# THE NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

# NEWSLETTER

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## Contents



**PUBLISHER'S NOTICE**

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was assembled and printed at Massey University.

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

However, correspondence should normally be sent to the Secretary:

Dr Charles Semple, Secretary, NZ Mathematical Society,
Department of Mathematics and Statistics,
University of Canterbury,
Private Bag 4800, Christchurch.

## NZMS Council and Officers

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Garry Tee Mathematics (University of Auckland)

## Web Sites

The homepage of the New Zealand Mathematical Society with URL address:
`http://www.math.waikato.ac.nz/NZMS/NZMS.html` (Webmaster:
`stephenj@math.waikato.ac.nz`)
The newsletter is available at: `http://www.massey.ac.nz/~wwifs/mathnews/NZMSnews.html`
Editorial enquiries and items for submission to this journal should be submitted as text or LaTeX files to
`m.hendy@massey.ac.nz`.

# EDITORIAL

## Anniversaries

This issue of the Newsletter commemorates the 25th anniversary of our Society. Our President Graeme Wake has written a centrefold article recalling the establishment of the Society. Rather than select an individual for this honour, we all have a place in this centrefold, represented by our iconic kiwi. I am also very grateful for Garry Tee giving me permission to reproduce the text of his talk, “The First 25 years of the New Zealand Mathematical Society" which he presented to the New Zealand Mathematics Colloquium at Canterbury in July this year.

Graeme has introduced a new department for the Newsletter in this issue, the “President’s Column". But is it new? I dusted off my yellowing eleven foolscap page issue of the New Zealand Mathematical Society Newsletter, #1, dated October 1974. The front page begins: “President’s Notes", written by our inaugural President, David Vere-Jones. Some other features from issue #1 continue today, the minutes of the August 1974 Council Meeting, report from the 1975 Colloquium (held at Otago), and the ever popular Local News column. Unfortunately we do not seem to often have items for the Careers and Employment column! The final item was George Petersen’s report of his attending the 7th General Assembly of the IMU in Canada.

As this issue of the Newsletter is #76, it represents 75 issues since the issue of #1, another milestone to commemorate. Many folk seem intent, at the end of this December, on commemorating the beginning of the 1999th year of the modern era. Whether this is a significant milestone, it certainly does present a very good excuse for having a party! The numerology of having a date of 2000 is significant. When my once-new car reached 100000 km I took note of the event, whereas when it reached 100074 km (representing the distance of 100000km it had traveled since I had taken possession) it was of little significance. Of course had we still recorded distance is miles, the passing of 62,137 miles (or 62183) would not be noteworthy, we are victims of the arbitrariness of our system of units.

However the event at the end of this year will impact on our lives, albeit with uncertain consequences. We have been

given dire warnings of the effect of the so-called millenium (or Y2K) bug. I have already felt its coming, having lost access to my laptop while the operating system had to be replaced and the indignity of having my credit card rejected by a hotel computer that proclaimed that my card had expired almost 98 years previously! However why blame the millenium? Had our dating begun exactly 100 years earlier or later, we would still be approaching the same problem. Surely it only deserves to be called a “century bug"?

Of course with our lives intimately linked into diurnal and annual cycles, our units of time are not all arbitrary, but linked to the rotation of the Earth. But we do commemorate 1999 (or 2000) years from an arbitrary starting point. But even our counting system is arbitrary! Had our ancestors chosen to twiddle their thumbs, and just count on their fingers, we may have inherited an octal, rather than a decimal counting system! Just think what advantage we could have had over our decimal cousins in not having the Y2K bug looming, as we approached the year 3720 (base 8). Our century bug would be 20 years behind us, having occurred at a time when embedded microchips were not so ubiquitous. Our century bug would have occured much closer to the time the software was written, our octal world programmers would(?) have been more conscious of its approach and might never have let it develop!

However I still have the next issue of the newsletter to produce, my 18th, before I hand over the responsibility to my younger colleague, Robert McLachlan. It is not that I wish to avoid confrontation with the Y2K bug, indeed I got the wrong date on the cover of my first issue, without the excuse of a high tech glitch! I will attempt to conclude it with greater accuracy, and trust that future editors will be able to advance the date accurately into the new millenium, whenever it occurs. My real excuse is one of proximity, as I expect to be on the other side of the world!

*Mike Hendy*

## PRESIDENT'S COLUMN

### # 1 August 1999

In association with the Editor I have agreed to provide a regular contribution for each issue of the Newsletter, following the pattern set by the NZ Statistical Association Newsletter among others. I emphasise these are my views and I hope to provoke comments from our readers.

As I write this, we have at the University of Canterbury, just hosted the annual Colloquium. Thank you all who attended the regular meetings of NZMS and the support you gave me as your President for 1999-2001. I am honoured to have been returned to this office for a new term after a period of 20 years since I first assumed that role. I believe all enjoyed the Colloquium and the opportunity of meeting with one of our senior members, Professor Wilf Malcolm (previously Vice-Chancellor of the University of Waikato and currently, until December 1999, visiting Professor of Mathematics at the University of Brunei, Darussalam) who was an invited speaker at the Colloquium.

Matters reaching me since the annual meetings include further discussion about the proposed Asian Mathematical Union. The President of the Australian Mathematics Society, Professor Ian Sloan, suggests that Australia are positive about joining. Our Council is still seeking further information before making a recommendation. I am in touch with the founding officers about this. Please note activities of your Society in the reports continued in this Newsletter.

We noted our 25th anniversary this year and are conscious of what NZMS has achieved in its first quarter century and the challenges ahead. Following the review of mathematical sciences in New Zealand last year, we need to seek and seize new opportunities to increase the impact of our discipline. This is both for its role in underpinning science and society across the board and for its style of thought. I believe this to be the most important issue facing us today. The alternative is an increasing degree of isolation and marginalisation. What do you say when you’re asked

“Why should I study mathematics?”

Evidence points to the fact that we are not good at answering this question.

For myself, having missed the International Conference on Industrial and Applied Mathematics in Edinburgh in July (it clashed with the Colloquium) I have accepted the invitation to speak at the London Mathematical Society meeting in Leeds on “Modelling with Nonlinear Systems” in mid-September. My AgResearch role also takes me to UC. Davis, California en route. These will provide opportunities of Extending contacts abroad.

New Zealand hosts the ANZIAM meeting this coming summer (8-12th February 2000) in Waitangi and the Australian Mathematical Society Council meets there at the same time. This will provide a further opportunity of contact with our Australian counterparts. Professor Ian Sloan, currently President of the Australian Mathematical Society, has suggested regular trans-Tasman contact.

Finally, this issue contains the announcement of the NZMS Research Award for 2000. Nominations are invited. I will be asking our Council to appoint a panel of three distinguished members to recommend the winners for 2000.

*Graeme Wake*

# LOCAL NEWS

## AGRESEARCH

AgResearch has been restructured. Within the nation-wide AgSystems Science Platform we have a Mathematical Biology Group (Tony Pleasants, Mick Roberts, Tanya Soboleva, Kumar Vetharaniam plus one) and a Systems Modelling Group (Ken Louie, Dave McCall, Mike Rollo and Simon Woodward). Statistics are being overseen nationally by Peter Johnstone, and is now regarded as a science output rather than a support service. The "plus one" above refers to Glenn Fulford (ex ADFA Canberra) who is taking up a position at Wallaceville on September 1. Welcome Glenn.

Mick Roberts spent two weeks in May as part of a European Commission committee assessing the risks of BSE transmission in different member states and trading partners, then returned to Europe in June to present a paper at "Theory and Mathematics in Biology and Medicine '99" in Amsterdam. The second trip involved a period of joint research at Princeton on the way, and at Wageningen after the conference, plus a visit to Rowland Kao (ex Wallaceville) at Compton near Oxford. Ken Dodds attended the Association for the Advancement of Animal Breeding and Genetics conference in Mandurah, Western Australia in July. Roger Littlejohn attended the 50th Anniversary New Zealand Statistical Association Conference in Wellington, and gave a talk on statistical methods for analysing microsatellite data.

*Mick Roberts*

## UNIVERSITY OF AUCKLAND

### School of Mathematical and Information Sciences

Ivan Reilly has accepted the Vice-Chancellor's invitation to extend his appointment as Director of SMIS until the end of this year, 1999 December 31. Ivan is now on leave until then. It is expected that, by that date, some new organizational and administrative structure for mathematical sciences at the University of Auckland will have been decided upon.

### Department of Computer Science

In the previous Newsletter, there was a report of the triple farewell ceremony on March 25 for Alan Creak, Michael Lennon and Bob Doran, each of whom had arranged to continue working in computer science outside the Department. At that ceremony, Michael Lennon announced that he must leave promptly for a checkup, preparatory to major surgery.

Michael died of cancer on May 29, at the age of 57. An obituary article is published on page 16 of this Newsletter.

Dr John Grundy, from the University of Waikato, has been appointed as Senior Lecturer. He graduated as PhD from this Department, and he works in software tools and software engineering. Dr Emilia Mendes, who recently gained her PhD from the University of Southampton, has been appointed as Lecturer. She works in Hypermedia systems, software engineering and databases.

Xiaosong Li has completed her PhD, on "A Petri Net-based technique for graphical user interface design". Cris Calude is on leave in Europe.

### Seminars

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| **Richard Stallman** | (Free Software Foundation), "The GNU Project and the GNU/Linux operating system". |
| **Dr Jeremy Gibbons** | (Oxford Brookes University), "The under-appreciated unfold". |
| **Dr Margaret Burnett** | (Oregon State University), "Challenges and opportunities visual programming languages bring to programming language research". |
| **Dr Philip Ganchev,** | "Kripke models and intuitionistic logic" (4 presentations). |
| **Dr Michael Dinneen,** | "Finite-state algorithms for bounded-width graphs" (2 presentations). |
| **Sasha Rubin,** | "Finite automata". |

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| **Assoc. Prof. Peter Gibbons,** | "On chessboard covering problems". |
| **Dr Bakhadyr Khoussainov,** | "Buchi automata and computations of infinite duration", and "Graphs, games and update networks". |
| **Dr Hans Guesgen,** | "Fuzzy logic". |
| **Dr Hal Berghel** | (University of Arkansas), "Digital villages and virtual communities". |
| **Prof. Rod Downey** | (Victoria University of Wellington), "Presentations, jump enumerations, torsion-free Abelian groups". |
| **Dr Bakhadyr Khoussainov,** | "Graphs, games and update networks". |
| **Alan Samuel** | (Apple Computer), "Java on the Apple Macintosh". |

## Department of Mathematics

Professor Frederick Chong was Head of this Department from 1955 to 1965, when he became the foundation Director of the School of Mathematical and Information Sciences at Macquarie University. He had remained active mentally, and the University of Sydney had arranged to award him an honorary DSc on June 6. But on May 12 he was injured in a car crash, and he died in hospital on May 14, at the age of 84.

Vaughan Jones has been elected as a Member of the USA National Academy of Arts and Sciences. That is comparable in prestige to his Fellowship of the Royal Society of London.

Marston Conder has been appointed to the position of Deputy Vice-Chancellor (Research).

John Butcher has been honoured by admission to Fellowship of the New Zealand Mathematical Society.

The department has appointed C.J. Goh as an Adjunct Professor of Mathematics. Prof. Goh's interests are in optimization and mathematically related areas, where he has published a number of books and many research monographs. He has come from the University of Western Australia (Nedlands), where he was Associate Professor.

Stuart Scott gave an invited address to the International Near-Ring Conference at Edinburgh (July 11 to 17). His 95-page paper on "Advances in tame theory" is to appear in a Chinese mathematical journal.

Brent Everitt, who graduated from here as PhD, has been appointed to a tenurable lectureship at the University of York, in the UK.

Several graduate students have recently completed their PhDs in this Department: Jiling Cao, Anjana Singh, Sina Greenwood, Tsukasa Yashiro, Ye Yoon Hong and Abdul Mohamad.

Recent visitors include Sir Michael Berry (Bristol University) as the 1999 Forder Lecturer, Prof. John Conway (Princeton) en route to Australia as the 1999 Mahler Lecturer, Dr Mike Atkinson (St Andrews), Dr Jim Verner (University of British Columbia), Dr Charles Eaton (University of Leicester), Prof. Bob Gilman (Stevens Institute of Technology, New Jersey), Prof. Jane Gilman (Rutgers University, New Jersey), Prof. Richard Weiss (Tufts University, Massachusetts), Prof. Len Bos (University of Calgary), Prof. Richard Askey (Wisconsin - Madison), Dr Tim H. Marshall (Ifrane University, Morocco) and Prof. Zbigniew Blocki (Jagellonian University, Krakow).

Geoff Nicholls has returned from leave at Oxford, Gothenberg and Trondheim. Boris Pavlov is on leave at St Petersburg, Margaret Morton is on leave at Australia, USA and Europe, Colin Fox is on leave in USA, Chris King is on leave, David Gauld is on leave in USA, Bill Barton is on leave at the University of Canterbury, Eamonn O'Brien is on leave in Australia, and Arkadii Slinko is on leave in Russia and elsewhere.

The LOGOS #5 Seminar, on "Research Issues in Statistics Education", was held on March 31. The program contained the following lectures:

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| **Prof. Mike Shaughnessy** | (Portland State University, Oregon), "Research in stochastics learning: what questions might we be asking?". |
| **Sashi Sharma** | (Manukau Institute of Technology), "Statistical ideas of high school students: implications for teaching". |
| **Prof. Chris Wild** | (Department of Statistics) and **Maxine Pfannkuch**, "Statistical thinking for empirical enquiry". |

**Dr Sharon Gunn** (University of Waikato), "Statistics curriculum: a cultural framework?".

Marston Conder, Charles Leedham-Green and Eamonn O'Brien gave invited lectures at a conference on "Groups and Computation" at Ohio State University in June. Marston Conder visited the National University of Singapore and the National Institute of Education in Singapore in April/May, and the Section de Mathematique at the University of Geneva in June. Paul Bonnington, Marston Conder and Margaret Morton took part in an international conference on Algebraic and Topological Methods in Graph Theory at the lake resort of Bled (Slovenia) in June/July. Marston gave an invited lecture on combinatorial group-theoretic methods in graph theory and discrete geometry. Paul Bonnington and Margaret Morton attended the British Combinatorial Conference in July, held at the University of Kent at Canterbury. Jianbei An, Marston Conder, Charles Leedham-Green, John McKenzie, and PhD students Ben Warhurst and Tsukasa Yashiro, took part in the joint meeting of the American and Australian Mathematical Societies held in Melbourne in July, where Vaughan Jones gave an invited plenary lecture on planar algebra and a very popular public lecture on knots. Marston Conder co-organised one of the special sessions at the conference, on Group Actions and Geometric Themes in Group Theory.

The 50th Anniversary conference of the New Zealand Statistical Association was held at Victoria University of Wellington, on July 5 to 7. Garry Tee gave an Invited Address on "New Zealand Pioneers of Statistics".

The 1999 New Zealand Mathematics Colloquium was held at the University of Canterbury, on July 6 to 9. The New Zealand Mathematical Society awarded the Aitken Prize (for the best student talk at the Colloquium) jointly to Britta Basse (a former student from Auckland now at Canterbury) for her talk on "Mathematical modelling for conservation:- predator control via secondary poisoning" and to Jamie Sneddon (PhD student of Paul Bonnington and Margaret Morton) for his talk on "Domination conditions for tournaments". At that Colloquium, Garry Tee gave a Plenary Address on "The first 25 years of the New Zealand Mathematical Society". Members of this Department contributed the following talks:

**John Butcher,** "A new family of methods for stiff differential equations".

**Marston Conder,** "Finding normal subgroups of low index in finitely-presented groups".

**David Gauld,** "Topological games and manifolds".

**Gareth Hegarty,** "Existence of solutions for semilinear evolution equations".

**Andrei Korobeinikov,** "Long-term global dynamics: is a strange attractor responsible for the ice ages?".

**Alex McNabb,** "Chemical transients in water tanks".

**Abdul Mohamad,** "Quasi-developable manifolds".

**Jamie Sneddon,** "Domination conditions for tournaments".

**Steve Taylor,** "On smoothing properties of PDEs and abstract controllability results in Hilbert space, with applications to boundary control of systems governed by PDEs".

## Seminars

**Sir Michael Berry** (Bristol University, 1999 Forder Lecturer), "Quantum mechanics and the Riemann zeros", and "Diffraction of atoms by real, complex and imaginary crystals of light".

**Tsukasa Yashiro,** "Immersed surfaces and their lifts".

**Dr Colin Fox,** "Dynamic loading of a floating ice sheet: theory and measurement", and "Efficient, exact PDE solutions for MCMC".

**Prof. Ivan Reilly,** "Topological concepts and language: a report of research in progress", and "On preclosed sets and their generalisations".

**Dr Susan McKay** (Queen Mary and Westfield College, London), "Grigorchuk's celebrated 2-group".

**Prof. Gaven Martin,** "A proof of the Hilbert-Smith conjecture for quasiconformal actions".

**Prof. John Butcher,** "Inherent Runge-Kutta stability and practical general linear methods".

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| **Dr Norm Levenberg,** | "An elementary proof of an interesting theorem". |
| **Dr Steve Taylor,** | "On smoothing properties of PDEs and abstract controllability results in space with applications to boundary control of systems governed by PDEs". |
| **Prof. John Howie** | (University of St Andrews), "The concept of rank in semi-group theory". |
| **Dr Katharina Huber** | (Massey University), "Computing the injective hull of a metric space". |
| **Dr Paul Bonnington,** | "Accumulation points in infinite planar graphs". |
| **Dr Robert Chan,** | "Extrapolation of symplectic methods in long-term integration of Hamiltonian problems". |
| **Tsukasa Yashiro,** | "Deformations of immersed surfaces in the three-space". |
| **Ben Warhurst,** | "Teichmüller spaces and the Bers projection". |
| **Dr Philip Sharp,** | "Efficient Pouzet Methods". |
| **Assoc. Prof. M. K. Vamanamurthy,** | "Similarities between a topological space and its alpha extension". |
| **Dr Jiling Cao,** | "On some questions of $C_p(X)$". |
| **Prof. Charles Leedham-Green** | (University of London), "Calculating the order of an invertible matrix". |
| **Greg Oates,** | "Collaborative learning in tertiary mathematics". |
| **Prof. Mike Atkinson** | (University of St Andrews), "Descent algebras". |
| **Dr Brian Bolt,** | "Stimulating mathematical thinking". |
| **Dr Amal Al-Amleh,** | "Global stability analysis for difference equations". |
| **Dr Mike Thomas,** | "The conceptual modelling of functions by experienced teachers". |
| **Prof. Derek Holton** | (University of Otago), "Undergraduate teaching issues". |
| **Prof. Boris Pavlov,** | "Another quantum device for triadic logic". |
| **Prof. Muhittin Mungan** | (University of Chicago and Bogazici University Istanbul), "Science from Pictures: Determining pair interactions from structural correlations". |
| **Prof. Vladimir Pestov** | (Victoria University of Wellington), "Fixed points, amenability, and measure concentration". |
| **Gareth Hegarty,** | "Existence of solutions for semilinear evolution equations". |
| **Dr Stuart Scott,** | "Success and failure". |
| **Dr John Meakin** | (University of Nebraska, Lincoln), "Equations in groups and monoids". |
| **Bonnie Law,** | "Estimation of allele frequencies in ancestral Maori population". |
| **Dr Richard Weiss** | (Tufts University), "Generalised polygons". |
| **Prof. Len Bos** | (University of Calgary), "Fekete points for radial basis interpolation". |
| **Brian Van Dam and Abdul Mohamad,** | "Special resolutions and their properties and metrizability of manifolds by diagonal properties". |
| **Prof. Jane Gilman** | (Rutgers University, New Jersey, USA), "Discrete groups with real parameters". |
| **Prof. Bob Gilman** | (Stevens Institute of Technology, New Jersey, USA), "Groups and languages". |

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| **Dr Charles Eaton** | (University of Leicester), "Modular representation theory - my part in its downfall". |
| **Louise Parsons** | (Cornell University), "Dynamical systems modelling of turbulent wall layers". |
| **Prof. Richard Askey** | (University of Wisconsin-Madison), "An overview of orthogonal polynomials". |
| **Prof. Shicheng Wang** | (Peking University), "Achiral embeddings into 3-space". |
| **Prof. John Conway** | (Princeton University, 1999 Mahler Lecturer), "Understanding the symmetries of things" (Public Lecture), and "Mysteries of the Monster". |
| **Dr Bakhadyr Khoussainov** | (Computer Science Department), "Automata, algebras and computations with algebraic constraints". |
| **Garry J. Tee,** | "Computing with the Riemann zeta function". |
| **Dr John McKenzie,** | "Topological highlights of the Melbourne meeting". |
| **Dr Zbigniew Blocki** | (Jagellonian University , Krakow), "Regularity of the pluricomplex Green function". |

## Statistics

Chris Wild has been promoted to full Professor. Both Maxine Pfannkuch and Alain Vandal have completed their PhDs. Dr Henri Moolman (University of Zululand) and Dr Mark Rizzardi (Humboldt State University, Arcata, California) are visiting the Department.

The 50th Anniversary conference of the New Zealand Statistical Association was held at Victoria University of Wellington, on July 5 to 7. Members of this Department contributed the following talks:

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| **Jenni Holden and Chris Triggs,** | "Capture-recapture techniques and the Auckland leg ulcer study". |
| **John Huakau and Alan Lee,** | "A bootstrap approach to the estimation of the size of closed populations". |
| **Bonnie Law, Chris Triggs and John Buckleton** | (Institute of Environmental Science and Research Ltd), "Estimation of allele frequencies in ancestral Maori population". |
| **Alan Lee,** | "Perturbed lists". |
| **Patricia Metcalf,** | "Fitting a generalised linear model to a double-blind, randomised, placebo-controlled cross-over study". |
| **Alastair Scott,** | "Analyzing data from complex sample surveys by repeated subsampling". |
| **Chris M. Triggs, James M. Curran, John S. Buckleton** (Institute of Environmental Science and Research Ltd) **and Bruce S. Weir** (North Carolina), | "Assessing sampling error in DNA match probabilities". |
| **Chris Wild,** | "Case-control studies with complex sampling". |

Dr James Curran is temporarily teaching here, en route to his new appointment at the University of Waikato. In June he was an invited participant at the DNA Forensics conference in McClean, Virginia. He took part in a legal roundtable discussion on "Legal Issues in DNA Forensics". Other participants in that panel discussion were: Dr James F. Crow, Chairman of the USA National Research Council for the Evaluation of Forensic Evidence, and a highly-respected population geneticist;

Mr Peter Neufeld, a prominent defence attorney (defender of one O. J. Simpson) and co-collaborator of The Innocence Project, which re-examines cases with DNA evidence that was not analysable when the case was originally tried;
Mr G. Woody Clarke, a prominent prosecutor (of one O. J. Simpson) from the San Diego DA's Office; and
Judge Ronald Reinstein (Maricopa County Superior Court) and Dr Christopher Asplen, Chairman and Director respectively of the National Committee on the Future of DNA Evidence, set up by Attorney- General Janet Reno. _

## Seminars

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|---|---|
| **Dr Geoffrey Pritchard,** | "Stochastic programming and importance sampling". |
| **Dr Darryl Veitch** | (RMIT, Melbourne), "Wavelet based statistical methods for fractal processes". |
| **Dr Rachel Fewster,** | "Approaches to parameter estimation for a spatio-temporal ecological model". |
| **Dr Andy Philpott** | (Department of Engineering Science), "Optimisation and electricity markets". |
| **Prof. Alastair J. Scott,** | "Analyzing data from complex sample surveys by repeated subsampling". |
| **Dr Simo Puntanen** | (University of Tampere, Finland), "Some properties of a partitioned linear model". |
| **Dr Ivy Liu** | (University of Waikato), "Strategies for modeling a categorical variable allowing multiple category choices". |

*Garry J. Tee*

# UNIVERSITY OF CANTERBURY

Dr Peter Renaud has resigned from the position of HOD. The department would like to thank Dr Renaud for his skillful leadership of the department over the last 8 years. The HOD position has been taken over by Professor Bridges.

Dr Mike Steel has received a New Zealand Mathematical Society award for mathematical research. The award came with the citation "for his fundamental contributions to the mathematical understanding of phylogeny, demonstrating a capacity for hard creative work in combinatorics and statistics and an excellent understanding of the biological implications of his results."

Britte Basse, a PhD student at Canterbury, was the joint winner of the prize for the best student talk in the colloquium recently held at Canterbury.

The department of Mathematics and Statistics at Canterbury has enjoyed hosting a number of visiting Professors. Amongst them was Dr Tim Marshall from the University of Al Alakhawayn in Morocco.

## Seminars

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| **Dr Tim Marshall** | (University of Al Alakhawayn, Morocco), "$\mathcal{C}$-universal graphs". |
| **Prof. Mark Boyce** | (University of Wisconsin), "Models for viability of grizzly bear populations in Yellowstone national park". |
| **Prof. Evelyn Merril** | (University of Wisconsin), "A remote sensing approach to the influence of summer forage conditions on Wapiti population dynamics in Yellowstone national park". |
| **Dr James O'Malley** | (Purdue University), "Real world experiences in modelling recidivism". |
| **Prof. Anne-Mette Pedersen** | (University of Aahrus), "Probabilistic models of DNA evolution with context dependent rates of substitution". |
| **Prof. Louis Fishman** | (Stennis Space Centre and University of New Orleans), "Phase space and path integral methods in classical elliptic wave propagation modelling". |

**Dr Mick Roberts** (AgResearch, Upper Hutt), “Measles: a mathematician on the spot”.

*Chris Price*

## LANDCARE

Robert Gibb and Mark Johnston have attended the “International Symposium on Spatial Data Quality” - ISSDQ’99 in July at Hong Kong Polytechnic University.

Aroon Parshotam has been recognised by the Institution of Professional Engineers New Zealand (IPENZ) and has been awarded the 1999 Fletcher Challenge Paper Award. This award is for the best paper on a subject possessing a substantial chemical engineering interest with a preference for papers dealing with the utilisation of New Zealand’s natural resources and of the development of New Zealand’s chemical process industry, published by the institution during the three year period ended 31 December 1998. The award takes the form of a certificate and a cheque for $1000. The award is shared with coauthor Professor Rao Bhamidimarri and senior coauthor Yoon-Seok Hong.

Aroon Parshotam has had his first PhD student Yoon-Seok Hong, complete with a successful thesis in the Institute of Engineering and Technology, Massey University on “Modelling of Biofilm Growth and Detachment in a Three-Phase Fluidised Bed Bio-reactor”. This thesis compared several models and modelling approaches: mechanistic models, sequential neural networks models, and intelligent hybrid models.

*Aroon Parshotam*

## MASSEY UNIVERSITY

### Mathematics, Institute of Fundamental Sciences

Glenda Anthony, our expert in mathematics education who transferred to the College of Education (Massey University, Hokowhitu Campus) has just been appointed to be head of the new Department of Curriculum Studies in Mathematics, Science and Technology Education.

Mike Hendy expects to be occupying a point in Hausdorff space next year, or more explicitly, to be a guest in the “Felix Hausdorff" house at the Univerity of Greifswald in North Eastern Germany. Mike has been offered a prestigious Mercator Visiting Professorship, for 10 months, beginning April 2000, to assist in the development there of a teaching and research programme in Biomathematics. The University of Greifswald, the second oldest in Northern Europe (founded in 1456), is in the former East German region, on the Baltic Coast due north of Berlin. The newly completed Hausdorff house was built as part of a renewal programme as accommodation for long term research visitors to the University. It is named to commemorate the mathematician Felix Hausdorff who was on the faculty at the university from 1914 to 1921, and who at the age of 70, died in a concentration camp in 1942.

Robert McLachlan has just returned from rubbing shoulders with Fields medallists - they were just a few cm away on the conference poster! The third meeting on the “Foundations of Computational Mathematics" was held in Oxford, and looks set to continue for some time, with a society being formed and a journal launched. Steve Smale mounted an assault on yet another new branch of maths - the theory of learning - and Roger Penrose somewhat wearily defended his bizarre position on consciousness and computability. Then it was on to the deliriously fabulous Oberwolfach in the Black Forest, a sort of glorified NZIM. In fact if the NZIM would build some beach huts and provide a library and a wine cellar, we’d be nearly there. Last stop Berlin, for the big European differential equations conference “Equadiff". Too hot, too big - 13 parallel sessions running continuously to 7pm - much better to explore east Berlin and bail out for Hong Kong and so home.

Dr Kee Teo was awarded a visiting professorship by the Department of Mathematics, Prince of Songkla University in Hatyai, Thailand in April this year for a duration of seven weeks. The main purpose was to give lectures/seminars, conducting a three-day workshop leading to research in the area of chromatic polynomials. With the help of five staff members substantial progress was made on a couple of problems concerning chromatic polynomials. Dr Teo was joined by four staff members from Massey University with the mission of setting up joint PhD supervision in Prince of Songkla University.

### Seminars

**Dr Igor Boglaev,** “Uniform Convergent Methods on Arbitrary Meshes”.

**Dr Benny Chor** (Computer Science Department, Technion, Israel), “A Geometric Approach to Betweenness”.

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|---|---|
| **Prof. Mike Hendy,** | “Investigating Multiple Maximum Likelihood Points in Phylogenetic Analysis”. |
| **Dr Mike Meylan** | (Institute of Information and Mathematical Sciences, Albany Campus), “Solution of the Linear Boltzmann Equation using Spectral Methods”. |
| **Dr Dong Feng Ming,** | “Proof of a Chromatic Polynomial Conjecture”. |
| **Dr Nicolas Robidoux,** | “Discretizing compositions of spatial differential operators”. |
| **Dr Kee Teo,** | “Chromatic Classes of Bipartite Graphs”. |
| **Dr Bruce van Brunt,** | “Compliant Components”. |
| **Dr John Hudson,** | “Braids, Word Problems and Automata”. |

*Robert McLachlan*

## Institute of Information and Mathematical Sciences, Albany Campus

Francis Thio reluctantly resigned from his position as Senior Lecturer in Mathematics (taking effect from mid-June) to return to the USA. There he has taken up a prestigious position of Lead Physicist, High Energy Plasma Propulsion, at NASA Marshall Space Flight Center, Huntsville, Alabama. In his three years at Albany, Francis has made considerable impact on our activities, both in undergraduate teaching and postgraduate level, where he has provided the supervision and projects for several of our current students. In addition, his research output has been considerable. Although we are sorry to lose him, we wish him well in the future, and thank him for the legacy he left us.

Shaun Cooper attended the International Workshop on Special Functions, held at the City University of Hong Kong during June 21 - 25. He talked on number theoretic properties of the coefficients in the series expansions of Euler’s infinite product $\prod_{n=1}^{\infty}(1-q^n)^r$, for various values of $r$. This is joint work with M. Hirschhorn (UNSW) and R. Lewis (Sussex).

Professor Jeff Hunter attended the World Conference in Science in Budapest, June 26 - July 1 as a member of the New Zealand delegation, representing the Royal Society of New Zealand. He also presented a paper at the 10th INFORMS Applied Probability Conference in Ulm, Germany, July 26-28. The intervening period was spent in England with visits to University College London and Oxford University, interviewing applicants for positions in the Institute, as well as enjoying a short period of annual leave.

Mike Meylan and Adrian Swift attended the 1999 NZ Mathematics Colloquium held at the University of Canterbury in July. Mike gave a paper entitled “Using resonance scattering to calculate hydroelastic response". Adrian Swift was re-elected as Treasurer/Secretary of the NZ Branch of ANZIAM.

## Seminars

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|---|---|
| **Professor Robert McKibbin** | (Palmerston North), “Mathematical Modelling: Interdisciplinary Conversations” and “Pollen - where does it go, where is it from?” |
| **Professor Richard Askey** | (University of Wisconsin - Madison), “S. Ramanujan: Who was he, What did he do, Why do we care?". |
| **Dr Doug Stirling** | (Palmerston North) “Java, Web Browsers and the Teaching of Statistics". |
| **Dr Kay Fielden,** | “Messages, Mail or Madness: is IF the ED of the ‘90s curable?" (There were prizes for the correct interpretations of “IF" and “ED") |

*Shaun Cooper*

## UNIVERSITY OF OTAGO

The Department of Mathematics and Statistics has recently upgraded their principal computer laboratory for the teaching of mathematics from Macintosh LCIIIs to Pentium IIs with seventeen-inch colour monitors. The laboratory is used primarily to support the teaching of algebra and calculus courses, with one first year course dedicated to the application Mathematica. The lab consists of twenty-five Windows NT workstations with server and printer support, and the principal applications are Microsoft Office, Mathematica and MATLAB. Conversion of software licenses and files from Mac to PC platforms has proceeded reasonably smoothly.

Can you solve this problem: "How long does it take to travel 9000 m vertically from Bucharest?". The answer will appear later in this article. The 1999 International Mathematical Olympiad was held from July 13 to July 22 in Bucharest Romania. A team of six high school students from New Zealand travelled to the Olympiad accompanied by Michael Albert (U of Otago) and Lyn Foulds (Villa Maria, Christchurch.). They were met at the site by team leader Dr Arkadii Slinko (Auckland U). The only medal for the team was won by Ben Handley (Dunedin), who obtained a bronze medal, one point short of a silver. Another team member, Sarah Young (Auckland) was only one point short of a bronze medal. The competition was extremely difficult, even by the standards of the Olympiad. The easiest of the six problems (over two four and a half hour examinations) was: "Characterize those finite sets $S$ of points in the plane which are symmetric about the perpendicular bisector of any segment joining two of the points." The answer to the Bucharest problem above was obtained by the team on their return journey to New Zealand. It appears to be 11 hours, consisting of a two hour flight from Bucharest to Frankfurt, a seven hour lay over in Frankfurt, and then the first two hours of a flight from Frankfurt to Singapore.

Robert Aldred attended the 24th Australasian Conference on Combinatorial Mathematics and Computing in Darwin in early July after which he travelled to Silpakorn University, Thailand where he worked with Professors Nawarat Ananchuen and Mike Plummer for two weeks.

Richard Barker found time during the between-semesters break to take a quick trip to Hungary and back. Besides enjoying some fine Hungarian wines, warm weather and bird-watching he also attended the 2nd International Wildlife Management Congress, helping run a workshop on using the computer program MARK to analyze mark-recapture data.

Austina Clark attended the New Zealand Statistical Association's 50th Anniversary conference held at Victoria University of Wellington from 4-7 July this year. After the official opening by Len Cook, the government statistician, Garry Tee gave a very interesting review of New Zealand pioneers of statistics. This was followed by a talk by Robin Williams (formerly V-C at Otago) on mathematics and statistics here in New Zealand 40 or 50 years ago. There was a wide range of participants including government statisticians, actuaries, agricultural researchers and academics. Austina said it certainly was a worthwhile conference.

In April, John Clark visited the Department of Mathematics at Khon Kaen University, Thailand, where, together with Prof. Nguyen Van Sanh of the Department, he conducted a week-long research school on ring and module theory. At the end of June, John attended the Third Korea-China-Japan International Symposium on Ring Theory in Kyongju, South Korea.

David Fletcher recently ran a workshop for maths teachers on Statistics in Conservation Biology, as part of the New Zealand Association of Maths Teachers conference held in Dunedin at the end of June. This provided an introduction to two projects on Hooker's sealions: one on fisheries bycatch and one on mark-recapture to estimate abundance of pups. Both involved simulation, first using suitably illustrated cards, and then with an Excel spreadsheet. The teachers involved showed considerable thirst for this kind of resource, especially as some of the issues arising are topical and controversial. The classroom session was followed by a visit to the local Royal Albatross Centre at Taiaroa Head. Great fun was had by all.

John Harraway presented a short workshop From Bursary to University at the NZAMT 6 Conference in Dunedin in June. The new Biostatistics paper for Health Sciences students was described, the role of project work at school and university was discussed and the suggestion made that additional resources be put into the schools to ensure that at least one statistical package is available in every high school to enhance project work, data exploration in particular. MINITAB was suggested as one possible package.

Derek Holton attended the 24th Australasian Conference on Combinatorial Mathematics and Computing in Darwin in early July. He gave a plenary talk on the Four Colour Theorem. At this meeting he was re-elected as president of CMSA (Inc).

Bryan Manly attended the 11th Conference on Applied Statistics held in Kansas from 24 April - 5 May, Bryan also attended a meeting at the American Statistical Association headquarters on 18 June as well as a meeting of the Western North American Meeting of the International Biometric Society from 27 to 30 June in Seattle.

Caryn Thompson returned from Study Leave in Canada where she visited the Department of Mathematics and Statistics at Dalhousie University in Halifax, Nova Scotia from January to June. Her contacts there were Dr Chris Field and Dr Bruce Smith, who are part of a research group investigating various statistical problems in genetics. Caryn's own interest is application of Hidden Markov Models to DNA sequences.

No word this month from Vernon, our heid-yin. After attending the Colloquium he says he is keeping his head down, having been inspired to get stuck into his research again by all those clever people at the conference.

## National Certificate of Educational Achievement

All departments should, by now, have received copies of the mathematics achievement standards that are to replace the School Certificate, Sixth Form Certificate and Bursary qualifications. It is not clear what significance the change over will have for universities. However, all departments should consider the matter seriously. If you have any major concerns, let your Vice-Chancellor know and forward them also to Derek Holton who is on the committee that is producing the mathematics achievement standards. He would also like to know what departments think are the positive factors in the new scheme.

## Mathematics Seminars

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|---|---|
| **Professor Shinji Mizuno** | (William Evans Fellow, The Institute of Statistical Mathematics, Tokyo, Japan), "Two homogeneous systems for LP." |
| **Dr Colin Fox** | (Department of Mathematics, University of Auckland), "Dynamic loading of a floating ice sheet: theory and measurement." |
| **Roger Glendenning,** | "Orthodontic Applications of a Superelastic Shape-Memory Alloy Model." |
| **Dr Michael Meylan** | (Institute of Information and Mathematical Sciences, Massey University), "Solution of the Linear Boltzmann Equation using Spectral Methods." |

## Statistics Seminars

| | |
|---|---|
| **Richard Barker and Peter Taylor (Wellington Fish and Game Council)** | , "Survival of rainbow trout in the Rangitikei River." |
| **Professor Mark Boyce** | (Department of Biological Sciences, University of Alberta, Canada), "Models for Viability of Grizzly Bear Populations." |
| **Peter Herbison** | (Department of Preventive and Social Medicine), "A Jobbing Statistician's Worst Nightmare." |
| **Will Hopkins** | (Department of Physiology), "Planning Performing and Publishing Research with Confidence Limits." |
| **Darryl MacKenzie,** | "How Many? Estimating population sizes from a series of datasets where the sighting probabilities for individuals are not equal." |
| **Susan Mikulich** | (Department of Psychiatry at University of Colorado Health Sciences Center, Department of Preventive Medicine and Biometrics at University of Colorado Health Sciences Center), "Relating the Classical Covariance Adjustment Techniques of Multivariate Growth Curve Models to Modern Univariate Mixed Effects Models." |
| **Duncan Roper** | (Operations Researcher Statistician, University of Western Sydney), "Stochastic Riverflow Modelling for the Control of Hydrosystems." |
| **Richard Anderson-Sprecher and Christopher Nations (University of Wyoming),** | "Home Range Estimation Based on Wildlife Telemetry Data." |
| **Harald Steen** | (Department of Zoology), "Can Population Growth Rates Vary With the Spatial Scale at which they are Measured?" |

*Vernon Squire*

# UNIVERSITY OF WAIKATO

## Department of Mathematics

Three new staff have arrived in our department since the last Newsletter. We welcome our two new lecturers, Dr Rua Murray and Dr Warren Moors. As mentioned previously, Rua has formerly been based at the University of Victoria in Victoria, Canada. Warren also comes from a Victoria University, but this is the one in Wellington. There he has been a research fellow working with Vladimir Pestov on his Supergeometry Marsden project. Also joining our department is Dr Jonathan Kress who will be working with Ernie Kalnins on his Marsden project 'Special functions, superintegrability and separation of variables'. Jonathan was previously based at the University of Sydney where had been an Associate Lecturer and research assistant.

Though this correspondent's last column mentioned that there was a plan to merge the School of Computing and Mathematical Sciences and the School of Science and Technology into a new faculty, this merger plan has been put on hold because of legal action culminating in a judgement from the High Court. Whether the merger will now take place is open to conjecture.

Kevin Broughan is away on study leave until the end of the year. He will spending most of this time in New York.

A number of members of the department went to the 1999 Colloquium in Christchurch. These were Ali Jaballah, Ernie, and Rua, and your local correspondent. Before the Colloquium, Ernie attended the 'International Workshop on Special Functions: Asymptotics, Harmonic Analysis, and Mathematical Physics' held in Hong Kong. Warren attended the Joint Meeting of the Australian Mathematical Society and American Mathematical Society held in Melbourne recently.

Shortly our department should have the best cellphone reception of any mathematics department in the country as there is a proposal to install a cellphone transmitter on the roof of our building and we are all located on the top floor. To the surprise of the university administration, this proposal was not met with universal acclaim. Perhaps things might have been different if the plan had not been announced to us via the local student magazine.

## Seminars

**S. Scott** (University of Auckland), "Interesting topology".

**E. Kalnins,** "Group theory and elementary particles".

*Stephen Joe*

## Department of Statistics

The Department of Statistics and The Waikato Centre for Applied Statistics recently hosted a one-day workshop on Categorical Data Analysis, given by Professor Alan Agresti, from the University of Florida. Approximately 80 people attended the workshop. The workshop was held immediately following the NZSA 50th Anniversary Conference, at the Victoria University of Wellington. This was attended by Murray Jorgensen (recently back from sabbatical), Judi McWhirter and I-Ming Liu.

Lyn Hunt recently attended the Classification Society of North America Conference at the University of Pittsburgh in Pennsylvania and Sharon Gunn presented a paper at MERGA 22 at the University of Adelaide.

Nye John is on sabbatical and is currently overseas, where he is planning to attend the 8th International Workshop on Matrices and Statistics, being held at the University of Tampere, Finland. Later in August, David Whitaker will be attending the First International Symposium of Industrial Statistics in Sweden.

The department is also looking forward to the arrival of James Curran, who is due to take up his position as Lecturer, commencing 1 September.

Congratulations go to Samuel Manda, who has successfully defended his PhD thesis entitled, 'A Nested Random Effects Model Analysis of Child Survival in Malawi'. He is currently working on a short-term contract as a Biostatistician at the Cardiovascular Research Unit of Auckland Healthcare and is looking to obtain a post-doctoral fellowship. We wish him well in the future.

## Seminars

**Dr David Johnson** (Loughborough University), "Triangular approximations in continuous random variables in risk analysis".

**Dr Ray Littler,** "The challenge of statistical practice: how does it help us teach?".

**Dr I-Ming Liu,** "Strategies for modeling a categorical variable allowing many category choices".

**Dr Simo Puntanen** (University of Tampere, Finland), "Some properties of a partitioned linear model".

**Dr Doug Stirling** (Massey University), "Java, Web Browsers and the Teaching of Statistics".

**Professor J A John,** "Recursive formulae for the average efficiency factor".

**Professor Alastair Scott** (University of Auckland), "Analyzing data from complex sample surveys by repeated subsampling".

## VICTORIA UNIVERSITY OF WELLINGTON

Vladimir Pestov has visited Universite de Geneve and Tel-Aviv University in April (for talks and joint work), attended the joint meeting of the Australian and American Math societies in July, and attended as the major invited speaker the 14-th Summer Conference on Topology and its Applications in New York (Long Island University) in August. For the second half of 1999, he is visiting the Computer Sciences Lab of the Australian National University in Canberra, where he is working with the datamining group, supported by a grant from ACSys (= Australian Cooperative Research Centre for Advanced Computational Systems).

John Harper received a 3-year Marsden grant in spite of his retirement, to continue his work on bubbles and drops moving in liquids. It didn't rise to the post-doc he had hoped for but it did finance the travel and computing facilities that the University will no longer pay for.

John's research contribution was celebrated at the 2nd Inaugural Annual Wellington-Manawatu Regional One-day Conference on Applied and Computational Mathematics at Industrial Research Limited on 26 Jan 1999, with a tribute delivered by Graeme Wake and printed in the book of abstracts. His talk there was also given at the Australian Applied Mathematics Conference a couple of weeks later, and by now 6 times in 6 different countries, as in April he took off for a Clayton's sabbatical: a trip to Oxford (with a visiting fellowship at St Catherine's) and Heriot-Watt, with stops at Purdue, Bristol, Cambridge, Birmingham, Twente, and ICIAM in Edinburgh.

He has also been the external examiner of an Oxford D.Phil., when he was glad he didn't have to wear subfusc at the oral like the internal examiner and the candidate. He is now enjoying a mostly dry and warm Scottish summer. He will be returning at the end of September.

Mark McGuinness was at the Mathematics-in-Industry Study Group held at Queensland University of Technology early this year, and helped moderate the session on coating hot iron castings by dipping them into fluidised epoxy powder. Then on to the ANZIAM meeting in Mollymook, south of Sydney, to talk about grain cooking and sun on sea ice, and to be awarded the Cherry Ripe prize. The prize is awarded by students for the best non-student talk given at the conference, and is a somewhat tongue-in-cheek reference to the Professor Cherry prize that is awarded at the same conference for the best student talk! Mark reports that the prize, a bar called Cherry Ripe (cherry-flavoured coconut and chocolate), was absolutely delicious.

Later this year Mark is to visit at the University of Melbourne, working on mathematical modelling of rice cooking and beer brewing, and later is off to Antarctica for 12 days, furthering joint work with Joe Trodahl on the transport of heat and light through sea ice.

Catherine McCartin (nee Richardson) began a Ph.D. with Rod Downey in December, and has just submitted a paper on the $k$-jump problem in constrained scheduling. She visited Mike Fellows earlier this year, working on parameterized complexity, and treewidth for posets.

Wu Guohua has been awarded a scholarship to do a Ph.D. with Rod Downey and is also partially supported through Rod's new Marsden grant, awarded late last year.

Rod Downey was an Invited speaker at the DMTCS/CATS computer science meeting in Auckland in January, and an Invited speaker at the AMS special session in Computability Theory in Gainesville, Florida, in March; and also at the Association for Symbolic Logic meeting in San Diego in March.

Rod Downey has been appointed to the Editorial Board of the Journal of Symbolic Logic.

Denis Hirschfeldt from Cornell has just accepted a Postdoc to work with Rod Downey for 14 months. He will arrive in October. Rod's book with Mike Fellows is now published "Parameterized Complexity" ISBN 0-387-94883-X, Monographs in Computer Science, XV+533 pages.

Rod reports that he is enjoying his sabbatical. He spoke in Taiwan as invited speaker in the 7th Asian logic conference, and is now overseas visiting Singapore, Sienna, Cornell, Urbana and Madison.

Megan Clark is the Bevan Werry Memorial speaker for the NZ Association of Mathematics Teachers (NZAMT) for 1999 and in that capacity gave a plenary lecture at NZAMT's biennial conference in Dunedin.

Fiona Walls is doing a Ph.D. with Megan tracking the achievement, attitude and home influences on mathematics from the age 7 to 10. Darren Upton won the award for the best student presentation at the recent NZ Statistics Association conference with his presentation on the "One Factor Interest Rate Model for the New Zealand Term Structure of Interest Rates". Graduate students John Randal, Justin Harrington and Khanhav Au also gave presentations.

Rob Goldblatt was presented with a surprise festschrift on his 50th birthday, comprising articles by friends and colleagues, and entitled "The Goldblatt Variations". Production of the volume was organised by Krister Segerberg, Professor of Philosophy at Uppsala University, formerly HOD of Philosophy at Auckland.

Geoff Whittle tells me that from August to November 1998 he was at Merton College Oxford as a visiting research fellow. Geoff gave invited talk at ACCOTTA 98, a discrete mathematics conference held in Oaxaca Mexico in November 1998. He followed this with a research visit to Professor Isidoro Gitler in Mexico City.

Jim Geelen from University of Waterloo in Canada visited Geoff for three weeks in January to work on problems in matroid representation theory, and also visited for another two weeks around Easter. Dirk Vertigan, from Louisiana State University is currently visiting Geoff for four weeks.

So life goes on, in the face of falling staff numbers consequent on a student-staff ratio that is lower than in other parts of the university, and in face of increasing teaching loads as we try to balance the need for more students (to which one response is to put on more courses) with our own research needs.

Ka kite

*Mark McGuinness*

## OBITUARY

### Dr Michael J. J. Lennon PhD(M.I.T.), MSc, MNZCS 1942-1999

The community of Computer Scientists and Mathematicians in New Zealand was saddened to hear of the death of Mike Lennon, on 1999 May 29. Mike was a member of the University of Auckland Computer Science Department, and prior to that, a member of the Mathematics and Statistics Department.

Mike came to the University of Auckland from Mt Albert Grammar School after topping the national Scholarship examinations, and he completed an MSc with First Class Honours in Mathematics. After that he completed a PhD in Mathematical Physics at MIT. Following a brief stint at Aarhus University in Denmark, he came back to Auckland to work in the Mathematics and Statistics Department, transferring to the Computer Science Department in 1990.

While trained as a Mathematician, Mike also had a love of computing. He was one of the earliest computer programmers in New Zealand, working on the Treasury IBM650 while still an undergraduate. On returning to Auckland he developed a part-time computer consultancy business and also developed programs for the complex tasks of streaming Science Faculty classes and timetabling the University examinations. His move to Computer

Science was thus a natural one, from which our Department has benefited enormously.

Mike was, however, a somewhat unconventional academic. He did not concentrate his efforts on research activities, which are a major determinant in promotion. This was not due to a lack of ability: he had one of the sharpest intellects we have come across. Rather, he deliberately and selflessly chose to put his energies into the development of other people's careers. He was, as a result, an outstanding teacher and mentor. His teaching did not stop at the lecture room door. Mike spent hours mentoring students in his office. Whether it was the weakest student in the class, ultimately doomed to fail, or the brightest students seeking to extend their grasp of the discipline, Mike was there, bringing the best potential out of them, and advising them on new directions to head in. In countless cases, Mike's mentoring and advice was a turning point in people's careers. Professor Vaughan Jones from Berkeley and Auckland, Fields Medal winner and arguably the best mathematician New Zealand has produced, was profoundly influenced by Mike. He says:

"It is with the greatest sadness that I learned that Mike Lennon has died. He was for me a friend and a great source of mathematical inspiration, having introduced me to von Neumann algebras and set me on a course that would determine my career".

Mike's mentoring also extended to his long time involvement in preparing teams for programming contests. His teams gained international success, reaching the world finals of the ACM programming contest in Philadelphia in 1996.

Mike was also a sound and capable administrator. He was a sub-Dean of the Faculty of Science for many years in the 1980s, an assistant Dean in the 1990s, and took a particular responsibility for our Department's activities at the new Tamaki campus. He had an encyclopedic knowledge of the curriculum and University regulations, and was always the first person we turned to when revamping those. If the changes passed Mike's appraisal they were usually bulletproof. His administrative duties brought him into contact with many students suffering from bad course or career choices or advice, and Mike had a particular knack of being able to steer the students into new and more appropriate directions, recovering their careers in the process.

Mike was, though, much more than just a scholar. For instance, he was also a passionate tramper and an outstanding humorist, with a ready grin on his face, and a wicked laugh. Mike was also a devoted family man, survived by his wife Jennifer, a Senior Lecturer in the Computer Science Department, and his children Chris, Tava, and David. Mike will be sadly missed by his colleagues for his kindness, intelligence, integrity and humour.

It is perhaps fitting to finish with a quote from Jennifer and Mike's good friend Professor Hermann Maurer from Graz University, who on hearing of Mike's death wrote: "Mike was what I liked best about New Zealand".

*By Associate-Professor John Hosking and Dr Peter Fenwick, Department of Computer Science, University of Auckland.*

## RECENT RESEARCH GRADUATES

**Doctorate**

Arslanov, A; University of Auckland; 1998; ``Topics in Algorithmic Information Theory"; Prof. Cris Calude; Teaching Assistant in Department of Computer Science.

Balemi, A P; University of Auckland; 1998; ``Some Properties of the Liang-Zeger Method for the Analysis of Correlated Binary Data"; Prof. Alastair J. Scott and A-Prof. Alan J. Lee

Cao, Jiling; University of Auckland; 1999; ``Assymetric Topology and Topological Spaces Defined by Games"; Prof. Ivan L. Reilly and A-Prof. M. K. Vamanamurthy

Chen, David Jan Lung; University of Auckland; 1999; ``The Effective Order of Singly-Implicit Methods for Stiff Ordinary Differential Equations"; Prof. John C. Butcher; Lecturer at Ling-Tung Institute of Technology, Taiwan

Greenwood, S; University of Auckland; 1999; ``Nonmetrisable Manifolds"; Prof. David B. Gauld and Dr David W. McIntyre

Higgins, Joanna; Victoria University; 1999; ``Learning and Teaching Mathematics in the First Two Years of School"; Megan Clark and Lise Bird

Hong, Ye Yoon; University of Auckland; 1999; ``Promoting Versatile Understanding in Integration, Using a Computer"; Dr Michael O. J. Thomas

Li, Xiaosong; University of Auckland; 1999; ``A Petri Net-based Technique for Graphical User Interface Design"; Dr Rick Mugridge and A-Prof. John G. Hosking

Manda, S; University of Waikato; 1999; ``A nested random effects model analysis of child survival in Malawi"; Dr Bill Bolstad; Biometrician at the Cardiovascular Unit, Auckland Healthcare

McNaughton, A; University of Auckland; 1998; ``Long-term Scheduling of Harvesting with Adjacency and Trigger Constraints"; Prof. Graeme C. Wake; Senior Lecturer in the Department of Mathematics

Mohamad, A; University of Auckland; 1999; ``Metrization and Manifolds"; Prof. David B. Gauld and Dr David W. McIntyre

Murrell, P R; University of Auckland; 1998; ``Investigations in Graphical Statistics"; Dr Ross Ihaka

O'Malley, James; University of Canterbury; 1999; ``Some new considerations for the statistical analysis of an assay"; Prof. J. J. Deely

Pfannkuch, M J; University of Auckland; 1999; ``Characteristics of Statistical Thinking in Empirical Enquiry"; Prof. Chris Wild; Senior Lecturer in the Department of Mathematics

Semple, Charles; Victoria University; 1998; ``$k$-Regular Matroids"; Dr Geoff Whittle; Post-doctoral fellowship, Canterbury University

Singh, A D; University of Auckland; 1999; ``Parallel Diagonally Implicit Multistage Integration Methods for Stiff Ordinary Differential Equations"; Prof. John C. Butcher

Vandal, A J; University of Auckland; 1998; ``Order Theory and Nonparametric Analysis for Interval Censored Data"; Dr Rob Gentleman

Yashiro, Tsukasa; University of Auckland; 1999; ``Constructing Immersions From Three-dimensional Manifolds To Four-dimensional Space"; Prof. Gaven J. Martin.

## MATHEMATICAL MINIATURE 9

## Hardy's taxi, $x^2 + 3y^2 = p$ and Michael Lennon

Michael Lennon was a member of the academic staff of The University of Auckland, first in the Mathematics Department and then in the Computer Science Department, from 1970 until his untimely death in 1999. Although he was far from being a "publish or perish" scientist, he made his own distinctive contributions. He is, for example, recognised as the teacher of Vaughan Jones who most influenced the early career of that famous mathematician. As a colleague of Michael, I turned to him from time to time for advice on technical matters. There were many areas in which he was the sole authority in Auckland, and probably in New Zealand. An ambition I never achieved was to write something with Michael, but I at least had the privilege of seeing how his brilliant mind worked, as we tried out a few projects together.

The famous anecdote in which Hardy told Ramanaujan, that the number of a taxi he had used was not particularly interesting, was recalled by Mrs Shakuntala Devi, a visiting calculating prodigy, when she spoke in Auckland in 1978. Clever though she was, Mrs Devi was not a mathematician in the usual sense, and both Michael and I were surprised by a mistake she made in quoting Ramanujan's rejoinder. The number $1729$ was, she said, the *only* number that could be written as the sum of two cubes in two different ways. Of course the correct statement would have said that the taxi number is the *lowest* such number. Michael and I started to consider the question as to what the other solutions to the Diophantine equation $x^3 + y^3 = u^3 + v^3$ are like. Obviously we exclude as trivial solutions for which $x, y, u$ and $v$ have a common factor greater than $1$, but there is still a family of solutions that seemed to go on forever, as we found from computer searches. After poring through the pages of output we generated, Michael found some interesting patterns and was able to prove a formula for an infinite sub-family of solutions. Unfortunately, I cannot reproduce this formula after all these years, so I will do something else with the "Ramanujan Diophantine Equation" in this miniature, which I dedicate to the memory of Michael Lennon.

First a special result which will be used below, although just beneath the surface. _

**Theorem 1** *Let $p > 3$ be a prime then there exist integers $x$ and $y$ such that $x^2 + 3y^2 = p$ if and only if $p \equiv 1 \bmod 6$.*

**Proof.** The "only if" part follows from the fact that $-3$ is a quadratic residue only if the primes referred to in the statement of the theorem. To prove the "if" part, consider the lattice points in $S = \mathbb{Z}_p \times \mathbb{Z}_p$ satisfying $x^2 + 3y^2 \equiv 0 \bmod p$. For convenience, we represent $\mathbb{Z}_p$ as the set of integers reduced mod $p$, $\{0, 1, 2, \ldots, p-1\}$, although the word "closest" that we use below will refer to the closest distance between a given point and *any* representative of another point. Using the inner product $\langle x, y \rangle = x^2 + 3y^2$ and the associated norm, the area of $S$ is $\sqrt{3}p^2$. Let $P_1 = (x_1, y_1)$ denote the closest lattice point to $P_0 = (0, 0)$ and let $P_2 = (x_2, y_2) = (-3y_1, x_1)$. The vectors $P_0P_1$ and $P_0P_2$ are orthogonal and there is no lattice point on the interval $P_0P_2$, except $P_0$ and $P_2$, since such a point would be closer to $P_0$ than $P_1$ is. The rectangle with

corners $P_0$, $P_1$, $P_1 + P_2$ and $P_2$, has area $\sqrt{3}np$, where $x_1^2 + 3y_1^2 = np$. Exactly $p$ of these rectangles make up an area equal to that of $S$. Thus, $\sqrt{3}np^2 = \sqrt{3}p^2$, implying that $n = 1$.

A simple corollary is that a square-free positive integer is of the form $x^2 + 3y^2$ if and only if its prime factorisation contains only primes congruent to $1 \bmod 6$. The "if" part of the proof is based on the fact that $(x_1 + y_1\sqrt{-3})(x_2 + y_2\sqrt{-3}) = (x_1x_2 - 3y_1y_2) + (x_1y_2 + y_1x_2)\sqrt{-3}$.

Our main result is given in the following discussion.

Let $N = x^3 + y^3 = u^3 + v^3$, where the four integers have no common factor. If $N$ is even, define $a' = (x + y)/2, b' = (x - y)/2, c' = (u + v)/2, d' = (u - v)/2$; if $N$ is odd, define $a' = x + y$, $b' = x - y, c' = u + v, d' = u - v$. In either case $\gcd(x, y, u, v) = 1$ implies $\gcd(a', b', c', d') = 1$. Let $\mu = \gcd(a', b'), \nu = \gcd(c', d')$ and let $a = a'/\mu\nu^3, b = b'/\mu, c = c'/\nu\mu^3, d = d'/\nu$, where we note that, because $\gcd(\mu, \nu) = 1$, $a$ and $b$ must be integers. It is found that $a(\nu^6a^2 + 3b^2) = c(\mu^6c^2 + 3d^2)$. It now follows that integers $r, X, Y, Z$ exist such that

$$a = rY, \quad (1) \qquad c = rX, \quad (2)$$
$$\nu^6a^2 + 3b^2 = XZ, \qquad \mu^6c^2 + 3d^2 = YZ.$$

Because $\gcd(a, b) = \gcd(c, d) = 1$, it follows that $X, Y$ and $Z$ can be written in the form $X = |\xi|^2$, $Y = |\eta|^2, Z = |\zeta|^2$, where $\xi = \alpha + \beta\sqrt{-3}, \eta = \gamma + \delta\sqrt{-3}, \zeta = s + t\sqrt{-3}$ and

$$\nu^3a + b\sqrt{-3} = \xi\zeta, \quad (3) \qquad \mu^3c + d\sqrt{-3} = \eta\zeta. \quad (4)$$

We can now find conditions on $r$, $s$ and $t$ to ensure that (1), (2), (3) and (4) are consistent. These conditions are $\nu^3(\gamma^2 + 3\delta^2)r = \alpha s - 3\beta t$ and $\mu^3(\alpha^2 + 3\beta^2)r = \gamma s - 3\delta t$. Solve these and we have a representation of the solution which enables us to back-track from given values of $\alpha, \beta, \gamma, \delta, \mu$ and $\nu$ to find $a'$, $b'$, $c'$ and $d'$ and finally $x, y, u$ and $v$. For example, $\xi = 1 + 2\sqrt{-3}, \eta = 4 + \sqrt{-3}, \mu = \nu = 1$ gives the values $r = 1$, $\zeta = 1 - 3\sqrt{-3}$ and the famous solution of Ramanujan $9^3 + 10^3 = 1^3 + 12^3 = 1729$. Other examples are (i) $\xi = \sqrt{-3}, \eta = 1 + \sqrt{-3}, \mu = \nu = 1$ which gives $r = 3, \zeta = -3 - 4\sqrt{-3}$ and the solution $9^3 + 15^3 = 2^3 + 16^3 = 4104$ and (ii) $\xi = \sqrt{-3}, \eta = 1, \mu = 1, \nu = 2$ which gives $r = 3$, $\zeta = 9 - 8\sqrt{-3}$ and the solution $33^3 + 15^3 = 2^3 + 34^3 = 39312$. Finally, $\xi = \sqrt{-3}, \eta = -1$, $\mu = \nu = 1$, gives a solution which rearranges to $3^3 + 4^3 + 5^3 = 6^3$.

*John Butcher,* butcher@math.auckland.ac.nz