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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Contents

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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://IFS.massey.ac.nz/mathnews/NZMSnews.shtml
Editorial enquiries and items for submission to this journal should be submitted as text or LaTeX files to r.mclachlan@massey.ac.nz

EDITORIAL

WORRY, BUT DON'T PANIC

In an article titled "The global brain drain" in the NZ Education Review for 9 June 2004, Jacqueline Rowarth (postgraduate dean and director of research at Unitec) looks at science education in New Zealand, describing the huge demand for scientists overseas and how we must all (ministers, academics, and scientists) work to increase participation in science.

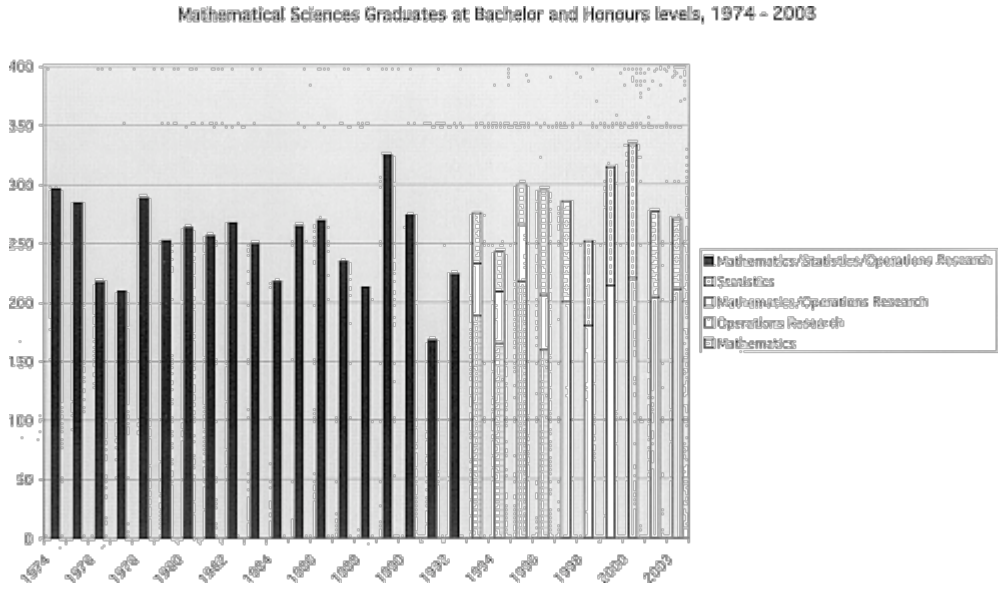
It is a familiar refrain, and our concerns are made even more immediate in the current climate in which we live and die by our year-to-year enrolments. Here's another version from 7 July: "Australia's mathematics capability is in steep decline... The numbers of honours graduates in maths and stats from 1997 to 2001 was three-quarters of that in the previous 5 years" (NZER, quoting Peter Hall in the July

Australasian Science). A common response to local worries is that the downturn in science is a worldwide phenomenon, a response which, even if true, makes the task of organizing a local response seem much harder. On the other hand, the opposite point of view, "Numbers of Mathematics Graduates Static" (which is in fact the content of this editorial) sounds like a entry for the most boring headline of all time.

Unfortunately the whole field seems to be plagued with anecdotal evidence and unreliable data. Even when good data has been collected, as for Australian honours graduates, it can be misused: apart from the 3 years 1992–1994, when numbers were unusually high, numbers have in fact been roughly static since the early 1970s, while maths PhDs are sharply up in the last 10 years.[1]

Here are the data I have managed to collect. While inconclusive, they do not indicate, to me at least, that we are in an abnormal crisis.

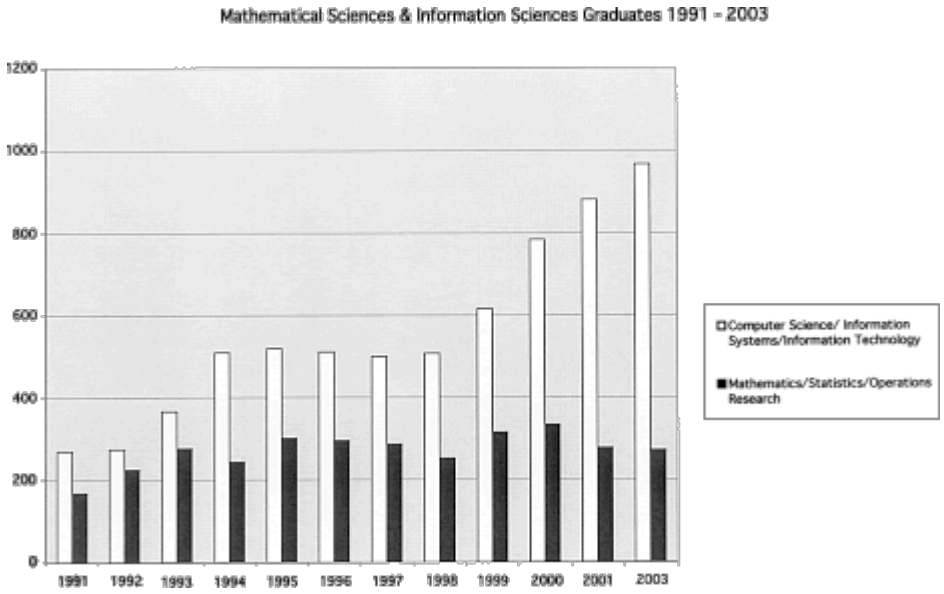
My immediate concern was whether there has been any collapse in the numbers of students doing mathematics degrees in New Zealand. In 1996 Jeff Hunter chaired a panel which produced the major study "Mathematics in New Zealand: Past, Present, and Future", commenting that "The disturbing feature is the lack of growth in student numbers, despite the increases in overall university enrolments". Wondering about more recent trends, I asked him to update the data and he produced the following graph.[2]



To me this graph displays a striking lack of trend, considering the long time series and the huge changes in New Zealand's education scene over the past 30 years. On the other hand, the average number of bachelor's and honour's graduates is 263 per year, or (recently) 66 per million of population.

(There is, however, a worrying drop in statistics graduates in 2001 and 2003. When does a fluctuation become a trend?)

It is equally striking that we haven't captured any of the growth that has taken place in population or in tertiary participation. Numbers of graduates in computer and information science have mushroomed, from 269 in 2001 to 968 in 2003.



Still, lately about 1.8% of all bachelors' and honours' degrees have been in mathematics, which is quite respectable by world standards. In the United States, numbers of maths graduates declined from a peak of 15,600 in 1987 to about 11,300 in 2000, a decline from 64 to 40 per million population, or from 1.5% to less than 1% of all bachelors' degrees. (Even more striking, NZ is now producing 242 computing sciences degrees per million population per year, while the USA produces only 117.)[3]

The UK is often considered to be a bastion of higher education, especially in traditional subjects like mathematics. The just-issued International Review of Mathematics in the UK (http://www.cms.ac.uk/irm) comments

> "Remarkably, UK mathematics is not suffering from a decline in undergraduate students. Compared to the world, in particular the US and continental Europe, undergraduate enrolment levels are high and have remained more or less constant. There is also a widespread feeling that studying mathematics is a good path to a non-academic career, e.g. in finance or industry."

—but don't provide any data. However, in 2000 the UK produced just 3274 maths bachelors. That is 1.67% of all bachelors' degrees and 56 per million of population. In those terms, we are not out of line.[4]

I have also heard comments that science as a whole is unpopular in New Zealand. Is that really true? In the NZVCC's 2003 report, there are 17379 bachelors' degrees awarded, of which 4000 (or 23%) were in science. (6.5% were international students, but these are not broken down by subject.) This is actually an improvement from the 20% recorded in 1996, but is still slightly behind the OECD average of 26%, and markedly behind some countries like the UK and Finland (nearer 40%). On the other hand, tertiary participation rates confound some of these figures. The NSF has compiled figures in its report Science and Engineering Indicators 2002 comparing the number of 24 year olds who have a first degree in science or engineering in different countries. In 1999, the figure for New Zealand is 5.4% which is well behind the UK and Finland (10%), most other European countries (around 7%), and even the USA (6%). So for science as a whole we do seem to be slightly behind—but nor are we in a state of collapse.

Strangely, even now I have collected and attempted to review this data, I still don't feel particularly reassured. I still believe that a mathematics degree would be useful to more people than are currently getting one, and I am still swayed both by press releases like those by Jacqueline Rowarth and Peter Hall, and by stories about how employers in the UK and Germany, say, will eagerly consider mathematics graduates for jobs in finance, technology, and computing. As usual, further research is needed.

Robert McLachlan
Massey University

[1] November 2003 AusMS *Gazette* or web site.

[2] The data have originated with the Ministry of Education prior to 1990 and with the NZVCC from 1991, from their "University Graduate Destinations" booklet. Unfortunately they did not produce a report in 2002 so there is one year of missing data. The data may be unreliable, and the merging of maths and OR confuses the picture. Even in the US, a recent article in the Notices of the AMS notes large discrepancies

between three studies of numbers of mathematics graduates.

[3] F. M. Goodchild, The pipeline: Still leaking, *American Scientist* **92**, pp. 112-114. These maths grads were taught by, in 1996, 16,700 tenure and tenure-track faculty, plus innumerable fixed-term instructors and T.A.'s.

[4] Again, I found it hard to get clear figures for the UK. Maths participation may be higher in the traditional universities: in 1994, prior to the UK polytechs being made into universities, 2.7% of all university students declared mathematics as their subject of study.

PRESIDENT'S COLUMN

A few weeks' ago I was standing in Blackwell's bookshop in Oxford. I had bought a volume on partial differential equations, but could anticipate my attention wavering during the later stages of the flight back home. The 'three for the price of two' section is a great institution and contained several popular science titles, including Bill Bryson's 'A short history of nearly everything' (Transworld 2003). I was also intrigued by a book written for teenagers: 'The curious incident of the dog in the night-time' by Mark Haddon (David Fickling Books 2003). Bill Bryson believes that equations reduce the sales potential of books, I'm sure there are frequent misquotations about that around. He says in a footnote that "it remains an amazement that anyone seeing 1.4×10^9 km^3 would know at once that it signifies 1.4 billion cubic kilometers." I don't see the problem in envisaging a cube with each side 1000 km and billions always confuse me, maybe that's why I don't write bestsellers.

Christopher, the narrator of 'the dog in the night-time' thinks differently, so differently that he attends a special school. The chapter numbers are all primes, Christopher likes primes and claims to know them all up to 7,507. It also gives the impression of getting through a book faster when Chapter 13 is followed by Chapter 17. When Christopher wants to relax he solves quadratic equations in his head or recites the cubes of the cardinal numbers in order. His ambition is to take A level mathematics, and then go to university and become a scientist. Noticing that the number of frogs in the school pond appears to fluctuate randomly, Christopher writes down a discrete logistic equation and describes the dependence of long term behaviour on the distinguished parameter. His take on chaotic population dynamics is that "sometimes, a whole population of frogs, or worms, or people, can die for no reason whatsoever, just because that is the way the numbers work." The book contains numerous diagrams, graphs and equations, but the only theorem is consigned to an appendix with its proof. Despite all this, the narration style is easy and the story is accessible and pitched at a suitable level for a teenage audience. It was awarded the Booktrust Teenage Fiction Award in 2003.

It is always a pleasure to congratulate members of the society for significant achievements, but it carries with it the danger that I get something wrong or leave someone out. To set the record straight, Charles Pearce FNZMS is now the "Elder Professor of Applied Mathematics" at the University of Adelaide. My apologies to Charles for my inaccuracy in the last issue. I also overlooked that the 2003 Hatherton Award for the best scientific paper by a PhD student at any New Zealand university in physical sciences, earth sciences, and mathematical and information sciences was awarded to Dr Guohua Wu, now a post-doctoral fellow at Victoria University of Wellington. The award is for his contribution as senior author to the paper "Isolation and lattice embeddings", published in the Journal of Symbolic logic.

Finally, it gives me pleasure to announce that the New Zealand Mathematical Society's award for Mathematical Research in 2004 goes to Associate Professor Eamonn O'Brien of The University of Auckland. Eamonn was cited for his "outstanding achievements in using computation, backed up by deep algebraic theory, to solve long-standing and difficult problems in group theory."

Mick Roberts
Massey University, Auckland

LOCAL NEWS

AGRESEARCH

The Mathematical Biology team have a new PhD student who started in May. Shawn Harrison joins us from the University of Utah, Salt Lake City, where he recently completed his MSc in Mathematical Biology under the guidance of James Keener. Shawn will be working on a problem initiated with the Liggins Institute and The University of Auckland and thus has a team of advisors: Peter Lobie (Liggins Inst), Tanya Soboleva (AgResearch) and James Sneyd (The University of Auckland). This is to do with modelling signal transduction pathways, in particular examining the dynamics behind pharmacological and hormonal factors impinging on the ability of Growth Hormone (GH) to stimulate STAT5-dependent growth. Outside the office, Shawn enjoys cycling, hiking and communing with nature.

Stathie Triadis has left the Mathematical Biology group to return to fulltime studies at Waikato

University. He will be completing a postgraduate Diploma in Computer Science and we wish him well for the future.

Ken Louie

THE UNIVERSITY OF AUCKLAND

Department of Computer Science

Bakh Khoussainov has been promoted to a Personal Chair.

Some senior members of the Department are retiring: Peter Fenwick, Peter Gibbons and Jennifer Lennon.

Mike Barley was Chairman of the workshop on Safety and Security in Multi-Agent Systems (SASEMAS 04), which was part of the conference on Autonomous Agents and Multi-Agent Systems (AAMAS), held at Columbia University in July. In August he was Chairman of the Pacific Rim International Workshop on Multi-Agent Systems (PRIMA 04), which was part of the Pacific Rim International Conference on Aretificial Intelligence (PRICAI), held at The University of Auckland in August 2004.

Hans Guesgen was the Programme Chair for PRCAI, at The University of Auckland in August 2004.

The Department now has more Master students than the School of Biological Sciences, making it the largest Master students group in the Faculty of Science.

Seminars

Michel Deza (ENS/CNRS, Paris & ISM, Tokyo), "Zig-zag structure of simple polyhedra."

Professor Cris Calude, "From uncertainty to incompleteness via randomness."

Professor Bob Doran, "Project Whirlwind movie (1953)—NZ premiere."

Professor Eric Goles (CONICYT, Chile), "Complexity of some 2-dimensional cellular automata."

Santokh Singh, "Aspect-oriented component engineering for web services."

Jasvir Nagra & Professor Clark Thomborson, "New techniques for software protection."

Professor Michael Twidale (University of Illinois at Urbana-Champaign), "Windows versus Whiteboards: talking about interfaces."

Dr Craig Nevill-Manning (Director of New York Engineering for Google), "Finding needles in a 20 TB haystack, 200 million times per day."

Michael Goebel, "Ensemble learning by data re-sampling."

Dr Susan Dray (Dray & Associates, Inc.), "Practicing theories: lessons from the Tablet PC field trials."

Mr Simon Phipps (Sun Microsystems), "Waves of change, rivers of freedom."

Dr Graham Farr (Monash University), "Cost-effectiveness of algorithms."

Garry J. Tee

Department of Mathematics

In July 2004, Gaven Martin was elected to the council of the RSNZ.

Bruce Calvert visited the University of Nevada at Reno, where he worked with Chaitan Gupta on boundary-value problems for o.d.e.s, getting unqiueness as well as existence results. He then visited the University of Bucharest where he worked with Cornelia Marinov, on the dynamical system given by Lazzaro's Winner-take-all circuit, which uses metal-oxide semiconductors.

Gaven Martin was a Research Fellow at the Institute Mittag-Leffler in November and December 2003. In 2004 he attended the Summer School at Nelson in January, and he was a visiting Professor at Syracuse University in March, with a short visit to Cornell University. He was a visiting Professor at University of Michigan in May, and a Visiting Professor at UCLA in July.

Mike Meylan visited Professor Sakai at Iwate University. They are developing a computer model for the wave scattering by multiple thin plates, which they are testing against the experiments which Sakai is performing in his wave flume (using polystyrene in place of ice).

Geoff Nicholls took up a 3-month visiting Associate Professorship with the Department of Mathematical Sciences at the University of Aalborg in Denmark. He worked on a solution to the initialization bias problem present in Monte-Carlo algorithms. Then he gave a series of classes at a workshop on Inverse Problems in Finland, as well as a couple of invited lectures in the UK, one at an LMS Durham symposium on Mathematical Genetics, and another at a meeting in Cambridge on Glottochronology (the study of dating changes in language).

Ivan Reilly spent a month at the University of Burgundy - Dijon, sponsored by the French Embassy in Wellington.

Josef Siran visited Professor Devid Surowski, currently located at Shanghai American School, in April 2004. They worked on classification of nonorientable regular maps with automorphism groups PSL(2,p), and were able to make substantial progress. He was an invited speaker on "Vertex-transitive maps" at the Czech and Slovak International Conference in Graph Theory, which took place in Vysne Ruzbachy, Slovakia in May. He was an organizer of the Workshop in Topological Design Theory, which took place at the Slovak University of Technology, Bratislava, Slovakia in June.

As part of the NZIMA thematic programme on numerical differential equations, a workshop on Computational Partial and Ordinary Differential Equations was held at The University of Auckland, 21–23 April 2004 and organized by John Butcher and Helmut Podhaisky. The invited speakers were Michael Baines (University of Reading), Igor Boglaev, (Massey University) Joseph Flaherty (Rensselaer Polytechnic Institute, USA) and Zahari Zlatev (National Environmental Research Institute, Denmark), each of whom presented a short series of lectures. In addition there were 10 additional speakers and a total of 32 participants.

On 12–16 July 2004 The University of Auckland hosted the Workshop on Combinatorics and its Applications, organised by Paul Bonnington and sponsored by NZIMA. This was an introductory workshop on several key topics in the 6-month NZIMA thematic programme in Combinatorics and its Applications. Each of the six invited speakers gave a series of 3–5 lectures on a particular topic:

Rod Downey (VUW) on Algorithmic Randomness,

James Oxley (Louisiana State University) on Matroid Theory,

Bruce Richter (University of Waterloo) on Graph Minors and Well Quasi-Ordering,

Gordon Royle (UWA) on Algebraic Combinatorics,

David Ryan on Combinatorial Optimization,

Jozef Siran on Symmetries in Graph Embeddings.

One of the main goals was to attract those researchers and students wishing to become more familiar with these important emerging areas in Combinatorics and its Applications. The workshop included informal discussions and plenty of time for collaborative research. Thanks to the very generous support of NZIMA there was no registration fee and free backpacker-style accommodation. With attendance about 25, the workshop was highly succesful.

Brian van Dam has completed his PhD; with his thesis on "Construction of topological spaces via resolutions."

Recent visitors include: Carlos Perez (Universidad de Las Palmas de Gran Canari), Dr Larry Peterson (University of North Dakota), Professor Bruce Richter (University of Waterloo), Adam Szereszewski (Warsaw University) and Professor Xinyuan Wu (Nanjing University).

Seminars

Simon Marshall, "Rankings of multisets and discrete cones."

Nodira Khoussainova, "Determinization of Buchi-automata: Safra's construction."

Professor Marston Conder, "Compact hyperbolic 4-manifolds of small volume."

Professor Paul Fong, "Dade's conjecture for finite reductive groups."

Richard Lundgren, "Variations on Interval Graphs."

Professor Douglas Lind, "A gentle introduction to algebraic dynamics."

Professor Mike F. Newman (ANU), "Classifying *p*-groups by coclass."

Kirsi Peltonen, "Finsler Geometry: Convenient framework for applications containing infinitesimal Banach space structure."

Professor Richard S. Laugesen, "How to say 'subsolution' with the maximum principle," and "Wavelet type spanning sets for L^p and Sobolev space."

Professor Hershel Farkas (Hebrew University of Jerusalem), "Theta functions: conformal mapping through combinatorial number theory."

Vadim Kuznetsov, "Jack polynomials: integral equation, representation and factorization."

Tran Thanh Tam, "Pricing electricity derivative using price duration curve."

Professor David Gauld, "An introduction to convergence spaces."

Shan-I Lee, "Calculating the Alexander polynomial from the Dowker sequence."

Dr Ji-ling Cao, "Barely Baire spaces and a problem of McCoy."

Professor Robert Raphael, "A functor on Tychonof spaces."

Professor Valentin Gutev, "Selections and their applications."

Associate Professor Chris Triggs (Statistics), "Probability and statistics in forensic science."

Associate Professor Jozef Siran, "Regular maps on nonorientable surfaces."

Professor Boris Pavlov, "Analytic perturbation theory on continuous spectrum revisited: Intermediate operator (observation on the Friedrich's model)."

Brian van Dam, "A thesis resolved: resolutions, their properties and use towards manifolds and Dowker spaces."

Professor Peter Nyikos, "A strong separation property," "Cardinal restrictions on some homogeneous compacta," "Elbow room in Hilbert space and other Banach spaces," and "Spaces of continuous functions on subsets of the real line."

Krasimira Tsaneva-Atanasova (2 seminars), "Synchronisation of calcium oscillations in a pancreatic acinus."

Greg Ewing, "Inferring migration rates from DNA sequence data using reversible-jump MCMC."

Dr Bart Oldeman, "The saddle-node Hopf bifurcation with global reinjection."

Dr Ruhama Even, "The preparation of providers of professional development for teachers of mathematics."

Professor Grant Woods, "Using group 'research projects' in the teaching of introductory calculus."

Professor David A. Smith, "Reusable tools for creating interactive online learning environments."

Dr Melissa Rodd, "Ways ahead: successful mathematics students at two universities."

Dr Wiremu Solomon, "Teaching Maths 101 via Multi-Videoconferencing to Kura Kaupapa Maths Teachers."

Jessica Utts (University of California—Davis), "Investigating psychic phenomena with statistics," and "Principles and practices for teaching statistics."

Garry J. Tee

Department of Statistics

Keith Worsley has been awarded a Gold Medal by the Statistical Society of Canada, for his outstanding contributions to statistics.

The Department is in the process of appointing two professors. Dr Sam Ferreira, from the Department of Conservation, has joined us as a postdoctoral fellow, working on ecological modelling of metapopulations.

Recent visitors include: Mayasuki Jimichi (Kwansei Gakuin University, Japan, 2003–9–9 to 2004–10–1, Jeong Hwan Ko (Andong National University, South Korea) 2004–1–23 to 2005–1–10, Claude Belisle (Laval University, Canada) 2004–7–1 to 2004–12–31, Jessica Utts (university of California—Davis), 2004–7–1 to 2004–7–8.

Seminars

Dr Ray Hoare (Hoare Software), "Presentation of Statistica software package."

Dr Anna Bogolmonaia, "A new solution to the random assignment problem."

Professor Colin Aitken, "Evaluation of forensic trace evidence in the form of multivariate data."

Michael Bulmer, "Virtual worlds for teaching mathematics and statistics."

Mark Maunder, "Ecological modelling: information and uncertainty."

Dr Sam Ferreira (joint seminar with Department of Mathematics), "Metapopulations: scaling African conservation challenges."

Garry J. Tee

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

In July, Rick Beatson gave an invited lecture at the conference on Mathematical Methods for Curves and Surfaces in Tromso, Norway. The conference was great and the scenery fantastic.

Mike Steel has been around the world a few times recently as part of his NZIMA Maclauren fellowship. In recent months he has given talks and worked with colleagues at UC Berkeley, UC Davis, the Max Plank Institute for Mathematics in the Sciences in Germany, and has attended workshops and conferences in Sweden, Colorado, Chicago, Germany, California and China. A number of visitors will visit University of Canterbury as part of this fellowship, starting with Dr Laszlo Szekely who is visiting during July and August.

Seminars

Beverley Horn, "Optimisation of the decompression of divers."

Professor Richard Laugesen (University of Illinois), "Sampling in Lebesgue and Sobolev spaces."

Professor Estate Khmaladze (Victoria University of Wellington), "Theory of large number of rare events and estimation of abundancies."

Bernie Tsang, "Modelling of the mechanisms governing crimp in wool."

Dr Gabi Popa, "A quintessence of a PhD Thesis."

Professor V.S. Sunder (The Institute of Mathematical Sciences, Chennai), "Unitary invariants of tensors."

Suruj Seunarine, "The decay of an unstable Universe; should we be worried?"

Philip Daniel, "Some supertree algorithms."

Dr Siva Ganesh (Massey University), "Data mining in practice."

Leng Leng Lim (Massey University), "Modelling of volcanic ashfall."

Melissa Ziegler (University of Pittsburg), "Variable selection when confronted with missing data."

Dr Barbara Holland (Massey University), "An overview of phylogenetic methods."

Gabriela Czanner (University of Pittsburg), "Applications of statistics in neuroscience."

Professor Satish Iyengar, "Data with a bias."

Ulises Carcamo, "Mathematics applied to finance: regularities in the VIX and the distribution of option's payoff."

Dr Michael Plank, "Heart disease and calcium signalling in endothelial cells."

Professor Peter Robinson (London School of Economics), "Efficiency improvement in inference on stationary and nonstationary fractional time series."

Willy Hereman (Colorado School of Mines Golden), "Continuous and discrete homotopy operators with applications in integrability testing of nonlinear PDEs and lattices."

Charles Semple

INDUSTRIAL RESEARCH LIMITED

Applied Mathematics Team

Applied Maths had a very successful FRST bidding round this year. Shaun Hendy, Steve White and Roger Young were PIs on a successful NERF proposal "Multiscale Modelling" which was funded for 6 years. This programme aims to develop multiscale modelling tools for describing the fabrication and properties of nanostructures. Most of these tools will involve coupling atomic-scale processes to mesoscale or macroscale material models. Graham Weir, John Burnell and Shaun Hendy were PIs on another successful NERF proposal "Nanoactive Microfluidics" which was funded for four years. This project will involve modelling microfluidic devices and new nanostructured surfaces that can control flows with switchable hydrophobicity. Applied Maths staff are also involved in a number of new other projects including "Augmented Humans" (Kit Whithers, Robin Willink), "Chiranz" (Steve White) and "Dental and Medical Imaging" (Roger Young). We will all sleep a little more soundly for the next few years.

The new programmes have brought some new staff members. Dr Tim Cooper (modelling surfaces with switchable hydrophobicity) and Dr Aruna Awasthi (multiscale modelling of nanostructures) have taken up post-doctoral fellowships in the Applied Maths Team. Also Peter Zoontjens will be doing his PhD with Shaun Hendy on developing a hybrid molcular dynamics/kinetic monte carlo algorithm for modelling sintering processes in metals.

Warwick Kissling helped organise the annual conference of the Royal Astronomical Society of New Zealand this year. It was held in early July at the NZ International Campus in Silverstream, Upper Hutt and featured a number of interesting speakers, including Warwick ("Computer controlled polishing of mirrors") and Prof Elaine Sadler from Sydney ("The Life History of Galaxies and Black Holes").

Shaun Hendy visited the Mathematics Department at the University of Tennessee in Knoxville for a week in June to work with Dr Tim Schulze on the multiscale modelling of nanowires. Shaun also stopped by Cambridge and Imperial College in the UK, squeezing in a morning at the Natural History Museum in London to watch the Transit of Venus. Shaun is continuing with his fractional appointment in the School of Chemical and Physical Sciences at Victoria, and has now developed a new honours course in Computational Physics and is helping put together a new first-year course in Nanotechnology.

Finally John Burnell has been acting as an expert witness in a High Court case, providing evidence on the Wairakei geothermal field.

Shaun Hendy

MASSEY UNIVERSITY

Institute of Fundamental Sciences (Palmerston North)

Mathematics

It is congratulations time and in chronological order our congratulations to:

- Bruce, Charles and Igor who were all presented in March with the 2003 Distinguished Teaching Award for their outstanding efforts in 300 level.
- Padma Senarath who successfully defended her PhD thesis: "Differential geometry of projectively related Finsler Spaces."
- Seung Hee Joo who successfully defended her PhD thesis: "Contact systems and contact integrators."
- Tammy Smith for securing a Massey University award: "Fund for Innovation and Excellence in Teaching" for the project "Developing MathsFirst: A web-based system to enhance first year mathematics teaching and learning." Other participants in this project are Kee Teo, Bob Richardson and Judy Edwards.
- Robert McLachlan on the award of the New Zealand Institute of Mathematics and its Applications (NZIMA) Maclaurin Fellowship. This has a value of $159,000 and will allow Robert to undertake research full time for the 2005 calendar year. He expects to spend three months in Melbourne but will otherwise be based in Palmerston North.
- Robert and Fiona on the birth of their daughter (Willa, 3.8 kg). Robert advises that this name was the name discussed prior to the birth! A little sister for Helena. Everyone is well.

Igor Boglaev, Brett Ryland and Matthew Hardy attended the "Workshop on computational partial and ordinary differential equations" held from 21–23 April 2004 at The University of Auckland. Igor spoke about "Physically motivated domain decomposition for singularly perturbed equations," Brett about "Multisymplectic methods" and Matthew about "Boundary layers in high speed gas flows."

Igor also set off to Europe for a few weeks. Firstly he attended The 6th International Meeting on High Performance Computing for Computational Science (VECPAR 2004) held at the Universidad Politecnica de Valencia, Valencia in Spain held from 26–30 June 2004, and gave a paper: "Parallel Monotone Algorithm for Nonlinear Parabolic Reaction-Diffusion Problem." Then he crossed The Pyrenees (but not by bike as the Tour de France had not started yet) to Toulouse (France). Here Igor attended An International Conference on Boundary and Interior Layers (BAIL 2004), ONERA, 5–10 July 2004, where he talked about "Monotone Multidomain Decomposition Algorithm for Nonlinear Singular Perturbation Problem."

We said farewell to Jonathan Marshall who left for the United Kingdom late May. We wish him all the best on his travel and future employment. We will certainly miss his input into the mathematics discipline!

Robert McKibbin was supposed to have delivered his inaugural lecture on the 15th of July here on the Turitea Campus (PN) but the heavens descended upon earth and deposited a thick layer of dense fog upon Auckland Airport and surroundings. Ergo, the lecture vanished into thin (thick) air and will hopefully be delivered at some other time.

And of course on this day Bruce van-Brunt had booked a flight to Auckland. He had to catch an early flight to Sydney next morning. After some anxious hours of wondering how to get to Auckland, the fog lifted and he could breathe again when he heard that his flight to Auckland had been unaffected. From Sydney, Bruce flew to Canada where he attended the International Conference on Differential Equations and Applications in Mathematical Biology, held at Malaspina University College, Nanaimo, British Columbia, Canada, July 18–23, 2004. Bruce gave a talk about "Holomorphic Solutions to Linear Functional Differential Equations." The conference must have been a 'stunning' success as apparently nobody had felt the earthquake on Vancouver Island during that week.

We welcome Matt Perlmutter back in his new position as Lecturer. Matt held a Postdoctoral Fellowship with Robert McLachlan a few years ago.

Brett Ryland, Robert McLachlan and Matt Perlmutter intend to parcipitate in the Thematic Programme on Dynamical Systems and Numerical Analyses, held in Raglan, 30 August–3 September, hosted by The New Zealand Institute of Mathematics & its Applications.

Allan Wilson Centre:
Professor Tom LoFaro, of the Department of Mathematics and Computer Science at Gustavus Adolphus College, Saint Peter, Minnesota, is visiting as a sabbatical visitor for the remainder of the year. Tom's research interests include non-linear dynamical systems and their applications to mathematical biology. In particular he is investigating the evolutionary dynamics of the spread of a rare allele when the population's dynamics are periodic or non-periodic. He is also undertaking some teaching within the

Institute while Robert McLachlan is on parental leave. Tom is accompanied by his wife and young family.

HELIX, our high performance computer is currently approaching saturation, as we share access with other users with serious computational research. Massey has just approved the purchase of an additional 40 processors (all 64-bit chips) bringing the system up to 46 64-bit processors combined with the original 132 32-bit processors. The cluster is housed at our Albany campus, and maintained by the computer scientists of IIMS. It is available for external research users, contact Mike Hendy (m.hendy@massey.ac.nz) for details.

Various IFS members of the Allan Wilson Centre have just returned from their "conference season" travels. Barbara Holland presented talks at the "Evolution" meeting at Fort Collins, Colorado (1300 participants!) and the Phylogenetic Combinatorics and Applications (PCA) workshop in Uppsala. Michael Woodhams also attended PCA, and then presented a paper on his "QAML algorithm approximating maximum likelihood for phylogenetics," to the European Conference on Computational Biology in Glasgow (fewer than 20% of papers were selected for presentation). Bhalchandra Thatte presented his "multiple sequence alignment program MANTRA" to the 15th Australasian Workshop on Combinatorial Algorithms (in celebration of Professor Jennifer Seberry's 60th Birthday) at Ballina Beach, NSW. Tim White, who is just commencing his PhD studies, also crossed the Tasman, to participate in an AMSI winter school on Mathematics and Computational Biology in Brisbane.

Seminars

Dr Stephen Marsland (IIST, Massey University at Palmerston North), "Diffeomorphic image warping and the non-rigid registration of medical images."

Dr Barbara Holland, "From gene trees to species trees."

Professor Willy Hereman (Department of Mathematical and Computer Sciences, Colorado School of Mines, USA), "Continuous and discrete homotopy operators with applications in integrabilty testing of nonlinear PDE's and lattices."

Associate Professor Mick Roberts (IIMS, Massey University at Albany), "Modelling strategies for minimizing the impact of an imported exotic infection."

Professor Thomas LoFaro (Gustavius Adolphus College, St. Peter, Minnesota), "Adaptation vs migration in demographically unstable populations."

Marijcke Vlieg-Hulstman

Institute of Information and Mathematical Sciences (Albany)

Congratulations to Mick Roberts, who has been awarded a Christensen Fellowship at St Catherine's College in Oxford for the Michaelmas term, 2005. He will spend it working with the epidemiology group which is based in the zoology department, in particular with Dr Angela McLean. They will address some dynamical systems problems arising from the evolution of infectious diseases.

We also congratulate Galkadowite Senaratne (Sena), who has been awarded a TIF (Technology in Industry Fellowship) and who has also been appointed as a Graduate Assistant in Computer Engineering while he studies for his PhD with supervisors Graeme Wake, Rick Keam (Keam Holden Associates Ltd.), and Winston Sweatman.

Shaun Cooper was awarded one of the inaugural IIMS teaching awards to recognise consistent high-quality teaching. He was presented with his award on 23 March by the Massey University Albany Deputy Vice Chancellor, Professor Ian Watson.

Winston Sweatman has been elected an individual member of the International Astronomical Union. This is the worldwide professional body for the Astronomical Sciences. He is specifically a member of the IAU Commission 7: Celestial Mechanics and Dynamical Astronomy.

Robert McKibbin presented the initial stage of a Mathematics-in-Industry initiative in Thailand, arising from a request to the Centre for Mathematics in Industry within IIMS. He presented lectures on mathematical modelling and industrial mathematics over two days at Chulalongkorn University, Bangkok, and also facilitated two MISG-style workshops over two days at Chiangmai University in Northern Thailand. Graeme Wake is to follow up with the second stage of the initiative in October.

Robert was also an invited speaker at the Thailand National Mathematics Conference in Chiangmai where he delivered a talk on "The distribution of particles by the atmosphere". From there he went to Japan to spend one week in research collaboration with Shigeo Kimura, Professor of Mechanical

Engineering at Kanazawa University.

In a warmer vein, Robert McKibbin spent a too-short two days in Samoa, as part of a panel interviewing candidates for promotion to professorial positions at the National University of Samoa.

Mick Roberts attended the combined 3rd Conference on Deterministic and Stochastic Models for Biological Interactions (DeStoBio) and 7th Conference on Mathematical Population Dynamics (MPD) at Trento in Italy, presenting one paper and as co-author of another. He then spent a week with the Oxford epidemiology group laying the foundations for a joint research programme and presenting a seminar.

Graeme Wake visited the University of Sydney in late June-early July . He and Mick Roberts are members of the MBN (Mathematical Biology Network), an Australian version of our COREs. In between meetings with potential Australian industrial presenters at MISG2005 (to be held in Auckland), he gave an Applied Mathematics seminar entitled "Modelling of Cancer Treatment".

Graeme Wake also departs late July for his next period as Visiting Professor in KAIST, Daejeon to teach a block postgraduate course (3 weeks) in Applied Mathematics, and to co-Direct the Korean Industrial Mathematics Initiative 2004 in late August. These meetings are a pre-cursor to MISG-type activity. He is an invited speaker at the Korean Applied Mathematics Forum in Gyeongju in mid-August and will be a participant (in Korea only) with the North-Asian NZ Science Delegation led by Peter Hodgson, Minister of RST, also in mid-August. Mark McGuiness (VUW) is also part of this Visiting Team in KAIST. En-route to Korea Graeme will speak at the National University of Singapore.

The 3rd of June saw the first Get-Together of Data Miners on the Albany Campus. Four university and four business speakers presented an exciting range of talks for a packed QA1 lecture theatre. The Get-Together was followed by a workshop for Vero Insurance and Fisher & Paykel on 30th June and preceded by data mining workshops for Hort Research and the IRD in March and April. Future plans include another workshop in Wellington later in the year and a seminar entitled 'Data Mining @ Monash: a collection of case studies and projects' to be presented by Kate Smith on 18th August. Kate is an Associate Professor, Deputy Head and Director of Research in the School of Business Systems at Monash University, Australia. In the meantime there are many requests for students trained in data mining. In desperation three Auckland businesses are advertising Work Placement Programmes for students. 'Our customers are screaming out for resources' says Melissa Cassar, Academic Program Manager SAS Australia & New Zealand.

Further on the horizon, for the start of next year we have the Mathematics-in-Industry Study Group MISG2005: January 24–28, 2005 directed by Graeme Wake (see http://misg2005.massey.ac.nz), and the International Workshop in Matrices and Statistics IWMS-2005: March 29- April 1, 2005 of which Jeff Hunter is Chair of the Local Organising Committee (see http://iwms2005.massey.ac.nz}.

We said farewell to Cynthia Wang who has taken up a postdoctoral research position at the University of Queensland working with Lutz Gross, who was an IIMS Mathematics staff member two years ago before leaving for Australia. We welcome our new arrivals Dr Beatrix Jones and Dr Danny Walsh, Lecturers in Statistics and Dr Mini Ghosh, postdoctoral fellow in Mathematics. Freda Anderson, recently from Unitech and the University of Auckland, has joined the IIMS team as Administrator.

Beatrix comes to us following a postdoctoral position at Duke University. Her PhD is from the University of Washington in Seattle, and her interests lie in applications of statistics to problems in genetics and ecology, especially those requiring stochastic computation for the evaluation of posterior probabilities/ likelihoods.

Daniel Walsh received a PhD in Statistics from the University of Washington in 2000. Subsequently, he was a postdoctoral researcher and a visiting lecturer at Penn State University for two years. He spent the last two years in North Carolina at SAMSI (Statistical and Applied Mathematical Sciences Institute) and NISS (National Institute of Statistical Sciences) as a postdoctoral fellow. His research interests are pattern recognition, spatial statistics and computer model evaluation.

Mini completed her PhD in January 2002 at the Department of Mathematics, IIT Kanpur (India). From March 2002 to March 2004, prior to coming to Massey, she worked as a postdoctoral fellow at the University of Trento, Italy. She is collaborating with Mick Roberts in the area of Epidemiological/Ecological Modelling.

Members of the Institute, recently met together in one of our regular pot luck dinner evenings. Those who were there had a great time, with a splendid selection of food dishes to sample.

Visitors

Geoff Aldis (ADFA, University of New South Wales) visited Mick Roberts in July.

Michael Hirschhorn (University of New South Wales, Australia) visited Shaun Cooper in July.

John Butcher (The University of Auckland) visited the Mathematics group in July.

Amos Gera from Israel is at IIMS for Semester Two.

Seminars

James Wallace (University of Bradford, England), "Statistical Modelling and Bootstrap."

David Munroe, "Proposals for increasing learning ability and reducing prior knowledge for Genetic Programming."

Geoff Jones (IIST, Massey University at Palmerston North), "Small-Area Estimation of Poverty and Malnutrition in Bangladesh."

Leng Leng Lim,"Modelling of Volcanic Ash Fall."

Edmund J Crampin (Bioengineering Institute, The University of Auckland), "Modelling biological pattern formation on growing domains."

Robert McKibbin, "Models, Chicks and Birds: Too Much Excitement for Mathematicians?"

Rua Murray (University of Waikato), "Variational Methods for Invariant Measure Approximation: Duality and Numerical Studies."

Carlo R. Laing, "Mode locking in a periodically forced 'ghostbursting' neuron."

Chris Bose (Department of Mathematics and Statistics, University of Victoria, Canada), "Variational Methods for Invariant Measure Approximation—Convergence Issues."

Heath James, "On Graphs: Perturbations and Small Worlds."

Jo Mann, "To Vaccinate or Not to Vaccinate?: That is the Question."

Mick Roberts, "Measles: A Mathematician on the Spot."

Paul Cowpertwait, "Point process modelling: A pointless exercise?"

Mini Ghosh, "Seasonal population dynamics of ticks, and its influence on infection transmission: a semi-discrete approach."

Satish Iyengar (Department of Mathematics and Statistics, University of Canterbury), "Diffusion Models for Neural Activity."

Marie Fitch, "NCEA—An overview."

Stephen Marsland (IIST, Massey University at Palmerston North), "Diffeomorphic Image Warping and the Non-Rigid Registration of Medical Images."

Winston Sweatman

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

John Clark attended the 4th China-Japan-Korea International Symposium on Ring Theory in Nanjing, China from 22–29 June. He gave a plenary talk at the Symposium. Austina Clark accompanied John on the trip and her Mandarin (her first language) was in great demand.

Derek Holton attended the 10th International Congress on Mathematical Education (ICME) in Copenhagen, Denmark from 4–11 July. As the conference covers all aspects of mathematical education from primary to tertiary, it necessarily attracts a large audience. The organisers of this year's ICME were disappointed that only 2,300 people attended.

A large number of activities were crammed into the 5.5 active days of the conference. There were eight plenary talks/panels; around 90 regular lectures; 29 topic study groups; 5 affiliated study group meetings;

12 small group activities; several national presentations; and numerous posters. My own interests centred around the topic study group on maths education at tertiary level. There we discussed such issues as the gap between secondary school and university; technology; teacher education; and methods of teaching. Apart from the material on the web site below, there is also to be a special issue of the International Journal of Mathematics Education in Science and Technology with extended papers from the conference. This should appear early in 2005.

But, as with most conferences, the most important parts of ICME-10 were lunchtime and the happy hour when there was a chance to speak with people on things of mutual interest. In addition the conference tour that I was on provided the opportunity to see the remnants of beautifully shaped Viking ships at Roskilde and to row and sail on their replicas. The crew of the boat that I was in was very reluctant to leave the boat. If you happen to be in the area, I thoroughly recommend a visit to the Viking museum.

For more details and outlines of various ICME presentations see www.icme-10.dk.

ICMEs take place every four years. The next one is to be held in Mexico in 2008.

International Science Festival. As part of the "Pathways to the Future" event on 8 and 9 July, the Department mounted a stand featuring lots of posters and Moebius strips, John Shanks' Mandelbrot animation and math software, and some videos on fractals and chaos. Being mainly visual, the display went down very well with kids and their parents who tried their hand. Many of the staff in the Department took turns at answering questions. It was hard to compete with whales and robots, but we held our own. The whole event, while hard work for the organisers, was a great success.

Gareth Hegarty and Tim Williams (PhD student) travelled to the ISOPE conference in Toulon, France, in May to present papers on wave scattering by ice floes and ice fields (respectively). Gareth left his Research Fellow position, working on Vernon Squire's Marsden project, on 30 June.

Bill Link (Patuxent Wildlife Research Center) visited to run a workshop 'Bayesian Methods in Statistical Ecology' with Richard Barker. He spent two weeks in the Department working with Richard on collaborative research.

Simon Nicol and Charles Todd visited from the Arthur Rylah Research Institute in Victoria, Australia, to work with Richard Barker on developing methods for monitoring the response of native fish to restoration of habitat in the Murray River.

Seminars

Mike Paulin (Zoology Department), "Neural Particle Filters for Non-linear State Estimation."

John Curran, "Automorphism groups."

Chris Hopkins (Scott Technology), "Meat the reel world—an introduction to a modern innovative engineering company."

Damien Mather (Department of Marketing), "Plato, Popper & Rasch: Future Heirloom Jewellery."

Roswitha Senske, "Evaluation of properties and performance of the truncated product method."

Robert Aldred, "I've been everywhere ... with cycles."

Peter Brook (Otago Polytechnic), "Confessions of an ex-Mathematician."

Annette Becher (Bioinformaticist, AgResearch, Invermay), "Multiple Alignments algorithms and applications."

Kevin McLeod (University of Wisconsin-Milwaukee), "MERLOT and Other Digital Libraries."

Kevin McLeod (University of Wisconsin-Milwaukee), "Quantum Mechanics in the Twentieth Century."

Tamsin Meaney (EARU), "The inequality of students' mathematical explanations and justifications."

Peter Johnstone (AgResearch, Invermay), "Density Estimates from Distance Sampling using Splines."

Matthew Schofield, "Modelling growth of adult Rangitikei River rainbow trout from mark recapture data."

Professor Frank Neubrander (Lousiana State University, William Evans Fellow), "The Laplace

Transform: From Heaviside's Operational Calculus to Modern Applications."

Dr Mosaad Alabdullatif (King Saud University), "Highlights of Saudi Higher Education."

Professor Frank Neubrander (Lousiana State University, William Evans Fellow), "Interdisciplinary, Industrial, and Educational Outreach in Mathematics at Louisiana State University—A Case Study."

Jim Neyland (Victoria University), "JazzMaths: Putting Improvisation at the Heart of Maths Education."

Darryl MacKenzie (Proteus Wildlife Research Consultants), "Modelling co-occurrence patterns for species that are detected imperfectly."

Neil Watson (Canterbury University), "Weighted mean value properties for the Heat Equation."

Dr Chris Button (Director of the Human Performance Centre), "Data Collection and Analysis for Elite Human Performance."

Clinton Hayes (Statistics New Zealand), "Graduate recruitment programme."

StatChat

Laimonis Kavalieris, "Choosing the right wrong model."

Phil Battley, "Challenges in tracking the movements and demographics of migratory shorebirds."

Peter Robinson (London School of Economics), "Fractional Cointegration."

Dennis McCaughan, "p^2: A magic number for number theory."

Lenette Grant

THE UNIVERSITY OF WAIKATO

Department of Mathematics

Congratulations are due to Alfred Sneyd on his recent promotion to the rank of Professor. Alfred is the Convenor of the ANZIAM 2005 conference which will be held in Napier early next year. Preparations are well underway and a notice about this conference appears elsewhere in this Newsletter.

We also congratulate Sean Oughton and his partner Tracy on the birth of their daughter Maya Laura on 14 April. She weighed 4.1 kg or 9 pounds 1 ounce for those used to imperial measurements. Following a month of parental leave, Sean then attended the inaugural Asia-Oceania Geophysical Society conference in Singapore, where he gave invited talks on Solar Wind Turbulence and a Coronal Heating model. Immediately after that it was off to Switzerland for a productive week at the International Space Science Institute in Bern.

Besides Sean, there were a number of other travellers in the department. Kevin Broughan used his Claude McCarthy Fellowship to spend most of April at Columbia University in New York. He continued his research collaboration with Dorian Goldfeld, a leading researcher in analytic number theory. Besides working on a software package to go with Goldfeld's book on analytic number theory, they also worked on a range of problems.

In the fortnight prior to the start of the semester, Tim Stokes spent a week visiting Graeme Hocking at Murdoch University in Perth. They continued their collaborative work on free surface problems in fluid mechanics. Tim then travelled back to the East as far as Hobart, where he stopped off for four days to work with Larry Forbes at the University of Tasmania on the same project.

Rua Murray attended the Canadian Mathematical Society summer meeting in Halifax in June while our post-doc, Gabriel Fruit, spent three weeks in May visiting his native France.

Stephen Joe spent over two weeks in June in Europe. He attended the MC^2QMC 2004 conference held near Nice in France and was also a semi-plenary speaker at the MCM04 conference held near Poznan in Poland. His term as Associate Dean in the School of Computing and Mathematical Sciences looks like it will be extended until the end of the year. After that, he looks forward to being on study leave in the first half of next year.

An impending traveller is Ernie Kalnins who will soon start the overseas leg of his study leave. He will spend most of his overseas leave in the US and in Mexico.

We had a few visitors in June and July. Willard Miller Jr from the University of Minnesota visited Emie Kalnins for just over a week while Yuri Litvinenko from the University of New Hampshire, Durham, visited Ian Craig for about four weeks. Chris Bose who has been visiting Rua since last September returned to Canada towards the end of June.

Despite whatever doubts and misgivings we had about the PBRF, we are certainly very pleased that our department came out in such a positive light. Equally pleasing was that the other departments in our School of Computing of Mathematical Sciences, namely Computer Science and Statistics also did very well. More generally, the strength of mathematics research in New Zealand is clear from the PBRF exercise. Ian Craig (COD) and Stephen featured in an article about the department in the local newspaper.

Seminars

C. Bose (University of Victoria, Canada), "Shock waves for the discrete Boltzmann equation".

A. Sneyd and K. Spragg, "Liquid-metal oscillations and viscous damping".

G. Fruit, "Propagation of MHD waves in current sheets. Comparison with CLUSTER data".

R. Murray, "Variational methods for invariant measure approximation: duality and numerical studies".

C. Bose (University of Victoria, Canada), "A variational approach to the approximation of invariant measures".

Stephen Joe

VICTORIA UNIVERSITY OF WELLINGTON

School of Mathematical and Computing Sciences

Comings and Goings
Matt Visser went to the workshop Vortex04 in Cargese, Corsica. It is an interdisciplinary workshop on vortices, in fluids, optics, and the various "analogues" that can developed connecting general relativity (more specifically, pseudo-Riemannian differential geometry) with other fields of mathematics and physics. Other lectures included Sir Michael Berry (Bristol), Kieth Moffatt (Cambridge), and Alexander Fetter (Stanford).

Matt also went to Dublin for GR17—the 17th international conference on general relativity, which featured in the news because Steven Hawking spoke there and retracted his theory about emissions from black holes.

In August, David Wiltshire (Canterbury) and Matt are arranging a brief conference, the Kerr-fest, to celebrate Roy Kerr's 70th birthday. Roy Kerr, who spent much of his professional life at the mathematics department in Canterbury, is responsible for finding the exact solution to the Einstein equations that corresponds to a rotating black hole. This was a very difficult task that defeated mathematicians and theoretical physicists for some 45 years (Einstein field equations in 1918, Kerr solution in 1963).

Geoff Whittle went to Nashville Tennessee to attend the SIAM conference on discrete mathematics.

Lizzie Burslem will be visiting us and lecturing in mathematics for the remainder of the year. Lizzie is a Victoria graduate and has most recently been a post-doctoral fellow at University of Michigan, Ann Arbor, working in ergodic theory and dynamical systems. Her husband, Eric Zaslow, will also be with us for 12 months on research leave from Northwestern University. Eric works in differential and algebraic geometry, mirror symmetry and string theory and will be working with Matt Visser in part.

David Pearce has just joined the computer science group as lecturer. David works on online algorithms among other things and has just about completed a PhD under Paul Kelly at Imperial College.

Ornrudee Suttisri and Prapanporn Rattana from King Mongkut's University of Technology Thonburi, Thailand, are visiting for two months to find out more about our maths programmes.

Lyudmila Kozeratska, research fellow at University of Alberta working on multi-criteria optimization, is visiting Estate Khmaladze till August in connection with his Marsden project on point processes and change sets.

Peter Donelan attended the 8th Sao Carlos Singularity Workshop in July, held (oddly enough) at CIRM Marseille.

Denis Hirschfeldt (Chicago) is visiting us from the 19th July for a month.

Joe Miller was plenary speaker at the annual meeting of the Association for Symbolic Logic last month. Yu Liang also spoke there. Guohua Wu has been working in China and Singapore.

Peter Donelan's term as Head of School finishes on 30 November. He is applying to go on research and study leave from July 2005, and the formal process for seeking a new HoS has commenced.

Mark McGuinness went to the UK for three weeks during June and July. Most of the time he worked with Andrew Fowler at the Mathematics Institute at Oxford University, on modelling the human cardiovascular control system. He also visited the University of Reading, the University of Southampton and the University of Nottingham for discussions with applied mathematicians, on cooking cereals, and on the modelling of lead-acid batteries.

A new course in bioinformatics is being taught as a collaboration between SMCS and School of Biological Sciences. Those involved are Rod Lea, post-doctoral fellow in SBS, Marcus Frean from the computer science group, Richard Arnold from statistics and Aleksandar Stojmirovic, who is just completing a mathematics PhD on algorithms in proteomics (under Bill Jordan and Vladimir Pestov).

Tuapapa Putaiao Maori Fellowship
Alysha Nickerson has been awarded a Tuapapa Putaiao Maori Fellowship to do an MSc in Mathematics, supervised by Mark McGuinness. She will work on the solar heating of sea ice.

STOR Programme Director:
Megan Clark's term as programme director for the STOR group ends in July, and Shirley Pledger has agreed to take on the role until the middle of next year.

Conferences:
The STOR group is involved in two forthcoming meetings. John Haywood organised this year's NZ Statistical Association conference on 1 July: http://www.mcs.vuw.ac.nz/events/NZSA2004/

Richard Arnold and Ivy Liu, together with colleagues at Wellington School of Medicine and SAS Institute have organised a three-day workshop on Longitudinal Data Analysis 6–8 July (http://www.mcs.vuw.ac.nz/events/LDA04/). The workshop is sponsored by the governmental interdepartmental social policy evaluation and research programme.

Geoff Whittle is co-organisor (with Paul Bonnington) of the NZIMA workshop on Combinatorics and its applications, held 12–17 July in Auckland. Rod Downey presented two of the talks there.

Seminars

Robbie Morrison (VUW and Institute for Energy Engineering, Technical University of Berlin), "Sustainability-motivated energy policy simulation: the design of *xeona*."

Liang Yu, "$WWKL_0$ and Reverse Mathematics."

Satish Iyengar (University of Canterbury), "Diffusion Models for Neural Activity."

Rod Downey, "Degrees Computable from 1-Generic Degrees."

Neil Dodgson (Computer Laboratory, University of Cambridge), "Where mathematics and art meet: improving the tools for Computer Aided Design."

John Cleary (University of Waikato), "Starlog - A Stratified Logic Programming Language."

Carl Scarrott (University of Canterbury), "Spectrum Estimation for Nuclear Reactor Control and Risk Assessment."

John A. Randal, "A reinvestigation of robust scale estimation in finite samples."

Moon-ho Ringo Ho (McGill University), "State-Space Approach to Modelling Brain Dynamics from fMRI Data."

Annika Hinze (University of Waikato), "Context-aware information delivery using event notification."

David Vere-Jones, "Self-similarity for marked point processes: developing a self-similar version of the ETAS earthquake model."

Daryl Daley (The Australian National University), "Classical *k*-Server Queues Revisited: Some Problems."

Sebastian Link (Massey University, Palmerston North), "Database Design in the Presence of Lists."

Alex Potanin, "Defaulting Java to Ownership."

Michael Norrish (NICTA, Canberra Research Lab), "Mechanising Hankin and Barendregt using the Gordon-Melham axioms."

François Coallier (Universitè; du Quèbec), "International Standardization in Software and Systems Engineering and the Global IT Market."

Magnus Bordewich (University of Canterbury), "Quantum Computation, Topology and Approximate Counting."

Angela Martin, "When XP Met Outsourcing, and The XP Customer Role in Practice: Three Studies."

John F. Harper, "Stagnant-cap bubbles with both diffusion and adsorption rate-determining."

Mark McGuiness

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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

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CENTREFOLD

Professor Rod Downey

Since coming to New Zealand in 1986 Rod Downey's career has flourished. He is now one of New Zealand's most prominent mathematicians and is undoubtedly one of the best two or three computability theorists in the world. Rod ra rose through the ranks to a Personal Chair in Mathematics at Victoria University in 1995. He currently has over 170 publications. He has a string of awards including the RSNZ Hamilton Award and an NZMS Research Award. He has h numerous major research grants including being a PI on at least three Marsden Grants as well as an AI on several othe is a director of the NZIMA and the NZMRI. He is a former president of the NZMS, has had a number of graduate stud has very successfully supervised numerous post docs, is an FRSNZ, and no doubt I've missed a number of other things should have mentioned.

Having got that out of the way we can proceed to the good stuff; that is, the human interest and the question of what d Rod's research. Human interest first. Rod grew up in a working class family in Brisbane, Australia. His father was a bo a career in which survival required a sharp mind. Given Rod's current interest in Martingales (essentially betting strate it seems the wheel has turned full circle. Rod claims that mathematics is one of the few academic areas in which you c achieve even if you do not come from a cultured background and perhaps he is right, but there is no doubt that his par regarded his interest in mathematics as eccentric at best. After graduating from Queensland University Rod had to dec between doing a PhD at Monash or managing the bottle shop at the local pub. His parents were keen on the pub. From economic point of view they were probably right.

Rod developed an interest in logic at an early stage. One of the curiosities of the Queensland system at the time was th was possible to study logic in the final years of high school, but only for students in the bottom class. Rod duly moved from the top class to study logic. Rod's first year at university was not distinguished, but a threat to take him out of the honours stream brought out a streak that will be familiar to all who know him, and from then on he excelled. I believe he gained an A^+ in all of his papers in his honours year with the exception of a course in Combinatorics. Of course, thi meant that subsequently some of his best research has had strong interactions with combinatorics.

Given his research output it is remarkable that Rod has time for anything else, but the energy and enthusiasm with whi tackles mathematics is also evident in his recreation. Rod has always been a keen sportsman. While a PhD student he represented the state of Victoria in volleyball. Rod tells me he thoroughly enjoyed the black art of being a rugby forwa his youth (why am I not surprised). He played squash to a high standard and is currently a keen tennis player. But amo sports, it is surfing that is his lifelong passion. I guess that most surfers need a day job and what could be better than b an academic with its generally flexible hours. Rod and Mike Fellows developed the fundamental ideas of paramaterize complexity (now a significant branch of theoretical computer science) while on a surfing trip around New Zealand; something to think about for those who would seek to prescribe how mathematical research ought be undertaken.

Apparently Rod's wife Kristen first encouraged him to take up Scottish Country Dancing. In characteristic style the int developed rapidly and now he is even a qualified teacher — something achieved only at the end of a lengthy and arcan process. He has also written numerous dances leading to the marvelously named "Cane Toad Collection". Rod's individuality is evident to all who meet him, but a quick proof can be obtained by examining the cardinality of the intersection of the set of mathematicians, surfers and Scottish Country Dancing teachers.

Rod's research is broad ranging and far reaching. While it is impossible here to begin to do justice to it, there are sever themes that run through his work. A strong theme is the question of what it means for an object to be more "complex" another and how does one measure this. This is entwined with the theme of trying to understand the intrinsic difficulty computation. Rod takes a very broad view of these themes. For example, his view of "complexity" ranges from Turing reducibility to polynomial-time reducibility to parametric reducibility. In addition, his view of a reasonable object to st

has no bounds. He has studied objects which only appear in computability theory such as the c.e. sets and degrees, ind sets, and Π^0_1-classes to almost any type of graph or algebraic structure.

As a highlight from computability theory consider the array non-recursive sets and degrees. In a permitting argument c likes to construct an object, say B, Turing below some set S and before one adds anything to B one needs permission fi More or less a set is an anr set if it allows a certain type of permitting argument where multiple and increasing permiss are needed. The idea for these sets first arose in Rod's thesis. At that time the goal was to show that there was a Martin Pour-El theory of every Turing degree but Rod showed this was impossible. It turned out that the construction of a Ma Pour-El theory needed a multiple permitting argument and works for every anr degree. Over time Rod with others was to refine this idea into the anr sets. Since these sets have nice properties in terms of permitting arguments it is not surpi that they have other nice properties. For example, recent work of Downey and others showed that there is an orbit $\mathcal{O}$ o Π^0_1 classes such that if $P \in M$ then P has anr degree and if a degree has anr degree there is an element of that degree that is the anr degrees are invariant in the Π^0_1 classes. It is open and a great question if the anr degrees are definable wi the c.e. degrees. Rod with others was able to use an extension of these permitting arguments to define the low_2 within c.e. weak Turing degrees.

Rod's work in combinatorial complexity has a somewhat different flavour. A problem with classical complexity theory what to do when a problem is found to be *NP*-complete. Do we just give up in despair? Rod and Mike Fellows noticed such problems frequently become tractable when certain parameters are bounded. Moreover many parameters, such as vertex degree or tree width of a graph frequently are bounded in natural examples. This study flourished and eventuall to the monograph "Parameterized Complexity". The area is now a thriving branch of computer science with regular meetings in Dagstuhl (the computer science equivalent of Oberwolfach). It is typical of Rod that, while the subject has thrived, his interests have largely moved on and currently he is focussing on algorithmic randomness with a book in th due for completion soon.

To conclude, a personal note. From Rod I've learnt so much about what it means to be a serious research mathematicia particular, I've learnt that there are no excuses and the only limitiations are the ones you place on yourself. I could not had a better lesson.

Geoff Whittle (with help from Peter Cholak and Mike Fe

Centrefolds Index

NEW COLLEAGUES

Dr Sina Greenwood
The University of Auckland

Dr Sina Greenwood
Dr Sina Greenwood has taken up a lectureship in mathematics at The University of Auckland. She completed a PhD a Auckland on nonmetrisable manifolds in 1999. She worked as a temporary lecturer in 1999 and was awarded a Found for Research Science and Technology post doctoral fellowship from 2000 to 2003. During her fellowship she worked reflection theorems in topology and ZFC combinatorics, and developed an interest in the characterization of continuou functions on spaces with certain covering properties. Sina is of Samoan decent and over the last four years she has set various programmes in the department to improve the success of Maori and Pasifika students.

FEATURES

THE CRAWLER

MORST (www.morst.govt.nz) has just published its *National Bibliometric Report 1997–2001*. Overall, NZ scientists to write and be cited at average rates, albeit at very low cost per paper. Mathematics, however, does not fare so well. In years considered we published 394 mathematics papers which received 441 citations (also in the period 1997–2001), c citations per paper. The world average is 1.60 while Australia managed 1.77. (I hope whoever computed the *p*-values i report took into account the extremely long tails on the distribution of citations.) The UK government has just respond www.dfes.gov.uk/pns/DisplayPN.cgi?pn_id=2004_0123) to a major study on high school mathematics teaching condu by Professor Adrian Smith (www.mathsinquiry.org.uk/report/). There is a BBC commentary at news.bbc.co.uk/1 /hi/education/3841215.stm. Amongst other changes, teachers of advanced mathematics (presumably A level) will be p minimum of £40,000 p.a.

How about this for immortality? Dave Rusin has compiled a list (www.math.niu.edu/~rusin/known-math/98/MSC.nam the 357 names appearing in the 1991 Mathematics Subject Classification. Only name used in lower case: Abel. Only n used in a non-hyphenated root: Abel again, for metabelian. Name used the most times: Lie (57). Number of women: at 4 (Kovalevskaya, Neumann, Noether, Reiten).Youngest: Drinfeld, born 1954.

Exam anxiety dream... far from being an established mathematician, you actually haven't even passed your qualifying yet. You are back in grad school and are about to be cross-examined by, oh, let's say John Conway, Andrew Wiles, and Charles Fefferman. In case this happens to you you'd better read about it first at www.math.princeton.edu/graduate/ger

Robert McL
Massey Uni

BOOK REVIEWS

Information has been received about the following publications. Anyone interested in reviewing any of these books sh contact

David Alcorn
Department of Mathematics
University of Auckland
(email: alcorn@math.auckland.ac.nz)

SPRINGER-VERLAG

Agrachev A, Control theory from the geometric viewpoint. (Encyclopaedia of Mathematical Sciences, 87) 412pp.
Angell TS, Optimization methods in electromagnetic radiation. (Springer Monographs in Mathematics) 331pp.
Berggren JL, Episodes in the mathematics of medieval Islam. 197pp.
Birbenhake C, Complex abelian varieties. (2nd ed) (Grundlehren der mathematischen Wissenschaften, 302) 638pp.
Bouleau N, Financial markets and martingales. Observations on science and speculation. 151pp.
Bronshtein IN, Handbook of mathematics. (4th ed) 1157pp.
Carter S, Surfaces in 4-space. (Encyclopaedia of Mathematical Sciences, 142) 213pp.
van Dalen D, Logic and structure. (4th ed) (Universitext) 263pp.
Deuflhard P, Newton methods for nonlinear problems. (Springer Series in Computational Mathematics, 35) 424pp.
Dimca A, Sheaves in topology. (Universitext) 236pp.
Dyke PPG, Managing mathematical projects—with success! 266pp.
Ewens WJ, Mathematical population genetics. I. Theoretical introduction. (2nd ed) (Interdisciplinary Applied Mather 27) 436pp.
Gander W (ed), Solving problems in scientific computing using Maple and MATLAB. (4th ed) 476pp.
Haken H, Synergetics. 758pp.
Hankerson D, Guide to elliptic curve cryptography. 311pp.
Husemöller D, Elliptic curves. (2nd ed) (Graduate Texts in Mathematics, 111) 487pp.
Irving RS, Integers, polynomials, and rings. 284pp.
Isaev A, Introduction to mathematical methods in bioinformatics. (Universitext) 294pp.
Ito K, Stochastic processes. 234pp.
Kacznski T, Computational homology. (Applied Mathematical Sciences, 157) 470pp.
Korevaar J, Tauberian theory. A century of developments. (Grundlehren der mathematischen Wissenschaften , 329) 4
Laudal OA (ed), The legacy of Niels Hendrik Abel. 784pp.
Mandelbrot BB, Fractals and chaos. The Mandelbrot set and beyond. 308pp.
Mazzola G, Comprehensive mathematics for computer scientists 1. (Universitext) 357pp.
Peitgen H-O, Chaos and fractals. (2nd ed) 864pp.
Popov VL (ed), Algebraic transformation groups and algebraic varieites. (Encyclopaedia of Mathematical Sciences, 1 238pp.
Rade L, Mathematics handbook for science and engineering. (5th ed) 562pp.
Renardy M, An introduction to partial differential equations. (2nd ed) (Texts in Applied Mathematics, 13) 434pp.

Ribenboim P, The little book of bigger primes. (2nd ed) 350pp.
de Souza PN, Berkeley problems in mathematics. (3rd ed) 615pp.
Stinson DR, Combinatorial designs. Construction and analysis. (300pp.
Walschap G, Metric structures in differential geometry. 226pp.

NONLINEAR DYNAMICS IN PHYSIOLOGY AND MEDICINE

by Anne Beuter, Leon Glass, Michael C. Mackey, and Michele S. Titcombe (Editors),
Interdisciplinary Applied Mathematics Vol. 25, Springer-Verlag, Berlin, 2003, 434 pp, EUR 69.95.
ISBN 0-387-00449-1

Beuter, Glass, Mackey and Titcombe edit a book that provides an understanding of the theory and application of mathematical tools to the study of physiological systems. The book will be of interest to those involved in the modelin such physiological systems. The book consists of ten chapters with three appendices, and is divided into two parts. Pa describes nonlinear dynamics relevant to the analysis of biological rhythms. Part 2 describes five in-depth case studies Twelve contributors provide a wide range of expertise in the discipline. The material is well written, clear and concise editors suggest the book be used as a graduate or advanced undergraduate level textbook, for example in a biomathem course. I agree and also feel the book provides an excellent source of reference material. The ten chapters and three appendices present much material and contain much reference material. The five in-depth case studies provide for interesting and somewhat unusual examples.

Chapter 1 introduces the theoretical approaches used in physiology and presents historical motivations. The second ch introduces the main concepts of nonlinear dynamics. Medical examples provide for illustration. The authors describe t of difference equations in one dimension, ordinary differential equations, one- and two- dimensional differential equat A glucose tolerance test is used for an example. Computer exercises use MATLAB programs to describe time delay differential equations. Chapter 3 illustrates how fixed points can be created and how a bifurcation is produced. A fixed is a behavior that is constant in time. Bifurcation describes the qualitative change in dynamics that can be observed as parameters in a system vary. Saddle-node, pitchfork and transcritical bifurcation of fixed points are described. The saddle-node bifurcation of limit cycles is introduced. Computer exercises using the software XPP provide a numerical analysis of bifurcations involving fixed points. Chapter 4 provides a case study, the first of five that involves the giant of the squid. This is one of a pair of axons that runs down the mantle of the squid in the stellate nerve. Hodgkin-Huxle formulation and equations are presented. Computer exercises using XPP provide a numerical study of the Hodgkin-Hu equations. Chapter 5 describes the resetting and entrainment of biological oscillators, the perturbation of biological oscillations by a single stimulus, and phase locking of event cycles by periodic stimulations. The PoincarÈ oscillator provides an interesting example for the resetting and entrainment of cardiac oscillations. Compute r exercises use the MATLAB software.

Chapter 6 measures the effects of different kinds of noise on nonlinear dynamics. The Langevin equation is introduced refers to the stochastic differential equation obtained by adding Gaussian white noise to a simple first-order linear syst The author illustrates the effect of noise on nonlinear dynamics with the use of the pupil light reflex case study. The phenomenology and mathematical models of skipping are presented. The computer exercises use MATLAB for the Langevin equation. Chapter 7 addresses the importance of reentry as a major mechanism responsible for the initiation maintenance of tachycardia and fibrillation. The threshold of the excitable cardiac cell, the propagation of excitation a cellular automata are topics discussed. The Wiener and Rosenblueth model is introduced. The authorsnote that this has become the classical deterministic cellular automat representation of excitable tissues. The computer exercises focus o reentry using cellular automata. MATLAB is used.

Chapter 8 describes the pathologies associated with blood cell replication. Hematological disorders, the mathematical modeling and analysis include those disorders associated with bone marrow defects. Stem cell dynamics and cyclical neatropenia are topics discussed. The computer exercises use XPP to provide a simple model for the regulation of red cell production. Chapter 9 considers the analysis of dynamical systems in which the value of a state variable depends value at some past time. The findings are discussed with reference to studies on the human pupil light index. Mathema models are developed and a stability analysis is carried out. Computer exercises use MATLAB to measure pupil size e and signal recovery. Chapter 10 presents a data analysis and mathematical modeling study of the human tremor. Topic discussed include the physiology of tremor , the characterization of tremor in patients with Parkinsonís disease and conventional methods used to analyze the tremor. Time series analysis is used to characterize tremor data. Computer exercises use MATLAB for the data analysis. Appendix A describes the software XPP. Appendix B describes the softw MATLAB. Concepts used in time series analysis can be found in Appendix C.

I liked the book. It makes an important contribution to the field, it contains much reference material and is well written There is an extensive subject index. The figures, tables, examples, summaries, discussions and conclusions are well presented. I liked the useful computer exercises at the end of each chapter. The five in-depth case studies provide for interesting reading. I recommend this book. It makes a worthwhile addition to a biological/medical science library.

Paul J
Davis, Cal

Conferences in 2004

26–28 August 2004 (University of Canterbury, Christchurch, New Zealand) **Kerr Fest: Black Holes in Astrophysics General Relativity & Quantum Gravity**
website: http://www.phys.canterbury.ac.nz/kerrfest/

30 August–3 September 2004 (Raglan) **International Workshop on Dynamical Systems and Numerical Analysis**
website: http://www.math.waikato.ac.nz/~rua/dsna.html\#events

30 August–3 September 2004 (Palmerston North) **7th Australasian Conference on Mathematics and Computers ir Sport**
website: http://7mcs.massey.ac.nz/

30 August–3 September 2004 **NZIMA Workshop on Dynamical Systems and Numerical Analysis**
website: http://www.math.waikato.ac.nz/~rua/dsna.html

12–17 December 2004 (Massey University, Albany) **Eighth International Conference on Developments in Langua Theory**; International Workshop on Automata, Structures and Logic; and the International Workshop "Tilings and Cel Automata"
website: https://www.cs.auckland.ac.nz/dlt04/

13–18 December 2004 (Taupo) **Conference in Combinatorics and its Applications**, in association with the **29th Australasian Conference in Combinatorial Mathematics and Combinatorial Computing (29th ACCMCC)**
website: http://www.nzima.auckland.ac.nz/combinatorics/conference.html

Conferences in 2005

8–15 January 2005 (Napier) **11th NZMRI Summer Meeting on Geometry: Interactions with Algebra and Analys**
website: http://www.math.auckland.ac.nz/Conferences/2005/geometry-program/nzmri.html

24–28 January 2005 (Massey University at Albany, Auckland) **Mathematics-in-Industry Study Group 2005**
website: http://misg2005.massey.ac.nz
ANZIAM'S Annual Conference is the following week in Napier, New Zealand, six hours comfortable drive from Aucl

30 January–3 February 2005 (Napier) **Annual meeting of ANZIAM (Australian and New Zealand Industrial and Applied Mathematics)**
website: http://www.anziam.org.au/nzbranch.html

14–18 February 2005 (Auckland) **International Meeting on Geometry: Interactions with Algebra and Analysis**
website: http://www.math.auckland.ac.nz/Conferences/2005/geometry-program/auckland.html

ANZIAM 2005
The annual ANZIAM Applied Mathematics Conference
January 30 - February 3, 2005
War Memorial Conference Centre, Napier, New Zealand

The Annual ANZIAM Applied Mathematics Conference and Annual Meeting of ANZIAM for 2005 will be held in N in New Zealand from Sunday 30 January to Thursday 3 February. The conference is sponsored by the Royal Society o Zealand. The venue is the War Memorial Conference Centre which is situated on the sea front in Marine Parade.

The annual conference of ANZIAM is an established annual gathering of applied mathematicians, scientists and engin with wide-ranging interests. It provides an interactive forum for presentation of results and discussions by students, academics and other researchers on applied and industrial problems derived in many scientific fields and amenable to quantitative description and solution.

Further information, including details of invited speakers, may be obtained from the Web page:

http://www.math.waikato.ac.nz/anziam05

Registration:
Registration circulars are expected to be distributed at the end of August at which time on-line registration will becom available. The deadline for registration is December 1.

Accommodation:
Sixty double rooms have been reserved at the Te Pania Hotel directly opposite the conference venue, and another twer double rooms at the Masonic Hotel (three minute's walk from the venue). More will be reserved if demand is high at e Bookings at these two establishments may be done when you register on-line. There are several nearby motels and a

backpackers for which you need to make your own arrangements.

NOTICES

NOTICE OF ANNUAL GENERAL MEETING

The Annual General Meeting of the New Zealand Mathematical Society will be held during the New Zealand Mathem Colloquium at Otago University in Dunedin

(http://www.maths.otago.ac.nz/home/department/conferences/colloquium.html)

The meeting will take place on Monday the 6th of December at the conference venue commencing at approximately 5 pm.

Items for the Agenda should be forwarded by Wednesday the 1st of December to the New Zealand Mathematical Soci Secretary, Dr Shaun Hendy, IRL Applied Maths, Industrial Research Ltd, PO Box 31–310, Lower Hutt (fax: (04) 931 email: s.hendy@irl.cri.nz).

NEW ZEALAND MATHEMATICAL SOCIETY AMENDMENT TO CONSTITUTION

Last year the Council decided that it ought to be a requirement for new Fellows of the NZMS to have shown a strong interest in the New Zealand Mathematical Community in addition to excellence in their professional activities. The wo of the Constitution as it stands does not clearly stipulate this. The Council proposed an amendment to the constitution better reflect this view and this was put to a ballot in the last issue of the NZMS newsletter.

The ballot closed on May 30th and at that date three votes had been received. The amendment did not get the required majority in favour and so the Constitution will remain unaltered.

CALL FOR NOMINATIONS FOR NEW ZEALAND MATHEMATICAL SOCIETY COUNCIL POSITIONS

Nominations are called for two Councillors and an Incoming Vice-President on the New Zealand Mathematical Societ Council.

As the terms of office of two Council members (Shaun Hendy and Geoff Whittle) come to an end in 2004, nomination called for the two vacancies on the New Zealand Mathematical Society Council. Rod Downey is finishing his year as Immediate Past President. Rod's position on the Council must be filled by an Incoming Vice-President, who will succe Mick Roberts as President after one year on the Council.

The term of office of a Council member is three years. Council members may hold office for two (but no more than tw 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 Honorary members of the New Zealand Mathematical Society. The nominations, including the nominees consent, shou forwarded by Wednesday the 1st of December 2004 to the New Zealand Mathematical Society Secretary, Dr Shaun He Industrial Research Ltd, PO Box 31–310, Lower Hutt (fax: (04) 931 3003, email: s.hendy@irl.cri.nz). If nominations a sent by email, the two proposers and the nominee should each send separate email messages to the Secretary

NZMS VISITING LECTURER

The NZMS visiting lecturer is Bruce Richter of the University of Waterloo. His itinerary, yet to be confirmed, is as fol

Wednesday, 15 September	The University of Waikato
Friday, 17 September	Massey University
Monday, 20 September	Victoria University of Wellington
Tuesday, 12 October	University of Canterbury
Thursday, 14 October	University of Otago

INTRODUCING MATHEMATICS-IN-INDUSTRY INFORMATION SITE

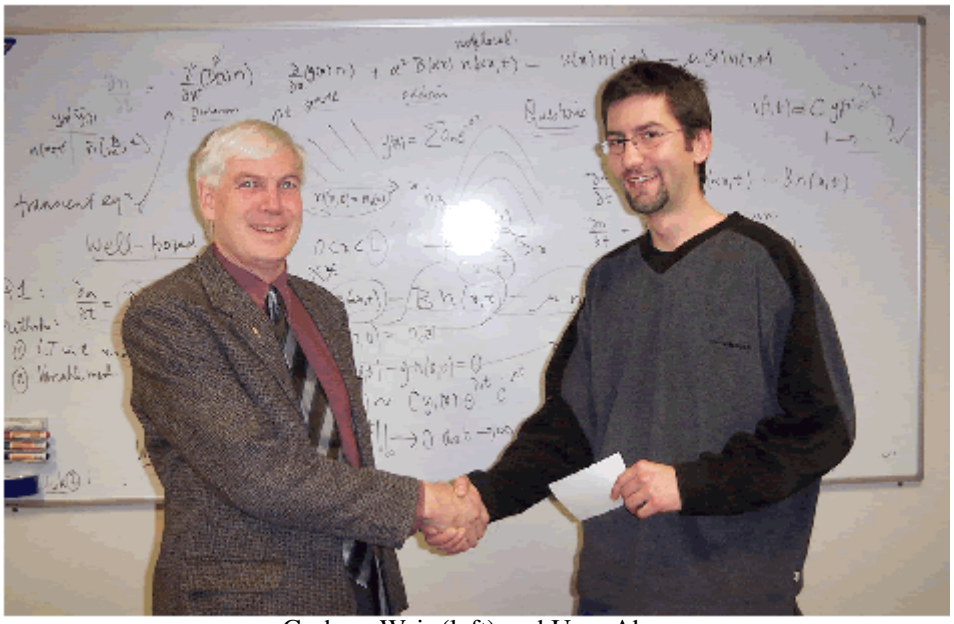
Cambridge University Press has announced the launch of a new website, Mathematics in Industry Information Site—M is a joint venture of Oxford Centre for Industrial and Applied Mathematics, The Smith Institute for Industrial Mathem and System Engineering, and Cambridge University Press/European Journal of Applied Mathematics It contains recor Study Groups, Workshop reports, interactive elements, a combination of preprint server, notice board, and help facility

will help mathematicians and scientists/engineers in Universities and those in industry. This is free MIIS aims to be a window on what mathematics can do for industry and how industry can be a source of new ideas for mathematics It is on-line resource of choice for Industrial Mathematics The ANZIAM MISGs have been invited to participate Visit: http://misg2005.massey.ac.nz

Graem
Centre for Mathematics in Industry, Massey Uni
Director, MIS

INDUSTRIAL RESEARCH LTD BURSARY TO IIMS HONOURS STUDENT AT MASSEY UNIVERSIT

The 2004 award of the Industrial Research Ltd Bursary to support students studying Mathematics at the 700 or Master level, focussed towards the application of mathematics, has been awarded to Uros Abas. Uros is completing his study level papers this year. This award was completed by arrangement with Massey University about 10 years ago, and is available annually. This is the first time it has been awarded to a student from the Albany campus. Uros Abas is pictur receiving the award from Dr Graham Weir, Group Leader, Industrial Research Ltd at the Institute of Information and Mathematical Sciences on Wednesday 21st July.



Graham Weir (left) and Uros Abas

COMPUTING: THE AUSTRALASIAN THEORY SYMPOSIUM (CATS'05)

CATS'05 will take place as part of Australasian Computer Science Week (ACSW) at the University of Newcastle, 30 January to 3 February. Papers are invited in all areas of theoretical computer science. Submissions should be made by September 2004 via the conference web site: http://www.cs.otago.ac.nz/staffpriv/mike/CATS05/CATS05.html. Confer participants should register through the ACSW web site: http://www.cs.newcastle.edu.au/~acsw05.

GRANTEE REPORTS

The Conference Recollections of an Undergraduate

If I were to say that the defining characteristic of a mathematics conference was mathematics, this article would be ratl dull. So, I will leave aside the brilliant thoughts and ideas to come out of the week, and describe my own unique view 2004 Mathematics in Industry Study Group.

If anyone reading this has had the unfortunate experience of providing education to me, you will understand that punc is not my strength. Indeed, arriving at class extraordinarily late is not uncommon, but as I always say, better extraordir late than extraordinarily never. Thus, it was with no great surprise that my fellow Otago conference-goers saw me shu into the opening lecture thirty-two minutes late; a fine start.

The first day was spent being introduced to the several problems, and some time allocated for deciding which to work followed the lead of my supervisor and went for the pine tree dispersion model. At the end of the day we went over to functions room for refreshments. I awoke the next morning to discover a proportionality relationship between volume beer, and level of sickness. So, in true student fashion, I donned my trusty hangover shirt, and set off to the second day the conference; late, of course.

On first impression, the pine tree problem seemed completely intractable. I couldn't see how it was possible to come u

models exhibiting enough complexity to be considered realistic. But somehow, the efforts of this group of people prod results which matched observed data. So the mathematicians were happy, and the industry representatives were happy.

It was great to witness so many people sharing thoughts and ideas. And, most remarkable of all, there were actual tang results at the end of it. This process of ideas and results was something entirely new to me, and I fnd myself now trying emulate the achievements of those in attendance. This leads me to believe that this conference lark might not be such a idea after all.

I would very much like to thank the NZMS for sponsoring my attendance at MISG. I believe that the benefits in enabl young students (such as myself) to attend conferences are endless. It is with this thought in mind that I notice a Combinatorics conference in Italy this September...

Geoff Wa
University of

Note from the Director of MISG2004:

There were a total of 18 students sponsored to attend MISG2004. Two of these were supported by the NZMS. MISG2(thanks NZMS for their support.

Graem

MATHEMATICAL MINIATURE 24

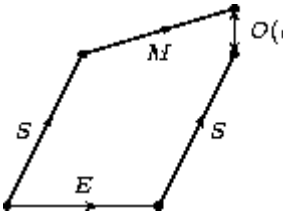
Blowing our own Google; Dynamical Systems and Numerical Analysis

I thought it meant somethibng that , not so long ago, a Google search for John Butcher gave me first billing, and many remaining first few places as well. Now I have been displaced by John Butcherm an English Jazz Saxophonist. But I a ahead of John Butcher, an American baseball player.

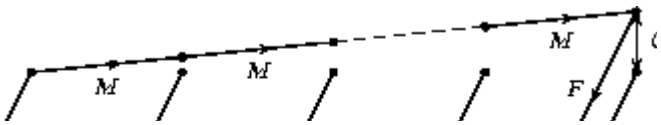
Another search for Dynamical Systems and Numerical Analysis, reveals 463,000 hits and the first of these is for the N Thematic Programme with this title. This is evidently a gung ho subject and we in New Zealand must be a gung ho pa it. With all this resonance between Dynamical Systems and Numerical Analysis there must be something that I can sa about one or the other or possibly both. The best I can do is to make some comparisons between two distinct types of numerical methods for evolutionary problems and see if there is anything related to dynamical systems coming out of comparison.

The two distinct approaches to numerical ordinary differential equations that I am referring to are known as one-step methods and multistep methods. Given an autonomous differential equation system characterised by the vector field f vector space X, the flow through a time interval h is often written as $\exp(hf) : X \rightarrow X$ but I will write it as E (with the dependence on h suppressed from the notation). A one-step method to approximate the action of E typically involves a number of evaluations of f and a recombination of the results. The standard method of ths type is a Runge-Kutta meth I will write a typical example by the symbol R. Since R is supposed to approximate E, an important concept is the loca truncation error which measures how much the result computed by R differs from the exact solution represented by the action of E. The order of the method is an integer p such that the local truncation error can be estimated in terms of h^{p+} Over an extended numerical integration, these local errors combine and reinforce each other leading to a global error b in terms of h^p.

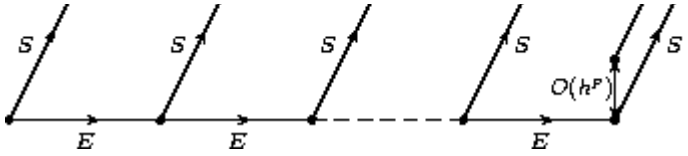
In parallel with the historical development of Runge-Kutta methods, multistep methods were achieving popularity for practical computations because of their low costs. However, on the face of it, they have much more complicated dynar because the computations take place in the vector space X^r, where the integer r indicates how many items of informati passed from step to step. Introduce two mappings $S : X \rightarrow X^r$ and $F : X^r \rightarrow X$, where it is supposed that $F \circ S = id$ computer implementation of an r-value method, S (the "starting method") is used to generate input to the first step and (the "finishing method") -is used to produce a usable approximation to the solution. To understand the meaning of accuracy for this sort of method, it is not enough to simply estimate the quality of $F \circ M \circ S$ as an approximation to E, where $M : X^r \rightarrow X^r$ denotes a single step of the multivalue integration process, because we want to carry on for many steps applying F only at the end. Hence, we need to assess the accuracy in terms of $M \circ S$ as an approximation to $S \circ E$. This is shown in the schema at the right.



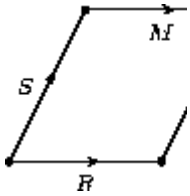
In a long-term computation, over n steps, armed with stability conditions imposed on any convergent method, it is possible to estimate the error in $M^n \circ S$, as an approximation to $S \circ E^n$. Now the asymptotic behaviour, as $h \rightarrow 0$ with $n \rightarrow \infty$ and nh constant, is $O(h^p)$ with the decreased exponent a consequence of the accumulation and reinforcement



of the errors over n steps. Applying F at the end of the computation gives the error in F o M^n o S, as an approximation to E^n, also equal to $O(h^p)$. This is shown at the right



A completely new way of looking at the dynamics of these multivalue methods (or general linear methods as they are commonly known) was proposed by D. Stoffer (1993): "General lineax methods: connection to one-step methods and invariant curves", *Numer. Math*. **64**, 395-408, as a generalization of the work of U. Kirchgraber (1986): "Multistep methods are essentially one-step methods" *Numer. Math*. **48**, 85-90, who had applied it to the special case of classical linear multistep methods. In the final diagram, S now represents a formal starting method and R a formal one-step method related to M and S so that this diagram commutes. Although there is generally no Runge-Kutta method with the role of R, it is possibly to approximate this formal method using Taylor expansions, written in terms of what are known as B-series.



Even though there is no explicit computational scheme which produces the action of S, the hope is that we can get clos and remain close to, the manifold on which powers of R evolve, because of attraction. Methods designed on the princi "Inherent RK stability" seem to be good candidates for efficient integrators and their strong stability property makes th very close in behaviour to Runge-Kutta methods. I would like to understand better if this makes them especially attrac the invariant manifold defined by their underlying one step methods.

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

Newsletters Index Centrefolds Index

[ ]