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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

Contents

PUBLISHER'S NOTICE

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The New Zealand Mathematical Society,
c/- The Royal Society of New Zealand,
P.O. Box 598, Wellington, New Zealand.

However, correspondence should normally be sent to the Secretary:

Dr Alex James
Department of Mathematics and Statistics
University of Canterbury
Private Bag 4800
Christchurch 8140
New Zealand
a.james@math.canterbury.ac.nz

NZMS Council and Officers

Newsletter Correspondents

Web Sites

The homepage of the New Zealand Mathematical Society is:
http://nzmathsoc.org.nz/ (Webmaster: bbaeumer@maths.otago.ac.nz)
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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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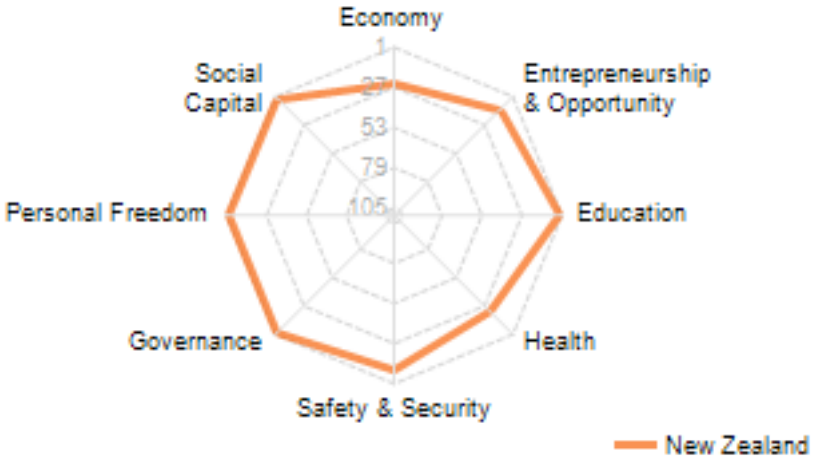
PRESIDENT'S COLUMN

This week has seen the closing of the London Olympics, which provided a snapshot of the international standings of our elite athletes. Given the focus on national sporting performances, it is natural to ask how we stand internationally in the mathematical rankings.

The data below is a little out of date, but should be indicative of present rankings. Of course, the relevance of such rankings is open to challenge, as they tend to focus on one criteria, which may not be indicative of a holistic view.

As an introduction to this question, I want to mention the Legatum Prosperity Index, which ranks NZ as the fourth most attractive country in which to live. The top 10 countries are Norway, Denmark, Australia, NZ, Sweden, Canada, Finland, Switzerland, Netherlands and the US. The Legatum plot for NZ is below, which shows we are somewhat weak in our economy and in health, but strong in other important indicators. The maximum score is the outer band at unity.

Our education system is of fundamental importance to our high Legatum score. As we move to improve our economy and health statistics, we cannot do this at the expense of our education system, if we want to preserve the attractiveness of NZ. One conjecture is that NZ should be a good country in which to do mathematical research.



Of course the Legatum Prosperity Index is just one measure. Interestingly, NZ is seen as the least corrupt of countries (1/153); we are second in the Vision of Humanity Global Peace Index (2/153); third in the UN Human Development Index, and fourth in the Heritage/WSJ Economic Freedom Index (4/153).

NZ research publications per population rank about 11th in the OECD with the ordering in 2007: Switzerland, Sweden, Finland, Denmark, Netherlands, Iceland, Norway, UK, Australia, Canada, NZ almost a permutation of the Legatum top 10 rankings. We produce about 0.8% of the worlds scientific publications. (National bibliometric report for 2002/2007 http://ndhadeliver.natlib.govt.nz/content-aggregator/getIEs?system=ilsdb&id=1527233)

NZ is ranked 17th regarding paper citations, with the top countries being Switzerland, Iceland, Denmark, Netherlands, US, Sweden, Belgium, UK, Norway, Finland, Canada, Germany, Austria, Australia, Ireland, France, NZ.

Focussing on mathematics, in 2007, our citations are essentially those of the OECD average. Mathematics outperformed agricultural and biological sciences, computer science, engineering, chemistry, materials science and chemical engineering, in average citations. The two research areas in NZ significantly above the OECD citation average are veterinary and nursing. NZ citation rates in mathematics are also about the world average. However, NZ's citation rate is behind that for the eight major Australian universities, in mathematics, physical science and engineering, and the recent decision to increase funding in engineering, science and mathematics seems warranted.

Given the high number of publications and citations for NZ, and the positive correlation between scientific outputs and economic strength, why then is our economy not performing better? A most worrying statistic is that we produce our papers very cheaply, begging the question, about their value. The five countries producing their papers the cheapest, in ranked order are: Poland, NZ, Slovak Republic, Spain, and Portugal. A plot of papers per researcher, versus cost, gives four outliers: Slovak Republic, Poland, Greece and NZ.

A challenge for the NZ research community in general, and the mathematics community in particular, is how can we contribute to improving the NZ economy, which will also improve our health statistics, while at the same time, maintaining the values implicit in the Legatum diagram above?

Graham Weir
President

EDITORIAL

Thanks again to the office staff (Prema, Kelsey and Kelly) for all their help in putting the newsletter together.

Steven Archer
Editor

INVITED PAPER

Ramanujan's Legacy

This year marks the 125th anniversary of the birth of the Indian mathematician Srinivasa Ramanujan [Dec. 22, 1887 – 26 April, 1920]. Born into a poor family and largely self-taught, Ramanujan obtained a scholarship to attend Cambridge during 1914–1919. He was elected a Fellow of the Royal Society in May, 1918. He became ill, returned to India, and died aged 32. A full and interesting account of Ramanujan's extraordinary life has been given in the book by R. Kanigel [4]. To commemorate the anniversary, the Prime Minister of India has designated 2012 as the National Mathematics Year. Celebrations and activities will culminate in a conference to be held at the University of Delhi in December.

There is more interest in Ramanujan's mathematics today than ever before. Ramanujan's collected papers have been published three times (1927, 1962, 2000); his notebooks have been published twice (1957, 2012); and an assortment of loose papers and manuscripts was published under the title of 'The Lost Notebook' in 1987. There are three mathematical journals named in Ramanujan's honour: Journal of the Ramanujan Mathematical Society (1986—), Hardy-Ramanujan Journal (1988—), and The Ramanujan Journal (1997—). The SASTRA Ramanujan Prize [5] has been awarded annually since 2005 to a mathematician, aged 32 or under, judged to have done outstanding work in Ramanujan's fields of interest. Fields Medallist Terrence Tao and NZMS Forder Lecturer Ben Green received the prize in 2006 and 2007, respectively.

Perhaps the biggest influence in making Ramanujan's work accessible has been the work of B. C. Berndt. This includes of a systematic analysis, conducted during 1977–1997, of all of the results in Ramanujan's notebooks [2]. The analysis has has been extended, in a joint project with G. E. Andrews which is still in progress [1], to the mathematical results in The Lost Notebook.

In the remainder of this article I would like to discuss a formula of Ramanujan, that I have used many times in my work, and describe some of its consequences. The formula is:

$$\begin{aligned}\prod_{n=1}^{\infty}\frac{(1+zq^{2n-1})(1+z^{-1}q^{2n-1})(1-q^{2n})(1-\alpha\beta q^{2n})}{(1+\alpha zq^{2n-1})(1+\beta z^{-1}q^{2n-1})(1-\alpha q^{2n})(1-\beta q^{2n})}\\ = \quad 1+\sum_{n=1}^{\infty}\frac{(1-\alpha)(q^2-\alpha)\cdots(q^{2n-2}-\alpha)}{(1-\beta q^2)(1-\beta q^4)\cdots(1-\beta q^{2n})}\,q^n z^n\\ +\sum_{n=1}^{\infty}\frac{(1-\beta)(q^2-\beta)\cdots(q^{2n-2}-\beta)}{(1-\alpha q^2)(1-\alpha q^4)\cdots(1-\alpha q^{2n})}q^n z^{-n}. \qquad (1)\end{aligned}$$

It holds provided $|q| < 1$ and $|\beta q| < |z| < |\alpha q|^{-1}$.

It's easy to be bewildered by a formula that involves so many variables, so let us begin by pointing out that the series on the right hand side should be regarded as a Laurent expansion in powers of z, and the variables α, β and q may be regarded as constants. If $\Phi(z, \alpha, \beta, q)$ denotes either side of the identity, then clearly the symmetry property

$$\Phi(z, \alpha, \beta, q) = \Phi(z^{-1}, \beta, \alpha, q)$$

holds. The zeros and poles, when viewed as a function of z, can be determined from the infinite product by inspecting the factors in the numerator and denominator, respectively. The poles are simple and occur along two geometric progressions, namely when

$$z \in \left\{-(\alpha q)^{-1}, -(\alpha q^3)^{-1}, -(\alpha q^5)^{-1}, \ldots\right\} \cup \left\{-\beta q, -\beta q^3, -\beta q^5, \ldots\right\}.$$

The condition $|\beta q| < |z| < |\alpha q|^{-1}$ is to ensure that the geometric progressions do not overlap, so the infinite product is analytic in the annular region that separates the two families of poles. On the right hand side of the identity, the ratio test shows that the series in positive powers of z converges for $|z| < |\alpha q|^{-1}$, while the series in negative powers of q converges for $|\beta q| < |z|$. Therefore, the right hand side of the identity is valid in the intersection of the two regions, and this is just $|\beta q| < |z| < |\alpha q|^{-1}$, the same annulus as before.

If $\alpha = \beta = 0$, the annulus of convergences expands to become $0 < |z| < \infty$ and Ramanujan's identity simplifies to

$$\prod_{n=1}^{\infty}(1 + zq^{2n-1})(1 + z^{-1}q^{2n-1})(1 - q^{2n}) = \sum_{n=-\infty}^{\infty} q^{n^2} z^n. \tag{2}$$

This is Jacobi's triple product identity. Under the change of variables $q = e^{-t}$, $z = e^{i\theta}$, the series on the right hand side becomes

$$\sum_{n=-\infty}^{\infty} e^{-n^2 t} e^{in\theta}$$

which is a solution of the heat equation $u_t = u_{\theta\theta}$. Jacobi's triple product identity can be used to show this solution is never negative. This is not obvious from the series. For future reference, set $z = 1$ in Jacobi's triple product identity (2) and record the result:

$$\prod_{n=1}^{\infty}(1 + q^{2n-1})^2(1 - q^{2n}) = \sum_{n=-\infty}^{\infty} q^{n^2}. \tag{3}$$

Another specialization of Ramanujan's identity is to take $\alpha = \beta = -1$ to get

$$\prod_{n=1}^{\infty} \frac{(1 + zq^{2n-1})(1 + z^{-1}q^{2n-1})(1 - q^{2n})^2}{(1 - zq^{2n-1})(1 - z^{-1}q^{2n-1})(1 + q^{2n})^2} = 1 + 2\sum_{n=1}^{\infty} \frac{q^n}{1 + q^{2n}}(z^n + z^{-n}), \tag{4}$$

valid for $|q| < |z| < |q|^{-1}$. This is essentially the infinite product-to-Fourier series identity for the Jacobian elliptic function dn. Now let $z = 1$ to get

$$\prod_{n=1}^{\infty} \frac{(1 + q^{2n-1})^2(1 - q^{2n})^2}{(1 - q^{2n-1})^2(1 + q^{2n})^2} = 1 + 4\sum_{n=1}^{\infty} \frac{q^n}{1 + q^{2n}}. \tag{5}$$

Since

$$\prod_{n=1}^{\infty}(1 + q^{2n-1})(1 + q^{2n}) = \prod_{n=1}^{\infty}(1 + q^n) = \prod_{n=1}^{\infty} \frac{(1 - q^{2n})}{(1 - q^n)} = \prod_{n=1}^{\infty} \frac{1}{(1 - q^{2n-1})},$$

the infinite products can be eliminated from (3) and (5) to give

$$\left(\sum_{n=-\infty}^{\infty} q^{n^2}\right)^2 = 1 + 4\sum_{n=1}^{\infty} \frac{q^n}{1 + q^{2n}}.$$

This formula can be used to determine which integers are expressible as a sum of two squares, a favorite topic of Mathematical Miniatures published in this Newsletter (see vols. 72, 74, 81). For, expanding the right hand side as a double sum using geometric series, the previous identity may be written in the form

$$\sum_{x=-\infty}^{\infty}\sum_{y=-\infty}^{\infty} q^{x^2+y^2} = 1 + 4\sum_{n=1}^{\infty}\sum_{j=1}^{\infty}(-1)^{j-1}q^{n(2j-1)}.$$

Now equate coefficients of q^N to deduce that

$$r_2(N) = 4(d_1(N) - d_3(N))$$

where $r_k(N)$ is the number of solutions in integers of $x_1^2 + \cdots + x_k^2 = N$, and $d_m(N)$ is the number of divisors of N that are congruent to m modulo 4. It follows that if $N = p$ is an odd prime, then p is a sum of two squares if and only if p is congruent to 1 modulo 4. More generally, the positive integer N is a sum of two squares if and only if in the prime factorization of N, all of the odd prime factors of N congruent to 3 modulo 4 occur to an even exponent.

The reader may like to work out the analogous result for $r_4(N)$ by multiplying the identity (4) by $(1 - zq)/(1 + zq)$ and taking the limit as $z \to -1/q$. Some manipulations of the series are needed and the details may be found in [3].

Ramanujan took this analysis further and produced a general formula for $r_{2k}(N)$ for any positive integers k and N. For example, he gave the formula

$$691r_{24}(N) = 16\sum_{d|N}(-1)^{N+d}d^{11} + 33152(-1)^{N-1}\tau(N) - 65536\tau(N/2),$$

where $\tau(N)$ is the coefficient of q^N in the expansion of $q\prod_{j=1}^{\infty}(1-q^j)^{24}$ and $\tau(x)$ is defined to be zero if x is not a positive integer. Ramanujan noted, but did not prove, that the function $\tau(N)$ has some interesting properties, for example

$$\tau(mn) = \tau(m)\tau(n) \qquad \text{if } \gcd(m,n) = 1,$$

and

$$|\tau(n)| \le n^{11/2} \times \text{the number of divisors of } n.$$

The first result was quickly proved by Mordell, but the second result remained open for more than 50 years. The second result implies, for example, that the dominant term in the formula for $r_{24}(N)$ is the divisor sum, and the error term is asymptotic in magnitude to the square root of the divisor sum. The second result was eventually proved by P. Deligne, as a consequence of his proof of the Weil conjectures for which he was awarded the Fields Medal. It has been conjectured by D. H. Lehmer that $\tau(n)$ is never zero, but this has not been proved. In contrast, it is known that almost all of the coefficients in the expansion of $\prod_{j=1}^{\infty}(1-q^j)^{26}$ are zero!

Further properties and generalizations of Ramanujan's formula (1) have been surveyed in the forthcoming article by S. O. Warnaar [6].

Shaun Cooper

References

[1] G. E. Andrews and B. C. Berndt, *Ramanujan's Lost Notebook,* Parts I–III (with 2 more volumes expected to be written), Springer, 2005–2012.

[2] B. C. Berndt, *Ramanujan's Notebooks,* Parts I–V, Springer-Verlag, New York, 1985–1998.

[3] S. Cooper and H. Y. Lam, *Sums of two, four, six and eight squares and triangular numbers: an elementary approach,* Indian J. Math. **44** (2002), 21–40.

[4] R. Kanigel, *The Man Who Knew Infinity,* Scribner's, New York, 1991.

[5] The Shanmugha Arts, Science, Technology, Research Academy (SASTRA) Ramanujan Prize, http://www.math.ufl.edu/sastra-prize/

[6] S. O. Warnaar, *Ramanujan's* ${}_1\psi_1$ *summation,* Notices of the American Mathematical Society, *to appear.*

LOCAL NEWS

INDUSTRIAL RESEARCH LIMITED

Applied Mathematics Group

We have four new interns. Emily Pearson (St Andrews) is working with Doreen Mollenhauer on simulations of Palladium phosphate using molecular dynamics methods. Carl Neumayr (University of Graz, Austria) is working in Shaun Hendys complex system group. Anthony Belet and Hervé Plo (ENSAM, Bordeaux) are working on geothermal problems with Warwick Kissling and John Burnell. We also have a new PhD student, Udbhav Ojha from Gwalior in India, who will be working with Nicola Gaston on Gallium clusters.

Krista Steenbergen spent May and June at the Freie Universität Berlin, as a guest scientist with Prof. Beate Paulus' theoretical chemistry group. While not out enjoying the beautiful city by bike and soaking up the northern hemisphere sunshine, she was working with Dr. Carsten Müller on method of increments calculations for the electron-correlation energy of the solid halogens (chlorine, bromine and iodine).

Shaun Hendy spent five weeks at the Technical University of Dresden on an EU-funded (Marie Curie) scheme.

Warwick Kissling and Rajiv Chaturvedi gave presentations on mathematical modelling in industrial applications at the IRL Showcase day in July. This event was attended by nearly 200 outside people, and there were about 20 different displays from various groups at IRL.

John Burnell presented a session on geothermal reservoir modelling to the Start to Steam Workshop in Taupo in June. This workshop was organised by GNS for new geothermal developers. There were over 80 participants from all over the world, and John's session was well-received.

In early July, Doreen Mollenhauer attended a conference on "Coupled-Cluster Theory and Related Techniques" in Boulder, Colorado.

Nicola Gaston also attended the meeting in Boulder, as well as the 12$^{\text{th}}$ International Conference on Computational and Mathematical Methods in Science and Engineering in Murcia, Spain, and the XVIth International Symposium on Small Particles and Inorganic Clusters in Leuven, Belgium.

Bridget Ingham gave 3 lectures at the MacDiarmid Emerging Scientists Association (MESA) workshop on X-ray diffraction. Bridget also travelled to Melbourne to participate in the Small-angle X-ray Scattering (SAXS) Proposal Advisory Committee (PAC) meeting at the Australian Synchrotron.

Warwick Kissling

THE UNIVERSITY OF AUCKLAND

Department of Computer Science

The department's hiring continues, with the following new staff having arrived since last report: Yun Sing Koh (from AUT) and Pat Langley (from Arizona State). Yun Sing is a recent PhD graduate from Otago and works on data mining, machine learning, and information retrieval. Pat is a senior researcher with wide interests in the general area of artificial intelligence. For more information, see http://www.isle.org/~langley/ In late August Anikhet Mahanti will arrive from Calgary - see http://www.informatik.uni-trier.de/~ley/db/indices/a-tree/m/Mahanti:Aniket.html. Student enrolments are again considerably higher than last year, so the extra staff will have something to do, although our dean currently seems to feel that we don't teach very much.

Georgianne Griffiths is visiting Alexei Drummond from the University of Exeter, UK from 21 May-20 May 2015 on a Marie Curie Fellowship.

Safurah Abdul Jalil, Beryl Plimmer and Ian Warren received a best paper award from the ICCSE 2012 conference in Melbourne. Ian Watson has been invited to be on the Turing Centenary Advisory Committee of The Alan Turing Year. He has also been in the media a lot discussing both Turing and his new book The Universal Machine, including an interview with Kim Hill on her Saturday morning radio show.

Our faculty has decided to renovate the building next to ours, which will lead to substantial improvements (we are told) in access to ours, plus improved facilities, by 2017.

Robert Amor will be the next HoD, replacing Gill Dobbie. He will serve 2 terms with one year off in the middle (replaced by Gill). So the Amor-Dobbie team will have held the office of HoD for 12 consecutive years by the end of this plan.

Mark Wilson and Ben Martin (recently arrived in Maths) gave a simultaneous chess exhibition in July, in which they played alternate moves without consultation. They managed to win all 16 games, not without some strain.

Selected seminars: The following seminars can be found at the website http://www.cs.auckland.ac.nz/seminars/.

G. Gimelfarb, P. Delmas & R. Nicolescu '(BP + DP)/2 = CP: Discrete Global Optimisation by Concurrent Propagation'

Steven Galbraith 'The approximate GCD problem and homomorphic encryption'

There is much more going on, but your correspondent must extract information from various emails and websites, and tries to concentrate on the good stuff likely to be relevant to NZMS members.

Mark Wilson

Department of Engineering Science

Our first semester of 2012 is now complete since the last newsletter. Engineering Science drew its maximum capacity of 35 students which was good news for the Department.

We would like to start by congratulating our 24 autumn graduates with 8 first class honours. In addition we congratulate our postgraduates: Yi Chung Lim who was awarded a first class ME with honours and a UoA Doctoral Scholarship. First class honours were also awarded in Masters of Operations Research to Alexander Wilson and Kim Frew who received a University Graduate Scholarship.

Our HOD Prof. Matthias Ehrgott Finally Ties the Knot! On behalf of the Department of Engineering Science we would like to send our very best congratulations to our HOD, Prof. Matthias Ehrgott who slipped away to the Coromandel on the weekend of March 17th to get married to his long term partner Dr. Judith Wang.

Awards & Honours

Peter Bier wins UoA Early Career Excellence in Teaching

The Department would like to congratulate our Senior Tutor, Peter Bier, who was joint winner of the UoAs Early Career Excellence in Teaching award. Peter has consistently, over the years, demonstrated excellence in his teaching of mathematics to some our Facultys largest core courses. Peters teaching style knows no bounds and has often been reported demonstrating his uni-cycling and juggling skills during lectures ! In addition, Peter is also one of three staff nominated by the University for the 2012 National Tertiary Teaching Excellence Awards Good Luck, Peter!

4.8 million HRC Grant Awarded

Dr. Charles Unsworth in the Department of Engineering Science together with researchers in the Medical Faculty have been awarded $4.8million by the Health Research Council. This is 5 years funding to use advanced nonlinear signal processing techniques to identify early biomarkers in the EEG of premature babies that are at high risk of developing brain injury, at an early enough time that the injury may still be treatable.

Visitors & Seminars

14th March, Marc Goerigk - Goettingen , "LinTim - An Optimisation Tool for Public"

14th March, Florian Sepp - University of Kaiserslautern, "A polynomial time approach for the multiple objective minimum spanning tree problem"

4th April , Matthew Finn Adelaide, "Hotspots in chaotically stirred chemical reactions"

29th March, Ross Vennell , Marine Science, University of Otago, "Is Giga Watt Generation from Large Tidal Turbine Farms Realistic?"

21st March, Nikolaus Furian - Graz University of Technology, "Constrained Order Packing - Optimizing Concrete-Part Production Layouts"

30th May, Shixiao Wang - Mathematics, Auckland, "Theory of vortex breakdown phenomenon"

13th June, Vicente Gonzalez Civil Engineering, Auckland, "Simulation and optimisation of construction management problems"

Charles Unsworth

AUCKLAND UNIVERSITY OF TECHNOLOGY

School of Computing and Mathematical Sciences

Congratulations to Murray Black, who successfully completed his PhD through Deakin University in July 2012. The examination panel recommended the award of a doctoral degree subject to some minor amendments only. In July 2012, Guanghua Lian resigned from AUT University and took a lectureship position in the University of South Australia.

In June 2012, Jiling Cao and his PhD student Anuj Bhowmik participated in the 12th SAET (Society for the Advancement of Economic Theory) conference held at the University of Queensland, where they presented two papers on their recent work in

mathematical economics. The titles of these papers are "Blocking efficiency in an economy with asymmetric information", and "Robust efficiency in mixed economies with asymmetric information".

Hyuck Chung attended the 19th International Congress on Sound and Vibration in Vilnius Lithuania from the 8th to 12th of July. Approximately 400 papers were presented in various disciplines of acoustics and structural vibrations. He also visited the Department of Mathematics of the University of Augsburg in Germany on the 17th of July, and gave a seminar talk there. The topic of the seminar was 'Bending waves in composite structures with random parameters'.

Paul Cowpertwait has recently completed an external research grant for Sener International (Spain) that has involved developing a full spatial-temporal stochastic rainfall model. The model preserves the statistical properties of rainfall data and can be used to simulate hourly rainfall at any location in the Basque Country. The model will be used by Sener and the Basque Country Government when designing hydrological systems that aim to reduce the damage caused by flooding across the region. Sener have conducted experiments that compare data simulated by the model to observed flow discharges and have indicated that the results are good and that the rainfall model should be of value in the forthcoming engineering projects.

Farnon Ellwood from the University of Cambridge visited Robin Hankin at AUT during June and July 2012 to collaborate on their study of biodiversity. The work is progressing well.

Jeff Hunter had a successful research and conference leave visiting, in May, Prof Stephen Kirkland at the National University of Ireland at Maynooth, Professor Sally McLean at the University of Ulster at Coleraine and Professor Frank Ball at the Univeristy of Nottingham and delivering seminars at each university. This was followed up with him speaking at the Invited Mini Symposium on Markov Chains at the SIAM Applied Linear Algebra Conference in Valencia Spain in June that he co-organized with Steve Kirkland. He has been quite a traveller with three trips to Europe and one to India in the past twelve months! With a couple more trips planned in the next twelve months he really has become a "peripatetic" professor!

In June 2012, Farida Kachapova presented a talk "Consistency proof for an intuitionistic theory with types" at annual conference of AAL (Australasian Association of Logic) in Sydney. Recently, Farida was appointed an editor for Journal of Mathematics and Statistics (published by Science Publications, USA), and a member of editorial board of International Journal of Statistics and Probability (published by Canadian Center of Science and Education).

In May 2012, Sergiy Klymchuk was appointed as an associate editor of the international journal "Teaching Mathematics and its Applications" published by the Institute of Mathematics and its Applications (IMA) based in the UK. In May he gave a seminar "Different contexts in teaching mathematical modelling and applications to engineering students: students' attitudes and difficulties" at Mathematics Department of the University of Hong Kong and another seminar "The influence of attention on mathematical knowledge of teachers and lecturers: A comparison" at Mathematics Department of Chinese University of Hong Kong. In June Sergiy gave two presentations on teaching undergraduate mathematics at two international conferences on mathematics education in France and Spain.

Kate Lee attended the 11th World Meeting of the International Society for Bayesian Analysis, 25-29 June 2012, held at Kyoto, Japan. She presented a paper, entitled "Threshold selection method for modelling multivariate extremes using a Bayesian measure of surprise". This is an extend work jointly with Dr Scott Sisson and Dr Yanan Fan (UNSW, Sydney, Aus).

Between May 1 and May 15, Jiamou Liu spent two weeks at the Nanyang Technological University in Singapore. There he collaborated with Assoc Prof Guohua Wu on computability and automata structures. Jiamou also attended the International Conference on Theory and Applications of Models of Computation (TAMC 2012) held between May 16 and May 21 in Beijing. He presented his paper "Automata on structures" on the conference. Prof Alexander Meduna from Brno University of Technology visited Jiamou Liu between July 30 and August 12. While he was here he presented a seminar titled "Deep pushdown automata". He and Jiamou has worked on grammar systems and plan to write research papers together. Between August 14 and August 21, Jiamou attended the International Conference on Development on Language Theory (DLT 2012) in Taipei. He presented his paper "State complexity of finite word and tree languages" at the conference.

Seminars

Quan Bai (Auckland University of Technology), "Provenance and provenance-based trust evaluation"

Ankit Chaudhary (Birla Institute of Technology and Science), "Vision based robotics and virtual hand"

Farida Kachapova (Auckland University of Technology), "Consistency proof for an intuitionistic theory with types"

Sergiy Klymchuk (Auckland University of Technology), "Enhancing students' understanding of Calculus"

Jiamou Liu (Auckland University of Technology), "Automata for computations on arbitrary structures"

Alexander Meduna (Brno University of Technology), "Deep pushdown automata"

Xijin Tang (Chinese Academy of Sciences), "Metasynthetic system modelling to complex problems"

Xijin Tang (Chinese Academy of Sciences), "How to get a rough image from community opinions?"

Jiling Cao

MASSEY UNIVERSITY

Institute of Information and Mathematical Sciences (IIMS), Albany

Robert McKibbin has taken over the role of Head of Institute for the last couple of months before a restructuring of the College of Sciences sees IIMS disappear.

Graeme Wake was an invited speaker at the Mathematics and Applied Mathematics (MAM) joint Thai-Japanese conference in Pattaya, Thailand in late July. He spoke on Case Studies of Mathematics in Medicine, and also participated in a forum on how to progress Initiatives in Mathematics-in-Industry (IMI) in that country. He also gave seminars at two universities in Bangkok, and led a Thai maths group on a exploratory meeting at the NZ company: Fisher and Paykels manufacturing base in southern Thailand. Graeme was elected as a Professor Emeritus at Massey University at the end of June and continues to be based at Massey as a full-time self-employed research consultant which includes being a contract PI/AI in two CoREs (NRGGD and Riddet respectively). He is to be a short-term invited visitor at his other home, Oxford Centre for Collaborative Applied Mathematics (OCCAM), in September, working with Professor Helen Byrne on cancer cell growth.

In May, Winston Sweatman spent an enjoyable week at the Study Group with Industry at Fudan University in Shanghai. There were five interesting industrial problems relating to corrosion, steel processing, study of the brain, train time-tabling and bus transport. At the end of the workshop the generous hosts provided a tour of the beautiful city of Shanghai which is rapidly evolving. The Chinese food was fantastic.

Alona Ben-Tal and Carlo Laing attended the SIAM Conference on the Life Sciences in San Diego, August 7-10, each giving invited minisymposium presentations.

Gaven Martin gave invited lectures at the International conference in Geometric and Nonlinear Partial Differential Equations at Xi-An Jiaotong University, China (June) and the Conference on Group Actions and Applications in Geometry, Topology and Analysis in Kunming, China (August).

In May Mick Roberts visited RMIT in Melbourne, where he gave a seminar and discussed collaboration with Stephen Davis and Karen McCulloch. Karen has now joined us as PhD student on Mick's Marsden-funded project. Welcome Karen. Mick then spent three weeks at Utrecht University in the Netherlands, working with long-term collaborator Hans Heesterbeek. He also presented an invited seminar at Utrecht University Medical Centre, as part of the Life Sciences Seminars Series.

Robert McKibbin participated in two conferences in Germany during June and July, one in Potsdam on porous media and their applications, and the other in Leipzig on environmental modelling.

Seminars

Alona Ben-Tal , "Why breathing deep and slow is good for you"

Roslyn Hickson (University of Newcastle, Australia), "TB or not TB? in the Torres Strait region"

Carlo Laing , "The Kuramoto Model of Coupled Oscillators"

Gaven Martin , "New approaches to modelling nonlinear phenomena"

Karen McCulloch , "Transmission dynamics of rabies in domestic dogs"

Mick Roberts , "Ecological interactions in epidemic models"

Shaun Cooper

VICTORIA UNIVERSITY OF WELLINGTON

SCHOOL OF MATHEMATICS, STATISTICS AND OPERATIONS RESEARCH, *Te Kura Mātai Tatauranga, Rangahau Pūnaha*

Our earliest news from 2012 concerned a great finish to the previous year for Dillon Mayhew and Shirley Pledger. Dillon won a 2011 Victoria University of Wellington Early Career Research Excellence award and Shirley was honoured with an appointment as an International Member of the National Centre for Statistical Ecology (NCSE) in the UK. Following Shirley's appointment, the NCSE and MSOR signed an agreement to encourage the exchange of postdoctoral fellows and graduate students to facilitate further cooperation and collaboration in the area of statistical ecology.

Also early in 2012 and while on sabbatical, Estate Khmaladze gave an invited public lecture at the Tbilisi State University in Georgia. While there he was presented with the I. Javakhishvili medal. Javakhishvili is a classical figure in Georgian culture, the author of the monumental "History of Georgia" (usually in 12 volumes) and one of the founders of Tbilisi State University. This medal is the highest honour the University can award.

Some of our current students have had notable successes recently. Matt Visser's PhD student Kyle Tate was co-winner of the Kerr prize for the best student presentation at the Sixth Australasian Conference on General Relativity and Gravitation held in Queenstown in February; see http://www.maths.otago.ac.nz/acgrg6/programme.php for further details. Richard Arnold's PhD student Darcy Webber won the Ministry for Primary Industries Prize for Student Oral Presentation making the best use of Quantitative Methodology at the joint Australian Marine Sciences Association/New Zealand Marine Science Society Conference held in Hobart in July. Andreana Holowatyj won an award in the Victoria University 2012 Summer Gold Poster Competition for her poster, "Characterizing Moves in Hexagonal Regions of Hextile Knot Mosaics", which reported her summer research scholarship work supervised by Geoff Whittle.

Continuing with the theme of success by our students, an unprecedented outcome was the award to Adam Day of the 2011 Sacks Prize for the best PhD thesis in mathematical logic worldwide. Adam completed his PhD, entitled "Randomness and Computability", under the supervision of Rod Downey. This is the first time the Sacks Prize has been won outside of the US, France or Toronto. The prize is recognition of the logic group at VUW as well as the quality of Adam's thesis. Adam is currently in receipt of a Miller Fellowship at the University of California at Berkeley and he also won the Royal Society's Hatherton Prize in 2011 for the best paper in physical, earth or maths and information sciences by a New Zealand university PhD student. Our congratulations to AdamAnother successful outcome was the award of a PhD to Dayle Anderson for her thesis, "Teacher Knowledges, Classroom Realities: Implementing Sociocultural Science in New Zealand Year 7 and 8 Classrooms", which was supervised by Megan Clark.

It looks like BD Kim will not be seeing much summer weather over the next few years. He has been invited as a research visitor to both the Max Planck Institute for Mathematics in Bonn and IHES (The Institut des Hautes Études Scientifiques) near Paris. BD will be spending the summer of 2012/13 at the Max Planck Institute and the summer of 2013/14 at IHES. Judging by the 2011/12 summer in Wellington, he won't be missing much!

The matroids research group at VUW were visited by James Oxley in May and Stefan van Zwam in June. Both James and Stefan gave talks to the group: James on "Excluded minors for a class of non-binary matroids" and Stefan on "Classes of fixed-fragile matroids". That matroids group has been recently augmented by the arrival of Peter Nelson on a postdoc, working with Geoff Whittle. Peter has started off very well with the award of a Fulbright Travel Award for a visit to the US in September. The grant is to give various seminars, contributing to communication and exchange of knowledge between the US and NZ. Dr Nelson will be giving departmental seminars at Princeton, Rutgers and Columbia Universities, and presenting at the New York Combinatorics Seminar hosted by SUNY Brooklyn in September. The talks will be on Peter's research in extremal matroid theory. He will also be working with Stefan van Zwam at Princeton. Peter has recently been in Argentina, as the Deputy Leader of the NZ Maths Olympiad team. The team returned home in July with two bronze medals and four honourable mentions; see http://www.mathsolympiad.org.nz/ for more details.

Last but certainly not least, congratulations to Noam Greenberg who has won a John Templeton

Turing Research Fellowship. This Fellowship is one of five awarded to commemorate the Alan Turing Centenary Year. The fellowship provides Noam with 75,000 UK Pounds to support his research over the next years. Noam was awarded the fellowship in a webcast ceremony at the Turing Centenary Conference in Manchester on Turing's 100th birthday, 23rd June 2012. For more details see: http://www.mathcomp.leeds.ac.uk/turing2012/give-page.php?408. Noam won his award in theme 4: "How should we compute? New Models of Logic and Computation". Slightly earlier, Noam and Rod Downey gave two parts of a talk at the conference "The Incomputable" at the Royal Society research centre at Chicheley Hall in mid June. This conference was part of the Newton Institute semester, "Semantics and Syntax: A Legacy of Alan Turing". Noam participated in the programme for four weeks, and Rod for its entirety (half a year). Among his other contributions, Rod gave an invited presentation at the Turing Centenary Conference in Cambridge one week after his 'incomputable activities'.

Seminars

For abstracts for these seminars, please enter an appropriately-old date in the School's seminar web page: http://msor.victoria.ac.nz/Events/Seminars

Ittay Weiss (University of the South Pacific), "Metric inspired models for the geometry of operads and directed topology"

Iain Aitchison (VUW), "Mathematics - Star of Ishtar, Daughter of Sin (From Plimpton 322 and Pythagorus, to Elliptic Curve Cryptography)"

Peter Jupp (University of St Andrews), 2012 Shayle Searle Visiting Fellow in Statistics at Victoria University, "Inference on population size in binomial detectability models"

Peter Jupp (University of St Andrews), joint seminar with the Wellington Statistics Group (a local group of the New Zealand Statistical Association), "Statistics and Geometry: Surprisingly Interesting?"

Peter Jupp (University of St Andrews), 2012 Shayle Searle Visiting Fellow in Statistics at Victoria University, "Testing Quantum states for purity"

Peter Jupp (University of St Andrews), 2012 Shayle Searle Visiting Fellow in Statistics at Victoria University, "Delights of directional statistics: (a) free-lunch learning, (b) crystals, earthquakes and orthogonal axial frames"

Kyle Tate (VUW), "Simplicial Approaches to Quantum Gravity"

Valentina Baccetti (VUW), "Analogue models of spacetime: entanglement entropy, quantum information, and the Einstein equations"

Geoffrey Grimmett (University of Cambridge), 2012 LMS/NZMS Forder Lecturer, "Conformality and universality in probability"

Geoffrey Grimmett (University of Cambridge), 2012 LMS/NZMS Forder Lecturer, "Probability, the Science of Uncertainty"

Sione Paea (VUW), "A hybrid continuum Kinetic Monte Carlo simulation of solidification from a binary melt"

Moshe Haviv (The Hebrew University of Jerusalem), "Regulating arrivals to a queue"

Estate Khmaladze (VUW), "Simple marked point processes and age-dependent population models"

John Haywood

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Heavy snowfall and freezing temperatures during the night led to treacherous conditions on campus the next morning on 6 June. Due to safety issues created by snow-damaged trees and challenging driving conditions, the University was closed in the morning and remained closed the following day. Fortunately, the closure fell within the week after lectures had finished and before semester 1 exams began.

Congratulations to Mike Steel and Jennifer Brown on their elections to international bodies. Mike has been elected to the Council of the Society of Systematic Biologists (by the largest number of votes). The Society of Systematic Biologists is an international scientific body that helps to organize the annual Evolution meetings, normally held in North America; manages the journal Systematic Biology; and awards prizes and grants to students and Postdoctoral Fellows. Jennifer Brown has been elected as a new International Statistical Institute member. Elected membership involves being nominated by another elected member and being supported by three other elected members. There are 14 elected members from New Zealand.

Phillipa Williams' and Liz Ackerley's work on MapleTA has been featured at the Maplesoft website. Well done! MapleTA is now being used extensively in our first year mathematics and engineering mathematics courses as a formative assessment tool to increase student engagement and support student learning.

Congratulations to Marco Reale and Jennifer Brown who have both been successful in obtaining grants from the University of Pau, France, for one-month visiting professorships. Marco has been invited by the Laboratory of Applied Mathematics, and Jennifer by the Federation of Multidisciplinary Research on Aquatic Environments.

Best wishes go to our former student and tutor James Williams, who has been awarded a Fulbright/Ministry of Science and Innovation Graduate Award to study for a PhD in Applied Mathematics at Yale University, New Haven. James, who graduated BSc(Hons) in Mathematics last year, departs for the USA in August.

Congratulations to our PhD students Anna MacDonald and Adam Gillard. Anna was awarded her PhD degree in April. Her supervisors were Carl Scarrott and Dominic Lee. Anna is now working at Statistics NZ as a Statistical Analyst in the Population and Census Team, which is currently looking at how future censuses will be run. Adam successfully defended his PhD thesis in July in his oral exam. He will be awarded a PhD in Mathematical Physics after making some minor changes to his thesis. Adams supervisor was Ben Martin.

In June the department welcomed Patrick W. Saart to its continuing staff. Patrick had been in the department on a 2-year fixed-term contract. His research interests are in Econometric Theory, Time Series analysis, Nonparametric and Semiparametric inferences and Financial Mathematics.

In May we bid farewell to Postdoctoral Fellow Xin Zhao who has left to take up a position with Jade Corporation here in Christchurch. We wish her well in her new career.

The department welcomed three new PhD students recently. Aizuddin (Din) Yusoff from Malaysia arrived in May. Din is married with two daughters. His first degree was a Bachelor of Engineering Electronics majoring in Telecommunications. He worked for several years with Intel and Telekom Malaysia. Later, he obtained a Masters degree in Applied Statistics and joined the Universiti Putra Malaysia as a tutor. His research interests are Applied Statistics related to time series analysis, biostatistics and experimental design. His hobbies include chess, badminton and jogging.

Ealasukanthan (Sukanthan) Thavanayagam and Chitraka Wickramarachchi from Sri Lanka were probably in a state of shock given the weather they have encountered on arrival in Christchurch in June. Sukanthan, who hails from Karaitivu in Sri Lanka. He is doing a PhD in Mathematical Biology under the supervision of David Wall. Sukanthan completed his BSc(Hons) and MSc (Industrial Mathematics) in Sri Lanka and then went on to the UK where he completed a second Masters degree in Applied Mathematical Modelling and Scientific Computing. His interests include chess, the card game 304, cricket and badminton.

Chitraka is married with 3 daughters and a son. His first degree was a BSc Special Degree in Statistics at the University of Sri Jayewadenepura in Sri Lanka. He also has an MSc (Applied Statistics) and an M.Phil. degree, both from the University of Peradeniya, Sri Lanka. He has been working as a Lecturer in Statistics in the Department of Statistics and Computer Science at the University of Sri Jayewardenepura. His research interests are Categorical Data Analysis and Classification Techniques, and when hes not working he enjoys playing cricket and watching rugby.

April saw the publication of Neil Watsons book "Introduction to Heat Potential Theory". The AMS Bookstore described this book as the first to be devoted entirely to the potential theory of the heat equation, and thus dealing with time dependent potential theory. Its purpose is to give a logical, mathematically precise introduction to a subject where previously many proofs were not written in detail, due to their similarity with those of the potential theory of Laplace's equation. The approach to subtemperatures is a recent one, based on the Poisson integral representation of temperatures on a circular cylinder. Characterizations of subtemperatures in terms of heat balls and modified heat balls are proved, and thermal capacity is studied in detail. The generalized Dirichlet problem on arbitrary open sets is given a treatment that reflects its distinctive nature for an equation of parabolic type. Also included is some new material on caloric measure for arbitrary open sets. Each chapter concludes with bibliographical notes and open questions.

Conferences, workshops and visits

Maarten McKubre-Jordens was in Cambridge for 11 days in June for the Turing Centenary celebrations. He presented work on constructive solutions to Dirichlet's problem at the Computability in Europe (CiE) conference and attended the Computability and Complexity in Analysis (CCA) meeting. Douglas Bridges also attended these meetings and at CCA presented work on constructively

locating vector subspaces of a Hilbert space. Before travelling to Cambridge, Douglas spent 9 days in Dubrovnik, Croatia. While in Cambridge, Douglas and Maarten shared a meal in the Eagle pub. The Eagle is where Crick and Watson (discoverers of the structure of DNA) announced that "We have found the secret of life".

Jeanette McLeod made a research visit to ANU Canberra, 3-14 June, to work with Brendan MacKay on problems to do with graph reconstruction and switching stable graphs. While there Jeanette and Brendan visited the ANU Mt Stromlo observatory on 6 June to watch the transit of Venus.

Rick Beatson chaired an invited symposium on radial basis functions at the Eighth International Conference on Mathematical Methods for Curves and Surfaces, University of Oslo, 28 June - 3 July, and presented a paper "A Polya criterion for (strict) positive definiteness on the sphere". On the way, he made a working visit to Wolfgang zu Castell at the Helmholtz Zentrum, in Munich, 10 June - 27 June.

From late June to late July, Mike Steel visited Europe, presenting talks at a mathematical biology conference near Montpellier, and also at two other conferences – the SMBE (Society for Molecular Biology and Evolution) meeting in Dublin (with 1400 participants), and a bioinformatics conference held at Dagstuhl castle, in south-eastern Germany. Mike spent most of the time at Tübingen University, working on metagenomic and phylogenetic network algorithms, with Daniel Huson, who will visit New Zealand for 4 weeks next February. Mike also gave invited talks in Bielefeld, Cologne, and Tübingen.

Irene David, Hilary Seddon and Richard Penny attended the OZCOTS conference (Australian Conference on Teaching Statistics) in Adelaide 12th and 13th July. Richard's talk was titled 'Statistics training for multiple audiences'. Irene gave an overview of the on-line aspects of the STAT101 course in a forum called 'Online teaching'. There were many good presentations on aspects of the teaching of introductory statistics. The conference presentations confirmed that STAT101 at UC is in line with, and has the same issues (mainly relating to methods for increasing student participation) as, introductory statistics courses across Australia.

Raaz Sainudiin gave a talk "Regularly Paved Random Histograms and their Statistical Applications" at a Department of Statistics seminar at the University of Auckland on 12 July.

James Degnan made a research visit to Stanford University and gave a talk "Distribution of gene tree shape under Yule speciation" on 27 July 2012. He then attended the Joint Statistical Meetings in San Diego, 28 July - 2 August, and presented a paper "Identifying rooted species trees from probabilities of splits under the multispecies coalescent".

Visitors July saw the arrival of three Erskine fellows in the department. As part of their fellowships, they will be teaching into our undergraduate programme and interacting with postgraduate students.

Hajime Ishihara, hosted by Douglas Bridges, is coming to us from the School of Information Science at the Japan Advanced Institute of Science and Technology. His research interests include Theoretical Computer Science, Proof Theory and Constructive Mathematics. He will be a major figure at a workshop on Constructive Analysis and Topology.

Huaxiong Huang, hosted by Phil Wilson, is in the Department of Mathematics and Statistics at York University, Toronto, Canada. His field of special interest is Industrial and Biological Mathematical Modelling.

Markus Stroppel, hosted by Günter Steinke, comes to us from the Faculty of Mathematics and Physics at the University of Stuttgart, Germany. His fields of special interest are Topology, Geometry, Lie Groups, and Mathematics for engineering students.

Recent visitors include Deidre Wall (National University of Ireland, Galway), Charles Gonnaud (École Nationale Supérieure de Techniques Avancées ENSTA-ParisTech, France) and Robin Havea (University of the South Pacific, Fiji).

Seminars

Huaxiong Huang (York University, Toronto, Canada) "Singular Pertubation Solutions of the Steady-State Poisson-Nernst-Planck Systems"

Blair Robertson (University of Canterbury) "Bound Constrained Global Optimization using CART Partitions"

Hajime Ishihara (Japan Advanced Institute of Science & Technology) "Some Conservative Extension Results of Classical Logic over Intuitionistic Logic"

Robin Tiffen (Teaching Fellow, University of Canterbury) "Who are these people and where do they come from? Meet Jane and Joe Student"

Daniel Lond (University of Canterbury) "On Reductive Subgroups of Algebraic Groups and a Question of Külshammer"

Ngin-Tee Koh (Ohio University, USA) "Planar Mappings in Function Theory"

Paul Leopardi (Australian National University) "Sparse grid quadrature on products of spheres, and the optimal solution of a related knapsack problem"

Hannes Diener (University of Siegen, Germany) "Impossible Computations in Analysis"

Maarten McKubre-Jordens (University of Canterbury) "Solving the Dirichlet Problem Constructively"

Günter Steinke (University of Canterbury) "Groups and Geometries"

Erkan Buzbas (Stanford University) "Approximate Bayesian Computation when Simulating Data is Difficult"

Patrick W. Saart (University of Canterbury) "Nonparametric Specification Test in Semiparametric Autoregressive Condition Duration Model"

Robin Tiffen (Teaching Fellow, Department of Mathematics and Statistics) "NCEA what on earth does it mean?"

Greg Ewing (University of Vienna, Austria) "Inference under the Coalescent"

Jeanette McLeod (University of Canterbury) "Graph Connectivity in the Streaming Model"

Deidre Wall (National University of Ireland in Galway) "Graphical Comparisons of Survivor Functions and an Interactive Surrogate Plot for RPART trees"

Frank Lad (University of Canterbury) "Completing the Logarithmic Scoring Rule for Assessing Probability Distributions"

Mark Hickman (University of Canterbury) "Euclidean Signature Curves"

Günter Steinke

More local news, after the centrefold.

CENTREFOLD

Bill Barton

We are delighted to be able to write this item about our colleague, Bill Barton, during his term as President of the International Commission on Mathematical Instruction (ICMI). We can all be proud of Bill, not only for being elected to this position — which is arguably the highest position in the international mathematical sciences community ever held by a New Zealand based mathematician — but also because of what he is achieving in the role.

A particular highlight is the 'Klein project'. This project, co-sponsored by ICMI and the International Mathematical Union (IMU), was inspired by Felix Klein's famous book *Elementary Mathematics from an Advanced Standpoint*, published a century ago. Under Bill's leadership, the project is intended as a stimulus for mathematics teachers, to help them to reawaken their interest in mathematics, by making connections between the mathematics they teach (or might be asked to teach) and the wider field of mathematics, while taking into account the evolution of mathematics over the last century. The Klein project will eventually produce a book in several languages, but currently exists as a collection of readable 'Vignettes' (see http://blog.kleinproject.org).

At the 2010 International Congress of Mathematicians held in India, Bill gave a public lecture on 'Where is mathematics taking us?'. This attracted an audience of hundreds of students and teachers, and was highlighted on the cover of the November 2010 issue of the Notices of the American Mathematical Society, and described in an article on pages 1276 and 1277 of that issue. (A copy of the article can be downloaded from the website http://www.ams.org/notices/201010/index.html, by clicking on "The Public Lectures in Hyderabad".) Bill also gave a follow-up lecture to educators on 'Why are mathematics lecturers like Sachin Tendulkar?', about developing a culture of continual professional development.

Bill was born in New Zealand, and as a child, moved with his family around the country, from school to school. His love of travel and interest in other cultures was kindled when his family moved to Khartoum (Egypt), where his father had a position with UNESCO, and where he learned to sail on the Nile. He returned to New Zealand to finish his schooling, and his academic career began in the early 1970s with a Masters degree in Mathematics at the University of Auckland, followed by a Diploma in Teaching at Christchurch Teachers College. He then spent much of the next 17 years teaching in secondary schools, as well studying for a Masters degree in Education from Massey University.

Bill spent four years teaching at the University College of Botswana, Lesotho and Swaziland, where he learned about the importance of language in mathematics. Also in the 1980s he produced two series of public television programmes, which helped him learn about popularising mathematics, and he became involved in a project to develop the Maori language of New Zealand so that it could be the language of instruction for mathematics, which helped him learn the joys of research. These experiences, his high

level of imagination and his ability to entice people into new activity with well-chosen metaphors, have helped Bill develop a varied and successful career.

He completed his years of secondary school teaching as a Maori/English bilingual teacher at Wellington High School (1987-89), before moving into teacher education, and began studying for a PhD in Ethnomathematics at the University of Auckland. He joined the Mathematics Education Unit (MEU) in the Mathematics Department at the University of Auckland in 1993, completed his PhD in 1996, and continued his career as a mathematics educator, specialising in mathematics and language. He has written a Springer volume on this topic.

Bill has served two terms as head of the MEU and a four-year term as Head of the Mathematics Department at the University of Auckland. He was promoted to professor in 2009. Bill won a Claude McCarthy Fellowship (at Victoria University) in 1990, and a Hood Fellowship (at the University of Auckland) in 2007. He was Bevan Werry Memorial speaker at the biennial conference of the NZ Association of Mathematics Teachers in 1995, and he won a Faculty of Science Teaching Award in 2003 for his involvement as leader of the teaching team for the introductory course Maths 102.

Bill has published extensively in the field of mathematics education. He has served as Editor of the Australasian regional *Mathematics Education Research Journal*, and Assistant Editor for the leading international journal *Educational Studies in Mathematics*. Bill was co-director of the NZIMA programme on 'Senior Secondary and Undergraduate Mathematical Science in New Zealand' (2008-2011), with Megan Clark (VU Wellington).

The research of which Bill is most proud is in three fields: the part he played in the development of Maori mathematics vocabulary development (in the 1980s), his work in showing that 'English as a second language' (ESL) learners suffer more disadvantage the higher they go in mathematics (1990s and 2000s), and his recent work in the professional development of mathematics lecturers. The second of these has included joint work with his wife Pip Neville-Barton, who is an applied linguist. Also some of his recent research has been involved with the mathematical development of senior secondary teachers, and the ways in which language affects the mathematical thinking of research mathematics. Bill undertook a project with Ivan Reilly on the latter topic, supported by a grant from the Marsden Fund.

In 2010, Bill was elected President of ICMI. This led not only to his leadership of the Klein project, but also to initiating and leading the 'Capacity and Networking Project' (CANP). This is a major development initiative on behalf of ICMI and the IMU. Each year a developing region is selected, and a programme of activities is mounted in that region that has the aim of developing a regional self-sustaining network of mathematicians, mathematics educators, teachers, and government curriculum and research people from four or five countries in the region.

The idea behind the CANP initiative is to get key people together, with the aid of the international community, and then offer continued expertise when it is requested. Other activities include public lectures, outreach to schools, and media events in the hosting country. So far, CANP programmes have been run in West Africa (2011) and Central America (2012), and both succeeded beyond expectations. The next one will take place in South East Asia in 2013, and then another one in Africa in 2014. The annual cost of CANP is larger than the whole of the ICMI budget, so significant effort has been made by Bill and others in raising funds, from UNESCO, ICSU and various governments. Benefits will go well beyond the immediate ones: regional groupings have formed that are already organising their own activities, to promote mathematics and mathematics education in the region.

Marston Conder, Judy Paterson, Ivan Reilly and Mike Thomas

LOCAL NEWS continues

UNIVERSITY OF WAIKATO

Department of Mathematics

The Department congratulates Ernie Kalnins for being one of the three winners of the *Journal of Physics A* Best Paper Prize for 2012. He, together with Willard Miller Jr (University of Minnesota) and Sarah Post (University of Montreal), wrote the prize-winning paper "Coupling constant metamorphosis and Nth-order symmetries in classical and quantum mechanics". All original research papers published in *Journal of Physics A* in 2010 and 2011 were eligible for the prize. Nominations for the prize were received from readers of the journal. These nominations were then assessed by the Section Editors using the criteria of novelty, achievement, potential impact, and presentation. Their winning paper was considered to have excelled in all of these categories.

On the opposite side of the coin, Stephen Joe has recently completed his task on the two-member judging panel for the Journal of Complexity 2011 Best Paper Award. All 2011 papers published in this journal were eligible for the award.

Ian Craig is now officially a retiree. However, he has not totally disappeared as he has a half-time fixed term position in the Department.

In July, Woei Chet Lim attended the Thirteenth Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory, which was held in Stockholm. He presented a talk titled "Generating matter inhomogeneities in general relativity". Also in July, Woei Chet and Ernie attended a public lecture about the Large Hadron Collider held at the University of Auckland.

Continuing the theme of Thirteenth conferences, Sean Oughton attended the Thirteenth International Solar Wind Conference held in Hawaii in June. Besides presenting a talk titled "The MHD von Karman-Howarth equations and the role of fourth-order correlations", he was also a co-contributor for a number of poster presentations.

Nick Cavenagh and Yuri Litvinenko have now finished their periods of study leave while Sean has now started his. Sean will be on study leave until mid-January next year. During this period, he will work with collaborators at the University of Florence, Oxford University, Imperial College, and the Nordic Institute for Theoretical Physics in Stockholm.

It was a pleasure to have the 2012 Forder Lecturer, Professor Geoffrey Grimmett, visit at the end of April, where he presented a talk to both mathematicians and statisticians.

The air is alive with the sounds of construction next to G Block where the Dept of Mathematics is located. The amalgam of renovated and extended building will include in it a joint reception area and Deans' suites for our Faculty of Computing and Mathematical Sciences as well as the Faculty of Science and Engineering. Nobody in the Dept of Mathematics will be moving office except for Stephen who stays in G Block, but gets to shift down the corridor.

Seminars

K-L. Klein (Observatoire de Paris-Meudon), "Solar energetic particles in space: observational evidence on their origin and propagation".

N. Lopez, "A spectral method for compressible 2D Navier-Stokes turbulence".

L. Embling, "Axiomitisations of some quasi-ordered functions semigroups using determinative pairs".

C. Armstrong, "Modeling solar loop-top electron transport using stochastic methods".

G. Grimmett (University of Cambridge), "Conformality and universality in probability".

Stephen Joe

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

Megan Drysdale, enrolled in a Postgraduate Diploma in Applied Statistics, has won an Honours and Masters Scholarship from the International Biometric Society (Australasian Region). Congratulations Megan!

Jonathan Brown, a Postdoctoral Fellow working with Astrid an Huef, left in August to take up a position as Visiting Assistant Professor at Kansas State University. Jon was here for two years and we wish him all the best for his time in Kansas.

Mihály Kovács attended the Computational Stochastics Workshop in Annweiler, Germany, March 25-30, where he gave the presentation "Numerical approximation of a class of stochastic PDEs arising in linear viscoelasticity". In April, Misi took study leave for a research collaboration with Stig

Larsson in Göteborg, Sweden.

Peter Fenton gave a plenary address on "Subharmonic functions that are convex between two curves" at the conference on Normal Families, Meromorphic Functions and Value Distribution theory held in Akko, Israel from 23-26 May.

This May, Boris Baeumer attended the 5th IFAC Symposium on Fractional Differentiation and its Applications in Nanjing, China. He gave a talk entitled "A coupled system of fractional reaction diffusion equations". In June, Boris went to the International Workshop of Applied Probability in Jerusalem, where he gave the presentation "Boundary conditions for Levy Flights on bounded domains and their governing equations".

Matthew Parry attended the International Society for Bayesian Analysis 2012 World Meeting in Kyoto, Japan from 25-29 June. Matt talked about "Proper local scoring rules".

Richard Barker and Janine Wright attended the International Statistical Ecology Conference in Oslo, 3-6 July. Richard gave the presentation "Software for capture-recapture type models using genetic tags" and Janine talked about "Closed population genetic mark-recapture with genotyping error and heterogeneity". Afterwards, they went to Frankfurt for a collaboration with Matthew Schofield.

John Harraway and Sharlene Forbes worked on a module for the Certificate on Official Statistics. Moreover, John attended the Council Meeting of the International Statistics Institute in Rome in July.

Iain Raeburn and Lisa Clark attended the International Workshop on Operator Theory and Applications at the University of New South Wales from July 16-20. Iain gave a plenary talk "Equilibrium states in operator-algebraic systems". Lisa gave a seminar the following week at the University of Wollongong entitled "A groupoid generalisation of Leavitt path algebras".

Visitors

Visitors over the last few months have been Ellery Ames (University of Oregon), Sharlene Forbes (Victoria University and Statistics New Zealand), Jacques Printems (Université Paris-Est), Matthew Spencer (University of Liverpool) and Peter Waddell (Purdue University, Indiana).

Seminars

Mike Hendy "Molecular evolution — a mathematical perspective" (Inaugural Professorial Lecture)

Lisa Clark "Simplicity of algebras associated to groupoids"

Torbjørn Ergon (University of Oslo) "Separating mortality and emigration: modeling space use, dispersal and survival with robust-design spatial capture-recapture data"

Yorgos Doulis "How to impose Lax-stable boundary conditions for finite difference schemes with the SAT method"

Matt Parry "Proper local scoring rules"

Maths & Stats Honours project presentations

Liz Stanhope (Lewis & Clark College, Portland) "The spectrum of the Laplace operator of a Riemannian orbifold"

Ellery Ames (University of Oregon) "Fuchsian equations and AVTD behaviour in smooth solutions to the Einstein equations"

Richard Barker "Closed-population capture-recapture modelling using non-invasive DNA sampling with genotyping error"

Ellery Ames (University of Oregon) "Uncovering the mysteries of postgraduate programs in the USA"

Ben Whale "Coordinate invariance of coordinate techniques in the study of gravitational singularities"

Sterling Sawaya (Centre for Reproduction and Genomics, Department of Anatomy) "The probability of extinction in a branching process and its relationship with moments of the offspring distribution"

Iain Raeburn "Self-similar groups"

Matthew Spencer (University of Liverpool) "Dynamic species distribution models for marine intertidal invertebrates from categorical surveys"

Jörg Hennig

FEATURES

New Colleagues

Jim Denier

Prof. Jim Denier received his degrees from the Universities of Melbourne and UNSW. He was the Head of the School of Mathematical Sciences at the University of Adelaide leading the Theoretical and Applied Mechanics group.

His main research interest is in fluid mechanics particularly in boundary-layer flow theory and how such flows transit to turbulent states. His aims are to understand how small environmental disturbances promote turbulence. Through a detailed understanding of how such instabilities develop we will be able to develop programs of active control of turbulence. Thus, such detrimental phenomena such as drag can be controlled.

In addition, he is interested in areas where active control is not possible. One such problem that his group are working on is the effect of coiling in the umbilical cord on such things as mortality and fetal development. Here, he and his group model the flow of blood through the umbilical cord, which is known to exhibit complex coiling geometries. The group use this model to explore the effect of the coiling (both the geometry and amount of coiling) on the flow. Their aim is to develop an understanding of how coiling affects the fluid transport and to use this to provide insight into many poorly understood known pathologies.

Comments

Mark Wilson replies to Marston Conder.

Dear Marston - as a mathematical first cousin of Jianbei (via Richard Brauer → Donald Passman), I accept your congratulations. I was pleased to know of my illustrious "ancestry" when I found out. However Richard Brauer, for example, has 657 descendants, his advisor Schur has 1944, and his advisor Frobenius has 6744. We don't need to go back far before a large fraction of people working in the general area of algebra must merge in to the branch going back to Euler et al. It would be a nice problem to develop a model for this, so Jianbei and I can seen how special we really are!

Les Woods Memorial Lecture

On the evening of 1st May, Professor Emeritus John Ockendon, University of Oxford delivered the third annual Les Woods Memorial Lecture, entitled "Mathematics under the Bonnet". This was held in the Engineering Building of the University of Auckland. In this lecture John captured the spirit of his deceased (in 2007) colleague Professor Les Woods, covering gems from many years of novel applications of mathematics. Les Woods was arguably one of New Zealands best real-world applied mathematicians, and was regarded highly for his work in the theory of plasmas. The latter led to some controversy concerning the obtaining of energy from plasmas.

The lecture series has been a joint venture between the University of Auckland (the Departments of Mathematics, Statistics, and Engineering Science) and Massey University Auckland (the Institute of Information and Mathematical Sciences) since it was launched in late 2009. Previous speakers have been: Professor Gil Strang of MIT (2010) and Professor Peter Hunter of UoA (2011).

Professor John Ockendon and Professor Les Woods

Professor Graeme Wake FRSNZ, Centre for Mathematics in Industry, Institute of Information and Mathematical Sciences, Massey University at Albany.

Conference Reports

The Australia and New Zealand Applied Probability Workshop

Report on The Australia and New Zealand Applied Probability Workshop University of Auckland, 25 - 27 January 2012

The co-organizers wish to gratefully acknowledge the support given by the New Zealand Mathematical Society towards the running of the Workshop.

A programme of Summer Workshops in Probability was held at the University of Auckland during the week of 21-25 January 2012. Mark Holmes organized the New Zealand Probability Workshop, which was held on Monday and Tuesday of the week, whilst Jeff Hunter and Ilze Ziedins organized the Second Australia and New Zealand Applied Probability Workshop over Wednesday through Friday of the week. For details see http://www.stat.auckland.ac.nz/~mholmes/workshop/auckland_2012

The ANZAP Workshop consisted of 17 invited talks (14 from Australia, 2 from New Zealand and 1 from Poland). The programme committee consisted of Nigel Bean, Mark Holmes, Jeff Hunter, Yoni Nazarathy, Joshua Ross, Peter Taylor and Ilze Ziedins. It was pleasing to note that around half of the participants were postgraduate students or postdoctoral fellows.

This was the second such workshop, with the first ANZAP Workshop held at Second Valley, South Australia in September 1997. As Peter Taylor, the President of the Australian Mathematical Society commented in his editorial column in a recent Gazette (see http://www.austms.org.au/Publ/Gazette/2012/Mar12/PresCol.pdf): These workshops were examples of the type of conference that many academic mathematicians enjoy most a gathering of a relatively small number of experts, run at a pace that

does not require parallel sessions, and that allows time for extended talks and development of collaborations. I really enjoyed the chance to engage deeply with mathematics that I'm passionate about, and I came away with a number of good research ideas to pursue in the future. These comments are typical of those who attended the workshops. The aim is to ensure that these workshops are held on a much more regular basis.

The format consisted of talks on Wednesday morning, Thursday and Friday with an excursion to Waiheke Island on Wednesday afternoon. The Workshop Dinner was held at Mecca, Mission Bay, on Thursday evening with the participants transported by bus via Bastion Point en route to the dinner. Morning and afternoon teas and lunches were provided to all registrants.

The support of the New Zealand Mathematical Society covered the registration of a couple of invited speakers, subsidized the registration of other participants, and provided some support towards the transportation and conference dinner expenses. Support was also gratefully received from the New Zealand Statistical Association, the Marsden Fund, the Department of Statistics, University of Auckland and the School of Computing and Mathematical Sciences, AUT University.

Jeffrey Hunter, AUT University

Ilze Ziedins, University of Auckland

Co- organizers of the ANZAP Workshop

Report on NZ Mathematics Colloquium 2011

The conference was organised by the University of Auckland and AUT University. It was held on December 6–8, 2011 at the University of Auckland. All the lectures and also several well-lubricated social events were held in the Engineering department. In particular there was a welcome reception on the evening of Monday 5th and a very jolly reception and poster session on the evening of Tuesday 6th. The conference dinner and prize-awarding ceremony was held on the evening of Wednesday 7th at the Tamaki Yacht Club, with fine views to the city and islands.

Some photos from the conference can be found at:

http://www.math.auckland.ac.nz/~sgal018/NZMC2011/pics.html

The main conference organising commitee was Steven Galbraith, Jeff Hunter and Hyuck Chung. Further input into the academic programme was given by Jiling Cao, Tom ter Elst, Rod Gover, Sergiy Klymchuk, Greg Oates and Shixiao Wang.

The six excellent plenary speakers were:

- John Mason (Open University) "Making connections: shadows, crossed ladders, couriers, Ceva and parallel sums"
- Kiran Kedlaya (San Diego/MIT) "The Sato-Tate conjecture for elliptic and hyperelliptic curves"
- Graeme Wake (Massey, Auckland) "Mathematics in medicine: Enhancing your health" - ANZIAM Lecturer
- Alan McIntosh (ANU) "The square root problem of Kato for elliptic operators - a survey with emphasis on related first order systems" - NZIAS Lecturer
- Charles Semple (Canterbury) "Realizing phylogenies with local information" - NZMS Research Award winner
- Hinke Osinga (Auckland) "The role of global manifolds in the transition to chaos in the Lorenz system"

There were 110 participants, of whom 31 were students. There were several international visitors to the Delta conference who stayed for the colloquium, plus several other international participants. Indeed, there were participants from the following overseas countries: Australia, Czech Republic, Fiji, Oman, South Africa, United Arab Emirates, UK and the USA.

As well as the 6 plenary lectures, the programme featured 62 contributed talks and 13 posters.

The Aitken prize committee was chaired by Robert McKibbin and comprised Vivien Kirk, Ernie Kalnins, Tammy Lynch, Peter Donelan, Dion O'Neale and Maarten McKubre-Jordens. The prize winner was Edoardo Persichetti (University of Auckland), and the following were Highly Commended: Michael Lockyer, Stefanie Hittmeyer, Alexander Melnikov, Manfred Sauter (all from the University of Auckland). There seems to have been a home-town advantage for the Aitken prize.

The ANZIAM poster judging committee was chaired by Claire Postlethwaite and comprised Winston Sweatman, Shaun Cooper and Ben Martin. The prize winner was Laurence Palk (University of Auckland), and highly commended was Sophie Shamailov (Massey University).

We are very grateful to the following organisations for financial sponsorship: The University of Auckland, AUT University, The New Zealand Mathematical Society, New Zealand Institute of Mathematics and its Applications, New Zealand Institute for Advanced Study, ANZIAM (Australia and New Zealand Industrial and Applied Mathematics).

The conference webpage and registration system were developed and hosted by John Shanks of the NZMS. His help with the running of the conference was extremely valuable. Further contributions to the running of the conference were made by: Guanghua Lian, Lily Liow, Olita Moala, Guinevere Nalder, Lynda Pitcaithly and Jaya Venugopalan.

The conference finances ended up in credit, mainly due to the generous sponsorship, and we returned a surplus of around $300 to the NZMS.

During the NZMS AGM, Marston Conder remarked that it would be nice if the conference was scheduled in future so that it did not clash with the Australasian Conference on Combinatorial Mathematics and Combinatorial Computing (this conference will be held on December 10–14, 2012). It was decided that the 2012 NZ Mathematics Colloquium be hosted at Massey University in Palmerston North. It will be held on December 4–6, 2012.

Steven Galbraith

University of Auckland

Student reports

ICME-12, Seoul

Fiona Hagan

I was very fortunate to attend the 12th International Congress on Mathematical Education held from July 8th to 15th, 2012 in Seoul, South Korea. I presented my paper " "It's more active, you move around" contrasting girls' experiences of fabric technology with mathematics at school" in the Friday session of the Topic Study group on Gender and Mathematics.

It was really valuable to hear other speakers in this area and to receive comments and feedback on my own work, part of my Doctoral research. The ICME conference is held every four years and attracts up to 4000 participants.

It was great to reconnect with colleagues from NZ and Australia as well as many well-respected researchers from further afield. Seoul was a fascinating city to visit. An immense, smoggy city but wonderful, friendly, and helpful locals.

The food was a spicy taste sensation and I successfully navigated the metro system to experience the multitude of markets etc spread throughout the city during spaces in my very busy conference programme. Thank you to the NZMS for their generous financial contribution towards my travel costs. I had an amazing experience in Seoul!

Fiona Hagan

Conference in Dynamical Systems

Recipient: *Stefanie Hittmeyer*, University of Auckland

Supervisors: Bernd Krauskopf and Hinke Osinga

I would like to thank the NZMS and the Department of Mathematics at the University of Auckland for providing me with the financial support to attend the Conference in Dynamical Systems at the Abdus Salam International Centre for Theoretical (ICTP) in Trieste, Italy, in June. The new contacts I made

with world-leading experts during the conference and the discussions I had with them not only provided me with valuable feedback on my results so far but also gave me a lot of questions and ideas for future research.

I have now finished the second year of my PhD. Thus far, I had only attended conferences that had a focus on applications of dynamical systems, so this was a great opportunity for me to engage with specialists in the theory of dynamical systems. The conference was attended by the leading international experts in the field, in particular, in the area of robust non-hyperbolicity, including Marcelo Viana, Christian Bonatti, Stefano Luzzatto and Juan Rivera-Letelier. It was preceded by a two-week school on the theory of dynamical systems. The school and the conference together were attended by 222 participants from all over the world.

In my PhD project I study a planar non-invertible map that has been suggested by Bámon, Kiwi and Rivera-Letelier as a model for wild chaos in continuous-time dynamical systems of dimension at least five. I use advanced numerical techniques to study the changes of invariant sets that organise the dynamics on the plane as a parameter is varied. In the course of my project, I identified sequences of bifurcations of these invariant sets that are key ingredients in the transition to wild chaos in this map. Wild chaos is a "new" type of chaos (compared to the "classical chaos" in the three-dimensional Lorenz system) that may occur in continuous-time dynamical systems of dimension at least four; it is closely related to the concept of robust nonhyperbolicity. I have written up my results so far in a paper of about 45 pages that is nearly ready for submission.

At the Conference in Dynamical Systems in Trieste I presented the contents of the paper in the form of a poster. During the course of the conference, I had four meetings with Juan Rivera-Letelier who is one of the authors who suggested the map I study. We discussed how my results about the bifurcations of invariant sets of the planar map relate to invariant manifolds in higher dimensions and to what extend these bifurcations indicate when the wild chaos starts. I also took my paper to Marcelo Viana and Christian Bonatti and discussed with them how my results contribute to the understanding of the "geometry" of wild chaos and how they relate to recent theoretical developments. Attending the talks and discussing with these experts helped me to round off the theoretical background for my thesis and embed my results into the theory of robust non-hyperbolicity much better. Furthermore, I found out what the current research questions in the field are, which will help guide future research directions during the second half of my PhD project.

Stefanie Hittmeyer

PKC 2012 - The 15th IACR International Conference on Practice and Theory of Public-Key Cryptography

Recipient: *Edoardo Persichetti*

Supervisor: Ass. Prof. Steven Galbraith

Institute: University of Auckland

I am currently completing my third and final year of PhD in Pure Mathematics under the supervision of Steven Galbraith. My topic of research is cryptography, and in particular public-key cryptography with an eye on coding theory-based schemes. Modern cryptography is a quickly-evolving and exciting field that joins mathematics and computer science with the aim of studying and developing efficient systems for secure communication. These include structures like encryption schemes, digital signatures, identification protocols, secret-sharing etc.

My PhD aimed mainly at improving the efficiency of code-based schemes, like the very famous McEliece cryptosystem. This scheme was first introduced in 1978 and resisted cryptanalysis so far; moreover, it enjoys very fast encryption and it is one of the candidates for cryptography in a post-quantum scenario. However, it has one big flaw: the size of the public key. Thus, research in this area focused extensively on trying to reduce the public key size, by means of variants based on special algebraic properties. In this context, I first produced a paper, "Compact McEliece keys based on Quasi-Dyadic Srivastava codes", that features one of the above mentioned variants. The paper was presented in a 2011 seminar while visiting Pierre-Louis Cayrel in CASED (Center for Advanced Security Darmstadt), a high-profile research institute in Darmstadt, Germany. A collaboration arose from the visit and some months later a second paper was produced, in which my scheme was tested and implemented in C++ language and on an embedded microcontroller. Together with my co-authors Pierre-Louis Cayrel and

Gerhard Hoffmann, we decided to submit it to PKC 2012, which by chance was going to be held again in Darmstadt, in May, 2012.

PKC has been the main annual conference focusing on all aspects of public-key cryptography, attracting cutting-edge results from world-renowned scientists in the area. It is organized annually by the International Association for Cryptologic Research (IACR). Proceedings of PKC are published in Springer-Verlag's famous Lecture Notes in Computer Science Series. The proceedings are distributed at the conference and included in all major online databases.

Our paper "Efficient implementation of a CCA2-secure variant of McEliece using generalized Srivastava codes" was accepted and therefore appeared on the proceedings, resulting in a very prestigious publication. Moreover, I had the honor to be appointed as the designated speaker to present our work at the conference. This has been a great event, where I had the chance to showcase my research, listen to very interesting talks and meet many important names in cryptography. In addition to the conference itself, acceptance of the paper earned me an invitation to a code-based cryptography satellite workshop in Copenhagen, Denmark, where I gave a talk in the "recent results" session. It is impressive how important attending these events is for PhD students, and how many ideas and collaborations stem from it. I was able to afford the whole trip to Europe thanks to a PBRF grant and obviously the NZMS grant which, together, covered almost the whole cost of travel. I am therefore very grateful to NZMS for the financial assistance.

Edoardo Persichetti

CONFERENCES

46th Annual ORSNZ Conference

- Date: Mon 10 - Tue 11 Dec, 2012
- Location: Victoria University of Wellington, Wellington, New Zealand
- Enquiries: Email conference@orsnz.org.nz
- Website: https://secure.orsnz.org.nz/conf46/
- Description:

Workshop on Algebraic Number Theory

- Date: 17 Dec 2012
- Location: School of Mathematics, Statistics and Operations Research, Victoria University of Wellington.
- Enquiries: Email Byoung.Du.Kim@msor.vuw.ac.nz
- Website: http://msor.victoria.ac.nz/Events/WorkshoponAlgebraicNumberTheory

Doom 13: The Annual New Zealand Phylogenetics Meeting

- Date: Sunday 3rd - Friday 8th February 2013
- Location: Mount Ruapehu, New Zealand
- Enquiries: Email G.C.Gibb@massey.ac.nz or 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 mike.steel@canterbury.ac.nz
- Website: http://www.math.canterbury.ac.nz/bio/events/cass/

NZSA 2012 Conference

- Date: 29 30 November 2012
- Location: University of Otage, Dunedin, New Zealand
- Enquiries: Email NZSA2012@maths.otago.ac.nz
- Website: http://www.maths.otago.ac.nz/nzsa2012/

NZMRI Summer Workshop 2013

Geometric Mechanics and Shape

Ohope Beach, 13th 19th January 2013 (arrival on 12th)

The annual NZMRI summer workshop will be held in Ohope Beach, near Whakatane. The lectures will be themed around geometric mechanics and shape analysis, and will be at a level appropriate to graduate students. Confirmed speakers are:

Boris Khesin (University of Toronto)

Peter Michor (University of Vienna)

David Mumford (Brown University)

Xavier Pennec (INRIA, France)

Tudor Ratiu (EPFL, Switzerland)

Ohope Beach is an amazing summer location, and as is traditional for this workshop, the afternoons and the whole of Wednesday will be free.

Accommodation will be in Ohope Beach and nearby Whakatane, and hotels and houses in this area full up very fast in January, so please register early. A likely cut-off date for registrations will be **20th October 2012**.

Accommodation and some meals for New Zealand-based participants will be covered, and some support for travel for postgraduate students is available. Additionally, partners and families are welcome (if accommodation is available), although they will have to pay their own way. Overseas attendees are welcome, but will need to cover their own costs.

For more information and to register, visit http://seat.massey.ac.nz/NZMRI13 or http://nzmri.massey.ac.nz.

For any further information, contact Stephen Marsland at s.r.marsland@massey.ac.nz

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NZMS Status: Ordinary member ..... Student member .....

Date membership started .....

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

Type of assistance sought		Amount
(a)	Student Travel Grant	.....
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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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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 for reserach and student travel grants)

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- 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.
- 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).

Please send this application (and any supporting documents or other evidence) 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, applications will only be considered at other times in exceptional circumstances.

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:

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

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

NZMS Application Form

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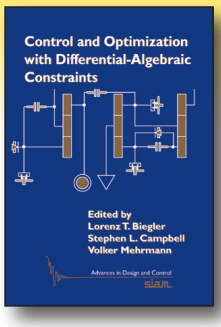

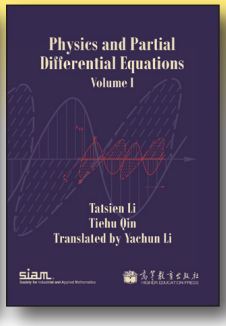

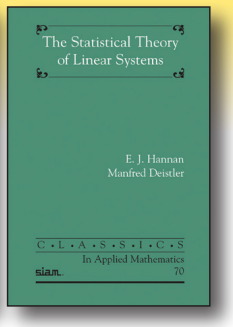

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Classics in Applied Mathematics 70

Originally published in 1988, this book deals with identification (in the sense of obtaining a model from data) of multi-input and multi-output linear systems, in particular systems in ARMAX and state space form. This edition includes an extensive new introduction that outlines central ideas and features of the subject matter, as well as developments since the book's original publication, such as subspace identification, data-driven local coordinates, and more.

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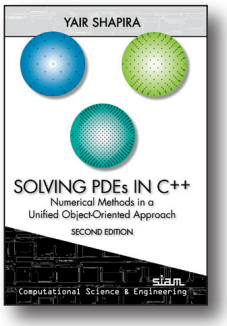

Yair Shapira

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This much-expanded second edition presents new applications and a substantial extension of the original object-oriented framework, making this popular and comprehensive book even easier to understand and use. It introduces the C and C++ programming languages and shows how to use them in the numerical solution of partial differential equations. Includes new material on 3-D nonlinear applications and image processing applications, cryptography applications, and new sections, many including additional algorithms.

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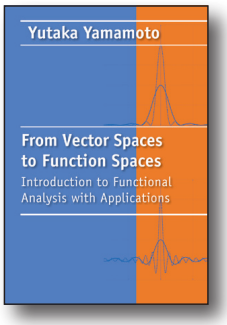

Yutaka Yamamoto

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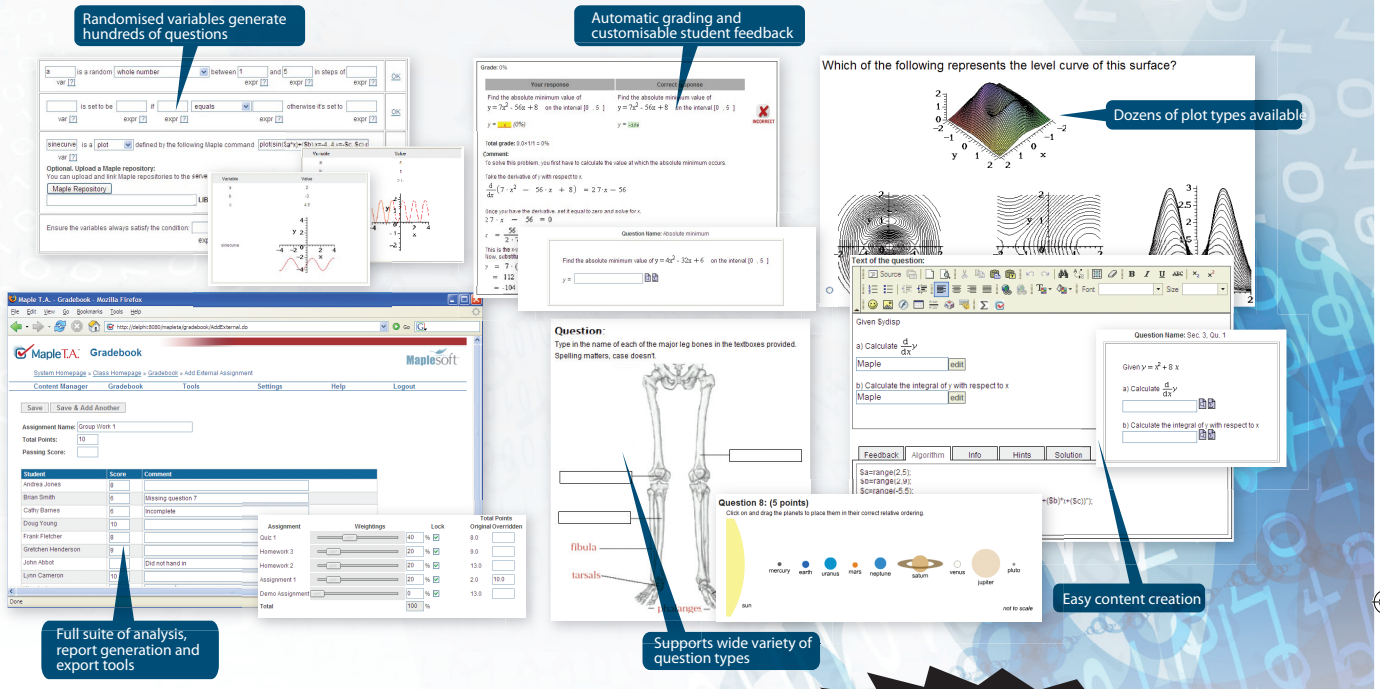

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