reciprocal: 16; Student: 33; Honorary:17; Life: 7; Overseas Student: 3; Free Student: 19). There are 84 members of ANZIAM.

I would especially like to welcome the new Ordinary Members of Annalisa Conversano, David Simpson, Hilary Seddon, Lisa Clark, Bernd Krauskopf, Jim Denier, Ittay Weiss, Steven Archer, Nicholas S Witte, Igor Klep, Hinke Osinga; and the new Student Members of Ali Ashher Zaidi, Graeme O'Brien, Jason Chen, Jennifer Creaser, Joshua Duley, Joshua Marshall, Lynette O'Brien, Mohammed Daher, Muhammad Yousuf Tufail, Pengxing Cao, Peter Langfield, Rachelle Binny, Raziyeh Zarre, Shaza Eltayeb, Simon Brady, Stefanie Hittmeyer, Valentin Bura, Wayne Burrows, and Alveen Aditya Chand.

Travel grants

Eight Travel grants were granted in 2012.

Forder/Aitken Lecturers

The annual exchange of Lecturers between the NZMS and the LMS is called the Forder Lecturer when a LMS-based Lecturer visits NZ (every even year) and the Aitken Lecturer when a NZMS-based Lecturer visits Britain (every odd year). Professor Geoffrey Grimmett (University of Cambridge) was the 2012 Forder Lecturer. Geoffrey toured New Zealand for three weeks in April. Starting in Dunedin, he worked his way up to Auckland visiting Christchurch, Wellington, Palmerston North, and Hamilton on the way. As well as public lectures, he gave more seminar-style talks on various topics including problems for the clairvoyant demon and stochastic pin-ball.

Geoffrey is interested in disordered physical systems, including percolation and related processes. He has written numerous research articles in probability theory and statistical mechanics, as well as three research books entitled Percolation (1999), The Random-Cluster Model (2006), and Probability on Graphs(2010).

The NZMS Council has provided the LMS with an ordered list of possible NZ Aitken Lecturers who could lecture in Britain in 2013.

MacLaurin Fellowship

MacLaurin Fellowships are awarded to AMS-based mathematicians to visit NZ in odd numbered years, and for NZMS-based mathematicians to visit the US in even numbered years. The plans for the first US MacLaurin Lecturer to NZ in 2011 were abandoned when the selected lecturer withdrew.

Professor Marston Conder from The University of Auckland was the first (outgoing) Maclaurin Lecturer. His lecture tour of the United States in 2012 included a plenary address to the American Mathematical Society.

Professor Conder is an international leader in his field. He specialises in the development and use of combinatorial group theory and computational methods to study the symmetries of discrete structures. These structures occur in a wide range of fields, including many other branches of mathematics as well as molecular chemistry and the design of computer architectures and efficient distribution networks.

The NZMS Council has provided the AMS with an ordered list of possible US speakers for 2013.

Newsletter

The Newsletter now includes contributions from recent winners of the NZMS Research Award and the NZMS Emerging Awards, not only to include more mathematics in the Newsletter, but to highlight current mathematical activity in NZ. This change is in response to last years AGM which requested more mathematics in the Newsletter.

NZMS Awards

The NZMS Research Award for 2011 was awarded to Shaun Cooper of Massey University (Albany), for sustained generation of significant and original contributions to number theory, particularly in the areas of elliptic functions, theta functions, and modular forms.

The NZMS Early Career Award for 2011 was awarded to Claire Postlethwaite of the University of Auckland, for her enormous progress in applying mathematics to the study of animal movement, and for her development of fundamental ideas in applied dynamical systems.

The NZMS Aitken Prize for 2011 was awarded to Edoardo Persichetti of the University of Auckland, for the best contributed talk by a student at the annual New Zealand Mathematical Society Colloquium.

The NZMS Accreditation Committee has recommended, and the NZMS Council accepted, Dr Jiling Cao of the Auckland University of Technology, be elected Fellow of the New Zealand Mathematical Society.

Thank you to the Aitken Prize panel, and the awards committees, for their contributions in 2012.

RSNZ Awards

Professor Shaun Hendy of Industrial Research and Victoria University of Wellington, and Professor Reinhard Klette of Auckland University were elected Fellows of the RSNZ from the Mathematics and Information Sciences panel, in 2012.

The 2012 Jones Medal for lifetime achievements in mathematical sciences was awarded to Professor Robert Goldblatt FRSNZ, School of Mathematics, Statistics, and Operations Research, Victoria University of Wellington, for his world-leading research in modal logic and category theory.

The 2012 Callaghan Medal for outstanding contribution to science communication was awarded to Professor Shaun Hendy FRSNZ, Distinguished Scientist at Industrial Research Limited, Professor of Physics in Victoria University of Wellingtons School of Chemical and Physical Sciences and Deputy Director of the MacDiarmid Institute for Advanced Materials and Nanotechnology. The medal is for his outstanding work in raising public awareness of science and its role in increasing economic prosperity.

Other Honours

Professors Marston Conder FRSNZ, University of Auckland; Rod Downey FRSNZ, Victoria University of Wellington; Gaven Martin FRSNZ, Massey University, and Vaughan Jones Hon FRSNZ, University of California, Berkeley have been selected to join the inaugural class of Fellows of the American Mathematical Society in honour of their distinguished contributions to mathematics. They will be officially inducted at the Joint Mathematics Meetings in San Diego on 11 January 2013.

Professor Bill Barton has just ended his term as President of the International Commission on Mathematical Instruction (ICMI) - arguably the highest position in the international mathematical sciences community ever held by a New Zealand based mathematician.

Professor Shaun Hendy won the 2012 Prime Ministers Science Media Communication Prize for being an effective communicator. The $100,000 prize will enable Shaun the opportunity to further develop his knowledge and capability in science media communication, and allow him to complete writing another book.

MPE2013

The RSNZ is making 2013 the Year of Mathematics in NZ; and internationally 2013 is the Year of the Mathematics of Planet Earth (MPE2013). The RSNZ will coordinate national activities to celebrate aspects of mathematics, and a RSNZ website will be formed to describe activities throughout the year. These events will bring the NZMS, NZSA, ORSNZ, NZAMT, ANZIAM, RSNZ and several of the COREs (MacDiarmid, Alan Wilson Centre) together (and hopefully other groupings) to help celebrate mathematics in NZ.

Some ideas at present are a national poster competition, radio panel discussions, distinguished speaker series, and 10 talks in different towns in different months. If you want to contribute with an idea, or other contribution, please contact Marston Conder or Graham Weir.

Acknowledgements

Thank you to the Council for all of their efforts. I particularly want to thank Alex James (Secretary) and Peter Donelan (Treasurer) for their contributions in 2012. Peter will be standing down as Treasurer this year, and Boris Baeumer stands down from Council, but will stay on as Webmaster.

Graham Weir

President

New Zealand Mathematical Society

4 December 2012

EDITORIAL

As always many thanks to the office staff for helping get this newsletter out in a timely fashion. Thank you Kelsey, Prema and Ping. Happy holidays to you all, and don't forget to read the mathematical miniature.

Steven Archer

INVITED PAPER

Bounding Fourier multiplier norms

In this note I would like to discuss two useful inequalities to bound Fourier multiplier norms and present a rather elementary proof for them. For $1 \leq p \leq \infty$ let $L_p(\mathbb{R}) = L_p$ denote the space of complex-valued measurable functions on $\mathbb{R}$ such that $\|f\|_{L_p} < \infty$ where $\|f\|_{L_p} = (\int_{\mathbb{R}} |f(x)|^p \, \mathrm{d}x)^{1/p}$, $1 \leq p < \infty$,

and $\|f\|_{L_\infty} = \operatorname{ess\,sup}_{x\in\mathbb{R}}|f(x)|$. If we identify functions that are equal almost everywhere on $\mathbb{R}$, then L_p becomes a complete normed space (Banach space) with the usual pointwise addition and scalar multiplication. For $1 \le p \le 2$ we denote the Fourier transform of a function $f \in L_p$ by $\hat{f}$ defined first for $f \in L_p \cap L_1$ as $\hat{f}(k) = \int_{\mathbb{R}} e^{ikx} f(x)\,\mathrm{d}x$, $k \in \mathbb{R}$. Since $L_p \cap L_1$ is dense in L_p this definition can be extended to the whole of L_p using the Hausdorff-Young inequality for Fourier transforms

$$\|\hat{f}\|_{L_q} \le (2\pi)^{1/q} \|f\|_{L_p}, u \in L_p,\ 1 \le p \le 2,\ \frac{1}{p} + \frac{1}{q} = 1. \tag{1}$$

If ψ is a measurable function from $\mathbb{R}$ to $\mathbb{C}$, then ψ is an L_1-*(Fourier) multiplier* if for all $f \in L_1$ there is $g \in L_1$ such that $\psi(k)\hat{f}(k) = \hat{g}(k)$ for all $k \in \mathbb{R}$. By the uniqueness of the Fourier transform we may define a linear mapping $\mathcal{M}_\psi : L_1 \to L_1$ by $\mathcal{M}_\psi f = g$. It turns out that $\mathcal{M}_\psi$ is a bounded linear mapping; that is,

$$\|M_\psi\| = \sup_{f\in L_1, f\neq 0} \frac{\|M_\psi f\|_{L_1}}{\|f\|_{L_1}} < \infty.$$

It is a classical result that ψ is an L_1-multiplier if and only if $\psi(k) = \int_{\mathbb{R}} e^{ikx}\,\mu(\mathrm{d}x) = \hat{\mu}(k)$, where μ is a (complex) Borel measure on $\mathbb{R}$ with finite total variation $\|\mu\|_{\mathrm{TV}}$. Furthermore, $\|M_\psi\| = \|\mu\|_{\mathrm{TV}}$. If μ has a density ρ; that is, $\mu(\mathrm{d}x) = \rho(x)\,\mathrm{d}x$, then $\|\mathcal{M}_\psi\| = \|\rho\|_{L_1}$.

In many cases only ψ is known explicitly while the corresponding measure μ (if there is any) is not. Hence, one would like to bound $\|\mathcal{M}_\psi\|$, and therefore also establish that ψ is in fact an L_1-multiplier, solely based on properties of ψ. In the sequel I will show how this can be done in two rather general cases yielding sharp bounds given in (2) and (6) below. Firstly, if ψ and ψ' have L_p bounds for some $1 < p \le 2$ and secondly, if ψ is periodic and there are local L_p bounds for ψ and ψ'. The latter case is important, for example, in numerical analysis.

Suppose first that $\psi \in L_p$ is locally absolutely continuous and that $\psi' \in L_p$ for some $1 < p \le 2$. Set $\psi_-(k) = \psi(-k)$, $k \in \mathbb{R}$. We may then define a function $\rho \in L_q$, where $\frac{1}{p} + \frac{1}{q} = 1$, by $\rho = \frac{1}{2\pi}\widehat{\psi_-}$. We will show that in fact $\rho \in L_1$. First note that $\widehat{\psi'}(x) = -(ix)\hat{\psi}(x)$. Then, provided that ψ is not the constant 0 function, using Hölder's inequality, inequality (1), and setting $v = \frac{\|\psi'\|_{L_p}}{(p-1)^{1/p}\|\psi\|_{L_p}}$ we get

$$\begin{aligned}
\|\rho\|_{L_1} = \frac{1}{2\pi}\|\widehat{\psi_-}\|_{L_1} = \frac{1}{2\pi}\|\hat{\psi}\|_{L_1} &= \frac{1}{2\pi}\left(\int_{|x|\le v} \left|\hat{\psi}(x)\right| dx + \int_{|x|>v} \left|\frac{1}{x}(x\hat{\psi}(x))\right| dx\right) \\
&\le \frac{2^{1/p}}{2\pi}\left(v^{\frac{1}{p}}\|\hat{\psi}\|_{L_q} + v^{\frac{-1}{q}}\|(\cdot)\hat{\psi}(\cdot)\|_{L_q}(p-1)^{-1/p}\right) \\
&\le (2\pi)^{\frac{1}{q}-1}2^{1/p}\left(v^{\frac{1}{p}}\|\psi\|_{L_p} + v^{\frac{-1}{q}}\|\psi'\|_{L_p}(p-1)^{-1/p}\right) \\
&= \frac{2}{\pi^{1/p}(p-1)^{1/p^2}}\|\psi\|_{L_p}^{\frac{1}{q}}\|\psi'\|_{L_p}^{\frac{1}{p}}.
\end{aligned}$$

Therefore, $\rho \in L_1$ whence $\hat{\rho}$ exists and $\psi(k) = \frac{1}{2\pi}\widehat{\widehat{\psi_-}}(k) = \hat{\rho}(k)$ for almost all k by the inversion formula for the Fourier transform. In fact, this holds for all k as both ψ and $\hat{\rho}$ are continuous. This shows that ψ is an L_1-multiplier and for some constant $C = C(p)$, independent of ψ, we have

$$\|M_\psi\| = \|\rho\|_{L_1} \le C(p)\,\|\psi\|_{L_p}^{\frac{1}{q}}\|\psi'\|_{L_p}^{\frac{1}{p}},\ 1 < p \le 2. \tag{2}$$

Before moving on to the periodic case we note that for $p = q = 2$ the inequality in (2) is proved in [4] and [7] while the case $p \neq 2$ (in a slightly more general form) is stated in [8] but with a typo in the exponent. It is also worth mentioning that by using a partition of unity one may further enhance the usefulness of (2) to cover multipliers ψ with insufficient decay at infinity to be in L_p but with ψ' having more decay than necessary to be in L_p, see for example, [2, 5, 6, 9].

Next we consider the case of periodic multipliers. Let ψ be a 2π-periodic function such that ψ is absolutely continuous and ψ' (and hence ψ) belong to $L_p[-\pi,\pi]$ for some $1 < p \le 2$, where $L_p[-\pi,\pi]$ is defined analogously to $L_p(\mathbb{R})$. It follows from the assumptions on ψ that $\psi \in L_1[-\pi,\pi]$ and hence we let $a_k := \frac{1}{2\pi}\int_{-\pi}^{\pi} e^{-ikx}\psi(x)dx$, $k \in \mathbb{Z}$, denote the k^{th} Fourier coefficient of ψ. First, note that

$|a_0| \le \frac{1}{2\pi}\int_{-\pi}^{\pi}|\psi(x)|\,dx < \infty$ and that ika_k are the Fourier coefficients of ψ' as can be seen using integration by parts and the fact that ψ is absolutely continuous. Next we recall the classical Hausdorff-Young inequality for Fourier series

$$\left(\sum_{k=-\infty}^{\infty}|a_k|^q\right)^{1/q} \le (2\pi)^{-\frac{1}{p}}\|\psi\|_{L_p[-\pi,\pi]},\ 1<p\le 2,\ \frac{1}{p}+\frac{1}{q}=1, \tag{3}$$

and Bellman's inequality [3]

$$\left(\sum_{k=1}^{\infty}b_k\right)^{\alpha\beta+\alpha-\beta} \le C(\alpha,\beta)\sum_{k=1}^{\infty}b_k^{\alpha}\left(\sum_{k=1}^{\infty}k^{\beta}b_k^{\beta}\right)^{\alpha-1},\ \alpha,\beta>1,\ b_k\ge 0,\ k\in\mathbb{N}. \tag{4}$$

Setting $\alpha=\beta=q$ in (3) and $b_k=|a_k|$ in (4), we get

$$\sum_{k=1}^{\infty}|a_k| \le C\left(\sum_{k=1}^{\infty}|a_k|^q\right)^{\frac{1}{q^2}}\left(\sum_{k=1}^{\infty}|(ika_k)|^q\right)^{\frac{1}{q}\left(\frac{q-1}{q}\right)} \le C\,\|\psi\|_{L_p[-\pi,\pi]}^{\frac{1}{q}}\,\|\psi'\|_{L_p[-\pi,\pi]}^{\frac{1}{p}}.$$

Since the same inequality holds for $\sum_{k=-\infty}^{-1}|a_k|$ we conclude that

$$\sum_{k=-\infty}^{\infty}|a_k| \le |a_0| + C(p)\,\|\psi\|_{L_p[-\pi,\pi]}^{\frac{1}{q}}\,\|\psi'\|_{L_p[-\pi,\pi]}^{\frac{1}{p}} < \infty. \tag{5}$$

Thus, ψ is the pointwise limit of its Fourier series; that is, $\psi(x)=\sum_{k=-\infty}^{\infty}a_ke^{ikx}$ for all $x\in\mathbb{R}$. If we let $\mu:=\sum_{k=-\infty}^{\infty}a_k\delta_k$, where δ_k is the Dirac measure concentrated at k, then the series converges in the total variation norm and $\psi=\hat{\mu}$. Therefore, by (5), it follows that

$$\|M_\psi\| = \|\mu\|_{\mathrm{TV}} = \sum_{k=-\infty}^{\infty}|a_k| \le |a_0| + C(p)\,\|\psi\|_{L_p[-\pi,\pi]}^{\frac{1}{q}}\,\|\psi'\|_{L_p[-\pi,\pi]}^{\frac{1}{p}},\ 1<p\le 2. \tag{6}$$

The fact that if $\psi'\in L_p$ for some $p>1$, then the Fourier series of ψ is absolutely summable was first proved in [11]. A multivariate version of (5) with a proof different from the one above can be found in [10].

It turns out that finding sharp bounds on Fourier multiplier norms has applications way beyond Fourier transforms and Fourier series. Applications that I came across range from numerical analysis [5, 6] through fractional calculus [2] (this is where the case $p\neq 2$ is essential) and functional analysis [1] to partial differential equations [9].

Mihály Kovács

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LOCAL NEWS

AGRESEARCH

Phuong Nguyen presented her work on the effect of enzyme compartmentalization on steroid biosynthesis at The Society for Mathematical Biology Conference in Knoxville, July 2012. Phuong also submitted her PhD thesis entitled Mathematical Modelling of Steroid Synthesis in Steroid-Producing Tissues and Steroid Partitioning in Circulation in August and plans to move to Christchurch in 2013.

Amy Van Wey attended the Riddet Institute Colloquium in Palmerston North in November and presented her work on a mathematical model of solid food degradation in the human stomach. Paul Shorten also presented work on homogenization theory at the Wellington-Manawatu Applied Mathematics Conference in Palmerston North in November.

Tony Pleasants visited Singapore in July to discuss a joint project on epigenetics and also gave a workshop on his work in this area. Tony also presented work on the life history equation at the Gravida National Centre for Growth & Development (NRCGD) Science Symposium in Palmerston North. There was a mix up with the PowerPoint slides and Tony managed to give his talk without PowerPoint.

Paul Shorten

INDUSTRIAL RESEARCH LTD

Applied Mathematics Group

In late September, Warwick Kissling visited Thomas Driesner at ETH, Zurich, to discuss details of the NaCl-H2O phase-diagram which Thomas has published, and which is used in both groups to model the flows of brines in geothermal and volcanic environments. The following week John Burnell and Warwick attended a workshop on geothermal simulation code benchmarking hosted by Thomas in Castasegna, in the Italian part of Switzerland. The purpose of the workshop was to create a framework for geothermal modellers worldwide where they can run their simulation codes on standard test examples of varying complexity, to allow comparison with known analytical results and/or with results from other simulation codes.

In November, Warwick Kissling and John Burnell attended the 2012 New Zealand Geothermal Workshop at the Aotea Centre in Auckland. Warwick gave a talk entitled Modelling deep production using a regional scale model of a TVZ-like geothermal field, describing recent work he has been doing with Susan Ellis at GNS. John and Warwick contributed to a paper on the future of geothermal modelling in collaboration with colleagues from Auckland University, and John also gave a review of recent geothermal work at IRL in an industry update session.

In late September Nicola Gaston left IRL to take up the position of Senior Lecturer in Chemistry at VUW.

Dion ONeale attended the NZ Maths Colloquium at Massey University in Palmerston North, and gave a talk entitled A Mathematical approach to identifying opportunities and advantages in Science and Innovation. He also attended the annual Wellington-Manawatu Applied mathematics meeting, also held at Massey Palmerston North.

Krista Steenbergen handed in her thesis: Modelling the Melting of Gallium Clusters: A Path to Understanding Molecular Solids". She also published a paper in October: "Electronic effects on the melting of small gallium clusters", JCP137, 144307 (2012); doi: 10.1063/1.4757420

Doreen Mollenhauer attended the Molecular Modelling 2012 Conference in Queenstown and gave a talk there: Towards the Understanding of the Chemical Environment Effect on Small Gold-containing Clusters. See http://www.mm2012.org.nz/

In October Doreen visited Prof. Hill and his group at the University of Adelaide (School of Mathematical Sciences) for two weeks. She gave two talks there and discussed possible future collaborations. She also gave a seminar at the Centre for Advanced Nanotechnology: Towards understanding nanocatalysts by quantum chemical calculations

It has been an eventful few months for Shaun Hendy. He was elected Fellow of the Royal Society of New Zealand in October, won the Royal Society of New Zealands Callaghan Medal for 2012 in November and in early December won the Prime Ministers Science Media Communication Prize.

Our French interns, Herve Plo and Anthony Belet finished their projects at IRL and have headed to Australia and the South Island for a couple of weeks before returning to France.

Kit Withers continues to produce papers in his retirement. A sample of the most recent ones:

Simultaneous confidence intervals for an unknown vector. Mathematical Scientist, CS Withers and S Nadarajah.

Normal maximum likelihood, weighted least squares, and ridge regression estimates. Prob. and

Math. Statistics, 32 (1), 11-24, CS Withers and S Nadarajah.

Hypergeometric functions where two arguments differ by an integer. Brazilian Journal of Probability and Statistics, 1-10, CS Withers and S Nadarajah.

Nonparametric estimates of low bias. REVSTAT, CS Withers and S Nadarajah.

Calibration with low bias. Statistical papers, 1-8., CS Withers and S Nadarajah.

Lastly, this will be the last report from the IRL Applied Mathematics Group. In early 2013 IRL will become part of Callaghan Innovation, the Governments new organisation aiming to bring science and technology closer to industry.

Warwick Kissling

THE UNIVERSITY OF AUCKLAND

Department of Engineering Science

The Department of Engineering Science would like to start by congratulating its 7 spring graduates. In particular, Paul Robertson who obtained a Bachelor of Engineering with first class honours. In addition, 2 postgraduate students were awarded a Masters of Engineering and Jee Lean Lim was awarded a first class Masters of Engineering in Bioengineering. Furthermore, 2 PhD awards in Engineering Science were made to Dr. Javad Khazaei and Dr. John OSullivan who has also received a lecturer appointment within the department.

NZ's Next Top Engineering Scientist 2012

The Department ran its Next Top Engineering Scientist on Saturday the 22nd of September, with $10,000 prize money up for grabs. Now in its fourth year, this annual competition is a mathematics problem solving event for teams of three to four secondary students. The question was revealed at 9am that day and students worked against the clock to submit their solution by 6pm. The competition continues to grow in popularity and this year 143 teams took part with entries from 69 schools all over New Zealand. This year's problem centered on Felix Baumgartner's planned record breaking high altitude skydive attempt, which he successfully completed on October 14th. Felix jumped from a height of 39km, launching himself from a capsule suspended beneath a balloon, at the edge of space. After Felix landed, a remote triggering system released the capsule from the balloon. The question asked on competition day was "In the event that electronic tracking is unavailable, what size search area is required in order to retrieve the capsule?"

The winners of the Pullan Prize for first place were Samuel Gilmour, John Theakston, Joe Lu and James Gardner from Saint Kentigern College. The runners up were Jenny Nguyen, Antara Nahian, Carla Sy and Clariss Wong from Botany Downs Secondary College and Tim Hight, Jack Barker, Nick Waddington and Akash Charles from Lynfield College.

We are also very pleased to announce that this year, foundation sponsors Orion and Fonterra are joined by a new sponsor, Fisher and Paykel Healthcare.

Charles Unsworth

Department of Mathematics

Jianbei An, on Research and Study Leave, visited East China Normal University (Shanghai) on 2011 December 16–21, where he gave an invited seminar talk at the Cao Xihua Mathematics Forum; and he discussed the possibility of a conjoint Doctor of Education programme for the University of Auckland and East China Normal University. In Chongqing he visited Chongqing Arts and Science University and Southwest University from 2011 December 21 to 2012 January 7, and then Beijing International Centre for Mathematical Research and Beijing University, from 2012 January 7 to February 3. He attended the conference on Representations of Finite Groups, held at Mathematisches Forschungsinstitut Oberwolfach, on March 25–31. He is a co–principal investigator of the project on "Research and Development on Decentralized Analytical Methods for Network Traffics with Regional Information". That large project is based at Unitec, and it is funded by the National Institute of Information and Communications Technology (Japan) from 2012 to 2015.

Bill Barton presided over the 12th International Congress on Mathematics Education, which was held in July at Seoul. It was attended by 3500 delegates, including many NZ researchers from several universities. Bill presented a paper at MERGA in Singapore, and a paper at Michelle Artigue's International Colloquium, The Didactics of Mathematics: Approaches and Issues, held in Paris. He delivered the opening keynote address at the conference on Adults Learning Mathematics, at Auckland. At the end of 2012, Bill will step down from his role as President of the International Commission on Mathematical Instruction (ICMI).

John Butcher, Robert Chan and Shixiao Wang took part in the International Conference on Numerical Analysis of Differential Equations (ICNADE

2012) at Nanjing University, 2012 June 15–17. They were joined by the sabbatical visitor Adrian Hill of Bath University. John Butcher followed this visit to China by a trip to the Czech Republic where he visited Brno Technical University, and then took part in the European Seminar on Computing (ESCO 2012), at Pilsen on 2012 June 25–29. Leonid Frants graduated in 1985 as M.Sc. in Computer Science, and in 2005 he founded a software company OneMarketData in New York. Leonid has established 3 scholarships in our Department of Computer Science, 1 for final–year undergraduate students and 2 for graduate students. Those scholarships honour some of the early members of the Department and specifically John Butcher, the founder Head of the Department of Computer Science, whose "academic brilliance and wonderful personality were key to creating a unique educational atmosphere".

Marston Conder and Vaughan Jones have been selected to join the inaugural class of Fellows of the American Mathematical Society, in honour of their distinguished contributions to mathematics — and so have Gaven Martin (at Massey–Albany) and Rod Downey (at VUW). They will be officially inducted at the Joint Mathematics Meetings in San Diego, on 2013 January 11. Marston gave invited lectures at a Special Session on Graphs & Groups at the SIAM Conference on Discrete Maths (at Halifax) in June 2012, and a Workshop on Low–dimensional Conformal Structures and their Groups (at Gdansk) in June 2012, and at a Workshop on Abstract Polytopes (at Cuernavaca) in July 2012. He had a busy time in November as one of the three moderators for the PBRF research quality evaluation, attending meetings of all 12 assessment panels. He will give an invited plenary lecture at the 36th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing, at UNSW in 2012 December 9–15. Marston will make a tour of US universities in 2013 March/April, as the first Maclaurin Lecturer (selected by the American and NZ Mathematical Societies), concluding with a plenary lecture at the AMS meeting in Boston on 2013 April 6–7. Marston and Eamonn O'Brien will soon host a Feodor Lynen Fellow, Dr Sebastian Jambor, at the University of Auckland for 18 months, with funding from the Alexander von Humboldt Foundation.

Steven Galbraith has been awarded a 21–month Science Faculty Research Development Fund Post–Doctoral Fellowship grant, for research on "New lattice-based cryptosystems". The Fellow will be Shi Bai (currently at ANU), who will start in January 2013. Steven gave an invited plenary talk at the Elliptic Curve Cryptography Conference (ECC 2012) at Queretaro, Mexico, in October 2012; and in December he will attend the INDOCRYPT 2012 conference at Kolkata, in his role as co–chair of the conference. Steven has recently served on the programme committees for the major international conferences CRYPTO 2012, PKC 2013 and EUROCRYPT 2013. His new PhD student Shishay Welay (from Ethiopia) started in October.

Rod Gover was elected as Fellow of the Royal Society of New Zealand, and in October he gave his New Fellows Seminar at the RSNZ. He was a Visiting Professor at ANU (2 weeks in April, 4 weeks in November), and an invited Visiting Professor at the University of Brest (3 weeks in May–June). In June he gave an Invited Seminar Talk on "Conformal geometry and holography" at Aarhus. He attended the conference on Conformal and CR geometry, BIRS Workshop at Banff in July. And he was a main organizer of the 2–week workshop and conference on The Interaction of Geometry and Representation Theory: Exploring New Frontiers which was held at the Erwin Schrödinger Institute at Vienna, in September. Rod has received an FRDF Postdoctoral Fellowship, which will be taken up by Callum Sleigh (from University of Melbourne).

Sina Greenwood has received the Excellence in Equity award, for Sustained Excellence. That recognizes her many years of selfless devotion to the education of Maori and Pacific students. She won this prize as an individual, not as a member of a large team, which makes it even more impressive. And she has received 2–year FRDF grant.

Allison Heard reduced her appointment to half–time in mid–2012, and she intends to retire in mid–2013. A Professional Teaching Fellow position to replace her has been advertized, and a decision on the appointment is expected in December.

Jari Kaipio chaired the MIS panel of the Marsden Fund for 2012.

Vivien Kirk had a new Marsden Fund award (with James Sneyd) starting this year.

Igor Klep gave a Plenary Talk in July to the 23rd International Workshop on Operator Theory and its Applications (IWOTA 2012) at UNSW in Sydney, and an Invited Talk to the annual AMS Meeting in Boston. He has received a 2–year FRDF new staff grant.

Bernd Krauskopf and Hinke Osinga were awarded a Worldwide Universities Network (WUN) Research Development Fund grant for $£30,000$ (with AIs including Vivien Kirk and James Sneyd), which was launched in August with a minisymposium on "Understanding Failure of Cell Signalling" at the SIAM Life Sciences Conference in San Diego. Moreover, Bernd and Hinke were invited speakers at the symposium on "Dynamics in Neural, Endocrine and

Metabolic Systems" at the National Institutes of Health in June. On August 31 Bernd Krauskopf delivered his Inaugural Lecture here on "Geometry of Chaos". He was awarded an FRDF New Staff grant of $30,000 on "Delay–induced dynamics: theory and applications"; his PhD student Chris Howcroft (at Bristol) won the prize for best presentation at the 2012 Airbus PhD day. On November 16 Hinke Osinga delivered her Inaugural Lecture here on "Exciting Transients". She is AI on a new Marsden Fund grant that started this year and was awarded an FRDF New Staff grant of $30,000 on "Critical boundaries in hybrid systems with applications to earthquake engineering". She gave an invited talk in the thematic programme "Towards Mathematical Modeling of Neurological Disease from Cellular Perspectives" at the Fields Institute in May. She will be co–chair (with Bruce Hendrikson, of Sandia National Labs) of the SIAM Annual Meeting in July 2013.

Dimitri Leemans was awarded a Marsden research grant for $580,000 on "Symmetries of discrete objects", with Marston Conder (and Egon Schulte at Northeastern University in Boston) as AIs. He organized (with Marston Conder) the conference on "Symmetries of Discrete Objects" at Queenstown on February 12-16, where he was an invited lecturer for a 2 hours minicourse on Permutation Groups. In June he visited the University of Sydney for 2 days, to work with the MAGMA group. He made a 6–week visit to Europe and Central America in July–August, to work with Francis Buekenhout & Thomas Connor (Université Libre de Bruxelles, Belgium), Hendrik Van Maldeghem (University of Ghent, Belgium), Maria–Elisa Fernandes & Mark Mixer (University of Aveiro, Portugal), and to participate in the Workshop on Abstract Polytopes at Cuernavaca (in Mexico). He was an invited speaker (fully funded) at the conference on "Buekenhout Geometries" held at Ghent on September 20–21, in honour of Francis Buekenhout' s 75th birthday; and an invited speaker at the New Zealand Mathematics and Statistics Postgraduate Conference (NZMASP), held at Shakespear Park in Auckland on November 12–16. He will participate in the 36th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing at Sydney, on December 10–14. He was appointed to the Editorial Boards of *ISRN Combinatorics* and of *Progress in Applied Mathematics and Studies in Mathematical Sciences*.

Ben Martin visited Oberwolfach in September as part of the Research in Pairs scheme, to work with his collaborators Michael Bate (York), Sebastian Herpel (Kaiserslautern) and Gerhard Roehrle (Bochum). Bate, Herpel and Roehrle made return visits to Auckland in November/December.

Warren Moors gave 2 Invited Talks: in April to the 41st Spring Conference of the Union of Bulgarian Mathematicians at Borovetz; and in October to the Fall Central Sectional Meeting of the AMS, Special Session on Separate versus Joint Continuity, at Akron Ohio.

Julia Novak has completed her PhD (at Royal Holloway College, London) with her thesis on *Generalised key distribution patterns*.

Greg Oates presented a paper at MERGA in Singapore, he was the co–chair of Topic Study Group 13 on "Teaching of Calculus" at ICME in Seoul, and he edited the *IJMEST* issue emanating from that Topic Study Group at ICME.

Eamonn O'Brien will succeed James Sneyd as Head of Department on 2013 January 1. He gave an invited lecture at the conference on Words and Growth at the Institute for Advanced Studies at the Hebrew University of Jerusalem (June 2012); and a series of lectures at the XXII Brazilian Algebra meeting (July 2012). Eamonn and Marston Conder will soon host a Feodor Lynen Fellow, Dr Sebastian Jambor, at the University of Auckland, with funding from the Alexander von Humboldt Foundation.

Judy Paterson attended the conference on Adults Learning Mathematics, in Auckland, and she organized 7 lectures in the CULMS/CMCT series.

Claire Postlethwaite received the NZMS Early Career Research Award in December 2011. Her work on modelling of pigeon movement was featured in a documentary that aired in November on PBS in the USA in November, and she was interviewed for the Radio NZ programme "Our Changing World" in October. She was an AI on a FRDF award for a postdoctoral position, she was on Research and Study Leave in Semester 1, and she had a new Marsden Fund award starting this year. She gave invited plenary talks on "Progress and Problems in Dynamics" at Houston in May, and on "Delayed Complex Systems" at Mallorca in June.

Phil Sharp has continued working on parallelizing accurate integration schemes for N–body simulations of the Solar System. He has developed an OpenMPI Størmer integrator for simulations of the planets and a non–interacting disk of asteroids. The algorithm employs adaptive load balancing to optimize the use of the processors. He also developed a CUDA Adams integrator for simulations of the planets and an interacting disk of asteroids.

Arkadii Slinko attended the Dagstuhl Seminar 12101 (by invitation only) on Computation and Incentives in Social Choice on March 4–9, and afterwards he visited a collaborator at Karlsruhe. He served as the Chair of the Organizing Committee

for our annual Student Research Conference (June 5). He gave a talk at the large 12th SAET (Society for Advancement of Economic Theory) conference in The University of Queensland's St. Lucia campus at Brisbane, from June 30 to July 3. Arkadii is a member of a group of European researchers, including some external experts from USA, in a research network funded by COST (European Coordination in Science and Technology) as a 4–year project. He was awarded a grant from the European Commission to conduct a COST Action in Computational Social Choice.

James Sneyd was a Plenary speaker at the Society for Mathematical Biology (India) in January, 2012, at Pune; and an Invited speaker at the Summer School in Mathematical and Computational Neuroendocrinology in July 2012, at Tours. He is the PI (with Vivien Kirk) for a grant from the Marsden Fund of the New Zealand Foundation for Research, Science and Technology, for the period March 2012 to February 2015. At the end of 2012, James will finish his term as Head of the Department.

Steve Taylor is on Research and Study Leave at the University of Minnesota, for Semester 2.

Tom ter Elst: Invited talks: Analysis and Randomness workshop at Auckland in December 2011; Conference on Spectral Theory and Differential Operators at Graz in August; Seminar "The Dirichlet–to–Neumann operator on rough domains" at Bordeaux 1 in September; Tulka Workshop of evolution equations at Konstantz on October; Analysis seminar "The Dirichlet–to–Neumann operator on rough domains" at Augsburg–München in November; Conference, New trends in Nonlinear Parabolic Equations at Parma in November; Seminar talk "Diffusion determines the compact manifold" at Ulm in November. Other activities: Visiting fellow ANU (1 week), July; Visitor (3 weeks) at Institute of Mathematics Polish Academy of Sciences, Warsaw, July/August; Invited Professor (1 month), at University of Bordeaux 1 in September. Visitor (2 months) at the University of Ulm in October/November. Co–organizer of the International Workshop on Operator Theory and Applications at UNSW in July.

Mike Thomas was on Study Leave in the first Semester, when he was a Visiting Professor at the National Institute of Education, Nanyang Technological University (Singapore). He visited Prof. Alan Schoenfeld at UC–Berkeley, Prof. Barbara Jaworski at Loughborough University and also Prof. Elena Nardi at University of East Anglia. He gave seminars entitled "Analysing mathematics lecturer practice: A possible route to professional development" at NIE, Southampton and East Anglia, and "The role of representations in versatile learning of mathematics" at NIE. He presented a paper at Michelle Artigue's International Colloquium, The Didactics of Mathematics: Approaches and Issues, held in Paris. He was an invited speaker at the USACAS/T3 International Conference, held in Chicago on March 2–4; and in July he headed the survey team on transition from school to university at ICME in Seoul. He is a member of the Scientific Committee of the 11th International Conference on Technology in Mathematics Teaching (ICTMT 11), to be held in 2013 at Bari.

Caroline Yoon, on Study Leave, visited John Mason in England and Ferdinando Arzarello in Turin. She presented a paper at Michelle Artigue's International Colloquium, The Didactics of Mathematics: Approaches and Issues, in Paris; and at ICME in Seoul she presented an invited regular lecture.

The Departments of Mathematics and of Statistics are advertizing for a joint Lecturer in Financial Mathematics.

Andrew Stafford is joining us from Senior College, for a year as Teaching Fellow. Moira Statham, Sheena Parnell and Helen McKenzie are retiring from the Tertiary Foundation Certificate and the Mathematics Education Unit. Jacqueline Field will arrive on December 1st to start work on both the Tertiary Foundation Certificate and the new Certificate in Academic Preparation. Rachel Passmore and Phil Kane have been appointed in the Tertiary Foundation Certificate, and they will arrive in January. Sepideh Stewart left to take up a lecturing position in Norman, Oklahoma.

A team led by the Department of Mathematics at The University of Auckland, but including researchers from Victoria and Canterbury universities, recently won a $300,000 Ako Aotearoa grant for research into undergraduate mathematics learning. The 2–year project will attempt to identify, observe, and report on the full spectrum of learning outcomes desired from undergraduate courses. It includes trialling 3 course innovations: Team–Based Learning; Intensive Technology; and Low Lecture/High Engagement modes.

ANODE2013

An international conference on Numerical Ordinary Differential Equations, ANODE2013, will be held at the University of Auckland, January 7–11, 2013, in celebration of Professor John Butcher's 80th birthday. The following have agreed to be plenary speakers:

Kevin Burrage (Oxford and Brisbane)

John Butcher (Auckland)

Rob Corless (London, Ontario)

Robert McLachlan (Palmerston North)

Linda Petzold (Santa Barbara)

Chus Sanz-Serna (Valladolid)

Zaiju Shang (Beijing)

Friends and colleagues of John, interested individuals, and students are welcome to participate.

Further information is available on ⟨http://jcbutcher.com/d/ANODE2013⟩

Arkadii Slinko organized our annual Student Research Conference, which was held on June 5.

Programme of the Student Research Conference

9:00 A–Prof Arkadii Slinko. Opening address of the Conference Chair.

9:10 Tan Do. MSc. Ternary quadratic forms and Kaplansky's conjecture. Supervisor: Steven Galbraith.

9:30 Manfred Sauter. PhD. Nonseparability and a theorem on operator ranges by von Neumann. Supervisor: Tom ter Elst.

9:50 Michael Lockyer. PhD. Generalised inverse limits of tent maps. Supervisor: Sina Greenwood.

10:10 Jacqueline Field. Master of Professional Studies. Emerging understanding of algebraic variables through spreadsheet use: Undressing the Iron Maiden.Supervisor Judy Paterson.

10:30 Morning tea

11:00 Pingyu Nan. PhD. Understanding physiological systems with three time scales. Supervisor: Vivien Kirk.

11:20 Katie Sharp, PhD. Cystic Fibrosis: a mathematical model. Supervisor: James Sneyd.

11:40 Alistair Watt. MSc. Team–based learning. Supervisor Judy Paterson.

12:00 Jesse Hart. MSc. Chebyshev constants and a Robin function for algebraic curves in C^2. Supervisor: Sione Ma'u.

12:20 Lunch

13:00 Tuan Chien. PhD. Coordinate systems with minimal L^2–norm. Supervisor: Shayne Waldron.

13:20 Rupert Freeman. BSc(Hons). Composition of weighted voting games.

13:40 Noorhelyna Binti Razali. PhD. Active and passive symmetrization. Supervisor: Robert Chan; co–supervisor: Shixiao Wang.

14:00 Ali Hameed. PhD. The structure and characterizations of hierarchical simple games. Supervisor: Arkadii Slinko.

14:20 Ban Heng Choy. PhD. Mathematics teaching as a discipline. Supervisors: Mike Thomas & Caroline Yoon

14:40 Afternoon tea

15:10 Edoardo Persichetti. PhD. Efficient implementation of a CCA2–secure variant of McEliece using generalized Srivastava codes. Supervisor: Steven Galbraith.

15:30 Simon Youl. PhD. A subsequence theorem for generalised inverse limits. Supervisor: Sina Greenwood.

15:50 Celia Dong. BSc(Hons). The security of cryptosystems based on learning with errors. Supervisor: Steven Galbraith.

16:10 Mo Wu. BSc(Hons). Modelling airway smooth muscle dynamics using crossbridges and crosslinkers. Supervisor: Graham Donovan.

16:30. Drinks and nibbles. Announcement of prizes.

Finally, the prizes. The Programme Committee failed to determine just 3 best talks, because there were so many good talks. With great difficulty they selected 5 students, who are listed here in alphabetical order:

Tan Do, Jacqueline Field, Pingyu Nan, Manfred Sauter, Simon Youl.

The available prize money which is $1500 was equally divided between them: i.e., each individual prize is $300.

Shannon Ezzat has completed his PhD, with his thesis on *Representation growth of finitely–generated torsion–free nilpotent groups: methods and examples.* Note that this is a University of Canterbury PhD rather than a University of Auckland one: Shannon followed his supervisor Ben Martin to Auckland and his oral examination was held here, but he did not change his enrolment.

Annie Georgey has completed her PhD, with her thesis on *Extrapolation of symmetrized Runge–Kutta methods.*

Tatiana Gvozdeva has completed her PhD, with her thesis on *Simple games: weightedness and generalizations.*

Jicheng Ma has completed his PhD, with his thesis on *Symmetric covers of graphs and maps.* Not bad going, for someone who started his PhD project only two years previously, in July 2010. Jicheng has returned to China, where he had already been offered an academic position; but he

will also be going to Europe for a one–year Post-Doctoral Fellowship, starting later in 2012.

Saraswathy Mala Nataraj has completed her PhD, with her thesis on *Incorporating ideas from Indian history in the teaching and learning of a general place value system.*

Edoardo Persichetti has completed his PhD with his thesis on *Improving the efficiency of code–based cryptography*, and he will become a PostDoctoral Fellow in Warsaw.

Wenjun Zhang has completed his PhD, with his thesis on *Waves in mathematical models of intracellular calcium and other excitable systems.*

Recent visitors to the Department include: Prof. Karoline Afamasaga-Fuata'i (National University of Samoa), Dr Michael Bate (University of York), Prof. Andreas Cap (Vienna), Prof. Jon Carlson (University of Georgia, Athens), Prof. Jeffrey Case (Princeton), A–Prof. Daniel Alves Castello (Universidad Federal Rio de Janiero), Thomas Connor (Université Libre de Bruxelles), Dr Christina Delfs (University of Oldenburg, Germany), Dr Manon Deville (École Normale Supérieure de Cachan, Rennes), Dr Heiko Dietrich (University of Trento), Dr Ken Dykema (Texas A&M), Dr Helmut Freidrich (Max–Planck–Institut für Gravitationsphysik), Ricardo Grande (University of the Basque Country, Bilbao), Prof. Geoffrey Grimmett (University of Cambridge, NZMS Forder Lecturer for 2012), Prof. Horst W. Hamacher (Universität Kaiserslautern), Prof. Sebastian Herpel (Universität Kaiserslautern), Dr Adrian Hill (Bath University), Prof. Kengo Hirachi (Tokyo), Dr Edward Huang (National Cheng Kung University, Taiwan), Prof. Charles Leedham–Green (Queen Mary College, University of London), Prof. Yanan Lin (Xiamen University, China), Dr Heather Macbeth (Princeton), Prof. Vladimir Matveev (Jena), Dr Aisling McCluskey (NUI, Galway), Prof. Richard Melrose (MIT), Dr Paul–Andi Nagy (Universidad de Murcia), Prof. Peter Nyikos (University of South Carolina), Dr Pablo Mejia Ramos (Rutgers University), Prof. Felix Rehren (University of Birmingham), Prof. Gerhard Roehrle (Universität Bochum), Dr Ron Steinfeld (Monash University), Dr Don Taylor (University of Sydney), Dr Dennis The (ANU), Prof. Lisa Townsley (University of Georgia, Athens), Dr Fre Vercauteren (Katholieke Universiteit Leuven, Belgium), Dr George Willis (University of Newcastle) and Prof. Keizo Yamaguchi (Hokkaido University).

Seminars

Dr Eugenia O'Reilly–Regueiro,

"Chiral 4–polytopes with alternating or symmetric automorphism groups",

Dr Adrian Hill, "Exponential decay for linear time–varying systems",

Matthieu Jacquemet,

"The discovery of hyperbolization of a knot complement — Part 2",

Dr Helmut Freidrich, "Conformal structures of static vacuum data",

Rachel Camina,

"The Nottingham group – an introduction and a survey of recent results",

Dr Annie Gorgey, "Extrapolation of symmetrized Runge–Kutta methods",

Dr Sebastian Jambor, "The L_2–quotient and $L_3 - U_3$–quotient algorithms",

Prof. Geoffrey Whittle, "Matroid representation over infinite fields",

Prof. Martin Liebeck, "Some magic words",

Dr Dane Flannery, "Algebraic design theory",

Prof. John Butcher,

"Variable order and stepsize for numerical integrators",

Patrick Girard, "Ceteris paribus reasoning and preferences",

Dr Alla Detinko, "Computational aspects of infinite linear groups",

Prof. Ed Dubinsky,

"What are we thinking of when we say 'all' (or 'each' or 'every')?",

Prof. Geoffrey Grimmett (NZMS Forder Lecture for 2012),

"Problems for the Clairvoyant Demon",

Prof. Hinke Osinga, "Spike–adding mechanisms in transient bursts",

Dr. Aisling McCluskey,

"On topologies on X as points within $2^{\mathcal{P}}(X)$: lattice theory meets topology",

Dr Wenjun Zhang, "Waves in mathematical models of intracellular calcium and other excitable systems",

Tan Do, "Ternary quadratic forms and Kaplansky's conjecture",

A–Prof. Warren Moors,

"Fixed–point theorems and applications",

Prof. David Gauld, "Selections, games and metrisability of manifolds",

Patrick Girard, "Logical dynamics of belief change in the community",

Dr Shannon Ezzat,

"Exceptional primes and representation growth of T–groups",

Prof. Graeme Wake, "Calculus in the past with multiple delays, arising in cancer cell modelling",

Prof. Jon Carlson, "Classifying thick subcategories of the stable category",

Dr Steve Taylor, "The Korteweg–de Vries equation and swirling flow",

A–Prof. Jiling Cao,"Embedding topological spaces in 'nice' Wijsman hyperspaces",

Nazli Uresin & Afshin Mardani,

"Abstract topological dynamics involving set–valued functions", and

"Closed non–metrisable subsets of the product of the long line and a metric manifold",

Callum Sleigh,

"The Volume Conjecture and $SL(2, C)$ Chern–Simons Theory",

A–Prof. Arkadii Slinko, "Geometric properties of voting rules",

Prof. Karoline Afamasaga–Fuata'i,

"Authentic mathematical investigations and student teachers' mathematics attitudes",

Jack Stecher, "Expected utility and equilibrium with subjective choice sets and strategic reporting",

Dr Dennis The,

"The gap phenomenon in parabolic geometries",

Brenda McNaughton & Ken Rapson,

"Level 3 mathematics achievement standards",

A–Prof. Daniel Alves Castello,

"A model validation strategy applied on a constitutive viscoelastic model",

Prof. Rod Gover,

"Conformal geometry, holography, and boundary calculus", and

"Riemannian geometry in the parabolic playground",

Dr Sepideh Stewart, "Research on teaching and learning mathematics and statistics at university level: A journey through fresh pasture",

Dr Quentin Atkinson, "Language evolution in space and time",

Prof. Bakh Khoussainov,

"On finitely presented expansions of semigroups, groups, and algebras",

Prof. Joerg Frauendiener,

"Gravitational waves: general properties and numerical simulation",

Robyn Gandell, "Connecting the dots? Is there a link between student numeracy and literacy?",

Prof. Peter Nyikos, "Three closely related topological games",

"Sequential compactness versus countable compactness", and

"Uniform Box products",

Prof. Frederic Dias, "The numerical computation of violent liquid motion",

Dr Jicheng Ma, "Arc–transitive Abelian regular covers of cubic graphs",

Dr Shixiao Wang, "Why PDEs are so different from ODEs: from analytic and numerical viewpoints",

Dr Don Taylor, "Reflection subgroups of complex reflection groups",

Mike Smith,

"A primer to periodic problems in plates: crystals and clusters",

Dr Simona Fabrizi,"Learning and collusion in new markets with uncertain entry costs",

Prof. Marston Conder & Ricardo Grande,

"Embeddings of circulants on surfaces",

Shaun White, "Strategic voting: overshooting and undershooting, and safe and unsafe strategic votes",

Prof. Charles Leedham-Green, "Presentations of classical groups",

Dr. Rua Murray, "Stable leaves, probability and falling into holes",

Dr. Ville Rimpilainen,

"Electrical tomography imaging in pharmaceutical processes"

Dr Heiko Dietrich, "Computing nilpotent orbits in real Lie algebras",

Dr Michael Fowlie & Dr Mark C. Wilson,

"Electoral engineering through simulation",

Prof. Richard Melrose, "Scattering theory",

Dr Antoine Nectoux, "The essential rank of the alternating group",

Prof. Martin Wechselberger, "Canard theory and neuronal dynamics",

Dr Greg Oates, "Applications and implications of recent research for the teaching of calculus",

Dr Daniele Valtorta, "Critical sets of harmonic functions",

Dr Richard Clarke,

"Non-decaying interactions between squirming micro-organisms",

Marinus Ferreira, "Conventional authority",

Dr David Simpson, "Stochastic regular grazing bifurcations",

Prof. Daniel Delbourgo, "How fast do Mordell–Weil ranks grow?",

Dr Sina Greenwood, "Connected generalized inverse limits over intervals",

Prof. Yanan Lin, "From tubular algebras to elliptic Lie algebras",

Dr Igor Klep,

"From positive polynomials to central simple algebras with involution",

Peter Bier,

"Student perceptions of a day–long mathematical modelling group project",

Prof. David Gauld,

"Exotic differential structures may be found in dimension 2",

Prof. Jim Denier, "Singularities in fluid mechanics: a grand challenge",

A–Prof. André Nies, "Groups and first–order logic",

Dr George Willis, "Totally disconnected, locally compact groups",

Prof. Bill Barton & Dr Judy Paterson,

"Undergraduate Mathematics: What do we really hope to achieve?",

Thomas Connor,

"A geometry for the O'Nan group related to the Livingstone graph",

Prof. Sebastian Herpel,

"Completely reducible subgroups of reductive groups",

Prof. Felix Rehren, "Majorana theory",

A–Prof. Matthew Ryan, "Freedom of opportunity: axiomatic approaches".

Garry J. Tee

AUCKLAND UNIVERSITY OF TECHNOLOGY

School of Computing and Mathematical Sciences

Recently, two lectureship positions in the School of Computing and Mathematical Sciences at AUT have been advertised: One is for the Analytics/Statistics major and the other is for the Applied Mathematics major. Currently, the recruitment process is going smoothly. The two appointees are expected to join the School in Semester One 2013.

In early November, the Institute for Radio Astronomy & Space Research hosted Phil Crosby for two days. There was a good turnout for his presentation on Thursday 8th from IPENZ and Engenerate members, the Auckland Astronomical Society

and AUT. Phil's topic, "SKA and success drivers for extremely large, high-technology mega-science projects" addressed managing the challenges that the biggest engineering/scientific projects have in common. Phil was presented with a bottle of Ransom Winery 2008 Cosmos Chardonnay, which features the AUT 12m radio telescope on the label.

Jiling Cao participated in the International Conference on Topology and the Related Fields, held at Nanjing, 22–25 September, and two related post-conference workshops at Nanjing University and Nanjing Normal University, respectively. Jiling was a member of Scientific Committee of the Conference, and also one of the plenary speakers. His talk, "Bornoligies and applications in Topology", has stirred up some general interests among mathematicians in China: Dr Bin Chen, who has received a scholarship from Shandong Province, plans to undertake 6 month post-doctoral research at AUT in 2013 under Jiling's supervision. At the conference and workshops, Jiling also met one of his research collaborators, Heikki J. K. Junnila, from the University of Helsinki. The two had chance to discuss and revise a joint paper, which is now submitted to Topology and its Applications. In addition to several other invitations lined up ahead, at the present, Jiling and his colleagues from China are planning another international conference to be held in Shantou University (in Guangdong Province, China) in 2015.

Hyuck Chung visited the Department of Mathematical Sciences at the University of Adelaide in November. In December, Hyuck visited the Department of Physics at the University of Otago to undertake joint research work with A/Prof Colin Fox.

Robin Hankin hosted visiting theoretical ecologist Farnon Ellwood, currently at the University of the West of England, and continued their collaboration in the field of community ecology. He has also been statistical consulting on behalf of the SCMS for clients including Fisher and Paykel, and Housing NZ.

In November, Jeff Hunter participated in the 2012 Haifa Matrix Theory Conference, held at the Technion-Israel Institute of Technology, Israel. Jeff delivered his paper, "Generalized inverses of Markovian kernels in terms of properties of the Markov chain", in a special session honoring the work of the late Miki Neumann, with whom Jeff visited at the University of Connecticut in 2006. In addition, Jeff won the 2012 Dean's Research Excellence Award in the Faculty of Design and Creative Technologies.

Sergiy Klymchuk won AUT Vice Chancellor's 2012 Academic Excellence in Teaching Award.

In August, Jiamou Liu attended the 16th International Conference on Development in Language Theory, held at National Taiwan University, Taipei. At the conference, Jiamou gave a talk on his paper "State complexity of finite word and tree languages". In the second half of 2012, Jiamou hosted three international visitors: Prof Alexander Meduna from Brno University of Technology (Czech Republic), Martin Huschenbett from Ilmenau Technical University (Germany) and Dr Eric Martin from UNSW (Australia). Prof Meduna visited the school in August with the intention of carrying out collaborations between AUT and BUT on the area of formal languages and compiler theory. Martin Huschenbett carried out a one-month joint research with Jiamou on Ramsey theory in September. Eric Martin visited for two weeks in November and aimed to collaborate with Jiamou on the field of logic programming.

Two BMathSci students, Michael Ourednik and Katie Arthur, have been selected for a Summer scholarship by the Australian National University (ANU). Both Michael and Katie are currently in their third year towards a BMathSci in Computer Science and Applied Mathematics (double major). They have taken papers such as Algorithm Design and Analysis, Theory of Computation and Linear Algebra, as well as undergraduate projects and special topic courses on mathematical logic and mathematical analysis. In addition, three other students in Mathematical Sciences, Anuj Bhowmik, Zhenwen Cai and Kostya Ross, have been awarded a Summer scholarship by the Faculty of Design and Creative Technologies at AUT, to undertake research projects with Jiling Cao and Jiamou Liu, respectively.

Seminars and workshops

Martin Huschenbett (Technische Universitaet Ilmenau), "Tree-automatic linear orderings"

AI and Logic Day: The SCMS at AUT hosted the first Artificial Intelligence and Logic Day on 16 November 2012. This one-day event attracted more than 35 academics and students from AUT and the University of Auckland to engage in seminars and discussions on research topics related to AI, Logic and beyond. The goal of the workshop is to create a forum for exchanging ideas and building up a research environment between the two Auckland universities on the related areas. At the same

time, the event aims to attract students who have interests in recent advances of AI and Logic.

There were three "long" (45 minutes) invited talks: A/Prof Sebastian Link (UoA) started the day by giving a talk on his research on the logic of independence data in the context of databases. Dr Eric Martin (UNSW) gave a talk on his research on a logic framework that unifies classical and nonmonotonic reasoning in AI. A/Prof Minjie Zhang (Wollongong), who was a visitor of Dr Quan Bai, gave a talk on the challenges in multi-agent intelligent system research and presented a brief introduction to her research lab in Wollongong.

There were also six other "shorter" (30 minutes) invited talks from both AUT and the University of Auckland. Prof Ajit Narayanan gave a talk on his recent findings connecting proteins and signature of computer viruses. Dr Weiqi Yan presented his research on digital security through the use of visual cryptography. Other researchers presented their recent works on nature-inspired algorithms and Kolmogorov complexity. The event finished with an invited dinner of the visitors, speakers and participants in Gina's Italian Kitchen.

Jiling Cao

More local news, after the centrefold.

CENTREFOLD

Shaun Cooper

In the car-park at Massey University's Albany campus is a vehicle with the number plate 314159, with "Pi going on forever" on the plate surround. A present from his wife Hilary, who else could the plate belong to but the subject of this issue's Centrefold? It is a pleasure to write about Shaun Cooper, who delights in numbers and the mathematical theory that surrounds them, and is an international figure in "all things Ramanujan".

In an earlier life, Shaun went to school in Gisborne, and was Dux of Lytton High School there in 1983. He graduated from The University of Auckland in 1987 with a BSc(Hons) (First Class) in Mathematics; that year he completed an MSc and graduated with Distinction in 1988. The next few years were spent in the USA at the University of Wisconsin-Madison where he completed a PhD, graduating in 1995. He returned to NZ that year and took up a position as Lecturer in Mathematics at Massey's (then, new) Albany campus in North Shore City. He was promoted to Senior Lecturer in 2001, and to Associate Professor this year.

One of Shaun's passions is his teaching. He gained some experience as a Teaching Assistant at Auckland and Wisconsin while undertaking postgraduate study (and also winning two UW teaching awards), but really hit his straps in the Albany environment. He is renowned as one of the best Mathematics teachers around; he won an IIMS Teaching Award in 2004 and a College of Sciences Teaching Excellence Award in 2011. And now, he has just received the Albany Lecturer of the Year award for 2012, heading off the competition across all disciplines at the campus. His philosophy on teaching and learning is a great resource for his colleagues, and his success rates reflect his enthusiasm, and the care and attention he pays to his students at all levels.

A recipient of the NZMS Research Award in 2011, Shaun's research interests lie in number theory and special functions (elliptic and theta functions, and q-series). An active member of NZMS, AMS and the Society for Special Functions and their Applications, his current work includes trying to discover and classify theta function identities, to extend Ramanujan's theories of elliptic functions in various ways, and to classify corresponding Ramanujan-type series for (you guessed it!) $1/\pi$. Shaun has more than 60 refereed articles to his name. He also spent much time over a number of years revising and editing a monograph Development of Elliptic Functions According to Ramanujan, originally written in 1988 by K. Venkatachalienger; when in India, Shaun and Hilary visited the (now, late) author in his home. Shaun has made contributions to myriad conferences; that Shaun can give a great plenary talk has also been recognised by 10 invitations over the last 5 years to speak at international meetings in India (4), Singapore (2), Australia, China, France, and NZ.

He is also a successful postgraduate supervisor, with several PhD, MSc and project students having taken advantage of his knowledge, skill and wisdom. His international collaborators have sought him out for more than a dozen visits over the last few years, while he has reciprocated during periods of sabbatical leave. His repute keeps him in demand for refereeing papers, with such contributions so far to more than 30 different international journals, as well as about 140 invited reviews for the AMS's MathSciNet.

Shaun has a collection of Rubiks puzzles of all different shapes and sizes. His prized piece is an 11 by 11 by 11 Rubiks cube he spotted while window-shopping in Singapore. He often brings a selection of his puzzles to class to demonstrate mathematical principles. (He once made an urgent call home asking for a dodecahedron to be delivered to the campus, 10 minutes before a lecture.)

Shaun's vigour and stamina in another arena are also detected by those who are privileged to work in the same department and who have seen him coming and going in his running kit. As a former ultra-marathon competitor (in events that have him running through night and day), Shaun represented NZ at the World 100 km Challenge in 1997 and 2006, with a best 100 km time of 7:22:30. It makes us feel tired just to consider these things!

His current ground-level goal is to run at least one marathon per year. Apart from that he tends to build up for specific events, and in doing so, often cracks a few records, like the 8 year-old ones for 6 hours and 12 hours in the annual Auckland Sri Chinmoy races (Shaun's new records were 74.000 km in 6 hours and then 134.799 km in 12 hours). Shaun is motivated to take part in interesting events that he likes, to the best of his ability at the time. In recent years he has developed a particular interest for trail races (the harder they are the more he likes them!). His favourite event is the Tarawera Ultra Marathon 100k. He has also supported various races when not running and is a very proficient lap counter it is quite a challenge to keep track of several people all running around a 400m track for hours on end one way of putting number theory into practice!

All his colleagues and companions agree that Shaun seems able to cope with most things thrown at him. He is a great companion for long walks; he seems to dance dry-footed through the wettest of terrain, to the envy of his muddy-booted mates! Shaun is sure-footed, except for one memorable occasion. On his wedding day, Shaun and his best man decided to run to the wedding from Riverhead (the best mans home) to Bethells Beach. Inexplicably, on a smooth part of the road Shaun fell. He made it to the wedding venue to meet his wife-to-be covered in blood and had to have his arm and leg bandaged before the ceremony.

For those about him, Shaun is an intellectual powerhouse, but with a modesty that belies his national and international standing. His colleagues agree, without exception, that it is a privilege to be associated with him.

Robert McKibbin

MATHEMATICAL MINIATURE

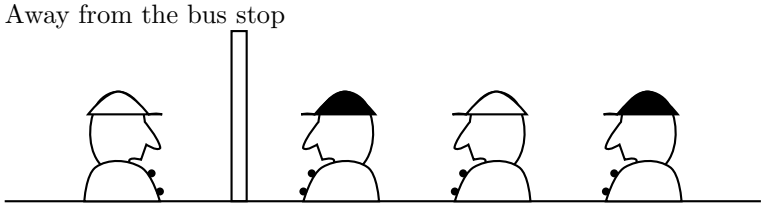
Mathematical miniature number 29: Maths Jam at the bus stop

I read about Maths Jams in the Australian Mathematical Society Gazette, **39** (3), pp 115–118, May 2012. Evidently these meetings of mathematics and puzzle enthusiasts take place in pubs at 7pm on the second to last Tuesday of each month, wherever one happens to be. They began in 2008 in London and have spread at least as far as Australia. I have no idea if they have started up in New Zealand but I may be the first person to organise a Jam at a bus stop. It could be argued that is was not a real Jam because it was not held in a pub, but pubs were certainly mentioned.

It is a corollary of Murphy's Law that I arrive at a bus stop just in time to miss a bus that had come early and that I will have to wait a long time for the next one which is going to be late. On an occasion when this was happening I got my own back on Murphy through an interesting encounter while I was waiting. I couldn't help overhearing two young men talking about something to do with numbers. One of the men was telling the other what he thought was something incredible and that he was sure that it would be a good pick-up line for use in pubs. His friend didn't seem to catch on so he indicated me and said, "Let's try it on this guy". He then asked me to choose a number from 1 to 9 and multiply it by 9, add the digits and then subtract 5. He then claimed to be able to predict my answer.

Well I am too much of a mathematical snob to choose a specific integer so I choose x. Multiplying by 9 gives the two digits $x-1$ and $10-x$ and the rest is easy.

Not to be outdone, I gave him what I thought was a more interesting question and one which I had read about in the Gazette article mentioned above. It was evidently used by the Manchester Jam group and passed on to the Nottingham group. Now many people know the puzzle, but the two young men at the bus stop were not amongst them.



Buried prisoners and their coloured hats, who knows their hat colour?

Four prisoners are buried in sand facing a wall, one on one side and the other three in line on the other side. No one can see past the wall and the three on the same side can only see the prisoners in front of them. Each is wearing a black or white hat as shown in the diagram but they cannot of course see their own hats or the hats of anyone behind them.

They are told that there are, altogether, two white hats and two black hats. They are also assured that they will all be set free if one of them can say what colour his hat is, but, if they fail, they will all be executed. The question is: who solves the problem so that they can all go free.

If you overhear this problem being used as a chat-up line then the chances are that it came indirectly from me at the Jam bus stop.

Feedback on this or any other minature is welcomed. So much so that the NZMS is offering a (Ed: single, we aren't made of money) $20 Amazon book voucher for an interesting comment, such as an answer to the men-in-the-sand puzzle, any of the questions in Miniature 28 or a suitable 13 question to go on a birthday card for a child of that age. Also interesting, and possibly prizeworthy, would be an account of the setting up of your own local Maths Jam and some of the puzzles emanating from it.

LOCAL NEWS continues

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Congratulations to Marco Reale on being promoted to Associate Professor, to Mike Plank on being promoted to Senior Lecturer over the bar, and to Miguel Moyers-Gonzalez on being promoted to Senior Lecturer.

Best wishes go to Mike Steel, Charles Semple and Maarten McKubre-Jordens on their successes in the recent Marsden round. Mike and Charles secured funding over three years for their project "Genetic jigsaws with missing pieces: Mathematical challenges for piecing together evolution from patchy taxon coverage" in the standard category. Maarten was successful with his Fast Start proposal for the three-year project "Non-classical Foundations of Analysis".

Congratulations to Clemency Montelle on the award of a Rutherford Discovery Fellowship with her project "New Perspectives on the History of the Exact Sciences in Second Millennium Sanskrit Sources". This prestigious fellowship is for a five year period and looks at the benefits of historical Mathematics, Astronomy and Science in India.

Despite an intellectual history spanning almost 3,000 years and 30 million manuscripts having been produced over this time, Indias intellectual contribution to science remains largely absent from mainstream historical accounts. Clemencys expertise in ancient languages including Sanskrit, coupled with her mathematical background, will enable her to work with those ancient documents to make them accessible to researchers around the world. With New Zealand seeking to strengthen its relations with India, the ramifications of contributing to that countrys heritage and the accessibility of its historic resources cannot be overestimated. Her project is in line with recent governmental strategies to enhance educational links with India. For example, the Government has welcomed the new NZ-India Research Institute. Also, the India-New Zealand Education Council recently held its inaugural meeting in Delhi to discuss how to boost cooperation between the two countries. In her interview with the UC Communications and External Relations Office, Clemency said that this is a unique opportunity for the University of Canterbury to assume a lead role in such research and she looks forward to forging new and important relationships with key Indian tertiary institutions.

Clemency and Yann-Pierre Montelle also saw the arrival of their first daughter, Aurelie, in September. Well done all round. There are busy years ahead.

In September the department welcomed Ngin-Tee Koh to its continuing staff. Ngin-Tee comes to us from Ohio University. He received his PhD in Mathematics from the University of Illinois at Urbana-Champaign in 2009. His research interests include geometric function theory, harmonic mappings, quasiconformal mappings and quasidisks, complex dynamics, geometric measure theory, summability methods, Tauberian theory and value distribution theory.

The department also saw the arrival of three new PhD sutdents. Abdul Haq cames to us from Pakistan to undertake a PhD in Statistics under the supervision of Jennifer Brown and Elena Moltchanova. Abdul graduated BSc in 2005, MSc (Statistics) in 2007, and MPhil (Statistics) in 2010. His research interests are the development of sampling designs, quality control charts and Bayesian inference. He is currently on study leave from his lecturing position at the Quad-i-Azam University in Islamabad, Pakistan.

Alfadino (Dino) Ali Akbar, from Malaysia, will be undertaking his PhD in Statistics (Extreme Value Theory with application in Finance) under Carl Scarrott. Dino graduated BSc(Hons) in Actuarial Mathematics and Statistics from Heriot Watt University in Edinburgh and MCom in Actuarial Studies from the University of NSW, Sydney. He is also an Associate of the Institute of Actuaries Australia and has had 14 years experience as a manager at the Central Bank of Malaysia and as an Actuarial Consultant in Australia, mostly in the area of regulation, supervision, capital adequacy and risk management of banking and insurance. Dino is married with 5 children and his wife, Mazlina, is currently a PhD student at UCs College of Education. He loves fishing, cooking, travelling and sports activities.

Rachelle Binny, who hails from Scotland, will be undertaking a PhD in Mathematical Biology (Mathematical Modelling of Cell Invasion) under the supervision of Mike Plank and Alex James. Rachelle graduated BSc(Hons) in Mathematical Biology from the University of Dundee in June. Her research interests lie in the application of mathematical modelling to cell biology and cancer. When shes not working, Rachelle enjoys any sport that gets her into the great outdoors, including tramping, skiing and climbing, to mention just a few.

Congratulations to James Dent and Janos Tamas Nemeth who have been awarded UC Doctoral Scholarships. James is a graduate of Canterbury. His

thesis is in the area of Constructive Reverse Mathematics and his co-supervisors are Douglas Bridges and Maarten McKubre-Jordens. Janos is an incoming international student from Hungary. He will be studying History and Philosophy of Science with Clemency Montelle as a co-supervisor.

Best wishes are due to PhD students Shannon Ezzat, Wen Ong and Gloria Teng. Shannon successfully defended his PhD thesis in Auckland on 13 August. With Ben Martin, his supervisor, and Shannon himself both in Auckland, the decision was made to hold the Canterbury oral in Auckland. Thanks go to Steven Galbraith of the University of Aucklands Mathematics Department, who did a fantastic job of representing Canterburys interests.

On 19 October, Wen Ong successfully defended her PhD thesis "Some Basis Function Methods for Surface Approximation". Wens supervisors were Rick Beatson and Chris Price. Since then she has completed the changes to her thesis post her viva and deposited the final version in the library. Wen is now taking up her new lecturing position at the University of Science, Penang.

Gloria Teng has been offered a permanent job as a Lecturer in Data Mining at the Faculty of Engineering and Sciences, University Tunku Abdul Rahman, Kuala Lumpur. The university is 10 years old and has around 21,000 students. Gloria plans to visit Christchurch to defend her PhD in January.

Congratulations to former Honours student Tim Candy, who was awarded a Chapman Fellowship at the Imperial College. Tim began the tenure of the fellowship in October.

Best wishes to Angela and Paul Brouwers on the birth of their son Matthew James in August. Liz Ackerley became a proud grandmother. Her first grandchild, a girl named Zita, was also born in August.

Congratulations to Penelope Goode on obtaining her USAR (Urban Search and Rescue) qualification.

Conferences, workshops, visits and visitors

In November Mike Steel travelled to Europe to present an invited talk at a conference on Phylogenetic Networks, held at the Lorentz Centre in Leiden (Netherlands). The Centre, opened five years ago and hosts interdisciplinary meetings involving a wide range of sciences. Charles Semple also gave an invited talk at this meeting, having flown across from Oxford where he is visiting for the rest of this year. Mike then travelled to Paris where he gave a plenary address at the College de France, at a conference devoted to stochastic modelling in evolution and biodiversity, which had around 200 participants.

Charles reports from the UK that this is his second extended visit to the University of Oxford and he now has a much greater appreciation of how the place works. He says that the university and, more particularly, the colleges, are very supportive of the students. The large number of students at all levels and the relatively small size of the city make for a vibrant community. Currently, hes involved with a 4th year combinatorics course, which even at this level has weekly tutorials of size 10, but, then again, the class does have over 60 students. He says that the weekly combinatorial seminars provide a great focal point for the discrete mathematics academics and their DPhil students.

While in Novosibirsk Siberia, Raaz Sainudiin gave talks "An Auto-validating von Neumann Rejection Sampler: Computer-aided Proofs in Statistical Simulation" at the Constraint Programming and Decision-making Workshop (CoProD2012) on 23 September, and "Arithmetic and Algebra of Mapped Regular Pavings" at the 15th GAMMI-MACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations, SCAN2012, from 23-29 September. He also gave a talk "Posterior Expectation and Minimum Distance Estimation over Adaptive Histograms from Randomized Priority Queues of Statistical Regular Pavings" at the Department of Mathematics, University of Oslo, on 2 October.

Raaz also gave a talk on "Population pedigree process of the Chatham island black robin: A case of human-assisted spread of a maladaptive behavior in a critically endangered bird" at Centre for Mathematics and its Applications, Ecole Polytechnique, Palaiseau, France. He has been awarded a Research Chair in Mathematical Models of Biodiversity held by Veolia Environnement, French National Museum of Natural History, Paris and Centre for Mathematics and its Applications, Ecole Polytechnique, Palaiseau, France during September 2013 to continue research on this pedigree process.

The Intervals Pavings and Applications workshop was successfully organized by Luc Jaulin (ENSTA, Brest), Raazesh Sainudiin (Canterbury, NZ), and Warwick Tucker (Uppsala, Sweden) in Uppsala from 15-17 October 2012. The workshop brought together 15 invited speakers from France, Germany, Poland, Sweden and USA and facilitated interactions between mathematicians, statisticians and engineers. Topics ranged from existence proofs of PDEs by a harmonic analyst to fuel-optimized ren-

dezvous in space by an engineer form the European Space Agency. He also gave a talk on "Arithmetic and Algebra of Mapped Regular Pavings" at the 15th GAMM-IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations, SCAN2012, September 23-29 2012, Novosibirsk, Siberia, Russia, September 27 2012.

The Canterbury Statistics Open Day was held on 2 November with about 60 people attending from different Canterbury-based organisations, including Otago Medical School, Statistics NZ, Lincoln University, Plant and Food Research, and private companies. It was good to see so many from other departments at UC attending. There were about 15 postgraduate students from our department and others. The talks were all interesting and quite varied. Jan Evans-Freeman and Jennifer Brown opened the day. Thomas Lumley from Auckland University was the keynote speaker and the day finished with an excellent talk by Frank Lad. Thank you to Patrick for his organisation and to Peter Jaksons, Irene van Woerden, Sarah, Penny and Pauline for their work. Special thanks go to all members of the Stats Group, especially Jennifer, Marco and Carl for their valuable support and assistance. Alasdair Noble was another one of the organisers (and first suggested the day). The event was jointly funded by Plant and Food Research and the College of Engineering.

John Hannah spent a week in Israel at the 16th Haifa Matrix Theory conference (Technion - Israel Institute of Technology, Haifa, November 12-15, 2012). This year, for the first time, the conference had a session devoted to the teaching of linear algebra and two New Zealanders (myself and Sepideh Stewart from Auckland) were invited to speak at it. John treated them to an account of his use of MATLAB experiments and report writing, which generated interesting discussions and several requests for more details. John says that the most intriguing talks for him were about the use of a generalized singular value decomposition both to analyze phylogenetic trees and to search cancer patient databases for clues to a possible cure. And a possible sign for the future was the number of participants (including Jeff Hunter from Massey and AUT) who had officially retired but were pursuing flourishing research careers.

PhD student Rosalie Hosking has been in Japan for most of the past 3 months on a research visit and has been photographing Japanese mathematical tablets hung in Shinto shrines. Rosalie reports that Matsuoka Tasaburou created in 1880 an original mathematical tablet dedicated to the Mishima Shrine as a prayer to the gods that his son would develop an interest in mathematics. Local history has it that his son later did become a talented mathematician.

Recent visitors include: Jalilzadeh Aidin (University of Otago), Wim Hordijk (Lausanne, Switzerland), Michael Matschiner (University of Basel, Switzerland), Ana-Maria Magdalina (University of Bucharest, NCRE Visitor), Hajime Ishihara (Erskine visitor, Japan Advanced Institute of Science and Technology), Markus Stroppel (Erskine visitor, Universität Stuttgart), Beata Faller (ANU Canberra), Paulette Lieby (NICTA, Canberra), Robin Havea (Univerity of the South Pacific), Tim Candy (Imperial College, London), Wolfgang zu Castell (Helmholtz Zentrum, Munich), Takako Nemoto (Japan Advanced Institute of Science and Technology), Rainer Löwen (Universität Brauschweig, Germany).

Seminars

Shen Liu (Monash University) "Polarization of forecast densities: a new approach to multivariate time series classification"

Sha (Joe) Zhu (University of Canterbury) "Computing Gene Tree Probabilities and Simulating Genealogies within Species Networks"

Katherine Horak (Fulbright Scholar) US Department of Agriculture "Monitoring Anticoagulant Residues in the Environment and Reducing Pesticide Impacts by Optimising Pesticide Usage"

Nuttanan Wichitaksorn (University of Sydney) "A Generalized Class of Skew Distributions and Parametric Quantile Regression Models"

Wen Eng Ong (University of Canterbury) "Some Basis Function Methods for Surface Approximation"

Qui Bui (University of Canterbury) "From Fourier to Wavelet Analysis"

Michael Plank (University of Canterbury) "So Long, and Thanks for all the Fish"

Rua Murray (University of Canterbury) "Stable Leaves, Probability and Falling into Holes"

Markus Stroppel (Visiting Erskine Fellow, Universität Stuttgart) "The Most Homogenous Groups"

Jennifer Brown (University of Canterbury) "Adaptive Sampling: How to Sample only the Good Stuff"

John Hannah (University of Canterbury) "Quest for Engagement"

James Dent (University of Canterbury) "Anti-Specker Properties in Constructive Reverse Mathematics"

Volker Nock (Department of Electrical and Computer Engineering, University of Canterbury) "Applied Maths in Microfluidics"

Günter Steinke

MASSEY UNIVERSITY

Institute of Information and Mathematical Sciences (IIMS), Albany

The College of Sciences at Massey University will be restructured into five units on January 1, 2013. The mathematics group at Albany will transfer to the new Institute of Natural and Mathematical Sciences along with biologists, chemists, computer scientists, physicists and statisticians. It will be headed by Gaven Martin, and Marti Anderson will be the Deputy Head of Institute.

Gaven Martin has been awarded a Marsden Grant of $615,000 over three years for the project Modern Analysis and Geometry.

Carlo Laing has been promoted to Associate Professor. Alona Ben-Tal and Winston Sweatman gained promotions within their current grades.

Winston Sweatman has succeeded Graeme Wake as the Director of the Centre for Mathematics-in-Industry effective from July 2012. Graeme served previously in the role for six and a half years.

The IIMS Postgraduate Conference was held on October 26. It featured talks and posters presented by graduate students from mathematics, statistics, computer science and information technology. In addition to the high quality of work being presented, a pleasing feature of the conference was the return of the chocolate fountain as part of the afternoon tea. Andrea Babylon received a prize for best mathematics talk and Graeme O'Brien was runner up. Lynette O'Brien received the award for best overall poster.

Winston Sweatman spent 5 weeks in Europe during July and August. He started and finished his trip with weeks working on Stellar Dynamics problems with colleagues in Scotland. In the middle of the trip, he attended the European Conference on Mathematics for Industry at University of Lund in Sweden and presented a talk: "Pollutant transport and its alleviation in groundwater aquifers" on collaborative research with Amjad Ali and Robert McKibbin. In between these activities, Winston climbed Kebnekaise (the highest mountain in Sweden) and watched judo at the London Olympics.

In August Alona Ben-Tal travelled to the small town of Almelo, Holland where she participated and presented a poster at the 12th Oxford Conference on Breathing, Emotion and Evolution. She also attended and presented a poster at the 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, San Diego, 28 Aug–01 Sep 2012.

In September Graeme Wake was a short-term invited visitor at his other home, the Oxford Centre for Collaborative Applied Mathematics (OCCAM), in September, working with Professor Helen Byrne on cancer cell growth. He and Lil enjoyed stopovers in Hong Kong (Kowloon) and Germany (Frankfurt) en route. Sailing down the Rhine river was a highlight.

Graeme has been (re)appointed as a Principal Investigator of the revamped Centre of Research Excellence (CoRE) "Gravida, National Research Centre for Growth and Development". Massey University is one of the seven partner national institutions in Gravida which is based at the Auckland Medical School. He is part of a group in Quantitative Methods based there. He continues as an an Associate Investigator in the Riddet (Food) CoRE.

Carlo Laing spent the last week of August visiting the Weierstrass Institute in Berlin, where he gave a seminar and continued his collaboration with the laser dynamics group. He then moved on to Gothenburg, Sweden, where he was an invited speaker at the 32nd Dynamics Days Europe meeting. Carlo was an invited speaker at a workshop on Mathematical Challenges in Neural Network Dynamics, held at the Mathematical Biosciences Institute in Columbus, Ohio, during October, where he spoke about his Marsden-Funded work on the respiratory neural network. Carlo was also a plenary speaker at BrainModes 2012, held at the Queensland Institute of Medical Research (Brisbane) in early December.

Robert McKibbin gave an invited Keynote Lecture in the Forum "Math-for-Industry 2012: Information Recovery and Discovery" (FMI2012) held at the International Congress Centre in Fukuoka during October. Robert's talk, "Industrial Mathematics adventures in the South-West Pacific" described how our ANZIAM MISG's work, and also a few interesting projects that have been dealt with in them. Professor Masato Wakayama, Director of the Institute of Mathematics-for-Industry (IMI), Kyushu University, and also the Programme Leader

of the Global COE Program
"Education-and-Research Hub for Mathematics-for-Industry", which has been sponsored over the period 2008–2012 by MEXT (the Japan Ministry of Education, Culture, Sports, Science and Technology), had visited the Albany Campus early this year, to discuss, with members of the Centre for Mathematics in Industry (CMI) here in IIMS, possibilities for the establishment of an Asia-Pacific Consortium for Mathematics-for-Industry (APCMI). Participation in FMI2012 was seen as a useful step towards establishing closer relationships with Asian and other Pacific-rim countries active in Industrial Mathematics initiatives. Our CMI has already been working towards such relationships with IM people in Thailand, Korea, Brazil and China. Members of our centre for Mathematics-in-Industry have been to these countries in the last two years to assist with developments there.

Annalisa Conversano, Shaun Cooper, Frederick Lam and Yow Tzong Yeh were nominated for the Albany Students' Association's Lecturer of the Year (LOTY) award and Shaun received the Lecturer of the Year Award.

Robert and two of his postgrads, Amjad Ali and Andrea Babylon, took part in the 23rd International Symposium on Transport Phenomena (ISTP23) at the University of Auckland in November. Amjad and Robert gave talks on aspects of flow in porous media, while Andrea presented a poster on sedimentation in lakes.

Ali Ashher Zaidi has begun his PhD from July on the Mathematics of Cell-growth under the supervision of Graeme Wake and Bruce van-Brunt (IFS). He is funded by the government of Pakistan under their HEC-scheme.

A number of Summer Scholarship students are doing some research in the Institute over the summer months: Joshua Duley (modelling volcanic eruptions), Aimee Harris (using recorded air pollution data to estimate turbulence length scales) and Poyan Nikrou (analysing geyser datalogger Recordings—a Waikato Regional Council project) are all working with Robert McKibbin.

Seminars:

Amjad Ali , Mathematical Modelling of Pollutant Transport in Groundwater Aquifers

Andrea Babylon , Mathematical Modelling of Sedimentation in Rivers

Ken Hawick , Domain-Specific Languages - a faster way of programming for scientific applications?

Chris Scogings , An Agent-Based Model of the Battle of Isandlwana

Daniele Valtorta (Università degli Studi di Milano), Critical Sets of Harmonic Functions

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

Michael Hendy was awarded the 2012 Shorland Medal of the New Zealand Association of Scientists for "an outstanding body of research into mathematical phylogeny — the set of mathematical tools for reconstructing evolutionary relationships between species using DNA sequences". The Shorland Medal is awarded in recognition of major and continued contribution to basic or applied research that has added significantly to scientific understanding or resulted in significant benefits to society.

David Bryant and Matthew Parry, together with colleagues from physics, have been awarded an interdisciplinary grant of almost 4 million dollars over 5 years from the Ministry of Business, Innovation and Employment for their project "Sensors for Agritech using Sequential Inference". The aim of the research is to embed sophisticated mathematical algorithms into existing and inexpensive hardware systems in order to develop innovative agritech sensors. This will offer new export opportunities to NZ-based agritech manufacturers.

Robert Thompson and Jörg Hennig have been awarded Marsden Fund Fast-Start Grants. Robert's project is "Transformation optics: the science of cloaking" and Jörg's is "Causality and cosmological models in general relativity".

Jörg Frauendiener gave a talk on "Numerical space-times at space-like and null infinity" at the Spanish Relativity Meeting in Guimarães, Portugal, from 3-7 September. Furthermore, Jörg spent some time in France and Germany for research visits.

Lisa Clark attended the Workshop on Applications to Operator Algebras in Toronto, Canada, from Sept 10-14.

John Harraway spoke at BIT's 1st International Foods Conference in Shenzhen, China, 1st to 3rd November, on the trace element analysis of ginseng samples. In mid September he spoke at the Conference of the International Association for Official Statistics in Kiev, Ukraine, on post graduate training in Official Statistics.

Mihály Kovács spent a month in Germany for a research visit at the Technical University of Dresden from November 20 to December 22.

Iain Raeburn attended the Workshop on Operator algebras and time-frequency methods at the Erwin Schrödinger International Institute for Mathematical Physics (ESI) in Vienna, Austria, from 19-23 November. Iain gave a talk entitled "Equilibrium states on operator-algebraic dynamical systems".

The Department hosted the annual meeting of the New Zealand Statistical Association on 28-30 November with more than 120 participants. The department's David Bryant, Austina Clark, Tilman Davies, David Fletcher, Peter Green, John Harraway, Daniel Turek and Janine Wright gave talks, and Matt Parry and Jimmy Zeng presented posters.

David Fletcher took part in a Shark Population Modelling Workshop, organized by the National Oceanic and Atmospheric Administration in the United States. The three-day workshop was held in San Diego, California in early December.

Boris Baeumer, Florian Beyer, Astrid an Huef and Iain Raeburn attended the NZMS Colloquium in Palmerston North from 4-6 December. Astrid gave the plenary lecture "Algebraic systems of isometries", Boris talked about "Markovian subordination for fractional Cauchy problems", Florian's talk was entitled "AVTD solutions of Einstein's field equations" and Iain's was "Self-similar groups".

Tilman Davies attended the 2012 meeting of the Australian and New Zealand Association of Clinical Anatomists (ANZACA), which was this year combined with the meeting of the Australasian Institute of Anatomical Sciences (AIAS), in New South Wales, Australia, from 9-11 December. Tilman talked about "Development of a novel statistical method to test spatial distributions of skeletal muscle fibre types".

Visitors

Visitors over the last few months have been Christian Klein (University of Burgundy), Simone Linz (University of Tübingen), and Adam Sierakowski (University of Wollongong).

Seminars

Robert Aldred "The cycle extension property in graphs"

Mike Paulin (Department of Zoology) "Design for agility in animals and machines"

Steffen Klaere (University of Auckland) "Do your data fit your phylogenetic tree?"

David Fletcher "StatChat: Bayes, asymptotics, simulation and the bootstrap"

Phil Weir "Sea ice: painting by numbers"

Peter Fenton "Wiman-Valiron Theory"

Fabien Montiel "The hydroelastic tale of two ice floes"

David Bryant "A full likelihood analysis of SNP data from multiple populations"

Gerrard Liddell "Visualization of group theory and tensors"

Maths & Stats Honours project presentations

John Clark "Rings with small homological dimension"

Joseph Heled (University of Auckland) "Sequence diversity under the multispecies coalescent"

Adam Sierakowski (University of Wollongong) "Non-amenable exact groups and classification of C*-algebras"

Tamlin Conner (Department of Psychology) "Tracking experience over time using mobile technology: strategies and pitfalls for analysing data"

Tilman Davies "A systematic comparison of second-order parameter estimation techniques for the stationary log-Gaussian Cox process"

Christian Klein (University of Burgundy, France) "Computational approach to Riemann surfaces"

Zoé van Havre (Queensland University of Technology and Université Paris-Dauphine) "Investigating the number of components in overfitted Gaussian mixture models"

Jörg Hennig

UNIVERSITY OF WAIKATO

Department of Mathematics

Applications have recently closed for a continuing Senior Tutor position in the department. We hope to make an appointment in time for Semester A teaching next year. A position still available is a

fixed term two-year postdoctoral research fellowship. The closing date for this position is 31 January 2013. For those more statistically-minded, the Department of Statistics is currently looking for a new lecturer, again with a closing date of 31 January.

Ian Hawthorn and Stephen Joe attended this year's Colloquium at Massey University in Palmerston North. The department will be hosting next year's Colloquium and plan to hold it in the first week of December on the Tuesday to Thursday (as it was this year). However, participants will have to forego the delights of Hamilton as the plan is to hold it in Tauranga.

In October, Daniel Delbourgo visited the University of Auckland where he presented a seminar titled 'How fast do Mordell-Weil ranks grow?'. In mid-December, he will be going to Victoria University of Wellington to participate in a Workshop on Algebraic Number Theory. This workshop is concerned with developments in Iwasawa theory and related areas. Daniel will speak there on 'Congruences between Hasse-Weil L-functions'.

There are a number of members of the department overseas at the current time. In fact, there were so many that the department Christmas lunch had to be held in November. Sean Oughton is in Europe as part of his study leave. Tim Stokes visited Perth for a week in November, but has now gone across the ditch again to spend over a month in Hobart. Also in Australia is Nick Cavenagh who has or will be spending time in Sydney, Melbourne, and Brisbane. Ernie Kalnins is away on a trip to Russia and the USA.

The air is still alive with the sounds of construction next door. However, it should all be finished by the end of January next year. *Seminars*

P. Noble (University of Sydney), "A Bayesian method for forecasting solar cycles using a Fokker-Planck equation".

W.H. Ng, "Defining sets for 4-cycle decompositions of complete bipartite graphs".

W.C. Lim, "BKL singularity, spikes and inhomogeneous cosmology".

R. Delbourgo (University of Tasmania), "The big physics questions — Some answers".

D. Delbourgo, "How fast do solutions to polynomial equations grow?".

Stephen Joe

FEATURES

NZMS awards

The 2012 NZMS Research Award went to both Ben Martin and to Tom ter Elst.

The Research Award recognises Ben Martin's outstanding and broad contributions to algebra including the application of geometric invariant theory to algebraic groups, the geometry of spherical buildings, and the representation growth of groups.

The Research Award recognises Tom ter Elst's deep and sustained contributions to the analysis and understanding of elliptic operators, and associated evolution processes. Especially notable are his contributions to Riesz transforms, the treatment of operators on Lie groups, and outstanding recent work on degenerate operators.

The 2012 NZMS Early Career Award went to Mark Holmes.

The Early Career Award recognises Mark Holmes early career excellence which has seen him rapidly become a world expert in the theory of random walks, and in the analysis of high-dimensional models in statistical physics.

The 2012 Aitken Prize for Best Student Paper went to Stefanie Hittmeyer of the University of Auckland, for her paper entitled Untangling Wild Chaos; and to Jennifer Creaser of the University of Auckland, for her paper entitled The Lorentz System Near the Loss of the Foliation Condition.

Book prizes were awarded to John Butcher, Luke Fullard and Hinke Osinga for their concepts for a Talking Heads topic.

Jiling Cao of the Auckland University of Technology was presented with his Fellowship of the NZMS at the Colloquium.

The NZIMA: 2002–2012

This is a brief item officially reporting the end of the New Zealand Institute of Mathematics and its Applications (the NZIMA).

The NZIMA was established in 2002 as one of the five NZ Centres of Research Excellence (CoREs) successful in the first CoRE selection round in 2001/02. As a joint venture between the University of Auckland (as host) and the NZMRI, it was awarded CoRE status and funding for a six-year period from 2002 to 2008, and a smaller amount for another three-year period from 2008 to 2011.

The initial aims of the NZIMA were to create and sustain a critical mass of researchers in concentrations of excellence in mathematics and statistics and their applications, to provide NZ with a source of high-level quantitative expertise across a range of areas, to act as a facilitator of access to new developments internationally in the mathematical sciences, and to raise the level of knowledge and skills in the mathematical sciences in NZ.

Modelled on similar mathematical research institutes overseas, the NZIMA's principal activities included supporting 17 short-term programmes across a range of thematic areas, as follows:

- Modelling Cellular Function
- Numerical Methods for Evolutionary Problems
- Logic and Computation
- Phylogenetic Genomics
- Combinatorics and Applications
- Dynamical Systems and Numerical Analysis
- Geometry: Interactions with Algebra and Analysis
- Hidden Markov Models and Complex Systems
- Math Models for Optimizing Transportation Services
- Geometric Methods in the Topology of 3-Manifolds
- PDEs: Applications, Analysis and Inverse Problems
- Modelling Invasive Species and Weed Impact
- Applications of Mathematics in the Nanosciences

- Algorithms: New Directions and Applications
- Conformal Geometry and Applications
- Energy, Wind and Water
- Senior Secondary and Undergraduate Mathematical Science in NZ.

In these programmes and through other specific initiatives, the NZIMA supported a large amount of research as well as conferences and workshops, postdoctoral/postgraduate researchers, invited experts, and postgraduate research students, right across the country. In total, the NZIMA supported 72 students, 21 postdoctoral fellows, 19 Maclaurin Fellows (seven NZ-based, and 12 from overseas), numerous other visitors, and over 30 conferences and workshops.

In addition, the NZIMA initiated a number of outreach activities, notably the colourful *NZ-IMAges* bulletin, produced twice-yearly for distribution to all universities and all secondary and intermediate schools in NZ, showcasing activities in the mathematical sciences, and *MathsReach* (www.mathsreach.org), a web-based resource for schools and other interested parties, including video interviews with mathematical scientists, glossy articles from *NZ-IMAges*, and other information.

There is no doubt that the NZIMA did a lot for the mathematical sciences and related fields in NZ, and helped lift research in these areas to a new level. For more details, see www.nzima.org.

Naturally we were very disappointed when the NZIMA's bid for continued CoRE status in 2006/07 did not succeed. The reasons are still difficult to fathom, but it is clear that in the end, more weight was given to things like public image and medial profile, cohesion and synergies, and perceived wider benefits, with rather little attention paid to research excellence. Indeed the NZIMA has outscored most other CoREs on several performance measures, bringing the 2006/07 selection process and outcome even further into question.

In the end, however, we had little choice but to live with the decision, and learn from the experience. It may still be possible for a case to be made for a new CoRE in the mathematical sciences some time in the future, but it is widely believed that the name, aims, focus and structure of any such new entity would need to be quite different from the NZIMA. In March this year, with funding running out, the NZIMA's Governing Board decided to disestablish the NZIMA completely.

We would like to take this opportunity to thank all of those people in the mathematical sciences in New Zealand who were involved with the NZIMA in various ways – its establishment, governances, programmes and other activities. We would also like to pay special tribute to Margaret Woolgrove, who served the NZIMA so well as its Research Manager, and helped us launch *NZ-IMAges* and *MathsReach*.

Marston Conder and Vaughan Jones

Conferences

Fluids in New Zealand (FiNZ) 2013

Fluids in New Zealand is a new research workshop and forum for discussing fluid mechanics in the broadest sense. FiNZ 2013 will take place at the University of Canterbury ⟨http://www.canterbury.ac.nz⟩ from Wednesday 30th January to Friday 1st February 2013.

The format will have both expository plenary talks and shorter workshop-style talk sessions, with time and space allocated for break-out discussion. The idea is to mix experienced researchers with research students, structured talks with free discussion, and experimentalists with theorists and numericists.

The confirmed plenary speakers are Prof Leslie Yeo⟨http://leslieyeo.tumblr.com/⟩ (RMIT), Prof Jim Denier⟨http://homepages.engineering.auckland.ac.nz/%7Ejden259/Jim/Home.html⟩ (Auckland), Dr Teo Burghelea⟨http://www.complexfluids.eu/Rheology_and_Hydrodynamics_of_Complex_Fluids/Home.html⟩ (Laboratoire de Thermocinetique, CNRS, University of Nantes), and Dr Stephane Popinet⟨http://gfs.sourceforge.net/wiki/index.php/User:Popinet⟩ (NIWA).

No peer-reviewed abstracts or papers will be published, but it is the Organizing Committee's hope that FiNZ 2013 will enhance attendees' research in and passion for fluid dynamics. Research students are especially encouraged to attend.

You are cordially invited to register your attendance⟨http://www.math.canterbury.ac.nz/finz2013/reg.shtml⟩. Registration is free.

Organizing committee:

- Dr Phil Wilson⟨http://www.math.canterbury.ac.nz/%7Ep.wilson/⟩ (UC, Mathematics & Statistics) email⟨mailto:phillip.wilson@canterbury.ac.nz⟩;
- Dr Miguel Moyers Gonzalez⟨http://www.math.canterbury.ac.nz/%7Em.moyers-gonzalez/⟩ (UC, Mathematics & Statistics) email⟨mailto:miguel.moyersgonzalez@canterbury.ac.nz⟩;
- Dr Mathieu Sellier⟨http://www.mech.canterbury.ac.nz/people/sellier.shtml⟩ (UC, Mechanical Engineering) email⟨mailto:mathieu.sellier@canterbury.ac.nz⟩.

The Second Pacific Rim Mathematical Association (PRIMA) Congress

will be held at Shanghai Jiao Tong University in China, on June 24-28, 2013.

PRIMA is an association of mathematical sciences institutes, departments and societies from around the Pacific Rim, established in 2005 with the aim of promoting and facilitating the development of the mathematical sciences throughout the Pacific Rim region.

See http://www.math.sjtu.edu.cn/Conference/prima/

The ANZIAM 2013 Conference

will be held Sunday 3rd FebruaryThursday 7th February 2013 at the Newcastle Town Hall, Newcastle, NSW.

The annual conference of ANZIAM is an established gathering of applied mathematicians, scientists and engineers, which will be hosted by the NSW Branch in 2013. The host city of Newcastle is only two hours north of Sydney, and the venue is the Newcastle City Hall, centrally located close to transport, beaches and restaurants.

See http://www.anziam.org.au/Events

Doom 13: The Interface of Mathematics and Biology

- The 17th Annual New Zealand Phylogenomics Meeting

Date: Sunday 3rd - Friday 8th February 2013

Location: Mount Ruapehu, New Zealand

Enquiries: Email mailto:G.C.Gibb@massey.ac.nz or mailto:S.F.Hills@massey.ac.nz

Website: http://www.math.canterbury.ac.nz/bio/events/doom13/

Cass 2013: Networks of life

Date: Sunday 17th - Monday 25th February, 2013

Location: Cass Field Station, Arthur's Pass, New Zealand

Enquiries: Email mailto:mike.steel@canterbury.ac.nz

Website: http://www.math.canterbury.ac.nz/bio/events/cass/

Job Notices

PhD scholarship

Applications are invited for a fully-funded PhD scholarship on the Marsden Fast-Start project

Non-classical Foundations of Analysis

The project seeks to formulate and understand new mathematical models of the continuum using non-classical logics. The main thrust of the project will be to use paraconsistent logics to explore properties of sets, sequences, functions and continuity, and to prove interesting theorems that are classically hidden by inconsistency.

The successful applicant will carry out doctoral study at the Department of Mathematics, University of Canterbury, New Zealand. The topic of the thesis is flexible within the parameters of the project; the appointment is for three years.

For details and how to apply, see the project website:

http://www.math.canterbury.ac.nz/~m.jordens/NCFA/

Informal queries should be directed to the project co-ordinator (e-mail: maarten.jordens@canterbury.ac.nz).

The University of the South Pacific
Faculty of Science, Technology and Environment
School of Computing, Information and Mathematical Sciences -FMA096

The School of Computing, Information and Mathematical Sciences is one of the largest schools in the University of the South Pacific and is sufficiently resourced to pursue excellence in teaching and research. The School offers undergraduate and postgraduate programs in Computing Science, Information Systems, Mathematics and Statistics. Applications are invited for a temporary Lecturer/Assistant Lecturer position to assist in the delivery of undergraduate and postgraduate courses in the areas of Mathematics.

The Opportunity In this role, your responsibilities will include coordinating, teaching, marking and assessment of relevant programmes at all levels (undergraduate and postgraduate) and a range of topics in the mathematics discipline (including some statistics). In this position, you will also be expected to contribute to the development of course material and conduct research and consultancies.

The Person We Seek

To be considered for appointment as Assistant Lecturer, applicants must have a good undergraduate degree in Mathematics and a Masters in a relevant area with either a formal tertiary qualification or an aggregate of 12 months teaching experience.

To be considered for appointment as Lecturer, applicants must have a PhD in a relevant area with good relevant tertiary (normally an aggregate of four years) teaching experience, and a good research and publication record. All applicants must have:

- The ability and willingness to teach a range of standard topics in the mathematics discipline (including some statistics)
- The ability and willingness to undertake research
- The ability to work collaboratively with colleagues
- Excellent English written and oral communication skills

The level of appointment will depend on qualifications and experience

Remuneration

This position is available for a fixed term of 1 year.

Salary Range:	Lecturer	F$59,813 to F$78,700 per annum
	Asst Lecturer	F$48,388 to F$58,066 per annum
		(Inclusive of 15% Gratuity)

In addition to the above benefits, the University contributes 10% of basic salary to an approved superannuation scheme, provides airfare and relocation costs where appropriate.

Enquiries: Dr. MGM Khan; ph: 32 32507; email: mgm.khan@usp.ac.fj⟨mailto:mgm.khan@usp.ac.fj⟩

Closing date for applications 28th December 2012

How to Apply Human Resources Office, ph: (679) 32 32072; email: ⟨mailto:hrhelp@usp.ac.fj⟩ or ⟨urlmailto:personnel@usp.ac.fj⟩ Candidates are strongly encouraged to use the University's on-line E-Recruitment system to view further details and apply for this position at www.usprecruits.usp.ac.fj/applicants/Central?quickFind=51488

Applicants can also submit two hard copy applications by post to The Recruitment Manager, The University of the South Pacific, Private Mail Bag, Suva, Fiji or at any of the University's campuses throughout the region and at the Human Resources Office on Laucala campus.

Please include the following documents in your application: Cover letter and Resume clearly addressing key Selection Criteria, and three reference names and contacts, one of which must be your current or most recent direct professional supervisor.

THE NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

APPLICATION FOR FINANCIAL ASSISTANCE

Please fill in where appropriate

Name of Applicant: .....
Address: .....
.....
.....
email: .....

Academic Affiliation / Official Status / Present Position:
.....

NZMS Status: Ordinary member ..... Student member .....
Date membership started.....

Signature: ..... Date: .....

Type of assistance sought — Amount

(a) Student Travel Grant .....
(b) Research Grant: conference/travel/other .....
(c) Grant from South Pacific Fund .....
(d) Conference/Workshop Organisation .....
(e) Other (please specify below) .....
.....

Please outline the purpose of this application and how you intend to use the funds (include any appropriate dates)

.....
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.....
.....

Estimated total expenditure (please include a breakdown of this expenditure, e.g. conference fees, travel accommodation, etc)

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Other sources of assistance sought/approved:

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List all previous support of this kind you have received from the NZMS in the past five years. (Please note that the society has a total funding cap of $1000 per application)

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Please attach and include the following supporting evidence to your application:

- For student applicants, a brief supporting statement from your supervisor outlining the relevance of the activity to your studies.
- For non-student applicants, a brief statement of support from your Head of Department.
- A statement outlining the benefit of the activity for which funds are being sought (this must be written by the applicant).
- Quotes for flights and accomodation if these are included in the total expenditure.
- Conference details if this application is supporting attendance at a conference including details of any presentation (oral or poster).

Applications without **all** the supporting material will be returned and not considered.

Please email your complete application as a single pdf file to the NZMS secretary alex.james@canterbury.ac.nz. Alternatively you may send a hard copy to:

Dr Alex James, Secretary, NZ Mathematical Society,
Dept of Maths and Stats
University of Canterbury,
Private Bag 4800,
Christchurch.

The NZMS Council normally considers these applications at its meetings in June and December each year.

Application for membership of the NZMS

The New Zealand Mathematical Society (Inc.) is the representative body of professional mathematicians in New Zealand, and was founded in 1974. Its aims include promotion of research and education in the mathematical sciences, the development, application and dissemination of mathematical knowledge within New Zealand, and effective cooperation and collaboration between mathematicians and their colleagues in New Zealand and in other countries.

Membership categories:

Ordinary*	$69.50 p.a.	(Full details at nzmathsoc.org.nz)
Reciprocal	$34.75 p.a.	

For overseas residents who are fully paid-up members of societies with which the NZMS maintains a reciprocity agreement (the American Mathematical Society, the Australian Mathematical Society, the Canadian Mathematical Society, the Edinburgh Mathematical Society, the Irish Mathematical Society, the London Mathematical Society, and the Mathematical Society of Japan).

Student*	$13.90 p.a.	For currently enrolled students in NZ
Overseas student	$34.75 p.a.	For currently enrolled students overseas

(15% GST is added to rates for NZ residents.)

* The Society offers NZ students and new staff a special free one-year membership

When paying their subs, members can also:

- elect to make a donation to the NZMS Endowment for Student Support
- pay their ANZIAM subs of $16 ($8 for students)

Please complete below and mail to:

John Shanks, NZMS Membership Secretary, Department of Mathematics and Statistics, University of Otago, P.O. Box 56, Dunedin 9054, New Zealand

or Fax: +64 (3) 479 8427

E-mail: jshanks@maths.otago.ac.nz

NZMS Application Form

Name: _____ Title: _____

Address: _____

_____

_____

An institutional address is preferred

E-mail: _____

Membership category: ☐ Ordinary ☐ Reciprocal ☐ Student ☐ Overseas student

If Reciprocal then complete this: *I am a fully-paid up member of* _____

☐ I am/wish to be a member of ANZIAM and pay its fees at the same time.

Signed: _____ Date: _____

Please send no money now. You will be invoiced once your application is accepted.

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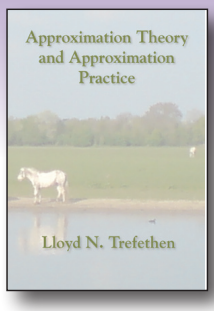

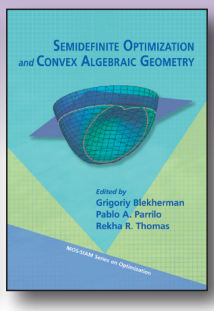

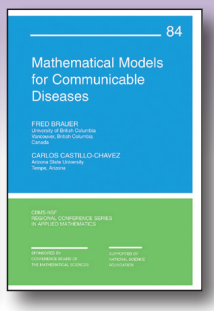

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In a book that will appeal to beginners and experts alike, Nick Trefethen presents approximation theory using a fresh approach. This is a textbook on classical polynomial and rational approximation theory for the 21st century. It uses Matlab® to teach the field's most important ideas and results and differs fundamentally from other works on approximation theory in a number of ways: its emphasis is on topics close to numerical algorithms; concepts are illustrated with Chebfun; and each chapter is a PUBLISHable Matlab M-file, available online.

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Semidefinite Optimization and Convex Algebraic Geometry

Edited by Grigoriy Blekherman, Pablo A. Parrilo, and Rekha R. Thomas

MOS-SIAM Series on Optimization 13

A self-contained, accessible introduction to the mathematical advances and challenges resulting from the use of semidefinite programming in polynomial optimization. Each chapter addresses a fundamental aspect of this quickly evolving research area. The book begins with an introduction to nonnegative polynomials and sums of squares and their connections to semidefinite programming and quickly advances to several areas at the forefront of current research.

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Fred Brauer and Carlos Castillo-Chavez

CBMS-NSF Regional Conference Series in Applied Mathematics 84

This graduate-level monograph appeals to readers interested in the mathematical theory of disease transmission models. It is self-contained and accessible to readers who are comfortable with calculus, elementary differential equations, and linear algebra. The book provides insight into modeling cross-immunity between different disease strains and the synergistic interactions between multiple diseases; diseases transmitted by viral agents, bacteria, and vectors (e.g., mosquitos transmitting malaria to humans); and both epidemic and endemic disease occurrences.

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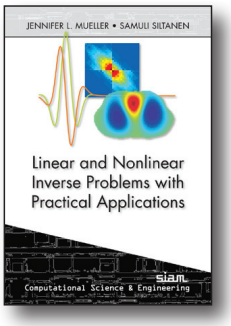


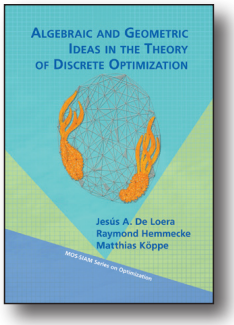
Linear and Nonlinear Inverse Problems with Practical Applications

Jennifer L. Mueller and Samuli Siltanen

Computational Science and Engineering 10

This book explains how to identify ill-posed inverse problems arising in practice and how to design computational solution methods for them. It explains computational approaches in a hands-on fashion, with related codes available on a website, and it serves as a convenient entry point to practical inversion. The book is well-suited for students in mathematics, engineering, physics, or computer science who wish to learn computational inversion (inverse problems). Professors will find that the exercises and project work topics make this a suitable textbook for advanced undergraduate and graduate courses on inverse problems.

2012 • xiv + 351 pages • Softcover • 978-1-611972-33-7
List $84.00 • SIAM Member $58.80 • CS10



Algebraic and Geometric Ideas in the Theory of Discrete Optimization

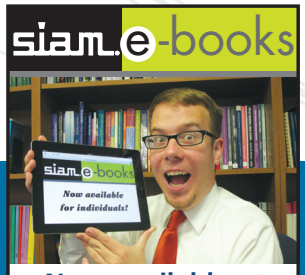
Jesús A. De Loera, Raymond Hemmecke, and Matthias Köppe

MOS-SIAM Series on Optimization 14

This book presents recent advances in the mathematical theory of discrete optimization, particularly those supported by methods from algebraic geometry,commutative algebra, convex and discrete geometry, generating functions, and other tools normally considered outside the standard curriculum in optimization. It offers several research technologies not yet well known among practitioners of discrete optimization, minimizes prerequisites for learning these methods, and provides a transition from linear discrete optimization to nonlinear discrete optimization.

2012 • xx + 322 pages • Softcover • 978-1-611972-43-6
List $109.00 • SIAM/MOS Member $76.30 • MO14

All prices are in US dollars.



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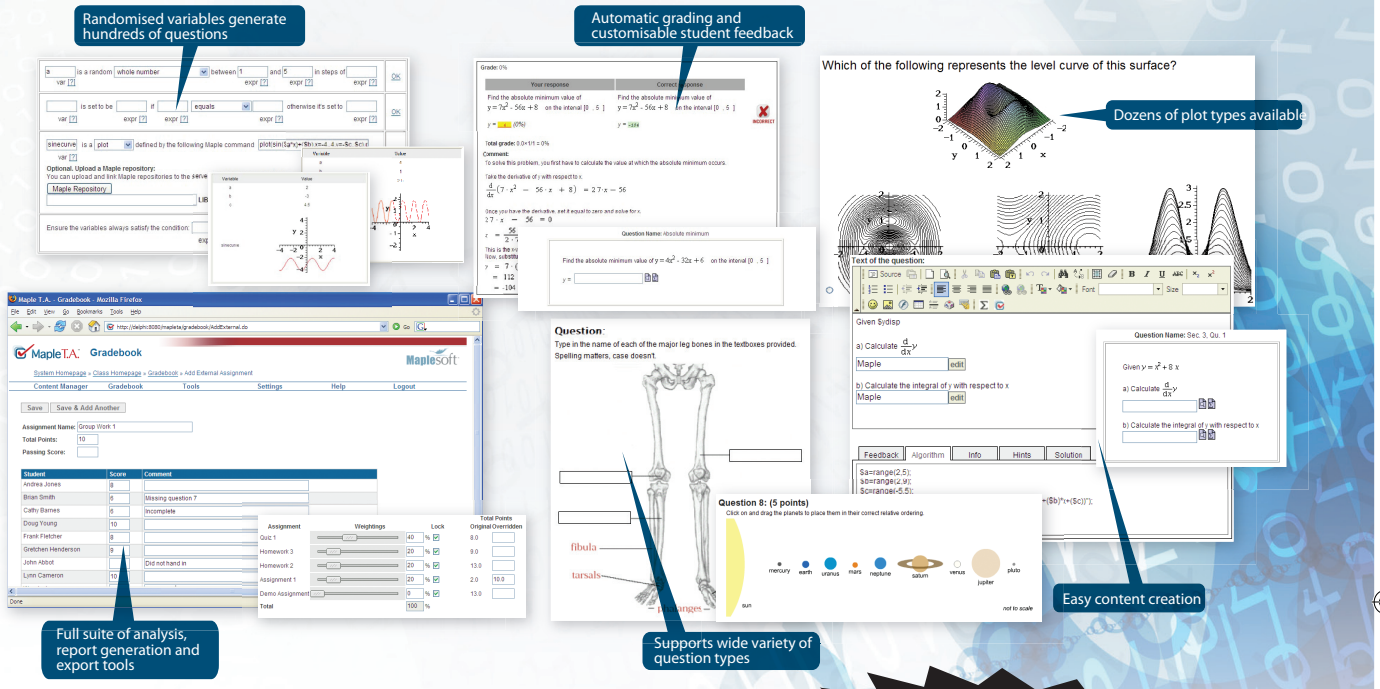

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Department of Mathematics & Statistics
University of Canterbury

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