Number 121 August 2014

NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

Contents

PUBLISHER'S NOTICE

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was edited by Mark C. Wilson with paid proofreader assistance. Editorial enquiries and items for submission to this journal should be submitted as plain text or LaTeX files to mcw@cs.auckland.ac.nz with "NZMS newsletter" in the title of the email.

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

ISSN 0110-0025

EDITORIAL

This marks the fourth issue under the new management.

Consistently producing a newsletter of good standard requires a lot of work from many contributors. Thanks to all those who have done so. My opinion is that our efforts have paid off, and that the Newsletter is a valuable publication. Others seem to agree: several of our recent articles have been reprinted (with permission) by the Asia-Pacific Mathematics Newsletter (http://www.asiapacific-mathnews.com/), which is well worth reading for other reasons.

In this issue we have a hiatus in our series of contributed articles by NZMS Research Award winners, which we hope to rectify next issue. The issue has a historical flavour, with articles on the Mathematics Chronicle, pieces on old colleagues, and, sadly, an obituary. We continue the series "Where Are They Now?", aimed at catching up with mathematicians with a NZ connection whom we may have lost track of. I would appreciate further suggestions for inclusions in this series, or offers of Centrefold contributions. The first in a series "Focus on ...", written with trademark humour by Rachel Fewster, allows us to see the current state of a department that contributes to the local news reports. I hope to work through all of these departments in the next several issues.

I have received a suggestion that the Newsletter publish abstracts of every PhD thesis in mathematics (broadly speaking) in NZ. This will be completely voluntary and there is no way of enforcing submission, but I hope that we will be able to publish these as they come in. Please let your colleagues know about this.

One area in which I would definitely like to see more activity, as usual, is correspondence. There have still been no letters to the editor, although John Butcher has at last managed to elicit a response to his column. Clearly readers (like editors) are very busy with their normal research, teaching and administrative work. However this publication is one of the few vehicles we have for building a community from our geographically scattered membership, and I urge all readers to use the opportunity. For example, timely notification of visitors and requests for collaboration cost very little and have a potentially large payoff.

The 2014 International Congress of Mathematicians is held this month in Korea. Time constraints did not allow us to include much on this topic. I would appreciate offers from anyone who attends ICM2014 to provide a report for the December issue. Although international travel is a lot easier now than in decades past, New Zealand is still rather isolated, and such reports combat that isolation somewhat.

I wish you all success with your submissions on the National Statement of Science Investment draft (http://www.mbie.govt.nz/about-us/consultation/draft-national-statement-of-science-investment). Perhaps in future we can act via the NZMS as a community to make our voice heard on such issues, in conjunction with related organisations. Mathematicians do seem to value their independence and are used to working in groups of size 1–3, but it seems that political change is almost never effected by such methods.

Mark C. Wilson

PRESIDENT'S COLUMN

Congratulations to Gaven Martin on being elected Vice President of the Royal Society of New Zealand.

MISG 2015

I have recently been at the Irish version of the Mathematics-in-Industry Study Group (MISG). This is my 15th MISG since starting participation in 2004. As with all these workshops, it has been enjoyable and instructive to spend a week trying to come to grips with a project brought by industry. If you have the chance to attend such an event, I encourage you to give it a go.

In previous years the NZMS has contributed towards student travel to attend the Australia/New Zealand MISG. We welcome applications for the next MISG which will be held at Queensland University of Technology, Brisbane at the end of January. Applications for NZMS funding are due before the deadline of 1 December. See details later in this newsletter and the MISG website (http://mathsinindustry.com/).

NZMS Colloquium 2014

May I remind members that this year's NZMS Colloquium is embedded in the joint Australia New Zealand Mathematics Convention in Melbourne, 8–12 December. Registration is available on the website and the conference fees will increase from the 25th of September.

Forder, Aitken and Maclaurin Lecturers

James Sneyd is about to go to the USA as AMS-NZMS Maclaurin Lecturer. All the best for a great visit. Steven Galbraith has been chosen as the LMS-NZMS Aitken Lecturer and will be going to the UK in 2015. As announced in the last newsletter, Endre Süli is the next Forder lecturer in March/April 2015.

The Butcher-Kalman Invited Speaker

The society has received a generous grant from the Margaret and John Kalman Charitable Trust. This is to be invested with the Mathematical Chronicle Funds donated earlier in the year for funding the annual Butcher-Kalman speaker at the NZMS Colloquium. The Butcher-Kalman Invited Speaker will be a New Zealand resident mathematician who is within ten years of completion of her/his doctoral degree. The first Butcher-Kalman speaker will be at the 2015 NZMS Colloquium.

Winston Sweatman

INVITED ARTICLES

The Mathematical Chronicle

The Mathematical Chronicle was founded in 1969 by some members of the University of Auckland (UoA) Department of Mathematics. The following shows the inside back cover of Volume 1. Notice the subscription charge!

MATHEMATICAL CHRONICLE

published in the interests of mathematics in New Zealand

by the

Mathematical Chronicle Committee

J. C. Butcher, D. P. Alcorn, D. A. Nield, J. A. Kalman, R. E. Swenson

Editors

J. C. Butcher, J. A. Kalman

R. E. Swenson (Managing Editor)

H. S. Roberts (Editor for News and Personal Items)

CONTRIBUTIONS. All contributions may be sent to the Chronicle Committee at the address below. However, News Items and Personal Notes should preferably be sent to Mr H. S. Roberts, Applied Mathematics Division, D.S.I.R., Box 196, Wellington. Articles submitted to this Chronicle or to the New Zealand Mathematics Magazine which are considered by the respective editors to be more appropriate to the other publication will be considered for that publication if the author agrees. Possible types of contributions are:-

Expository and survey articles. These will be particularly welcome and may be short or long. However, if an article is of more than 20 printed pages in length, the Committee reserves the right to divide it between two or more, not necessarily consecutive, parts.

Research articles and mathematical notes. Short research articles and mathematical notes (up to about five printed pages) will be considered for publication. Longer research articles will occasionally be published. Persons considering submission of research articles or mathematical notes estimated to require more than about five printed pages are welcome to correspond at an early stage with the Committee about their proposed contributions.

Research announcements of up to about one printed page.

Mathematical education notes; Teaching notes.

Problems.

News items and announcements; Personal notes.

Book reviews.

Letters to the editors.

REPRINTS. Authors of articles, notes and research announcements will be entitled to 30 free reprints. Additional reprints may be purchased if desired.

SUBSCRIPTIONS. The subscription rate is NZ$3 (A$3, US$4.20 or stg£1.80) per volume of three parts which will be published as material is available. There is a special rate of NZ$1.50 for individual subscribers. The price and availability of back issues may be obtained on request. Proposals for exchange are welcome and should be sent to the address below.

ADDRESS FOR ALL CORRESPONDENCE. Mathematical Chronicle Committee, Department of Mathematics, University of Auckland, Private Bag, Auckland, New Zealand.

The first issue, which appeared in November 1969, included tributes to Emeritus Professor H. G. Forder in honour of his 80th birthday, which many of us celebrated with him in September, 1969.

As shown in the extract above the journal was published by the Mathematical Chronicle Committee. The first Editors were John Butcher and John Kalman, with Roy Swenson as Managing Editor. By Volume 4, John Kalman was the sole Editor and he continued in this role until the publication of Volume 11. For Volumes 12–14 the Editor was David Smith who was followed in this position by Nicholas Wormald for Volumes 15–17 and finally Simon Fitzpatrick for Volumes 18–20. Over the years a number of other staff of the Mathematics (and Statistics for a decade) Department helped in the production, including David Gauld and Paul Hafner as Managing Editors and Graham Baird, Bruce Calvert, Ganesh Dixit, Simon Fitzpatrick, David Gauld, Paul Hafner, David Ryan, Joel Schiff, David Smith, M. K. Vamanamurthy and Nicholas Wormald as Assistant Editors. Stan Roberts was the Editor of News and Personal items in the early years.

Production of the Mathematical Chronicle would have been impossible without the amazing work of a succession of very competent secretaries of the Mathematics Department. As will be seen from the sample above early issues were produced using a typewriter. In the early days the typewriter had a second bank of keys with special symbols such as Greek letters and the typist had to move from one bank of keys to the other as she (yes, inevitably she) produced the finished product from what often was a very scruffily handwritten manuscript. One can only admire the skill and marvel now at the painstaking effort required to jiggle the paper slightly so as to accommodate a superscript like $^{-1}$ then further jiggle so that the rest of the line matched properly with what preceded it. Misprints were handled by use of white paint to hide the miscreant then again careful insertion of the paper into the typewriter so that the eventual reader would not realise there had ever been a misprint. Later they moved to electric typewriters which housed the fonts on a ball about the size of a golf ball so changing fonts required a manual change of the golf ball. Of course as their competence increased they stopped referring to charts which would tell them which key to press to get the top half of a large integral sign or a φ! Then in the mid-80s desktop computers came along and the secretaries had to master yet another way to prepare the journal. The following made contributions to this aspect of the production: Jane Addington, Barbara Clements, Helen Cope, Betty Fong, Sandra Glanville, Peggy Haworth, Sharyn Hill, Gladys Hubbard, Joanne Hunter, Helen Jackson, Lois Kennedy, S. Lai, Penny McGrail, Eve Malbon, Olita Moala, Linda Moxon, Mary Quinlan, Hildegard Scheunert, Marilyn Talamaivao and Carole Worthington.

The last volume, Volume 20, was published in November 1991 by which time an agreement was reached between the New Zealand Mathematical Society (NZMS) and the UoA Department of Mathematics and Statistics jointly to publish a Mathematics journal as a successor to the Mathematical Chronicle. The successor journal was given a different name, the New Zealand Journal of Mathematics, but the volume numbering was retained to show the link with the Mathematical Chronicle.

As stated on the inside back cover reproduced above, the aim of publishing the Mathematical Chronicle was "in the interests of mathematics in New Zealand." This interest was at least threefold: (1) to provide another outlet for the publication of mathematical research undertaken by mathematicians based in New Zealand or for research of interest to such folk; (2) to provide a permanent venue for news about mathematical activity in New Zealand; (3) to provide a reasonably cheap means of bringing many other mathematical journals to New Zealand.

Inspection of the content of the 20 volumes of the Mathematical Chronicle will readily reveal how the first two were satisfied. Regarding the third, especially in the early days, a lot of effort went into organising exchanges between the Mathematical Chronicle and many other mathematical journals published elsewhere in the world: up to about 200 exchanges were achieved. These journals are housed in the UoA Library but, especially before electronic transmission of such material, were of great use to mathematicians in other parts of New Zealand. They were particularly useful when funding for research journals was being cut and we could rightly argue that in a sense many of the mathematical journals coming to our Library were doing so thanks to the freely offered service of New Zealand mathematicians and at no cost to the Library except for storage.

In addition to copies being produced for exchange purposes a number of individuals or institutions took advantage of the low subscription rate to purchase their own subscriptions. While a lot of this income went straight into production costs, the Mathematical Chronicle Committee slowly accumulated some money to guard against a sudden increase in costs which might otherwise have made it difficult to honour commitments to authors and subscribers.

With the change from the Mathematical Chronicle to the New Zealand Journal of Mathematics (NZJM), the Mathematical Chronicle Committee continued, though with little activity. The NZJM now has its own overseeing committee consisting of two representatives of each of the two parties, viz the NZMS and the UoA Department of Mathematics, together with the Editor. Recently the Mathematical Chronicle Committee resolved to disband, transferring its rights over the Mathematical Chronicle to the NZJM Committee and gifting its accumulated funds to the NZMS. The NZMS accepted the proposal from the Mathematical Chronicle Committee to set this money aside to cover the costs of an invited speaker at the annual NZMS Colloquium, to be known as the Butcher-Kalman Invited Speaker in honour of the founders and first two Editors of the Mathematical Chronicle.

Another of the Mathematical Chronicle Committee's final acts was to agree that all issues of the Mathematical Chronicle should be scanned and made available online with the UoA Library as well as on the NZJM website within the Mathematics Department's website. At the same time the NZJM Committee agreed to the same being done for back issues of the NZJM not already online. At the time of writing all of these back issues are available through the Library's website and it is planned to make them available through the NZJM website as well.

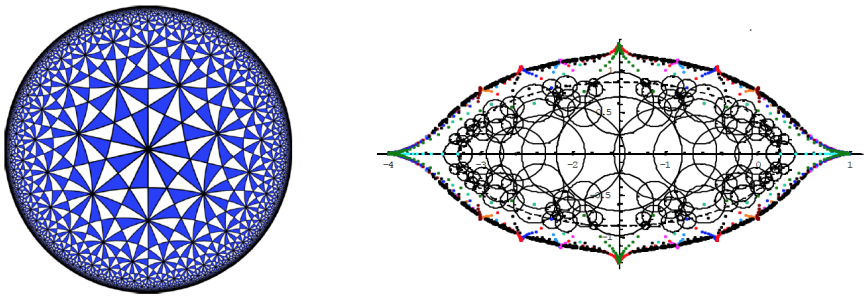
David Gauld

Siegel's problem in dimension three

Over the last few decades the theory of discrete groups of hyperbolic isometries (Kleinian Groups) has flourished because of its intimate connections with low dimensional topology and geometry. The culmination must certainly be G. Perelman's proof of W. Thurston's geometrisation conjecture stating that compact 3-manifolds can be canonically decomposed into submanifolds with geometric structures, and predominantly these structures are hyperbolic with a complete classification of those that are not. This is an analogue for 3-manifolds of the uniformization theorem of Koebe, Klein and others, for surfaces. This conjecture implied the Poincaré conjecture. With other recent advances we now have a remarkably complete picture of 3-manifold topology. The connection with Kleinian groups arises as they are the fundamental groups of the hyperbolic pieces and uniquely determine the topology.

I will discuss a related problem that I have worked on for a couple of decades (!) and the solution of which appeared in the papers *Minimal covolume lattices* **I***: spherical points of a Kleinian group*, Annals of Math., **170**, (2009), 123–161, with F. Gehring, and *Minimal covolume lattices* **II**, Annals of Math., **176**, (2012), 261–301, with my former PhD student T. Marshall.

A remarkable feature in negative curvature is that there are geometric constraints placed on a group in order for it to act discretely on hyperbolic space (meaning that the orbit $\Gamma(x) = \{\gamma(x) : \gamma \in \Gamma\}$ of a generic point should be a discrete set). In 1943 C.L. Siegel posed the problem of identifying the smallest possible covolume of a lattice of isometries of hyperbolic n–space. This is the volume of a piece which tiles hyperbolic space under the action of a group as illustrated below. He solved the problem in two dimensions : the $(2,3,7)$–triangle group is the unique lattice of minimal coarea. It is the orientation-preserving subgroup of the group generated by reflections across the sides of a hyperbolic triangle with interior angles $\pi/2, \pi/3$ and $\pi/7$.



Left : $(2,3,7)$-tessellation. Right : A slice through a space of discrete groups.

Siegel actually proved the signature formula determining the complete spectrum of co-areas of lattices of the hyperbolic plane. Next, in 1968 D. Každan and G. Margulis showed that for each n, the infimum of lattice covolumes is positive and achieved - so what are these numbers?

At the time of Siegel's result the theory of covering spaces was not well developed and he could only suggest a connection with Hurwitz's $84g-84$ theorem of 1892 - bounding the order of the symmetry group of a Riemann surface in terms of its genus (confirmed by M.A. Macbeath in 1961). Selberg's Lemma gives torsion-free finite index subgroups of hyperbolic lattices, and therefore with the Mostow rigidity theorem the $84g-84$ theorem takes its expression in terms of bounding the order of the symmetry group of a hyperbolic manifold by its volume. So solving Siegel's problem has implications for the order of the symmetry groups of hyperbolic manifolds. This was something we explored in joint work with M. Conder and his PhD student A. Torstensson.

At the same time as the excitement over the connections between 3-manifold theory and hyperbolic geometry was running, connections with number theory and arithmetic geometry were developing with similar objectives making the associated manifolds and orbifolds amenable to techniques from algebra and number theory, along with the topological, analytical and geometric tools. Earlier work of ours gave explicit criteria which determine when a two-generator group is arithmetic. It turns out that solutions to extremal problems are usually realised by arithmetic groups - the number theory forcing additional symmetries enabling it to be "smaller" or "tighter".

In order to solve Siegel's problem we adopted the following procedure. We describe the space of two-generator discrete groups using a very intriguing family of polynomial trace identities we discovered in $\mathrm{SL}(2,\mathbb{C})$ (the group of all isometries of hyperbolic 3-space $\mathbb{H}^3$). From this we get general *a priori* bounds which hold when various

assumptions are made which, in general, will not be true for the extremal case. We then went about proving that if these assumptions fail, specific geometric configurations must occur producing two-generator subgroups of a specific type. These will (fortunately) be arithmetic. This led to a second part of the programme: enumerate all the two-generator arithmetic groups. We show that the examples which our *a priori* bounds do not cover are arithmetic and use other techniques to identify the extremal from this finite list. Thus most examples of small volume hyperbolic orbifolds and manifolds have an arithmetic structure. Basically our programme of proof is predicated on the belief that the externals for these geometric problems are two-generator arithmetic, and luckily this is the case. We proved if Γ is a Kleinian group, then $\mathrm{vol}_{\mathbb{H}}(\mathbb{H}^3/\Gamma) = \mathrm{vol}_{\mathbb{H}}(\mathbb{H}^3/\Gamma_0) = 275^{3/2}2^{-7}\pi^{-6}\zeta_k(2) \sim 0.0390$ and $\Gamma = \Gamma_0$, or $\mathrm{vol}_{\mathbb{H}}(\mathbb{H}^3/\Gamma) \geq 0.04048$, which solves Siegel's problem.

Equality of groups is up to conjugacy. Γ_0 is a two-generator arithmetic Kleinian group obtained as a $\mathbb{Z}_2$–extension of the orientation-preserving subgroup of that generated by reflection in the faces of the 3-5-3–hyperbolic Coxeter tetrahedron and ζ_k is the Dedekind zeta function of the field $\mathbb{Q}(\gamma_0)$, with γ_0 a complex root of $\gamma^4 + 6\gamma^3 + 12\gamma^2 + 9\gamma + 1 = 0$, of discriminant -275.

Gaven Martin

V. Jones conference (see Events) — Gaven: back row, extreme left, Rod Downey 3rd row, extreme right.

W	X	X	W
Y	Z	Z	Y
Y	Z	Z	Y
W	X	X	W

Figure 1

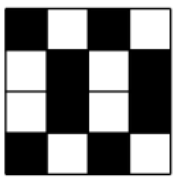


Figure 2

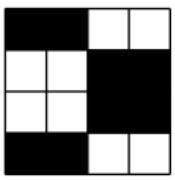


Figure 3

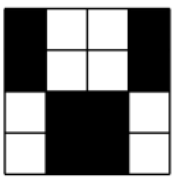


Figure 4

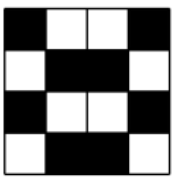


Figure 5

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

Figure 6

Figures for MM34 (facing page).

MATHEMATICAL MINIATURE

MM34: Goldbach's conjecture

My dreams have come true. A reader, namely Jörg Hennig, has acceded to my request for a response to one of the little challenges I threw out in MM33. My challenge was:

Consider the series $\varphi(x) = 1 + x + x^2 + 0x^3 + x^4 + \cdots$, where every power of x has coefficient 1 except terms of the form $x^{2mn+m+n-1}$, where m and n are positive integers, possibly equal. In this case the coefficient is zero. I have a strong belief that the series expansion for $\varphi(x)^2$ has only positive coefficients. I have checked this as far as I can but I have no proof. Can any reader give me hints or references?

I had already taken out insurance against any reader thinking that I was stupid in not realising that this puzzle is just the Goldbach conjecture in disguise. I had referred to BWV 988 as a great piece of music but this is Bach's Goldberg variations so I obviously had the two syllables Gold and Bach in my mind.

The fact that $4 = 2 + 2$ allows 4 to be safely omitted from this statement of Goldbach: "Every even integer greater than 4 can be written as the sum of two primes". Let $\psi(t) = t^3 + t^5 + t^7 + t^{11} + \cdots$, where only odd prime powers are present. Goldbach's conjecture is equivalent to the observation that the coefficients of all even powers of t in $\psi(t)^2$ are positive. Divide $\psi(t)$ by t^3 and then substitute $t^2 = x$ and we obtain $\varphi(x)$ with the equivalent property being that $\varphi(x)^2$ has no missing terms.

In addition to solving this problem, Jörg has provided a very nice commentary on the Goldbach conjecture and, with his permission, I am quoting this here.

> In a letter to Goldbach, dated 30th of June 1742, Euler repeats what Goldbach had discussed with him earlier, "*dass nehmlich ein jeder numerus par eine summa duorum numerorum primorum sey*" (namely that every even integer is a sum of two primes), and points out that he is convinced this must be a theorem, even though he cannot prove it. Needless to say Euler was not the only one who failed to find a proof for this "strong Goldbach conjecture" — the problem is still unsolved. Interestingy, the related "weak Goldbach conjecture", which states that every odd integer greater than 5 is the sum of three primes, has been verified by H. A. Helfgott in 2013 — assuming that his paper, currently available as a preprint, will be accepted for publication. (He shows the result analytically for numbers $> 10^{27}$ and closes the "little" gap of smaller numbers with an explicit computation, which has been carried out together with D. J. Platt.) For the strong conjecture, there is a heuristic argument, based on the density of prime numbers, according to which the expected number of ways of writing n as a sum of two primes is roughly $n/\ln^2 n$, which is greater than one and grows with n. So there seems to be a "good chance" that any given n has the required decomposition. However, the conjecture has only been rigorously verified for numbers up to 4×10^{18}, thanks to computations published by T. O. e Silva et al. in 2013.

I want to draw some 4×4 blocks of squares, eight coloured black and eight white (see facing page). They have the properties that (a) any two diagonally opposite squares have opposite colours, (b) there are exactly two black squares in each row and each column. Because of (a) there are exactly two black squares in each of the diagonals, and two black squares in each of the collections of 4 squares labelled W, X, Y and Z respectively in figure 1. There are four solutions to this easy problem in which the top left square is coloured black. (there are 4 additional solutions if the black and white squares are interchanged).

Figure 6 is formed by adding to 1 four terms: an additional 1 for each black square in Figure 2, 2 for each black square in figure 3, 4 for each black square in figure 4 and 8 for each black square in figure 5. We recognise figure 6 as a famous magic square appearing in the 1514 engraving *Melancholia* of Albrecht Dürer. Its magic properties are inherited from the properties shared by figure 2, 3, 4, 5.

How can you make sure you never lose the following game: the numbers $0, 1, \ldots, 8$ are available to be selected and retained by each of two players who choose in turn. Because there are only 9 numbers to choose from, there cannot be more than 5 moves. One of the players has won the game if, at any stage, exactly three of the numbers chosen by this player have a total value of 12. For example, if the first six numbers chosen are 5, 0, 1, 6, 4, 3, so that player A owns the numbers 5, 1 and 4; while player B owns 0, 6, 3. But it is now A's turn and a winning move is to select 7. Player A now owns 5, 1, 4 and 7 and the last three of these add up to 12.

J. C. Butcher

CYBERMATH

Future columns will no doubt return to the theme of research quality, but this time I want to discuss some useful online resources for exploring the mathematics literature. My opinion is that too many papers are published by authors without sufficient checking for novelty. The easier it is to find published work online, the less excuse there is for this behaviour, and with luck it will soon become a professional *faux pas*.

Preprint servers such as arXiv have now matured considerably, and offer more functionality than in earlier years. The arXiv is not the only mathematics preprint server. The French equivalent (roughly) is HAL http://hal.archives-ouvertes.fr/. For today, let's focus on the arXiv.

The arXiv http://arXiv.org is now 20 years old, but has still not yet developed the near-universal coverage in mathematics that it has in high-energy physics. However it is still widely used by mathematicians. Some of its newer features are not widely known. For example, references to published journal versions are easy to include, and there are automated mathods for publishers to link DOIs to arXiv versions. I encourage you to update the metadata of your papers by adding in the journal references. The old features, such as a daily email digest of new submissions, are still very useful.

There are several "third-party" websites that allow us to interact with arXiv.org. A nicer front end http://front.math.ucdavis.edu has been around for many years. More recently I found Paperscape http://paperscape.org, which allows graphical and other analysis of arXiv submissions, in a beautiful way.

After a hard day's work exploring the arXiv, relax by checking out the satirical version http://snarxiv.org/vs-arxiv/. If the acceptance criteria of arXiv are too restrictive for you, try http://vixra.org.

"Overlay journals" that consist mainly of curated links to arXiv papers have been discussed for many years. None has so far succeeded, probably because of an attempt to stick with the subscription model – there seems no obvious reason why open access journals of this type cannot work. A serious attempt is apparently being made by http://episciences.org – although so far their rate of progress seems glacial, we are told that more is happening behind the scenes than meets the eye.

Before we move on, note that arXiv.org is hosted by Cornell University Library and most funding comes from Cornell and the Simons Foundation. However they plan to raise several hundred thousand dollars per year from institutions who use it comparatively heavily, at the rate of $1500-3000 per year. While ANU, Melbourne and Sydney are members, no NZ university is. This seems to me to be rather disgraceful, given the usefulness of arXiv and the tens of millions of dollars spent by NZ universities yearly in subscription fees to allow them to rent access to papers by commercial publishers.

One reason why services such as arXiv.org are so useful is their timeliness. Of course, another is simply that subscription journals are expensive, and access is not always easy (another reason is that official published versions are sometimes mangled by publishers, which I have certainly experienced). One argument against open access publication is that "everything is available freely somewhere anyway". The Mathematics Literature Project run by Scott Morrison http://tqft.net/mlp/wiki/The_Mathematics_Literature_Project aims to quantify this, and has made a start with a few well-known journals. This initial stage is time-consuming for a single person but the task is easily parallelized, and I urge you to help, as I have - it takes only a few minutes.

Traditional subscription ("toll") publishers are in general not helping the cause of easier dissemination of research literature. However under pressure from the boycott, Elsevier has recently opened its mathematics archives. Complete downloads of large numbers of journal articles (with a moving 4-year embargo after publication) are now available and presented nicely by Scott Morrison at http://tqft.net/mlp/wiki/Elsevier_open_access_mathematics.

Although search engines are good at finding content, more centralization of the mathematics literature might be desirable. The International Mathematical Union has a project called Digital Mathematics Library www.mathunion.org/ceic/wdml/ aimed at integrating digitized versions of research from the pre-internet age. Some progress seems to have been made and more discussions are to follow at ICM2014. In the meantime, there are several interesting retrodigitization efforts, including the Euler archive http://eulerarchive.maa.org/, the European Digital Mathematics Library http://eudml.org and the Bielefeld site http://www.mathematik.uni-bielefeld.de/~rehmann/DML/.

Finally, if you still want to look at a paper copy of a mathematics book, and want to buy it yourself, try http://isbn.nu/ to search for online bookstores and compare prices.

Mark C. Wilson

WHERE ARE THEY NOW?

Victor Flynn is a US/Kiwi number theorist based in the UK. He is the son of the well-known Otago university professor of politics, Jim Flynn. After schooling at Otago Boys' High School he completed a BA(Hons) in Mathematics at the University of Otago. He then went to the University of Cambridge for his doctorate in number theory (supervised by Prof. J. W. S. Cassels), before having postdoc positions at the University of Michigan and the University of Cambridge. He held a lecturer position from 1994–2005 at the University of Liverpool, and then moved to the University of Oxford, where he has been Professor since 2006.

Victor is an authority on rational points on elliptic curves and curves of genus 2, and co-wrote the text "Prolegomena to a Middlebrow Arithmetic of Curves of Genus 2", published by Cambridge University Press in 1996.

I asked him a few questions by email.

SG When you went to the UK for your PhD back in 1985, did you imagine it would be a one-way trip?

VF At the time, I was unsure. I knew that I wanted a research career in number theory. In 1985 the main countries with researchers in my areas of interest were in Europe and the USA. So, I had a feeling in 1985 that I would likely want to remain in countries that had a lot of number theorists. But it's very hard to assess how these things will turn out when you are beginning a PhD.

SG What in your opinion are the most important differences (to you) between the UK mathematical environment and the NZ one?

VF There is a large difference in size of research groups; there are no mathematics departments in NZ as large as the larger departments in the UK. As a consequence, some of the larger UK departments can have substantial research groups in specific branches of mathematics. For example, Oxford has 8 number theorists on its permanent faculty, plus further number theorists amongst the postdocs. Many of the UK departments are also close to each other; for example, an hour away are the groups of number theorists in London, and not much further away are those in France and Germany, who are regular visitors to the UK. So, there is a wide range of potential research interactions nearby.

SG Briefly tell us about your sabbatical in NZ from September 2011 to March 2012.

VF I was very kindly and generously hosted by the University of Auckland. I was working on $(3,3)$-isogenies on abelian surfaces (joint work with Nils Bruin and Damiano Testa), and on Weil restrictions (joint work with Damiano Testa). I was also contributing an appendix to an article of Masser and Zannier on Torsion Points on Families of Abelian Surfaces. I gave a departmental seminar in Auckland, and at the Number Theory Satellite Meeting to the NZ Math Colloquium in Auckland in December. I also helped Shayne Waldron (a Senior Lecturer at the University of Auckland) with some of his work on Tight Frames.

SG What are your current position and admin duties in Oxford?

VF I am a Professor of Mathematics, as well as a Tutorial Fellow at New College, Oxford. I have the usual academic duties: research, giving undergraduate lectures, supervising postgraduate students, tutoring undergraduates (with the Oxford system of tutoring students in pairs), admissions, and general administration for both the department and New College.

SG What are you working on these days in your research?

VF I am extending my work on isogenies on abelian surfaces, and am investigating the p-part of Sha on abelian varieties.

SG When do you think you might next be back in NZ?

VF I hope to have another visit as soon as possible, depending on my next period of sabbatical leave. I very much enjoyed my time visiting the department in Auckland and hope to visit again, especially as they have now completed the renovation of their building, with the collegiality of having the Department together in one building and common rooms where one can interact with the whole department (during my last visit, they were in the middle of these renovations, and the department was temporarily scattered amongst a number of buildings).

Steven Galbraith

FOCUS ON ...

Department of Statistics, University of Auckland

'It is the mark of a truly intelligent person to be moved by statistics'
— 95% attributable to Bertrand Russell, 1926

The year 2014 marks the 20th birthday of the University of Auckland's Department of Statistics, which was born in 1994 when the former Department of Mathematics and Statistics split into its two component parts. According to life expectancy tables, the department's life expectancy at birth was 77 years, so we have a while to go yet. As is befitting of a 20-something, since its birth the department has grown a lot, has a few good qualifications, and enjoys diverse interests. To celebrate our coming-of-age, and because the Editor asked for them, here are some statistics about Statistics.

- We have about 32 academics, 9 teaching fellows, 5 staff in the Statistical Consulting Service, and 30 PhD students. At midnight on 9 August 2013, we first reached 1000 EFTS—equivalent full-time students in undergraduate and taught postgraduate papers. As far as EFTS go, we compete with the Computer Science and Psychology departments for the coveted title of second in the Faculty of Science. (The School of Biological Sciences is well in the lead with nearly 1300 EFTS.)
- Of our EFTS, 63% are at stage 1 level, thanks to the foresight of our forebears in securing most of the university's statistics service teaching in the late 1980s. Stage 2 and 3 courses account for about 15% of EFTS each, and postgraduate courses for 7%.
- Bearing in mind that students take multiple courses, the headcounts of physical people (as opposed to that mythical creature, the EFTS), tell a different story. Each year, about 5100 real people do stage 1 statistics, which means a lot of t-tests by any standards. This diminishes to 1260 people at stage 2, 260 at stage 3, and 70 studying postgraduate papers. With this uncannily faithful illustration of an exponential decay model, our students have demonstrated that they practise what we preach. As statisticians, we can confidently deduce that the coefficient of retention is one quarter of the cohort from each stage to the next; so if we taught four more levels of courses, we would have nobody left.
- Undergraduate students don't arrive at university believing that statistics and statisticians are boring. In fact, doing statistics is quite cool these days. This, along with many other interesting facts, was uncovered by a survey we commissioned in 2011 to discover more about statistics students, graduates, and employers. The resulting guide to statistical career planning can be found at `http://www.stat.auckland.ac.nz/en/for/current-students/cs-career-planning.html`. As to not being as boring as we thought we were: we await the exit survey to ascertain what the same students think when they leave university!

As far as research goes, the department has many thriving interests. In the PBRF exercise we ranked 6th in the University of Auckland in terms of the percentage of A grades, at 30.94% just a whisker behind the Mathematics department, which was in 5th place with 30.97%. (One suspects that this triumph of Mathematics over Statistics was achieved by the machinations of an advantageous denominator.)

Our spectrum of research interests and achievements is too broad to attempt a complete catalogue, but some particular strengths are below, listed alphabetically and with an attempt to explain what they mean:

- Bayesian statistics – how to update your beliefs on everything from astrophysics to fisheries.
- Biostatistics – using statistics to cure diseases, or at least to inform people how unlikely they are to be cured.
- Statistical computing – creating software systems that enable statisticians to do statistics.
- Statistical ecology and phylogenetics – methodologies relating to all things *Animalia*, *Plantae*, *et alia*.
- Statistics education – how best to do it, and how to spot it when it happens.
- Experimental design and sampling theory – the things that statisticians would have told you, if you had asked them before you collected your data.

- Forensic statistics – how to ensure that other people don't get away with murder, with 95% confidence.
- Operations research – how to optimise everything, including hospital beds, electricity markets, and selfish drivers.
- Probability and statistical physics – a very mathematical way of having fun with random walks and other stochastic processes; probably.

Perhaps most importantly, the department covers a rich spectrum of work involving mathematics, computation, and data analysis and management, with most of our staff doing a combination of all three. As Tukey famously said, statisticians "get to play in everyone's backyard", so most of us also have a favourite applications area such as ecology or astrophysics where we brandish our statistical tools, often requiring substantial additional understanding of the applications field.

Finally, some stand-out elements of our history and outreach activities deserve a special mention.

- The worldwide statistical computing package, R, was born in our department *circa* 1993 from a conversation in the corridor between Ross Ihaka and Robert Gentleman. R is now used by millions of people worldwide, and has changed the way that scientists and business professionals interact with data.
  Conclusion: keep on talking in corridors!
- The department has its own blog, StatsChat (http://www.statschat.org.nz), which is especially notable for Thomas Lumley's entertaining and erudite thoughts about nearly everything. David Scott is the media go-to man for predicting who will win the rugby, and Andrew Balemi is a regular on TV and in the national press for elucidating your chances of winning Lotto.
  Conclusion: not a lot, given that Andrew still seems to be coming to work.
- The department is heavily involved in developing statistics in the NZ school curriculum, particularly through projects such as Census at School, resampling theory as a basis for statistical inference, and iNZight, which are initiatives led by Chris Wild, Maxine Pfannkuch, and colleagues from around NZ. As a result, the NZ school statistics curriculum is regularly cited on statistics forums as being the international gold standard.
  Conclusion: this is why nobody arrives at university thinking statistics is boring any more!
- From 2004 to 2010, members of the department produced 14 children: all of them boys. Seen in the context of all 36 births from 2000 to 2014, the probability of having an unbroken run of 14 births of just one sex is only 0.0015, assuming an equal chance of a boy and a girl each time.
  Conclusion: Statisticians are statistically significant!

Rachel Fewster

Figure 1: Christmas Party 2013, with James Curran and Werner Schmidt proudly displaying their 2013 department award certificates, respectively for *Largest effect size* and *Most significant contribution*.

OBITUARIES

Mervyn Stanley Rosser, 14th September 1926 – 12th July 2014.

In 1948, Mervyn graduated with an M.Sc. with 1st class Honours in Mathematics. He then followed his love of music and in 1952 he graduated with Mus.B at the University of Auckland. After a year at Training College in 1948, he taught at Avondale College and Pukekohe High School. During this time he was awarded a Rotary Foundation Fellowship and spent 1954 at Brown University, Rhode Island, USA. In 1959 he returned to his old school, Mt. Albert Grammar, as Head of Mathematics.

In 1962 the late Professor Cecil Segedin approached him about a lecturer position being advertised by the Department of Mathematics "with special responsibility for teaching engineering mathematics courses". Mervyn was successful in his application, and in 1962 joined the staff of the University of Auckland.

Mike O'Sullivan notes that "Teaching any large class to the engineers was a challenge. Merv never had any problems, mainly because he was such an excellent teacher but also because he had a kind of steely gaze that seemed capable of incinerating the recipient. This was somewhat out of character because Merv was a very kind, decent man who always tried to treat the students well. His kindness and decency were coupled with common sense and humanity."

In 1963 Mervyn assisted Cecil in the formation of a new department, and together they left the Department of Mathematics to become the two foundation members of the School of Engineering's Department of Theoretical and Applied Mechanics – otherwise known as TAM.

David Edmonds was in the first intake of students into the TAM degree and recounts that "Mervyn's lectures were always enjoyable, delivered as they were at a rattling pace and with good humour. Besides engineering maths and statistics,

Mervyn also introduced us to the 'new' art of electronic computing. On many Wednesday afternoons during term time we would visit the mighty IBM 1620 in its own air conditioned room at the Princes Street campus, and under direction from Mervyn feed it with cards we had prepared on the cardpunch back at the Ardmore engineering school."

Mervyn's specialty was Operations Research – an area came that into prominence in the 1970s. He and others developed it into a significant portion of the TAM degree. When Ardmore alumni John List joined TAM as a faculty member in 1967, he and Mervyn (then Acting Head of Department) took the opportunity provided by Cecil's absence on sabbatical to get the operations research/systems analysis programme started. This included a third-year paper titled "Systems Analysis" offered by John and then Mervyn, which was to become increasingly popular.

As well as teaching, Mervyn made an important contribution supporting his HoD, both on a day-to-day basis, as well as throughout four or five periods of acting headship. Despite retiring in 1990, Mervyn's presence in what had then become the Department of Engineering Science continued. He taught part-time in engineering mathematics for another four years, and to this day accompanies hundreds of Engineering undergraduates each year in their exams, as the editor of the Department of Engineering Science Formulae & Tables booklet. As part of Engineering Science's 45th anniversary celebrations in 2008 of the anniversary celebrations, together with Andrew Pullan, Mervyn wrote the Department's history in the book *TAM to DES and beyond in 45 years*. In his foreword, Andrew said "While Mervyn himself freely admits he is advancing in years, on many levels he is ageless. He certainly looks the same to me as when I first met him some 24 years ago. Time also has not dulled either his wit or his memory. Whereas I only knew students back to the late 80s, Mervyn could name all the early students, and would often have a story or two to tell about them."

Mervyn was well known as an excellent administrator and this was recognised by the University of Auckland by his appointment as the University's representative on the Council of the Manukau Institute of Technology (MIT) in 1981. He served several terms on MIT's Council and earned such respect that he became chairman in 1995 and continued in that role until his retirement from the Council in 2004. He also served as chairman of the Association of New Zealand Polytechnic Institutes. Mervyn was awarded the NZ Order of Merit in the Queen's Birthday Honours in 2006 for services to tertiary education and the community.

Mervyn passing away marks the end of an era for the Department of Engineering Science. I arrived in the Department as a student just after Mervyn retired. It is now my privilege to head the Department and to support Mervyn's legacy of high quality teaching.

Rosalind Archer

CENTREFOLD

Iain Raeburn

Iain Raeburn was born and went to school in Edinburgh (the Scottish one). Then he did what young Scots did in those days: he went to the nearest university to study the thing he was best at in school. He found he liked maths just fine, and especially when it got more abstract: he has always found maths much more satisfactory when he knows exactly what everything means. He enjoyed university, and when he finished his honours it seemed natural to go on for a bit longer. After a brief spell at Cambridge (like many Scots, then and now, he didn't find the posher bits of England much to his taste!) he went back to do a PhD at Aberdeen.

Just one year into his PhD at Aberdeen, he attended a three-week NATO summer school on "Algebras in Analysis" in Birmingham. There he was very fortunate to get talking with one of the main lecturers, Joe Taylor. They found they got along really well, and after a few pints one night Joe invited Iain to visit him in Utah for a

year. The next morning Joe called Utah and arranged a Teaching Fellowship for Iain. It never crossed Iain's mind not to take it—even though he had only the vaguest idea of where Salt Lake City was, and no idea of what went on there.

But it all turned out remarkably well. Mathematically, it was a revelation. Joe expected Iain to know or learn all sorts of things he had never heard of, and Iain rose to the challenge. (Iain says "I must have been a wee bit quicker in those days…") Socially it was great too: the mathematics department at Utah was growing and had a large number of enthusiastic young people, both students and faculty. Many of them enjoyed the outdoor life, and Utah was ideal for that. At that time, for example, Utah had four new, undeveloped National Parks. Iain is forever grateful that he saw them before they became famous and busy.

After finishing his thesis, Iain was invited to stay on for a year at Utah, and this gave him a chance to establish his own research program while talking regularly with a friendly and knowledgeable mentor. (Today, there have been some small steps toward filling the post-thesis gap. The more programs the better.) Then he took up a postdoc at Dalhousie in Canada. Nominally, Iain was working with Peter Fillmore, who was developing a strong group in operator theory, but in practice he worked mostly with John Phillips, who had just been appointed to his first permanent position. Again, Iain and John got along very well, and started a fruitful collaboration that continued for 20 years.

Then, almost out of the blue, Iain got a phone call offering him a lectureship at the University of New South Wales in Sydney. He was a little better informed this time: geography in Scottish schools was still focused on the pink parts of the map. Again he was lucky to have a good mentor; Gavin Brown, his Head of Department, pushed and prodded Iain to apply for grants and use them well. Indeed, he and Gavin were among the first pure mathematicians to get national funding for their research. As a result, he was able to sustain his ongoing collaborations, develop new ones, and, most importantly, change direction. He firmly believes that taking on new challenges in new areas helps keep the subject interesting.

After 12 good years at UNSW, Iain belatedly realised that he had chosen a career. It took a perceptive student to tell him this: she was agonising over her many career options, and got frustrated with Iain's blinkered advice, telling him: "It's alright for you. You have a career." Iain started applying for more senior positions, and in 1991, took up the Chair in Mathematics at the University of Newcastle. There he built up a strong group of researchers with interests across a broad range of modern analysis. The group attracted some very talented students and postdocs, who are now spread all over the world. But success in teaching and research is not enough in the modern university: you've got to get lots of bums on seats and keep them there. Over a decade of formula-based funding, the maths department at Newcastle got badly run down, and eventually Iain and three of his colleagues moved to Wollongong.

Iain came to Otago in 2010, after his partner Astrid an Huef was appointed to the Chair in Pure Mathematics there, and they offered Iain a job too. They both like the university and their work. Otago is a destination university: the majority of students come from out of town, and many of them are very good students. They give the town a lively vibe (and, to be honest, it's then a bit dead when they're not around). So Astrid and Iain have already found good students, and they have a lively and friendly research group which enjoys its work.

When not working, Iain enjoys walking and running. Dunedin has some lovely places to run, though one has to work to find places which are not too steep. Since Dunedin was designed (yes, really!) in the days when walking was normal, it has lots of alleyways and staircases which make walking fun and interesting. As a result the family car gets driven so little it has battery problems. He really likes New Zealand, Dunedin in particular, and the locals have been very friendly and welcoming. Already it feels like home.

Now the serious bit:

Iain Raeburn is a Mathematician who specialises in functional analysis and its applications to other parts of mathematics, including algebraic topology, dynamical systems, number theory, algebra and harmonic analysis. He studied in the UK and the USA, obtaining his PhD from the University of Utah in 1976, and held positions in Canada and Australia before taking up a research chair at the University of Otago in 2010.

Raeburn has done pioneering work in several areas, and has written several papers which have fuelled new areas of interaction between disciplines. His work has therefore been highly influential, and he has been on Thomson ISI's list of Highly Cited researchers for over 10 years. He has supervised numerous students and postdocs, many of whom are now respected researchers holding chairs at major research universities.

Lisa Orloff Clark

Colleagues mentioned in Local News reports: left to right, top to bottom: Qui Bui (with Phillipa Williams, John Hannah); Mike Steel; Jennifer Brown receiving her UC Teaching Award from Vice Chancellor Rod Carr; Hannes Diener (with his 2-year old daughter Elizabeth); Luke Fullard; Brian Niven.

LOCAL NEWS

Jiling Cao

AUCKLAND UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND MATHEMATICAL SCIENCES

The Mathematical Sciences Research Group (MSRG) was recently formalised under the leadership of *Jeff Hunter*. The Research Group focuses on two main areas: "Applied Mathematics and Mathematical Finance" and "Analytics and Statistics". Regular seminars are held in these main categories with collaborative research with researchers in other New Zealand Universities being actively encouraged.

Funded by the MSRG, Dr *Fabien Montiel* and Prof. *Jin Zhang* from the University of Otago visited AUT in May and June. Fabien Montiel worked with Hyuck Chung on the computational simulations of ocean wave dynamics, and Jin Zhang had discussions with Jiling Cao and Wenjun Zhang on various topics on volatility market models.

Two MSc students from ENSTA Paris Tech, *Maxime Dufour* and *Marc Imhoff*, spent three months (from May to July) in AUT to work with Jiling Cao and Wenjun Zhang for their internship. They worked on two projects on mathematical finance. *Reza Moosavi Mohseni*, a new PhD candidate who is interested in dynamical and chaotic behaviors in economics and finance, started his PhD studies at AUT in June 2014.

In April–May, *Jiling Cao* visited Minnan Normal University in China to initiate a three-year joint project, "Mathematical Methods in Modern Economic Theory", under the scheme of Min Jiang Scholars with support from the Education Department of Fujian Province, China.

In April, *Alna van der Merwe* attended the 38th Annual South African Symposium on Numerical and Applied Mathematics at the University of the Witwatersrand. *Jeffrey Hunter* participated in the International Workshop on Matrices and Statistics held at the University of Ljubljana, Slovenia, 9–12 June. In June, *Alla Shymanska* attended International Conference on Engineering Mathematics and Physics (ICEMP 2014) which was held in Hong Kong together with the workshops: ICFN – International Conference on Future Networks, and ICKEA – International Conference on Knowledge Engineering and Applications.

During his sabbatical leave in Semester 1, *Robin Hankin* visited the UK to work with *Farnon Ellwood* at the University of the West of England (UWE), in Bristol. The visit included a trip to the University of Bielefeld, where he wrote and submitted a three-way research proposal (Auckland, UWE, Bielefeld) to the German equivalent of Marsden.

UNIVERSITY OF AUCKLAND

DEPARTMENT OF ENGINEERING SCIENCE

We would like to dedicate this month's NZMS newsletter to the commemoration of the life of Associate Professor *Mervyn Rosser*, co-founder of the Department of Engineering Science. Mervyn Stanley Rosser died peacefully in his sleep on 12 July 2014 at the age of 87, after a short period in hospital. This was a very sad day in the history of the department and the department would like to send its deepest sympathies to Mervyn's family and friends. Mervyn's funeral was held on Friday 18 July at Mt Albert Methodist Church. He was the dearly loved husband of Dorothy, father and father-in-law of John and Jude, Paul and Heather, Sue and Chris, Mark and Joanne, Grandpa to Cliff, Oliver, Jamie, Hilary, Sophia, Alex, Kenrick, Julia and Andrew.

In 1948, Mervyn graduated with an MSc with First Class Honours in Mathematics. He then followed his love of music and in 1952 he graduated with MusB at the University of Auckland. After a year at Training College in 1948, he taught at Avondale College and Pukekohe High School. During this time he was awarded a Rotary Foundation Fellowship and spent 1954 at Brown University, Rhode Island, USA. In 1959 he returned to his old school, Mt Albert Grammar, as Head of Mathematics and then returned to the University of Auckland in 1962.

Please see an obituary by our current HoD, Prof. Rosalind Archer, elsewhere in this issue.

Charles Unsworth

DEPARTMENT OF MATHEMATICS

Bill Barton, *Ban Heng Choy*, *Lisa Darragh*, *Greg Oates* and *Caroline Yoon* presented papers at the MERGA conference in Sydney, where Lisa Darragh won the MERGA Early Career Research Award. *John Butcher* gave lectures in May at the Institute of Computational Mathematics and Scientific/Engineering Computing of the Chinese Academy of Sciences, Nanjing Agricultural University, Nanjing University, He Fei University and Nanjing Technical University. *Steven Galbraith* attended a workshop at the Mathematisches Forschungsinstitut Oberwolfach (27 July–2 August 2014). *Steffanie Hittmeyer* is now a Research Fellow, working with Bernd Krauskopf and Hinke Osinga. *Claire Postlethwaite* gave lectures in April and May at the Universities of Leeds, Exeter and Nottingham, funded by a London Mathematical Society visitor travel

grant. *Arkadii Slinko* delivered his Inaugural Lecture "Is too much information endangering democracy?" on 29 May. *James Sneyd* gave a lecture on "Mathematics and Music – the beauties of pattern" in Wellington on 6 June, as part of the RSNZ series of lectures "At Six".

Professor *John Hosking* has been appointed as the new Dean of Science, following Grant Guilford's appointment as Vice-Chancellor of Victoria University of Wellington.

Professors *Rosemary Bailey* and *Peter Cameron* will visit the University of Auckland from mid-August to early October, as (incoming) Hood Fellows from the UK. They will be hosted by Marston Conder and Dimitri Leemans (Mathematics) and Katya Ruggiero (Statistics).

Steven Galbraith and *Dimitri Leemans* are organising the NZMRI summer meeting in January 2015, with the theme of "Algebra, Discrete Mathematics and Number Theory".

Marston Conder and *Dimitri Leemans* attended an amazing conference called Kaleidoscope (on beautiful forms in geometry, topology and combinatorics) at Ixtapa, on the Pacific coast of Mexico, in May. This was described by a large number of participants as one of the very best conferences they had ever attended.

Our Department founded and published the journal *Mathematical Chronicle* from Volume 1 (1969) to Volume 20 (1991), with John Butcher and John Kalman as the founding Editors. All 20 volumes are now available online at http://www.thebookshelf.auckland.ac.nz/document.php?wid=2081. Many Departments of Mathematics around the world (including ours) display the online series "Theorem of the Day", which is produced by Robin Whitty at Queen Mary University of London. In the list of on-line journals in Whittys website (http://www.theoremoftheday.org/Resources/RelatedSites.htm#magazines) he describes the *Mathematical Chronicle* as containing "more than 20 years of top quality articles, reviews etc."

The *Mathematical Chronicle* was succeeded by *The New Zealand Journal of Mathematics*, published jointly by the New Zealand Mathematical Society and our Department, starting with Volume 21 (1992). The Mathematical Chronicle Committee disbanded recently, and gifted its remaining funds to the NZMS to cover the costs of an invited speaker at the annual Mathematics Colloquium, to be known as the Kalman-Butcher Invited Speaker. Each Butcher-Kalman Invited Speaker will be a mathematician resident in New Zealand, within 10 years of completion of her/his doctoral degree.

Two new PhD students have arrived: *Daeed Farjami* (Vivien Kirk and Hinke Osinga), and *Stephen Lo* (Marston Conder and Dimitri Leemans), studying the genus of compact Riemann surfaces on which a given group acts.

Recent visitors include: Prof. *Michèl Artigue* (Université) Paris Diderot – Paris VII, Dr *Robin Averill* (VUW), Prof. M*arco Boggi* (Universidad de los Andes, Bogotà), Prof. *Peter Brooksbank* (Bucknell University), Dr *Tara Brough* (University of St Andrews), Prof. *David Cox* (Amherst College), Dr *Brendan Creutz* (University of Canterbury), Dr *Joseph Grant* (University of Leeds), Dr *Liangze Li* (Peking University), Dr *Nicolas Loughlin* (Newcastle University, UK), Dr *Vladimir Matveev* (Universität Jena), A-Prof. *Ravi Montenegro* (University of Massachusetts – Lowell), Dr *Anthony Morphett* (University of Melbourne), Dr *Aminu Mustafa* (Umanu Danfodyo University, Nigeria), Dr *Raazesh Sainudiin* (University of Canterbury), A-Prof. *Gerd Schmalz* (UNE), Prof. *Charles Semple* (University of Canterbury), Prof. *Dinesh Thakur* (University of Rochester), Prof. *Krasimira Tsaneva-Atanasova* (University of Exeter), Prof. *Hendrik Van Maldeghem* (Universiteit Gent), Dr *Adam Ward* (Massey University) and A-Prof. *Sebastian Wieczorek* (University of Exeter).

Garry J. Tee

DEPARTMENT OF STATISTICS

Please see the extended Focus article in this issue.

UNIVERSITY OF WAIKATO

DEPARTMENT OF MATHEMATICS

The Department congratulates *Woei Chet Lim* on his recent promotion to Senior Lecturer. Information about Woei Chet may be found in the *New Colleagues* section of the April 2012 issue of the Newsletter.

There has been a changing of the guard with *Ian Hawthorn* having completed a three year stint as Chairperson of Department. Ian is very happy to be able to hand over the reins of power. The new Chairperson is *Nick Cavenagh*. Besides his research in combinatorics, Nick is known for his Scrabble prowess as reported in detail in last year's December issue of the Newsletter.

The department members *Sean Oughton*, *Frederic Effenberger Ian Craig*, and *Yuri Litvinenko* are organising a meeting/workshop on the roles and properties of reconnection, turbulence, and (energetic) particles in the heliosphere. This will take place in Queenstown in early February, 2015.

Stephen Joe

MASSEY UNIVERSITY

INSTITUTE OF FUNDAMENTAL SCIENCES

Chris Tuffley has recently returned from leading the New Zealand team at the 55th International Mathematical Olympiad in Cape Town, South Africa. New Zealand had another successful year, winning one silver medal, one bronze medal and three honourable mentions, placing 60th overall out of 101 countries. For more details see an article elsewhere in this issue.

Luke Fullard and his wife Judith welcomed their son Corban John Fullard on the 14th of June, weighing 1.944kg.

Richard Brown

INSTITUTE FOR NATURAL AND MATHEMATICAL SCIENCES

Graeme Wake attended the Workshop on Evolution and Virus Dynamics run by the Centre for Research in Mathematics (a Catalonian Government Research Organisation) in Barcelona, Spain in early July. His invited plenary lecture was the opening one and was entitled "Models of developmental plasticity and cell-growth". He was supported to attend this by the organisers and Gravida (a CoRE): the National Centre for Growth and Development. The organiser of the workshop was Dr Andrei Korobeinikov, previously a PhD student in Auckland supervised by Wayne Walker (now retired) and Graeme Wake. Prior to the Workshop Graeme was in residence in Oxford where he has been an Adjunct Professor of Industrial Mathematics 2009–2014.

In July Professor Emeritus *Graeme Wake* was awarded a contract from a grouping of Agricultural service organisations to provide underpinning decision support to the agricultual industry on soil chemistry. Completing PhD student *Amjad Ali* is joining Graeme to complete this project as a temporary Research Fellow.

Nurul (Syaza) Addul Latif has completed all the requirements for the award of her PhD in Mathematics. She will graduate in person at the next ceremony. Her thesis was entitled "Modelling Induced Resistace to Plant Diseases" and completed under the supervision of Graeme Wake under a cooperative arrangement with Plant and Food Research Limited (a CRI). Syaza is now a Lecturer in Mathematics in the Landbased University in Malaysia: Universiti Malaysia Kelantan. In mid-June Syaza married childhood sweetheart Farah in Kuala Lumpur.

Shaun Cooper

UNIVERSITY OF CANTERBURY

SCHOOL OF MATHEMATICS AND STATISTICS

Congratulations to *Mike Steel*, who has been recognised for his work with the University's Research Medal. Mike is best known for his leading work in phylogenetics, or the science of reconstructing evolutionary trees and networks from genetic data. His research methods are used every day to study how different strains of bacteria and viruses like influenza and hepatitis are related to each other. They are also used to help figure out where some newly discovered organism fits in the tree of life, or how much biodiversity is at risk from current high levels of extinction.

"Phylogenetic techniques are also starting to be applied in medical research to reconstruct the tree of cell divisions in a tumor, and in linguistics the methods are used to understand how languages developed and diverged", he says.

More recently, Mike has been working on models of earliest life, using mathematics and computing in new ways to investigate networks. His research is attracting wide international interest and has led to collaborations with leaders in the field of origin of life research. The algorithms developed have also been recently applied to study metabolic pathways in bacteria.

In a light-hearted approach, Mike has also given away cash prizes to help find solutions. In the last decade he has set many mathematical challenges with US$100 for each correct solution.

"The hardest challenge took a team of three smart guys from Berkeley and Massachusetts Institute of Technology many months to find a correct proof—but eventually they did."

"The reward is really much greater than US$100 as each one of the solved questions has always led to a published paper by the solver, sometimes in a high profile journal like the Science magazine."

Mike Steel was also recently named as one of four principal investigators to win a $695,000 grant for a three-year research project "Terraces, Large Trees and Trait Evolution", funded by the US-based National Science Foundation (NSF). This project, led by Michael Sanderson at the University of Arizona, will develop and apply new mathematical and computational methods to phylogenetics. It provides three years of funding, which includes support for a postdoc, graduate students, and computing and exchanges amongst the three groups based at the University of Arizona, University of Canterbury, and Heidelberg, Germany.

Congratulations to *Jennifer Brown*, who received a 2014 UC Teaching Award. The citation describes Jennifer as an inspirational teacher and leader under whose

leadership the statistics programme at UC has blossomed into a successful programme with international recognition for teaching introductory statistics. It commends her student-centred approach to teaching, which is reflected in consistently high scores in her teaching surveys and the number of postgraduate students she attracts. Her active research profile is acknowledged, as is the fact that she is the lead academic at UC in teaching a pioneering joint graduate course in official statistics with 5 other universities through the KAREN access grid, and was joint winner in 2011 of the Best Co-operative Project in Statistical Literacy Award from the International Statistical Literacy Project.

Congratulations to *Alex James* (Deputy Director), *Jeanette McLeod* and *Mike Plank*, UC Principal Investigators with Te Punaha Matatini – The Centre for Complex Systems and Networks, hosted by the University of Auckland, which has been selected by the Tertiary Education Commission (TEC) as one of 6 new Centres of Research Excellence (CoREs) for 2015–2020. The Royal Society of New Zealand ran the selection process with the final decisions being made by the TEC. TEC Chief Executive Tim Fowler, when making the announcement, said that the CoREs will be conducting world-leading research in areas that are fundamental to the interests of New Zealand. Te Punaha Matatini – The Centre for Complex Systems will focus on harnessing and understanding complex big data sets for economic, social and environmental benefit. Funding of nearly $210 million over 6 years for the CoREs begins on 1 January 2015.

An hour of Kim Hill's show on Saturday 31 May was devoted to an interview with *Clemency Montelle*, during which her mathematical knowledge and her impeccable taste in music were on display! For those of you who missed it: http://www.radionz.co.nz/national/programmes/saturday.

In May the School welcomed *Hannes Diener* on a fixed-term lecturing contract. Hannes graduated with a PhD in Mathematics here in 2008 before returning to his native Germany in 2009 to take up a postdoctoral position at the University of Siegen. In 2011, he spent a semester as a visiting assistant research professor at Florida Atlantic University in Boca Raton before returning to a substitute (full) professor position at the University of Siegen. His research interests are in computable analysis, constructive mathematics, foundations of mathematics and computer science, and logic.

Qui Bui retired in late April after a 27-year career at UC. At his retirement function Qui recalled that Rick Laugesen (University of Illinois), his long-time collaborator and frequent visitor, was a student in his Honours Analysis class in his first year of teaching. Amongst the postgraduate students Qui has supervised is his current collaborator Tim Candy (Imperial College London), who was also a recent visitor. Qui will continue to be seen around the School in his capacity as a Senior Adjunct Fellow.

In May we farewelled long-term visitor *Simone Linz*, who has been hosted by Charles Semple for the past two years. Simone's stay in the School was the first two years of her three-year Marie Curie International Outgoing Fellowship working on questions relating to phylogenetic trees and networks. These fellowships enable scientists to pursue independent research programmes for up to three years, with the last year being spent at a European university. Similar programmes are available for New Zealand-based researchers who have completed their PhDs and want to work in Europe for an extended period. Simone has now returned to the University of Tübingen, Germany, and hopes to see us again in the future.

After five months *Michelle Dalrymple* returned to Cashmere High School in early July. She had been with us under the auspices of a Royal Society Endeavour Teaching Fellowship and was hosted by Jennifer Brown. These fellowships for teachers have three purposes: to gain new and up-to-date knowledge which will enhance teaching and learning; to develop leadership capacity in early and mid-career teachers; and to give teachers the opportunity to experience how science, mathematics and technology are used outside teaching.

Rua Murray had a fruitful sabbatical leave in the first half of the year and returned to the School at the start of July. Rua was mostly based in New Zealand, but also spent two weeks in Sydney working with Gary Froyland and Cecilia Gonzalez-Tokman, and five weeks in Victoria (Canada) working with Christopher Bose. *Charles Semple*, *Miguel Moyers-Gonzalez*, *Elena Moltchanova* and *Raazesh Sainudiin* started their sabbaticals during July.

Douglas Bridges was on an extended research visit to Padova and Munich in April–June, as part of the EU Marie Curie "CORCON" (correctness by construction) project, whose NZ node is at the University of Canterbury. The funding extends from 2014 through 2017, and is funded for research visits to Canterbury from academics in several EU university Mathematics and Computer Science departments, and reciprocal visits to Europe by Canterbury mathematicians. The project deals with many aspects of constructive analysis, topology, and set theory, with emphasis on program extraction and verification from constructive proofs. In particular, Douglas was working on a constructive formal development of Morse set theory, written in a kind of pseudocode that he hopes will facilitate the extraction and verification processes.

Remediation work continues in the Erskine building. Scaffolding surrounding the building has been removed but still fills the atrium. It will stay there for

some months to come as glass panels need to be replaced. Fortunately, for the start of semester 2, the teaching side with tutorial rooms, tutor rooms and the staff common room, which had been sorely missed, became available again.

Günter Steinke

UNIVERSITY OF OTAGO

DEPARTMENT OF MATHEMATICS AND STATISTICS

Congratulations to *Matthew Schofield* and his wife Bronwyn on the safe arrival of their newest family member, Ezra Riley, born on April 11. All the best, Matt and Bronwyn.

After 44 years at the University of Otago, *Brian Niven* retired this May. In his very important role as a statistical consultant, he provided statistical support and advice to countless staff members and postgraduate students around campus, who very much appreciated his sought-after services. We sadly said goodbye to Brian at a large farewell party in June, and we wish him all the best for a happy retirement!

John Harraway is working with Sharleen Forbes and the Royal Statistics Society Centre for Statistics Education on the development of apps for training in Official Statistics using smartphones, tablets and laptops. The apps will be available for use in developing countries where resources may be limited.

The department was present at the University of Otago Science Expo 2014, which is part of the International Science Festival. About 2000 visitors attended the popular event and, in particular, "discovered the statistical order in randomness" with experiments like the Galton box or the Monty Hall problem. Moreover, they could "uncover deep mathematical theorems behind the everyday", e.g. the illumination problem.

Christopher Laing has completed his PhD under the supervision of *Jörg Frauendiener* and graduates in August in absentia. In his thesis "Numerical construction of static fluid interfaces with the embedding formalism", Chris has developed a mathematical and numerical framework for representing static fluid interfaces as embedded manifolds.

John Clark has been invited to lecture at a two day workshop on Ring and Module Theory at the School of Mathematics, Institute for Research in Fundamental Sciences (IPM) in Isfahan, Iran, which will be on October 8–9. Details will shortly be available at http://math.ipm.ac.ir.

Visitors

William McLean (University of New South Wales) has visited the department for five weeks to work with Mihály Kovács on fractional diffusion equations. *Eleanor Lingham* (De Montford University) got a grant from the London Mathematical Society to visit Dunedin. She is working with Peter Fenton on potential theory. Another visitor was *Bill Link* from the USGS Patuxent Wildlife Research Center, who specializes in Bayesian statistics and ecological applications. During his visit, Bill jointly ran a statistics workshop with Richard Barker. A current visitor is *Pei Wu* (Chinese Academy of Sciences, Shanghai), a PhD student working with David Bryant on methods for classification. Furthermore, *Hjuck Chung* (Auckland University of Technology) visited the department hosted by Fabien Montiel. Hjuck studies the vibration of beams and plates.

In addition, we had several short-term visitors during the past few months, namely *John Butcher* (University of Auckland), *Markus Haase* (Delft University of Technology), *Ravi Montenegro* (University of Massachusetts Lowell) and *Ami Radunskaya* (Pomona College).

Jörg Hennig

REPORTS ON EVENTS

The 55th IMO, Cape Town, 3–13 July

New Zealand had another successful year at this year's International Mathematical Olympiad, which took place in Africa for the first time, beneath the dramatic backdrop of Cape Town's Table Mountain. The team and their results were as follows (individual scores out of 42):

Student	Score	Percentile	Award
George Han (Westlake Boys' High School)	23	80.68	Silver
Vincent Qi (Auckland International College)	16	52.42	Bronze
Kevin Shen (Saint Kentigern College)	14	42.75	Hon. men.
Peter Huxford (Newlands Coll., and now Westlake BHS)	11	33.09	Hon. men.
Martin Luk (King's College)	9	27.91	Hon. men.
Prince Michael Balanay (Botany Downs Sec. Coll.)	3	13.77	
Team result: 60th of 101 countries	76	41.00	

Compared to last year this represents a slight drop in our overall rank, from 48th of 97 countries, but an improvement in our medal count from two bronze and three honourable mentions. Silver medals are hard to come by, and this is only our ninth in our 27 years at the IMO. It was very pleasing to once again see over half the team come back with at least honourable mention (awarded for full marks on at least one problem), something we've consistently achieved every year since 2005, with the exception of 2008. Both George and Vincent were returning members of the 2013 team, and both improved their results from bronze and HM respectively, showing that previous IMO experience is an advantage — and I was especially pleased to see George make silver this year, after he just missed out by a couple of points last year. With George, Kevin, Martin and Prince all eligible to return next year we can hope for a strong performance in 2015.

Accompanying the team this year were May Meng (King's College) as team manager, Malcolm Granville (Harvard University, and member of our 2009–2011 teams, winning bronze, silver, bronze) as deputy leader, and me as team leader. The team, May and I arrived in Cape Town on July 1st, and were joined the next day by Malcolm, flying directly from the US. On arrival we got straight into our pre-IMO training, emerging from our hostel over the next few days only to go to the supermarket for lunch supplies or out to dinner. With the exchange rate roughly 10 rand to the dollar everything seemed very cheap! The hostel was a block off a busy street lined with trendy-looking cafés, restaurants and boutiques, and the area felt very safe, but there were still plenty of reminders that Cape Town was a place to be careful: tall fences topped with spikes, razor wire or high-voltage electric fences, and security company signs warning of an armed response. The weather was overcast the day we arrived, but the cloud began to lift the next day, giving us our first views of the spectacular Table Mountain to one side of us, and the Lion's Head to the other. At the first sight of this I excitedly ordered a brief break in problem solving so we could all pop up on a balcony and look at the view.

The jury meetings to select the problems for the competition began two days after our arrival, and leaving the team training in Malcolm's capable hands I left to attend these. The first order of business was to decide on the problem selection procedure to be used this year, and it was fairly quickly settled that we would reuse the new procedure introduced last year. This aims to produce a balanced paper, by ensuring that all four areas of algebra, combinatorics, geometry and number theory are represented among the two "easy" and "medium" problems, which are the problems where the contest will be fought by the vast majority of the contestants. A shortage of good accessible number theory problems on the shortlist made this aim difficult to achieve this year, with the number theory problem chosen having a strong combinatorial element; but nevertheless I think the procedure served us well, and hope we'll continue to use it.

By the time the opening ceremony rolled around on the 7th we had the problems selected, translated into the 54 different languages at the IMO, and the marking schemes approved. The ceremony featured the usual parade of teams, and we were treated to some amazing dancing, drumming and singing, including a night soundscape of insect, animal and bird life created entirely through voice and snapping fingers. The contest took place over the next two days, and then, as usual, the jury relocated to join our teams at the IMO site now that we no longer had to be kept apart, due to our knowledge of the paper. This was on the beautiful University of Cape Town campus, overlooked by Devil's Peak. Cape Town was lovely and warm while the sun was shining, but as soon as it went

down the temperature dropped markedly, and the student residences had no heating! So it was quite chilly at night, and I found myself piling all my spare clothing on top of the bed to stay warm.

The hardest problem on this year's paper was the following, solved in full by only 15 of the 560 contestants:

> **IMO 2014 Problem 6.** A set of lines in the plane is in *general position* if no two are parallel and no three pass through the same point. A finite set of lines in general position cuts the plane into regions, some of which have finite area; we call these its *finite regions*. Prove that for all sufficiently large n, in any set of n lines in general position, it is possible to colour at least $\sqrt{n}$ of the lines blue in such a way that none of its finite regions has a completely blue boundary.
>
> *Note:* Results with $\sqrt{n}$ replaced by $c\sqrt{n}$ will be awarded points depending on the value of the constant c.

This problem appeared in the shortlist with the bound $\sqrt{n/2}$ in place of $\sqrt{n}$, and its selection for the paper and appearance in the form above owes a great deal to the US leader Po Shen Loh (Carnegie Mellon). While tackling the shortlist he got excited about the problem and tried to push the bound as far as he could, eventually achieving $\sqrt{n\log n}$ using results on independent sets in hypergraphs. The bound of $\sqrt{n}$ can be achieved by more elementary means, and Po suggested that we use the problem with that bound, and add the note above to give a research flavour to the problem. This proposal was adopted by the jury as an interesting experiment and a possible new direction for IMO problems, so we may see more problems with this flavour in the future.

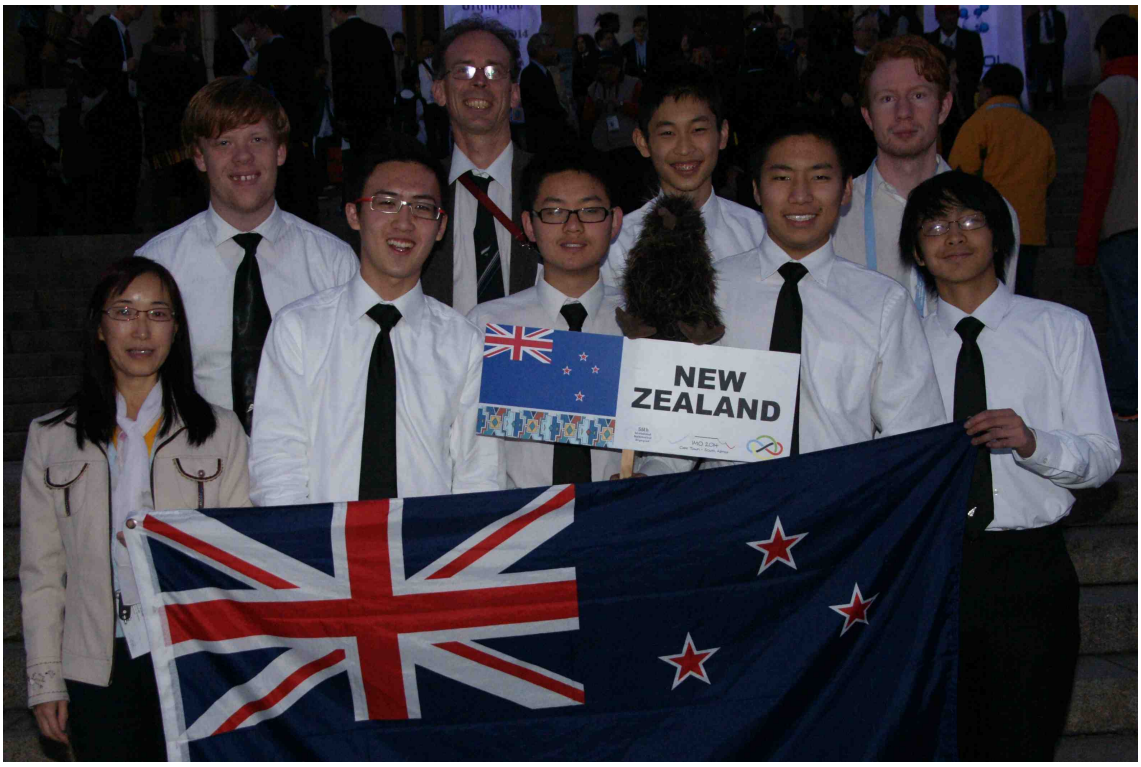
The bound of $\sqrt{n}$ is apparently the best one can achieve with a greedy approach of taking any maximal set of lines such that no finite region has a completely blue boundary. After the contest it was discovered that the $\sqrt{n\log n}$ bound had appeared in a 2012 preprint; it is not known if this is tight, and Po suggests that the sharp bound may be of the order of $n^{2/3}$. At the end of the IMO he gave a lecture on the problem to a packed room of contestants.

Over the two days after the contest the team and May went on an excursion to Cape Point and attended celebrity lectures by mathematicians Günter Ziegler, Peter Sarnak and John Barrow. Meanwhile, Malcolm and I were kept busy assessing their work and co-ordinating the results. The importance of this phase of the IMO cannot be overstated! Careful preparation on our part ensured it all went smoothly, and we were able to make several successful cases for an extra point the co-ordinators hadn't seen. With their scores all signed off we once again had students in the vicinity of typical bronze and silver boundaries, meaning things could go either way…but having had my hopes dashed a couple of times before I did my best to expect nothing more than the likely worst case scenario of one bronze and four honourable mentions. Fortunately this year that was not how things turned out! With the final jury meeting setting the medal cuts at 29 gold, 22 silver and 16 bronze.

As a keen tramper I had found it very frustrating to spend two weeks directly underneath Table Mountain, without any free time to go up it! But with co-ordination over my chance finally came, and the next day I hiked up and over it with the Danish and Slovenian leaders, enjoying fantastic views from the top. The closing ceremony took place that evening, followed by a reception and of course the award of the Golden Microphone — this year a golden vuvezela — to the leader who made the most speeches. UK leader Geoff Smith (Bath University) faced stiff competition, but succeeded in winning this for the third time. And then all too soon the IMO was over, and we were on our way home.

Our thanks go to Igor Klep (University of Auckland) and Peter Nelson (VUW) for their help with team training and selection, and to the Royal Society of New Zealand, Science OlympiaNZ, and the New Zealand Mathematics Enrichment Trust for their support. The problems and full results of the IMO can be found at imo-official.org, and slides from the celebrity lectures at www.imo2014.org.za.

Some photos:



The 2014 IMO team, at the closing ceremony. From left to right: May Meng (team manager), Peter Huxford, Martin Luk, Chris Tuffley (leader), George Han, Kevin Shen, Vincent Qi, Malcolm Granville (deputy leader), and Prince Michael Balanay.

IMO medalists George Han (left, silver) and Vincent Qi (bronze).

Chris Tuffley

Grant recipient report

In 2013 from June to November, I stayed in the UK attending four conferences on group theory and representations, and one workshop on computational group theory. I was fortunate enough to receive financial assistance from the NZMS, the University of Auckland, and the Marsden grant (UOA1021). The first conference I attended was the Postgraduate Group Theory Conference at the University of Manchester in June where I gave my first talk titled "On the number of conjugacy classes of n-tuples of linear algebraic groups". After the talk, several students asked me questions and I realized that there are many people working in the same field. It was really good to feel that.

Then, later in June I went to Scotland to attend the Computational Group Theory Workshop at the University of St. Andrews. There I learned several programming techniques for computational group theory and I met several experts such as Derek Holt and Alexander Hulpke. Before I went to the UK, I got stuck on a problem on computational group theory, but at St. Andrews I was able to ask questions to the experts and solve the problem. Following that, I attended the Groups St. Andrews at the University of St. Andrews. This was a big conference in group theory. I met more than 200 group theorists from all over the world including Martin Liebeck, Karen Vogtmann, Alan Reid, and Emmanuel Breuillard. During a conference lunch, I talked to Martin Liebeck who is one of the top experts in my field and got some good feedback on my first paper. Then in September, I attended two conferences, the first one was on representation theory at the University of Manchester, and the second one was on finite group theory at the University of Cambridge. The level of these two conferences were quite high, and the attendees were legends in the field such as George Glauberman, Robert Guralnick, Gunter Malle, Michael Aschbacher, Richard Weiss, John Thompson, and Jean-Pierre Serre. During the conference at Cambridge, George Glauberman spoke to me a lot, testing out his Japanese on me (his Japanese is quite good). At a conference lunch, George found that I was holding a copy of my paper (I was writing my first paper at the time) and he encouraged me to have a chat with Jean-Pierre Serre because my research was on Serre's notion of complete reducibility of algebraic groups. After being pushed by George many times, I ended up having a good chat with Jean-Pierre Serre. He asked me for a copy of my paper, so I gave it to him. A few days later he gave me a helpful (and critical) comment.

Overall, I really enjoyed the time in the UK attending lots of conferences and meeting many people working in group theory. So, again I would like to thank the NZMS, the University of Auckland, and the Marsden grant (UOA1021).

Tomohiro Uchiyama (University of Auckland)

Asia Pacific Consortium of Mathematics for Industry (APCMfI)

Mathematics for Industry (MfI) aims at the development of mathematics and its applications to enhance the quality of life on the planet by creating new technologies, improve industrial mathematical research and stimulate the two-way interaction between mathematics and industry. In Industrial Mathematics, it is the questions spawned by real world applications that drive the resulting two-way interaction between a particular application and the associated mathematics that is utilized and developed and that sometimes involves, quite unexpectedly, deeper aspects and new areas of mathematics than initially anticipated.

Though its significance has often been overlooked, industrial mathematics has always been an essential aspect of the history, culture, traditions and development of mathematics, including much of modern theoretical mathematics. Directly and indirectly, developments in mathematics can be traced to the initial attempts to answer quite practical questions. The development of Galileo's telescope and the design of clocks represent early stimuli. Harmonic analysis and Fourier analysis have their origins in the study of heat transfer in metals. The conservation and minimization of energy engendered in the study of thermodynamics and fluid motion underlie much of the foundations of modern theoretical mathematics as well as applied and industrial. The increasing sophistication of modern industry reflected in, for example, medical measurements, game theory applications in economics, psychology, behavioural science and biology, computer controlled instrumentation, the efficient development of geothermal energy, the microbial treatment of waste water, Itō calculus in finance, has generated a need and demand for mathematical expertise to stimulate, foster and implement the associated innovations. Even the theoretical areas of algebraic geometry, abstract algebra, topology, differential geometry and group theory are playing an increasingly important role in industrial endeavours connected with entertainment (such as games and movies), architecture, analysis of protein structure and error-correcting codes.

There is general agreement and support in the Asia Pacific region to have regular industrial mathematics exchanges, conferences, internships, etc, which build on the activities already occurring. In fact, over the years

since the concept of an Asian Consortium of Mathematics for Industry was first proposed and more recently when planning to formalize possibilities, there has been strong support and encouragement from colleagues in China, Hawaii, Korea, Malaysia and Singapore as well as Australia, New Zealand and Japan. Consequently, a small group, with the encouragement of various colleagues throughout the Asia Pacific region, met in Canberra March 31 to April 2, 2014, to do the initial planning for the formation and launch of APCMfI with the emphasis being fundamentally Mathematics-for-Industry. Those directly involved in the discussions in Canberra were Bob Anderssen (Australia), Zainal Aziz (Malaysia), Frank de Hoog (Australia), Yasuhide Fukumoto (Japan), Alexandra Hogan (Australia), Geoff Mercer (Australia), Masato Wakayama (Japan) and Graeme Wake (New Zealand).

In any endeavour that involves the initiation and implementation of a new opportunity, the situation is similar to planting and nurturing a seed which will grow into a strong and robust tree. The meeting and deliberations of this group represents the preparation of the ground for the planting of the seed. The subsequent planting and nurturing will involve the wide distribution of this Announcement throughout the Asia Pacific region; the seeking of seed funding from various mathematics departments, societies, agencies and industry; the establishment of a website; the launch of APCMfI under the MfI banner.

Bob Anderssen, Frank de Hoog, Alexandra Hogan (Australia); Zainal Aziz (Malaysia); Yasuhide Fukumoto, Masato Wakayama (Japan); and Graeme Wake (New Zealand).

Graeme Wake

Vaughan Jones' birthday conference

The conference "Subfactor Theory in Mathematics and Physics" was held in Maui, Hawaii, during July 14 – 18 in honor of Sir Vaughan Jones' 60th birthday. The wind blew strong and consistently for the conference, justifying the choice of venue! Many of Vaughan's current and former students were in attendance, as well as past colleagues from all over the world.

Vaughan is a Distinguished Professor at Vanderbilt University and Distinguished Alumni Professor at the University of Auckland. He received the Fields Medal in 1990 and was appointed Distinguished Companion of the New Zealand Order of Merit in 2002 (redesignated a Knight Companion in 2009).

Vaughan was instrumental in setting up the NZMRI summer workshops to which many New Zealand based researchers have attended and have attracted many other Fields Medalists and Abel Prize winners (yet another this January in Nelson).

(See a photo of this meeting at the end of Gaven's invited article earlier in this edition).

Gaven Martin

NZMS NOTICES

Student support to attend the Mathematics in Industry Study Group (MISG) 2015 (Brisbane)

The New Zealand Mathematical Society invites applications for financial assistance for students who are planning to attend the Mathematics in Industry Study Group (MISG) in Brisbane, 21-27 January 2015. To be eligible students must be based at an institution in New Zealand and be active within the New Zealand mathematical community.

To apply for funding students should complete the NZMS student travel grant application form available at http://nzmathsoc.org.nz/?assistance.

Completed Student Travel Grant application forms and additional information (see details on application form) should be sent as a single pdf via email to the NZMS Secretary, Dr. Emily Harvey

marking the email:

"Student Travel Grant Application: Travel to MISG2015".

For full consideration, the form must be received before the deadline of 1 December 2014. The amount of money available for individual students will be decided shortly after that date.

Notice of 2014 Annual General Meeting

The Annual General Meeting of the New Zealand Mathematical Society will be held during the New Zealand Mathematics Colloquium, which is this year incorporated into the Australia and New Zealand Mathematics Convention at the University of Melbourne.

Items for the Agenda should be forwarded by Monday the 1st of December to the NZMS Secretary.

Call for nominations for NZMS Council positions

Nominations are called for Councillors and an Incoming Vice-President on the New Zealand Mathematical Society Council. Nominees who are residents of Te Waipounamu (the South Island) are especially welcomed, as NZMS bylaws require that at least one of those elected this year must be from the South Island.

The term of office of a Council member is three years. Council members may hold office for two (but no more than two) consecutive terms. Existing Councillors may be nominated for the position of Incoming Vice-President.

Nominations should be put forward by two proposers. The nominee and the two proposers should be current Ordinary members (including Student members) or Honorary members of the New Zealand Mathematical Society. The nominations, including the nominees consent, should be forwarded by 10 November 2014 to the NZMS Secretary, preferably by email. If nominations are sent by email, the two proposers and the nominee should each send separate email messages to the Secretary e.p.harvey@massey.ac.nz

Reminder about financial assistance

The current version of the application form for financial assistance to students is available at http://nzmathsoc.org.nz/downloads/applications/NZMS_FundingApplication_2014.pdf.

GENERAL NOTICES

Job Opportunity at the University of Auckland

Applications are invited for a full-time permanent position at the Associate Professor/Professor level in Mathematics Education within the Department of Mathematics at The University of Auckland. The successful candidate will be part of the department's Mathematics Education Unit. The official notice for this position (ID Number 16394) is found at: https://www.opportunities.auckland.ac.nz/psp/ps/EMPLOYEE/HRMS/c/HRS_HRAM.HRS_CE.GBL?languageCd=ENG.

Informal enquiries about the position and Math Education Unit may be directed to the Professors Bill Barton b.barton@auckland.ac.nz or Mike Thomas moj.thomas@auckland.ac.nz.

More general enquiries about the Department and the University may be made to the Head of Department, Professor Eamonn O'Brien e.obrien@auckland.ac.nz.

Applications must be received by 1st October, 2014.

Kalman Visiting Fellowship in Mathematics at the University of Auckland

The purpose of the Kalman Visiting Fellowship is to enable a "rising star" in mathematics and its applications to visit the University of Auckland and to participate in the intellectual life of the University.

The Fellowship is for a person within 10 years of PhD. It is worth NZ$10,000, and can be spent on travel, accommodation, or other associated expenses.

To apply, send the following to eadeansoffice@sfac.auckland.ac.nz:

- a one page proposal of the research to be carried out;
- a letter of invitation from your proposed host in the Department of Mathematics or other department at the University;
- a CV (including qualifications, appointments, awards and publications);
- the names and contact details of two potential referees.

The closing date for applications is 5 September 2014. Informal enquiries may be addressed to kalman-fellowship@math.auckland.ac.nz

Full details of the Fellowship can be found at http://www.science.auckland.ac.nz/kalman

NZMRI Summer School 2015

11–16 January 2015 Tahuna beach holiday park, Tahunanui, Nelson, NZ

Speakers:

Prof. Pierre Deligne, IAS, Princeton, USA "What are modular forms of half-integral weight?" Prof. Gus Lehrer, University of Sydney, Australia "Fundamental theorems of invariant theory" Prof. Cheryl Praeger, University of Western Australia, Australia "Simple group factorisations and applications in combinatorics" Prof. Ren Schoof, Universit di Roma, Italy "TBA" Prof. Richard Weiss, Tufts University, Boston, USA "An Introduction to Buildings"

The conference will begin in the morning of Monday 12 January and will finish on Friday 16 at noon. Afternoons will be free as usual. Conference registration will start around 3pm on Sunday 11 January.

There will be no registration fee for the summer school.

Accommodation will be available at the holiday camp and nearby motels. These include rooms suitable for individuals or couples, and also a few rooms suitable for families. Our budget is much smaller than previous years,

as a result we will be expecting that paricipants pay for their accommodation from grants or department funds. We hope to provide free accommodation for PhD students.

Registration will be open in September and close at the end of November.

For more information visit: https://www.math.auckland.ac.nz/~dleemans/NZMRI/

Organising committee:

- A/Prof. Steven Galbraith, University of Auckland (s.galbraith@auckland.ac.nz)
- A/Prof. Dimitri Leemans, University of Auckland (d.leemans@auckland.ac.nz)

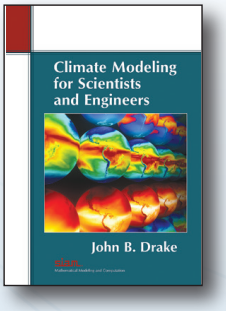
The Jade Mirror of the Four Unknowns

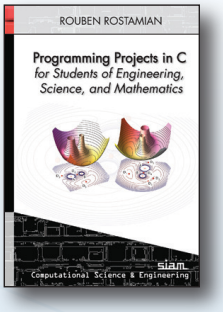
An updated copy of the study completed by noted scholar Dr Jock Hoe entitled "The Jade Mirror of the four unknowns" — which is a study on fourteenth-century Chinese mathematics concerned with polynomial equations, together with extensive supplementary material (the latter being completed in August 2009) is now held in the Special Collection at the Victoria University library. His original PhD thesis on this work (in French) is also held at VUW. Interested persons can contact the Special Collection Librarian, Sue Hirst, sue.hirst@vuw.ac.nz, for more information.

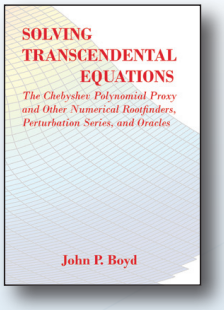
Dr John Hannah (UoC) and Professor Graeme Wake visited Dr Hoe at his home in Christchurch in March 2014, as had Sue Hirst earlier.

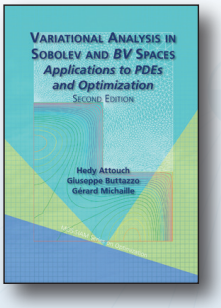
Graeme Wake

New & Notable Titles from siam









Climate Modeling for Scientists and Engineers

John B. Drake

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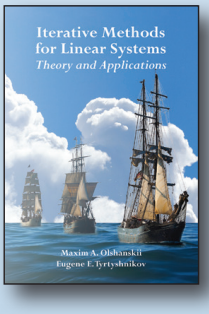

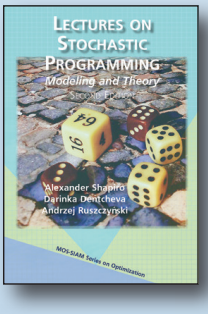

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