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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

Contents

PUBLISHER'S NOTICE

This newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was assembled by Fiona Richmond and printed at Massey University. The official address of the Society is:
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Web Sites

The homepage of the New Zealand Mathematical Society is:
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.

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EDITORIAL

A MAN'S REACH SHOULD EXCEED HIS GRASP

Professor Gerry Gilmore, a New Zealand now a Cambridge cosmologist, toured the country last month speaking to packed audiences in 5 centres. The audience in Palmerston North seemed to enjoy their night out, but I suspect the amount they learned was extremely little—perhaps that cosmology is big and exciting and really going off. (But even that little is, surely, enough). Professor Gilmore had the style, popular amongst physicists and especially, for some reason, cosmologists, of speaking very quickly and packing everything in and rushing from slide to slide. I liked it.

There's a danger, though, that the public will come away with a fundamental misconception about what kind of science this really is, or even what science is. Startling announcements like "universe accelerating" or "70% of universe is mysterious 'dark energy' " make good headlines but are far from being discoveries in the usual sense. Really, the further reaches of cosmology (inflation, dark matter, dark energy etc.) consist entirely of mathematical modelling, which unfortunately sounds much less glamorous. (The data we were shown for a second or two, supposedly indicating an accelerating universe, looked pretty shaky to me too—have a look at `supernova.lbl.gov` and see what you think.)

As befits Einstein Year 2005, we also heard the famous story about Einstein, Eddington, and the 1919 eclipse. Professor Gilmore showed a handwritten note from Eddington, which he found in a Cambridge library, containing the first news of the result (in a letter to his mother!), remarking something like "the better of the data supports the Einstein result." According to Tony Rothman in his book "Everything's Relative", by "better" Eddington meant "better supports the Einstein result"; only by judiciously throwing away data from measurements deemed unreliable was he able to get a result supporting general relativity. The data were in fact consistent with any light-bending factor from 1 (the Newtonian value) to 2 (the general relativity value). (As for Einstein, far from being nonchalant, he was actively involved in an earlier (failed) German expedition to Siberia to attempt to view a solar eclipse.) Presumably, some of the spectacularly far-reaching conjectures being made today on similarly slender data will hold up, leading to fame for their creators, while others will quietly vanish.

Fortunately, less glamorous subjects continue to attract attention. The boom in popular mathematics books is continuing and even reaching closer to home, and I was pleased to see the beautifully-produced "QED: Beauty in Mathematical Proof" by Burkard Polster of Monash University in the bookshops. *QED* consists of several dozen geometrical theorems proved in pictures, with just a few lapidary phrases to set them off. It's a little gem.

Robert McLachlan
Massey University, Palmerston North

PRESIDENT'S COLUMN

Winter in New Zealand is the time to head for the northern hemisphere as the summer conference season gets under way. The size and scope of some of these conferences make our own colloquium look like something of a tea-party. However, there are common principles for organizing a good meeting, and while we invariably 'get it right' a few cracks can sometimes appear. I have just attended the European Conference on Mathematical and Theoretical Biology held at the Center for High Performance Computing at Dresden University of Technology. It was interesting to see how German efficiency coped with 800 delegates.

First the venue: a large lecture theatre easily accommodated everybody for plenary talks. This was surrounded by spacious concourse areas on many levels used for coffee breaks, book displays, posters and 'meeting and greeting'. The adjacent grass area would have added to the spaciousness if it hadn't rained all the time. Smaller rooms off the concourse were used for parallel sessions and as an internet centre. The building also had wireless access, so many delegates could use their laptops to check emails in the concourse or in the lecture rooms during talks. It is interesting that the first thing people want to do when the leave home is to reconnect. The venue was a few kilometers from the main city hotels, but the conference name-tag doubled as a tram pass.

We were warned at the beginning that queuing would be a conference feature. However, after the first day's lunch, which didn't work too well, lunch was served in the concourse without undue hassles. One conference feature was having to produce tickets for meals, drinks and social events: not only was there a ticket for the conference boat trip down the River Elbe, but there was another for the boat home! An informal contest developed to see who could get the most free drinks on one ticket at the evening receptions; I think three was the record. Another innovation was hiring a local saxophonist to announce the start of each session. That was classier than our conference bell but it was going a bit far to engage him to play at the dinner too.

The conference featured some excellent presentations. The opening lecture by André de Roos on the structure of ecological communities was the perfect prequel to Odo Diekmann's plenary on structured population models. The first was a slick PowerPoint presentation and the second was 'talk and chalk', but both were models of clarity. At the other end of the spectrum was a presenter with twelve graphs with multiple lines and unreadable legends on one slide, and another with publications photocopied onto transparencies without magnification. I couldn't make sense of either. Contributed talks were in thirteen parallel sessions. These effectively turned into stand-alone specialist meetings, making good quality plenaries all the more important for giving the meeting coherence.

The Dresden meeting nicely combined the benefits of a large conference with those of a specialist workshop. By necessity, attendance at a large conference means hearing talks in your non-specialist area. If these are plenary talks it is the duty of the speaker to make them accessible to a more general mathematical audience. There were excellent examples of plenary talks that fulfilled this ideal at our own Maths Colloquium in December. The rewards for the audience are a broader understanding of what others are doing, sometimes with a realization that the technique might work on your own problem. Student talks at the colloquium too have traditionally been pitched at a broader rather than specialist audience, especially if they want a chance at winning the Aitken Prize.

There appear to be different techniques to giving general talks available to pure and applied mathematicians. Sometimes the applied speaker focuses on the application and even apologizes for displaying equations. This makes the talk accessible, but not necessarily mathematical, and more open to criticism as everybody can have an opinion on how the flu is transmitted or how a dog chases a rabbit. The pure mathematician doesn't have this luxury, but the best speakers motivate the presentation in a way that makes the subject attractive to even the most applied in the audience. Martin Bridson was our Forder lecturer in April, and he achieved this with style. His talks, based around ideas in group theory, grabbed the audience's attention from the start and gently took you down an ever more complicated path, with pauses for breath and reassessment whenever the going got tough. Professor Bridson is to be congratulated on his achievement.

In the non-Forder years the society sponsors an NZMS lecturer who tours the country giving a mixture of specialist and general talks, in much the same way as the Forder lecturer. At the moment we do not have a nominee for 2006, and any suggestions would be welcome. Is there a case for revising this scheme? Modern travel means that visitors to New Zealand are much more common, and we travel to overseas universities more frequently. Should we be encouraging our home-grown talent to share their expertise with us, perhaps linking the visiting lecturer to the research award? Let me or any council member know your views: do you want more visits from overseas visitors or do you want to hear more about what your colleagues in other New Zealand universities are doing?

Mick Roberts
Massey University, Albany

LOCAL NEWS

AGRESEARCH

The Math Biology group hosted a two day visit from Kevin Burrage. Kevin has joint positions in Mathematics, ITEE and the Institute for Molecular Biosicence. He is Professor of Computational Mathematics at the University of Queensland and Co-Director of the Advanced Computational Modelling Centre. `http://www.acmc.uq.edu.au/` Kevin presented a joint seminar (with the Mathematics Department of Waikato) at Ruakura on June 15th and also held a workshop on stochastic differential equations.

Models developed by the Math Biology group were recently presented at a number of national and international conferences. These included the International Congress on Animal Reproduction (Porto Seguro, Brazil), International Union of Microbiological Societies meeting (San Francisco), Gordon Research Conference on Plant Metabolomics (Boston) and the Animal Production Society meeting (Christchurch).

A workshop on "Hidden Markov Models and their Applications in New Zealand", held at Wanaka over June 29–July 1 2005, was organized by Roger Littlejohn from Invermay. This meeting was part of an NZIMA Programme on Hidden Markov Models, which is continuing throughout the year. See `http://www.statsresearch.co.nz/hmm/index.html` for links to further information on the seminar series and second workshop. This was a satellite meeting to the New Zealand Statistical Association Conference, which was held in Dunedin over 4–6 July. Roger Littlejohn, Peter Johnstone and Vanessa Cave contributed to the organization, and David Baird and Harold Henderson gave an invited paper on "Graphical and Computing Techniques for Large Data sets". Ken Dodds spoke on "Realigning observations when there are errors in sequence order", and the conference was also attended by Fred Potter, Zaneta Park-Ng, John Koolaard, Neil Cox and Benoit Auvray. Both meetings were very stimulating, with good company, excellent food, and fine weather!

David Saville offered a 3-day course entitled "Basic statistics/analysis of variance" at AgResearch Lincoln 26–27 & 29 July. The course started "from scratch" and used an interactive "workshop" method which focused on explaining the basic ideas behind statistical methods. The course was especially designed for people involved in experimental or other applied research work.

Ken Louie

THE UNIVERSITY OF AUCKLAND

Department of Computer Science

Paul Denny has received one of the 5 Dean's Awards for Excellence in Teaching.

Sasha Rubin won a University of Auckland Best Doctoral Thesis Award for his thesis entitled "Topics in Computational Algebra", which was jointly supervised in both the Mathematics and Computer Science Departments.

Dr Ute Lorch has resigned from the Department.

Seminars

Yu Liang, "Antichains in the Turing degrees".

Dr Michael Dinneen, "A simple linear-time algorithm for finding path decompositions of small width".

Professor Hal Berghel, "WiFi attack vectors".

Garry J. Tee

Department of Mathematics

Dr David Bryant has arrived, as Senior Lecturer in Mathematical Biology.

David Alcorn joined the Department in 1969. His farewell ceremony was attended by many past members of the department and friends from the university, who came to express their appreciation of David's long career of valuable service to the Department.

Joel Schiff and David Smith have retired, but Joel will be lecturing in the first semester 2006 and David will be lecturing in the second semester 2006.

Dr Geoff Nicholls is leaving us, for the Department of Statistics at Oxford University.

Barbara Miller-Reilly resigned in March, and she will take up a tutoring contract in 2006.

Dr David McIntyre has resigned, to resume his studies in Computer Science.

Hyuck Chung completed his PhD in this Department in 2002, and subsequently he took up a postdoctoral position in the Department of Theoretical and Applied Mechanics at the University of Illinois at Urbana-Champaign for work in non-linear acoustics. Now he has been awarded a NZS&T Postdoctoral Fellowship, for work on "Improving sound insulation in multi-dwelling timber buildings", to be conducted in our Department over the coming three years.

The John Butcher Award in Numerical Analysis has been established to recognize John's long and productive career in numerical analysis, and in particular in the numerical solution of ordinary differential equations. In keeping with John's consistent encouragement of students, the award is given for the best student talk at SciCADE, considering both the academic merit of the content and the presentation itself. The inaugural award was made at SciCADE 2005 (held at Nagoya, Japan) to Tatiana Marquez Lago, for her talk on "Numerical estimation of progesterone transcriptional activity in the ERB1 pathway using Chemcell". She is currently studying at the University of New Mexico, and she will visit New Zealand to give a plenary talk at the NZMC in December, and to spend some time at the University of Auckland.

Boris Pavlov has a UARC $3000 travel grant, and he and Colin Fox both won grants from the ISAT fund. Bill Barton has a $US5000 grant from The Institute of Figuring (California) for Tongan and Samoan mathematical vocabulary development. Rod Gover has been awarded one of the five University of Auckland Postdoctoral Fellowships awarded this year by the University's Research Committee. James Sneyd has had the National Institute of Health grant for an international project fully funded for the next five years.

Bill Barton and Suzanne Kerr (a 2005 Teaching Fellow) gave the second half of a course for Malaysian teachers at Penang, Malaysia. Bill has been invited to give a two-day workshop at the King Fahd University of Petroleum & Mining in Saudi Arabia in September.

Marston Conder travelled to the University of Colorado for a conference, and to UC-Berkeley to work with Vaughan Jones. He gave invited lectures at conferences in Colorado and in Germany, and he was the opening plenary speaker at a conference on Graph Embeddings, at Stara Lesna, in Slovakia. He has been invited to a meeting of directors of mathematical research institutes from around the Pacific Rim, at Banff (Alberta) in October, set up to lay the groundwork for substantial networking activities among these institutes.

Rod Gover gave a plenary talk at the 7th International Conference on Clifford Algebras at Toulouse. He was also a fully-funded invited presenter at an 8-day international workshop at The National Center for Theoretical Sciences (CTS) Taiwan, and to Universitaet Leipzig and Humboldt-University in Germany.

Allison Heard, Angela Tsai and John Butcher attended the SciCADE 05 conference in Nagoya, Japan, where Allison and Angela contributed talks and John gave an invited address.

Geoff Nicholls gave seminars at Harvard University, and at UNSW.

Sheena Parnell has been in Wellington. working with NZQA and the Ministry of Education to help solve the Scholarship problems of NCEA.

Judy Paterson spent 10 days providing professional development to a group of South African mathematics teachers with colleagues from Britain, Denmark, Australia and the USA in a project organised by AIMSSEC in Stellenbosch University, South Africa.

Boris Pavlov presented a lecture at the Conference on Mathematical Physics in Birmingham, Alabama, where he met Professor G Uhlman and discussed participation in the spectral semester NZOMA in 2007. He also visited Professor Robert Carlson and Professor Karl Gustafson at the University of Colorado, discussing 200-level courses and obtaining resources. On his recent trip to Russia and Israel, Boris met and has attracted to NZ Professor Ludvig Faddeev, Secretary of the Mathematical Division of the Russian Academy. On this trip he gave invited talks at Technicon and Ben-Gurion University, Israel, and at the American Mathematics Society Summer Research Conference in Utah, USA.

Ivan Reilly attended a General Topology Symposium at Zhangzhou in China.

Philip Sharp visited Professor Bill Newman at UCLA to discuss solar system simulations, and Dr Paul Chodas at NASA's Jet Propulsion Laboratory to discuss probabilities of asteroid strikes. He presented in Santa Barbara at a Dynamical Astronomy conference, gave a public lecture on the Earth's atmosphere here in Auckland, and another talk about science to primary school teachers.

Jozef Siran visited Tom Tucker at Colgate University (New York) on an ISAT Linkage Fund grant. He gave an invited colloquium at Syracuse University on "Regular maps on non-orientable surfaces". In Slovakia he was on the organizing committee of the international conference GEMS (Graph Embeddings and Maps on Surfaces) 2005, and he gave a talk at that conference.

Arkadii Slinko took part in the 23rd Australasian Economic Theory Workshop at Auckland in February. He led the New Zealand International Mathematics Olympiad team to its best-ever results in the competition in Mexico. One silver and two bronze medals put us in the top half of all teams, not far behind France. We congratulate Dr Slinko and his team on their achievement, and we hope to welcome some of the team to this university in 2006.

James Sneyd gave a plenary talk at the International Symposium on Computational Biology in

Lenox, Massachusetts, and an invited talk at AgResearch. His book "Mathematical Physiology" (with James Keener) has been translated into Japanese.

Steve Taylor was invited to speak at the AMS-IMS-SIAM Summer Research Conference in Snowbird, Utah.

Garry Tee visited the University of Otago to give a lecture, and to continue collaborating with Amal Amleh on a study of the mediaeval Arabic manuscript of Euclid's Elements which he found in the University of Otago Library.

Marston Conder has discovered the first known examples of chiral finite 5-dimensional polytopes with maximal symmetry group. Our Masters student Eyal Loz has made remarkable progress towards a new approach to the degree-diameter problem in graph theory. Jozef Siran is collaborating on a paper about classification of regular maps on non-orientable surfaces that is likely to be a major contribution in its field.

Professor Martin Bridson (Imperial College London) toured NZ as the 2006 Forder Lecturer, supported by the London Mathematical Society and the NZMS. He delivered the Forder Lecture on "Curvature and decidability in geometry and group theory" here, on April 21.

Recent visitors include Professor Mike Askew (Kings College, London), Professor Marcelo Borba (University of Rio Claro, Brazil), Dr Damian Brossard (University of Nantes), Professor Robin Callard (UCLA), Dr Benoit de Castelet (University of Nantes), Dr Steven Galbraith (University of London, Royal Holloway College), Professor Paul Gartside (University of Pittsburgh), Professor Adrian Hill (University of Bath), Dr Patrick Ions (Mathematical Reviews), Professor Heikki J.K. Junnila (University of Helsinki), Professor Charles Leedham-Green (University of London, Queen Mary College), Professor Stephen Lerman (South Bank University), Professor Lipster (Tel Aviv University), Professor Chuck Miller (University of Melbourne), Professor Akos Seress (Ohio State University), Professor Jan Slovak (Masaryk University), Dr Matt Tearle (University of Colorado in Boulder), Professor Artur H. Tomita (University of Sao Paulo, Brazil), Dr Andrew Waldron (University of California–Davis), Dr Daniel Watzenig (Graz University of Technology, Austria), and Tim Williams (University of Otago).

Two of our BSc (Hon) students, Jack Wang and Simon Young, have received Study Awards; and Elan Gin, Chris Hay and Joanne Woodward have received Postgraduate Tuition Fees Bursaries. Our doctoral students Renu Chaudury and Barbara Kensington-Miller have received grants from the University's Graduate Research Fund. Congratulations to Dr Edward (Shih-chang) Huang, who also has been awarded a New Zealand Science & Technology Postdoctoral Fellowship. He will work with Jianbei An and Eamonn O'Brien here at Auckland, and spend some time also at universities in Germany working with other experts in modular representation theory. David Welch has won a grant from the University's Graduate Research Fund. Sepideh Stewart has had her proposal to IOWME (International Organisation of Women in Mathematics Education) accepted. This organization supports new women researchers in the development of their careers.

Nicolette Rattenbury (formerly Nicolette Moir) now lives in Manchester, and hence her oral examination for PhD was held through videoconferencing facilities. The examining committee has recommended that she be awarded a PhD, subject to minor amendments and corrections to her thesis.

Jeffrey Gong has successfully completed his PhD, subject to the usual requirement to make some minor corrections to his thesis.

An NZIMA-funded one-day meeting on Dynamical Systems and Numerical Analysis was hosted in the Department on July 5th, attracting 30 academics including participants from Australia, USA and UK.

Several Mathematics Education conferences were held in Australia in June/July. Presentations were made at one or more conferences by: Hannah Bartholomew, Barbara Kensington-Miller, Viliami Latu, Sepideh Stewart, Moira Statham, Helen McKenzie, Mike Thomas. In May Hannah Bartholomew attended an invitation-only conference in Brazil to deliver a paper authored by the MEP project team.

Seminars

Dr Steven Galbraith (University of London, Royal Holloway College), "Applications of elliptic curves in cryptography".

Professor Peter M.W. Gill (ANU), "Efficient calculation of p values in permutation significance tests", and "Hartree-Fock-Wigner models for quantum chemistry".

Professor David Gauld, "Topological manifolds, games and function spaces".

Professor Martin Bridson (Imperial College, London), "Balanced presentations of groups, and problems of Andrews-Curtis and Grothendieck", and "Curvature and decidability in geometry and group theory" (the 2005 Forder Lecture).

Associate Professor Vojislav Kecman (Faculty of Engineering), "Learning from huge data sets by SVMs".

Professor Adrian Hill (University of Bath), "Applications of control theory to numerical stability".

Dr Aisling McCluskey (National University of Ireland, Galway), "Representing posets in $P(R)$".

Dr Matt Tearle (University of Colorado in Boulder), "Generalized linear stability analysis of stratified shear flow".

Professor Jan Slovak (Masaryk University), "Generalized planar curves and quaternionic geometry".

Professor Paul Gartside (University of Pittsburgh), "The shape of space", "The circular squares are wild", and "The texture of the universe" (Mathematics Public Lecture).

Dr Garry J. Tee, "Permutable polynomials and rational functions".

Dr David McIntyre, "Topology dictionary and topology oracle".

Dr Richard Evans, "Grafting hyperbolic 3-manifolds".

Eyal Loz, "Lifts of graphs in the search for cages and degree diameter problems".

Professor Heikki Junnila (University of Helsinki), "Hereditarily sigma-metacompact function spaces".

Jens Hornsgaard (Odense Technical University), "Sequences".

Professor Chuck Miller (University of Melbourne), "Reflections on some groups of B.H. Neumann".

Dr Jiling Cao, "Stratifiable Volterra spaces are Baire".

Tim Williams (University of Otago), "The scattering of ice-coupled flexural-gravity waves by a ramp or double step".

Professor Artur H. Tomita (University of Sao Paulo, Brazil), "Countably compact groups".

Garry J. Tee

Department of Statistics

James Curran, an Auckland PhD, has arrived to take up a Senior Lectureship. His main field is the statistics of forensic science, with a particular focus on glass evidence and DNA evidence. He is also heavily involved in statistical computing, and has often been an expert witness. James has held a Postdoctoral Fellowship at North Carolina State University with Bruce Weir (from NZ), a Lectureship and Senior Lectureship at Waikato, and concurrently a consultancy with the UK Forensic Science Service. He is an Associate Editor of Science and Justice, and also of the Australia and New Zealand Journal of Statistics.

Sharon Browning, whose fields are statistical genetics and stochastic processes, has accepted a Lectureship and she is due to arrive in October. She also has close connections with Bruce Weir, who has just been appointed to chair the Biostatistics Department at the University of Washington, and also he now has an on-going fractional Bioinformatics appointment in our School of Biological Sciences.

Professor Alastair Scott, the founding Head of The University's Department of Statistics and formerly Head of the Department of Mathematics and Statistics for five years, is one of New Zealand's leading mathematical scientists. He is a Fellow of the Royal Society of New Zealand, a Fellow of the American Statistical Association and a Fellow of the Institute of Mathematical Statistics. He is an elected member of the International Statistical Institute, a past president and one of only 14 honorary life members of the New Zealand Statistical Association. His 1981 paper with J.N.K. Rao, published in the Journal of American Statistical Association, was selected as one of 19 landmark papers in the history of survey sampling for the 2001 centenary volume of the International Association of Survey Statisticians.

Auckland University hosted an international conference in April to mark the retirement of Alastair Scott. Many leading international statisticians gathered in Auckland at a conference to celebrate the career of one of New Zealand's foremost mathematical scientists, and to advance research in areas where he has made his greatest contribution. The participants included winners of the most prestigious awards in statistics (conferred by the Committee of Presidents of Statistical Societies), former presidents of the Royal Statistical Society and of the Statistical Society of Canada, the 1995–2000 National Statistician of the UK, several Gold Medal winners of the Canadian Society, and former editors of some of the foremost international statistics journals.

The New Zealand Statistical Association Conference in Dunedin in early July, and an adjoining Wanaka workshop on Hidden Markov Models, both enjoyed a significant statistical contingent of Aucklanders. Concurrently the 4th Statistical Reasoning, Thinking and Literacy Forum was running in Auckland. That was a week-long invitation-only, residential, workshop conference that drew most of the biggest international names in the area. It was organised by Maxine Pfannkuch with support from Ross Parsonage, Stephen Cope and the Statistics office. The 20 participants left very pleased with the experience, despite some of the worst weather of the winter.

Rachel Fewster has received one of the five Dean's Awards for Excellence in Teaching.

Seminars

Dr Brajendra Sutradhar (Memorial University of Newfoundland), "Penalized versus generalized quasi-likelihood inference in GLMM", and "Familial longitudinal data analysis with biomedical applications".

Dr Robert King (University of Newcastle), "Investigating response times using the generalised lambda distribution".

Professor Alan J. Lee, "Case-control, efficiency and semi-parametric regression".

Associate Professor Bradford S. Jones (University of Arizona), "Timing and social change: an introduction to event history analysis".

Dr S.N. Lahiri (Iowa State University), "On the blocking mechanism for bootstrapping spatial data under a class of stochastic designs".

Dr Michael Stuart (Trinity College Dublin), "Mathematical thinking versus statistical thinking; redressing the balance in statistical teaching".

Dr Catherine Loader (Case Western Reserve University), "Statistical inference and tubular neighborhoods".

Professor Liptser (Tel Aviv University), "Simple branching model: likely path to extinction, LDP approach".

Dr Mark Clements (National Centre for Epidemiology & Population Health), "Small area analysis of cancer rates".

Garry J. Tee

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Late last year Bill Baritompa was awarded $22,000 from the Royal Society of New Zealand Science and Technology Promotion Fund for his "Dance of Mathematics" project. He and others from Mathematics and Statistics, Computer Science and Engineering visited a series of rural Canterbury towns to run mathematical barn dances and give public talks on mathematical topics such as evolutionary trees and cryptography—and how to find the area of a planar region using only an axe! The idea was to introduce some mathematical concepts such as symmetry in a gentle, non-threatening way: to show that maths relates to everyday life experience, rather than being an isolated activity involving only mathematicians. Bill and his helpers travelled to Kaiapoi, Culverden, Akaroa, Hokitika and Sefton. Audiences varied from the small and enthusiastic (Hokitika) to the large and enthusiastic (Sefton). More information and photos of dancing mathematicians can be found at `http://www.danceofmathematics.com/`.

In April Mike Steel headed off to the Mathematical Sciences Research Institute at Berkeley. He presented some results from his just-completed MacLaurin Fellowship at the workshop *Models of real world random networks*. Charles Semple and Mike were keynote speakers at the Institut Henri Poincaré in Paris in June at the conference *The mathematics of evolution and phylogeny*; Mike was co-organiser of the conference, which was attended by 180 people.

Rick Beatson was an invited speaker at the *Fifth International Conference on Algorithms for Approximation* in Chester. Ben Martin gave a talk at the NZIMA workshop *Geometry: Interactions with Algebra and Analysis* at Massey University (Albany) in June. John Hannah gave a public lecture on the work of Fibonacci for the Canterbury Mathematics Association and the Canterbury History and Philosophy of Science Society.

Recent visitors to the department include Dr John Holt (Massey University (Albany)), Professor Richard Laugesen (University of Illinois (Urbana-Champaign)), Dr Robin Havea (University of the South Pacific), Professor Daniel Naiman (Johns Hopkins University), Dr John Stell (University of Leeds).

Seminars

Professor Mike Steel, "Probability, networks and evolution."

Dr Ganes S. Ganesalingam (Massey University), "Ranked set sampling versus simple random sampling in the estimation of the mean and ratio."

Professor Martin Bridson (Imperial College), "Curvature and decidability in geometry and group theory."

Professor Carey Priebe (John Hopkins University), "On the role of the conditionality principle in dimensionality reduction."

Dr Jennifer Brown, "Surveying populations when there are too few animals to count."

Michelle Swenson (University of Texas), "Logically independent little trees."

Dr Neil Watson, "PDEs and their potential theory."

Dr Ben Martin, "Finite groups that live inside infinite matrix groups."

Ben Martin

MASSEY UNIVERSITY

Institute of Fundamental Sciences (Palmerston North)

Mathematics

Welcome to Professor Andrew Vince from the University of Florida. Andrew is a Visiting Research Fellow with Charles Little.

Also welcome to Rob Krausz who took up the position of Tutor in Mathematics. Rob will provide a welcome boost to the strength of our first year foundation and service teaching. Rob is Canadian and has a number of years experience in teaching mathematics to tertiary students at a college in British Columbia. He has an engineering degree and holds teaching qualifications in Canada and New Zealand. Rob has come to New Zealand with his French wife Sandrine for lifestyle reasons. They both enjoy the great outdoors and go tramping regularly with their four children. Having been brought up in Canada, Rob thinks the weather we have been having this winter has been nice and mild! They are looking forward to buying a home and establishing a large garden and becoming part of the New Zealand scene. We hope they will be very happy here.

And a welcome to Dion O'Neale who has joined us as a Graduate Assistant and will commence a PhD under Robert McLachlan. Dion did his undergraduate degree at The University of Auckland. Dion has just returned from the Heinrich-Heine-Universität, Düsseldorf, Germany, where he obtained an MSc in Applied Mathematics (2005).

Alas we had to farewell John Hudson who retired on the 1st of July. Prior to the formation of the Institute of Fundamental Sciences, John worked in the Department of Computer Science for a number of years but joined the Institute on its foundation late 1997. He will be greatly missed by all of us for his encyclopaedic knowledge of mathematics and his consistent willingness to help his colleagues. Invariably approachable and generous with his time, he always seemed to be able to bring some inside into a knotty problem. We wish him well for a happy retirement. Hopefully Laura and John are enjoying their stay in the US, Great Britain and France (although somewhat hot (sun and bushfires)).

Our congratulations to Patrick Rynhart who successfully defended his thesis titled: "Mathematical modelling of granulation processes". Patrick has taken up a Postdoctoral Fellowship with Igor Boglaev.

Bruce van-Brunt, Igor Boglaev, Aroon Parshotam, Robert McLachlan, Tammy Smith, Patrick Rynhart, Brett Ryland, Philip Zhang and Marijcke Vlieg went on their two yearly mission to the Wellington-Manawatu Applied Mathematics Day held at IRL, Gracefield, Lower Hutt. Wellington was basked in sunshine and there was not a breath of wind which was a great contrast to the blistery Arctic conditions with horizontal rain two years ago. It was a very pleasant day with interesting talks followed by dinner for the hardy and hungry stayers.

Robert McLachlan, Brett Ryland, and Phillip Zhang attended the 'Dynamical Systems and Numerical Analysis Day' held at The University of Auckland.

Aroon Parshotam attended the annual meeting of the International Energy Workshop held in Kyoto, Japan on 5–7 July 2005. This meeting was organised by at least 10 international organisations and focussed on managing uncertainty and climate change, abrupt climate change, post-Kyoto regimes, hydrogen economies and technological responses to climate change. Aroon presented some of his work on "negative emissions energy and CO_2 levels" with co-workers Ian Enting (ARC Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), the University of Melbourne) and Peter Read (Applied and International Economics Department, Massey University in Palmerston North). Aroon reports that Kyoto

is a very ancient (pre-1867!) and beautiful city in Japan. He spent two days after the workshop doing lots of walking and even did a day-tour of Nara where he marvelled a giant bronze Buddha, the size of a 10 story building!

On the subject of Buddha statues, Marijcke visited in 1995 the Buddha statue at Po Lin (Precious Lotus) Monastery and it took 2^8 steps to get to the top. This is the world's largest outdoor seated bronze statue of the Buddha. Located on the hillsides at Ngong Ping on Lantau Island (west of Hong Kong Island), the 220-ton seated Buddha statue is 26.4 metres high and took 10 years to complete. The statue was unveiled in 1993.

Seminars

Professor Wilfried Imrich (University of Leoben, Peoples Austria), "Two themes on the hypercube: new characterizations of the hypercube and the hypercube as a double cover".

Professor Martin Bridson (Imperial College, London; Forder Lecturer), "Curvature and decidability in geometry and group theory".

Professor Martin Bridson (Imperial College, London; Forder Lecturer), "The language of symmetry and the grammar of space".

Dr John Hudson, "Piecewise linear transversatility".

In conjunction with the Department of Information Systems:

Dr Attila Sali (Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest), "Combinatorial problems motivated by relational databases".

Marijcke Vlieg-Hulstman

Institute of Information and Mathematical Sciences (Albany)

The IWMS2005 ("14th International Workshop in Matrices and Statistics") was held on the Massey Albany Campus March 29–April 1, 2005 involving most of the statisticians and Institute support staff. Jeff Hunter was Chair of the Local Organising Committee. The meeting was structured around four keynote speakers each giving a lead-off talk each morning: Professor C.R. Rao from Pennsylvania State University (who also travelled to the other universities in New Zealand as the NZSA Visiting Lecturer for 2005), Professor Shayle Searle from Cornell University, Professor Eugene Seneta from the University of Sydney and Professor George Seber from The University of Auckland. From all the comments received everyone enjoyed the conference.

In mid-June Beatrix Jones attended a conference on "Random Graphs and Stochastic Computation," which she helped organize with her former colleagues at Duke University, Mike West and Adrian Dobra. The conference was at the Statistical and Applied Mathematical Sciences Institute in Research Triangle Park, North Carolina (SAMSI) which promotes research on statistics, applied math, and their interface. Beatrix presented a talk "Fitting and Interpreting Gaussian Graphical Models."

Robert McKibbin travelled to Turkey for the World Geothermal Conference 2005 in late April and presented a paper "A model for dispersal of eruption ejecta", co-authored by Leng Leng Lim, Winston Sweatman, and IFS colleague, Tammy Smith. The conference had about 1300 participants from over 80 countries, all parts of the geothermal world. The technical programme was interesting and varied. It featured sessions on all aspects of geothermal resource exploration, development and usage, and covered most scientific, engineering, environmental, social and economic disciplines. Interestingly for developers of the more traditional energy converters (e.g. electricity), the emerging technology seems to be that of direct use through heat pumps or downhole heat exchangers. With the vast amounts of low-temperature geothermal aquifers in Europe and elsewhere, there is a major possibility of removing a good deal of coal-produced atmospheric pollution by converting existing central heating systems in buildings to geothermal. Other highlights included a Turkish Night, with whirling Mevlevi Dervishes, Caucasian dancers and a performance by the Antalya Philharmonic Orchestra conducted by a leading Swiss geothermalist.

Carlo Laing spent three weeks in the UK dur-

ing March and April, largely funded by a grant from the London Mathematical Society to Steve Coombes (University of Nottingham). Carlo was an invited speaker at a meeting on Mathematical Neuroscience held at the ICMS in Edinburgh, gave seminars at Bristol, Manchester and Nottingham, and initiated some joint work on neural field theories with Steve.

Carlo also attended the SIAM Conference on Applications of Dynamical Systems in May, at Snowbird, Utah, giving invited presentations on "Spiral waves in neural field equations" and "Some neural examples of 'equation-free' modelling".

In June Alona Ben-Tal visited Dr Jeffrey Smith at NIH, USA for a week where she worked on the control of respiration and presented a talk entitled "Simplified models of the human lungs and the control of respiration".

In late June (27–28 June 2005) the "Geometry: Interactions with Algebra and Analysis Workshop" was held at Massey University (Auckland). This was one of the events in the Thematic Program "Geometry: Interactions with Algebra and Analysis" funded by the New Zealand Institute of Mathematics and its Applications through a grant held by Gaven Martin and Eamonn O'Brien. Speakers included our local Postdocs Richard Evans, John Holt and Mark Harmer as well as other researchers from NZ and Australia.

A number of folk attended the NZIMA Dynamical Systems and Numerical Analysis One Day Meeting on Tuesday July 5th at The University of Auckland. Amanda Elvin presented her work on "The role of gap junctions in a neural field model" and Graeme Wake presented his "Revisit of 'Criticality for Ignition with Reactant Consumption'—a new condition for practitioners". Other attendees were Alona Ben Tal, Carlo Laing and Winston Sweatman.

In early July, Senaratne Galkowite participated in the 5th International Conference on Inverse Problems in Engineering, at Cambridge, England. He presented "Inverse methods for detection of internal objects using microwave technology: with potential for breast screening", a joint paper with his PhD supervisors Graeme Wake, Winston Sweatman and Rick Keam (Keam Holden Associates).

Mick Roberts is away in Europe for much of July. First he spends a few days at Oxford University for joint work with Professor Angela McLean on HIV models. Then he goes to the University of Utrecht for joint work with Professor Hans Heesterbeek on threshold quantities in infectious disease dynamics. Finally he will attend the ECMTB 2005 conference in Dresden presenting a paper on modelling vaccination strategies for measles and pertussis. Mini Ghosh will attend this conference too, presenting a poster during her own travels in Europe. She will be in Italy the week before to finalize some of her joint work with Andrea Pugliese (University of Trento) on the effect of climatic factors on population dynamics of ticks and tick-borne disease.

Leng Leng Lim has also been away this July. She presented a paper "Modelling Volcanic Ashfall using Partial Differential Equations" at AMC2005, on research done with her PhD supervisors Robert McKibbin and Winston Sweatman. After the conference she will also visit Singapore Polytechnic to talk about this work.

By the time you read this Graeme Wake will be sweltering in hot and humid South Korea—a rich country with incredible drive. Over the last three years he has led, and been a small part of, a team introducing a 'very-applied' focus in the new (2000) Division of Applied Mathematics in the highly-regarded Korea Advanced Institute of Science and Technology in Daejeon. They have sought, at considerable cost to them, to import through a team of four (from NZ, Australia and Canada as regular visitors), a much needed momentum in Applied and Industrial Mathematics. Clearly they recognise the need to move in that direction. In late July Graeme will co-chair their 3rd national Industrial Mathematics Institute, which if circumstances permit, will give birth to a MISG-type of activity in South Korea and maybe also involving other parts of North Asia. (China does have one already—nurtured with UK (Oxford) help.) He will also be giving a three week block-course on financial mathematics to their postgraduates as well, arising from the work of Black and Scholes (who got the Nobel Prize for Economics in the early 1970s).

Graeme also attended the first Australian-wide (sponsored by the Australian Mathematical Sciences Institute, AMSI) Industrial Mathematics Forum in Sydney on 21st July. What they're doing here is different from our MISG and not necessarily better. Many industries will be represented and Graeme hopes some will be attracted to attend MISG2006 at Albany.

Jeff Hunter has been asked to help direct the Albany Campus Academic Development Plan.

Dr Tatiana Evans has joined IIMS as a Postdoctoral Fellow working with Gaven Martin on a Geometry and Analysis project supported by the Marsden Fund. Dr Heng Huat Chan, from the National University of Singapore, is visiting Shaun Cooper for collaborative research while on a year's sabbatical leave from NUS. Dr Chan's area is number theory, and he has already given some lectures

in a new Friday series. Heng Huat will be with IIMS until the end of the year.

We said goodbye to Dr Geoff Mercer who has spent the last semester with the Mathematics group while on leave from UNSW in Canberra. Geoff was a moderator of one of the MISG problems in January, and has been a very pleasant colleague to have around. He has given several seminars and has made many contributions to mathematical discussions.

In the recent Massey University Albany graduation ceremony Jeff Hunter graduated with a DSc based on his life's work in applied probability. We were also delighted to see Cynthia Wang graduate with her PhD in Mathematics at the ceremony, proudly watched by her parents who came over from Singapore, and by her Supervisor Mike Meylan, who came over from the South Shore! Further, Patrick Rynhart has completed his PhD on Mathematical Modelling of Granulation Processes. Supervised by Robert McKibbin, Robert McLachlan (IFS, PN) and Jim Jones (ITE, PN), Patrick was capped at a graduation ceremony in May.

Visitors

Geoff Mercer from the University of New South Wales (ADFA in Canberra).

Heng Huat Chan from the National University of Singapore .

Seminars

Mark Harmer, "The spectrum of a Riemann surface with a cusp".

Frederick Lam, "q-series in number theory and combinatorics".

Heng Huat Chan (National University of Singapore), "A glimpse at some congruences satisfied by $p(n)$".

Martin Bridson (Imperial College, England), "Decision problems, curvature and the universe of finitely presented groups" and "The language of symmetry and the grammar of space".

Gaven Martin, "Arithmetic 2-bridge knots".

Geoff Mercer (ADFA, University of New South Wales), "Two recent industrial mathematics case studies: wool scouring and agrichemical spray drift capture".

Pee Choon Toh (National University of Singapore), "Classes of identities involving the Dedekind eta function and Eisenstein series".

Galkadowite G. Senaratne, "Inverse methods for the detection of internal objects using microwave technology: with potential for breast screening".

Heng Huat Chan (National University of Singapore), "New identities associated with π, $1/\pi$ and $1/\pi^2$".

Graeme Wake, "Balls of fire in n-dimensions—some history".

Mario Schmitz, "Implementation of an online math tool".

Uros Abaz, "Elliptic curve arithmetic and applications to cryptography".

Geoff Mercer (ADFA, University of New South Wales), "Modelling burns caused by airbag deployment".

Leng Leng Lim, "Modelling volcanic ash fall".

Alona Ben-Tal, "When the lung meets the heart: mathematical modelling of the cardio-respiratory system".

Winston Sweatman

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

Ray Enlow's retirement in April was celebrated with a dinner at the French Café, the highlight being Ray's deadpan delivery of his farewell speech. No one suspected such talent for stand-up comedy. Ray joined the Department in 1972 after a stint at Boeing, and this engineering-mathematics background gave him a unique point of view. The students loved him and he was widely respected by his colleagues in the Department. His quiet, laconic manner will be missed.

In April Robert Aldred was invited to speak at a workshop on Degree Constrained Subgraphs in Ilha Grande, Brazil. The meeting provided an excellent opportunity to work and meet with leading experts in the field. Since his return he has had visits from Professor Mike Plummer of Vanderbilt University working on extendability problems and also from Professor Bill Jackson of Queen Mary, University of London to work on problems concerning zeros of chromatic polynomials in graphs with

certain factors. It has been a busy but enjoyable and productive time.

Peter Fenton attended the Computational Methods and Function Theory conference in Joensuu, Finland, 13–18 June, and gave a paper (joint work with John Rossi) on theorems of cos pi rho type for delta-subharmonic functions. Joensuu is the birthplace of Rolf Nevanlinna, and one of the conference receptions was held at his old school, a gracious building that is now the town's art gallery. The conference was notable for a talk by Mika Seppälä on the work of Olli Lehto, to commemorate Lehto's 80th birthday.

In June, John Clark and Stelios Charalambides (PhD student) attended the joint meeting of the American, German and Austrian Mathematical Societies in Mainz, Germany. On arrival, the first three people JC met there were Marston Conder, Yinhuo Zhang, and Stelios, the rest of the kiwi contingent. On departure, he met Peter Fenton at Frankfurt Airport on the way back from his conference in Finland.

Visitors

Dr Przemek Repetowicz from Trinity College in Dublin Ireland visited Professor Mark Meerschaert for two weeks in June to work on mathematical finance. They explored option pricing models based on neavy tailed operator stable driving processes, and distributions of eigenvaules for large random matrices with heavy tailed entries.

Professpr V Mandrekar from Michigan State University visited Professor Mark Meerschaert and Dr Boris Baeumer in July to work on random fields and stochastic differential equations with applications in ground water hydrology. They developed operator scaling random fields based on filtered stable noise. They also discussed particle tracking methods, where partial differential equations are solved by simulating Markov processes for which the PDE is the forward equation.

Professor Kiyoshi Kawazu from Yamaguchi University, Japan, visited Otago from 6th May for eight weeks. Kiyoshi has a special interest in stochastic processes and random walks and gave a seminar on these. This was his first visit to New Zealand, he certainly enjoyed discussing and exchanging ideas with Otago staff. He taught Austina Clark 34 years ago while she was an undergraduate in Taiwan and this was a pleasant teacher-student reunion.

Professor Dinh Van Huynh, a ring theorist from the University of Ohio, will visit John Clark for most of August.

Seminars

Professor Richard Porter (University of Bristol), "Wave scattering by ice sheets of varying thickness".

Professor Martin Bridson (Imperial College, London, 2005 Forder Lecturer), "The language of symmetry and the grammar of space" and "Curvature and decidability in geometry and group theory".

Ross Vennell (Marine Science), "Oceanographic interpolation using Radial Basis Functions".

Greg Reid (University of Western Ontario), "Non-commutative Groebner Theory for analytic non-linear PDE".

Mark M Meerschaert, "Parameter estimation for heavy tail data".

Margaret Walshaw (Massey University), "The Numeracy drive: Implications for teachers and students".

Garry Tee (The University of Auckland), "History of the Abacus".

Rachel Fewster (The University of Auckland), "Variance estimation for systematic designs in strip or line transect sampling".

Mike Plummer (Vanderbilt University), "Domination in graphs: Some recent results".

David C Wilson (University of Florida), "Echocardiographic Image Analysis".

Kioshi Kawazu (Yamaguchi University Japan), "Large Stochastic processes in random environment".

Sarah Flannery (Wolfram Research Inc), "Exploring Mathematics and Science with Mathematica:A Wolfram Research Tour".

Preliminary Presentations of Fourth Year Projects

Vivien Challis, "Modelling Viscoelastic Materials with the Finite Element Method".

John Irving, "Fundamentals of Relativistic Quantum Mechanics".

Scott McCracken, "Sylow's Theorems".

Andrew Sykes, "A Geometrical Approach to Temperature".

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

Gareth Vaughan, "Simulating Breaking Waves Using Smoothed Particle Hydrodynamics".

Gerrard Liddell, "Just a moment".

Lenette Grant

THE UNIVERSITY OF WAIKATO

Department of Mathematics

In the past few months, a significant proportion of the department has caught the travel bug. Kevin Broughan visited Columbia University in New York for about three weeks in April. In June he attended the Gauss-Dirichlet Conference in Göttingen in Germany and presented a talk titled "The ubiquity of integer kth roots". Pictures of the conference are available from the link at Kevin's homepage of `http://www.math.waikato.ac.nz/~kab/`.

Ernie Kalnins went to Dubna in Russia in late June to attend the Second International Workshop on Superintegrable Systems in Classical and Quantum Mechanics. There he presented a talk titled "Multiseparability and superintegrability". Tim Stokes spent two weeks in July visiting the University of Tasmania to further his collaborative work on free surface problems in fluid mechanics. In May, Rua Murray visited Chris Bose at the University of Victoria (Canada) before going to the SIAM Conference on Applications of Dynamical Systems in Snowbird (Utah) to present a talk titled "Accurate computation of invariant densities". Closer to home, Rua attended the one day meeting in Auckland on Dynamical Systems and Numerical Analysis. His MPhil student, Mirela Domijan, also attended this meeting. Gabriel Fruit, a postdoc in the department, spent about four weeks in June/July doing some work at Toulouse in his native France.

A number of visitors have been to the department in the past few months. Yuri Litvinenko from the University of New Hampshire visited Ian Craig for about two weeks in July. Ernie's former postdoc, Jonathan Kress (University of New South Wales) visited for a few days in July. Another visitor from UNSW for a few days in July was Gary Froyland who visited Rua.

Alfred Sneyd and Kevin are now on study leave. Alfred will be spending three months visiting the EPM-Madylam Laboratory in Grenoble, France. Also going to France is Alfred's PhD student, Kirk Spragg, who will spend 18 months there as part of a joint PhD programme. Back from study leave are Sean Oughton and Stephen Joe. The latter has taken on the position of Chairperson of the department.

Seminars

M Bridson (Imperial College, Forder Lecturer), "The geometry and grammar of 3-manifolds".

B Oldeman (The University of Auckland), "The Saddle-node Hopf bifurcation with global reinjection".

Stephen Joe

FEATURES

REPORT ON THE MATHEMATICS-IN-INDUSTRY STUDY GROUP 2005

Graeme Wake, Centre for Mathematics-in-Industry, Massey University, Auckland

Introduction

The second of the ANZIAM Mathematics-in-Industry Study Groups to be held in New Zealand (MISG2005) took place at Massey University at Auckland, 24–28 January 2005. Hosted by the Centre for Mathematics in Industry, based there it was directed by Professor Graeme Wake, Adjunct Professor of Industrial Mathematics. Administrative support was provided by the Institute of Information and Mathematical Sciences (headed by Professor Robert McKibbin) and the MISG2005 Administrator was Nikki Luke. Seven problems were presented, six from New Zealand and one from Australia. Industry based in Australia seems very reluctant to bring their problems off-shore, in spite of considerable effort being made to lure them to a New Zealand-based MISG. With a strong following from New Zealand it points to a need for a MISG-type of activity in both countries with synergy maintained between them.

The Centre for Mathematics in Industry was formed to provide a national base for MISG and has also built links with emerging similar activities, in South Korea and Thailand in 2004. This years MISG was fortunate in attracting Professor Sam Howison, Director of the Oxford Centre for Industrial and Applied Mathematics in the United Kingdom as an overview facilitator. The Deputy Prime Minister for New Zealand, the Honourable Dr Michael Cullen provided a keynote opening address providing welcome, but controversial, publicity for MISG2005. Student workshops were held and addressed by Dr Howison, Mr Paul Milliken (an entrepreneurial consultant) and MISG2005 Director Professor Graeme Wake. We were fortunate in obtaining a significant grant from Technology New Zealand under their "Smart Start" programme, which is gratefully acknowledged. Last but not least we acknowledge the immense work provided by the problem moderating team—which this year included a postgraduate student in each case. Their contributions—often beyond the call of duty—is warmly acknowledged. Without this input MISGs just would not happen.

The seven problems are described below along with the outcomes from the group meetings. A full technical report will be published by the CMI as "Proceedings of MISG2005" in due course. In most cases ongoing work is in progress. DVD recordings of the problem outlines are available for $NZ27 (incl GST) from the undersigned. Likewise the Full Proceedings of the MISG2004 (last year) are available for $NZ22.50 (incl GST) from the same place.

1. **Predicting Off-site Deposition of Spray Drift from Horticultural Spraying through Porous Barriers on Soil and Plant Surfaces (Lincoln Ventures Ltd/Plant Protection Chemistry of NZ)**

   The task set the MISG team was to develop and investigate a mathematical model of shelterbelt efficiency. Factors such as wind profiles through and above the shelterbelts, release height of the spray drift, capture efficiency of different droplet sizes and evaporation rates all need to be considered. The object is to either produce a better working model or to clearly define the deficiencies in the existing models. Any model that is developed would need to be usable at the farm level. That is, any inputs to the model need to be easily measured or estimated quantities such as free stream wind velocity, optical porosity of the shelterbelt and typical vegetation element size of the shelterbelt. In practice barriers effective at trapping spray drift must have some airflow through them, solid barriers will direct airflow with spray droplets upward and over the barrier.

   During the week, the MISG team verified that an existing model was suitable for use in determining the efficiency of a shelterbelt at collecting spray drift. The model is relatively simple to program and uses as inputs easily obtainable variables such as the free stream wind velocity, the optical porosity of the shelterbelt and the structure of the shelterbelt. With allowances for settling and evaporation the model was found to be valid over the range of inputs typically found for droplet distribution, wind velocity and vegetation element size. Numerical simulations of the flow field over and through the shelterbelt have justified some of the assumption used in the model and given insight into the flow characteristics that are important to consider. Although these models are never perfect representations of the real world, we believe they are suitably robust for inclusion in a larger spray drift management system, although care must be taken to ensure that some of the original assumptions are not overly breached.

2. **Development of Empirical Relationships for Metallurgical Design of Hot-rolled Steel Products (New Zealand Steel Ltd, Glenbrook)**
   New Zealand Steel Ltd asked the Study Group to develop empirical relationships for their hot-rolled coil and plate products. These empirical formulae are intended to describe the relationship between various mechanical properties of the coil and plate products and input parameters such as processing temperatures at various stages of the operation and steel chemistry. NZ Steel Ltd provided the Study Group with a large collection of data relating mechanical properties to the various input parameters of the hot-rolling process, which was analysed using multiple linear regression. A key measure of the analysis is the value of $R2$, which should be as close to unity as possible. This is a measure of how well a variation of the input variables explains a variation in the mechanical properties.

   Analyses were performed which showed that the mechanical properties do indeed depend linearly on the hot-rolling variables. Separate models were developed for each of the metallurgical properties. The model for Ultimate Tensile Strength (UTS) had the largest $R2$ value of 0.94, Yield Strength (YS) was next with a value of 0.78, and Elongation had a value of 0.57. The multiple linear regression model was used to determine how much the YS could be increased by varying the steel chemistry and processing temperatures within the allowed ranges. It was found that the mean YS could be increased to about two standard deviations above the test minimum, an outcome which would dramatically reduce test failures for this product. In reality, the optimisation problem is more complicated than this as more than one steel product uses the same chemical grade of steel. Hence optimisation of the relevant mechanical properties over a whole class of steel products needs to be done.

3. **Optimising the Relationship of the Electricity Spot Price to Real-time Input Data (Transpower Ltd, Wellington)**
   Electrical power is paid for at a marginal price calculated by an optimisation to minimise the total cost of generation based on bids made by the power generation companies and consumer requirements. Generation companies are paid on the marginal rate (the level of the highest bid accepted) determined at their location. Similarly bulk power consumers are charged on the marginal price of supply at their location, which includes costs related to delivery to the user's location.

   There are well known laws that determine the amount of power delivered along transmission lines. In the case where power lines form a loop, when a power limit is reached on one of the lines, it is necessary to bring into use more expensive generators to allow an increase in power consumption. This creates a step change in the marginal rates charged to consumers. Further it becomes more difficult to deliver power to one end of the limiting line, which is reflected in increased rates at that end. This sudden change in prices is known as a spring washer, with prices increasing on one side of the limiting line, and decreasing on the other side. This contrasts with the usual conditions where consumer costs are constant (when line costs are negligible). Under some circumstances the change in power costs can become extreme.

   Transpower wanted to determine when large spring washers could occur, and also determine when the spring washer is sensitive to the physical parameters of the network.

   The MISG group proposed two methods to determine the closeness of a possible spring washer. The first is an investigation of near optimal vertices in the linear programming optimisation. The sensitivity figures from the linear programming optimisation can be used as the basis for this calculation. The number of vertices near to the optimum and the proportion of these investigated—will determine the reliability of this method.

4. **Factors Associated with Trends in Bare Ground in High Country (Environment Canterbury, Christchurch)**
   The problem posed at MISG was to analyse the monitoring programme dataset to determine the factors associated with improvement or degradation in vegetative cover. A model resulting from this analysis would assist Environment Canterbury in recommending appropriate management strategies for different land types. Percent bare ground has been monitored at approximately 140 sites throughout the high country, at intervals of one to seven years. Record length varies from 12 to 27 years. Site characteristics specified in the dataset include soil type, topographic position and general management history. Initial analysis at Environment Canterbury suggested that soil fertility and altitude were important factors in recovery of vegetation, but that removal of the already low level of grazing had little effect.

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IVAN LEON REILLY

Born in Upper Hutt in 1942, Ivan Reilly attended Trentham Primary School (1947–54) and Heretaunga College for secondary education (1955–1959). In 1960, he was the first member of his family to become a university student, at Victoria University of Wellington (VUW). He held a Department of Education Studentship to obtain a degree intending to become a high school teacher (This is just one of his unfulfilled intentions). Ivan graduated BSc in Mathematics, MSc with the first class honours in Mathematics, and BA in Statistics and Geography in 1963, 1964 and 1966 respectively. From February 1964, he spent two and half years as a Junior Lecturer in Mathematics at VUW. During that time, he considered options for his PhD study in Mathematics in UK, Australia or USA. More significantly, he met a fellow-student, Barbara Miller, and they were married in 1965.

Ivan was awarded a New Zealand University Grants Committee Postgraduate Scholarship, and a Fulbright Travel Grant, and Barbara and he left NZ (for the first time) in August 1966. They travelled to USA by ship—two weeks cruise on the Canberra was cheaper than a flight from NZ to the west coast of USA. They sailed under the Golden Gate Bridge into San Francisco on their first wedding anniversary. Then a long train ride to Illinois, where they both became students at the University of Illinois, Urbana-Champaign (UIUC). In 1970, Ivan graduated PhD at UIUC, supporting his studies as a teaching assistant.

In December 1970, Ivan took up a lectureship in the Department of Mathematics (and Statistics), UOA. Since then, he has served the department for 35 years. Ivan has held a British Council Visiting Fellowship at University of Warwick in 1970, a Visiting Fellowship at Oxford University in 1975, Honorary Research Fellowships at University College, London in 1980 and at University of Michigan in 2002, a Claude McCarthy Fellowship in 1985, and a Visiting Professorship at University of California, Davis in 1987. He has also completed about 300 invited reviews for Mathematical Reviews and Zentralblatt für Mathematik, and has been an editor and a referee for many journals. Moreover, Ivan has presented papers and given invited lectures at numerous conferences both within New Zealand and in overseas countries.

Since his first paper appeared in Mathematische Annalen in 1970, Ivan has published at least one paper each year. He has always valued and enjoyed collaborative work. At the last count, he had published with 51 different co-authors having 14 different first languages. Ivan's contribution to mathematics lies in general topology, where he and his co-authors have published about 130 research papers in refereed international journals. In particular, Ivan specialises in nonsymmetrical topology, topological anti-properties, maximal and minimal topologies, non-Hausdorff spaces, and generalized continuity properties. When "symmetry" in the traditional definition of a metric space is dropped, the resulting space is called a quasi-metric space. Indeed, nonsymmetrical distances are quite common in our everyday life; examples include the "shortest-time taken" distance, the "minimum-energy consumed" distance and distance measured in "one-way street"

or "round-about" systems. Nonsymmetrical distances always appear in pairs, that is, they are bitopological spaces. In the 1970s, Ivan discovered that any quasi-metric space with a sequentially compact conjugate is metrisable. He also showed that three versions of bitopological compactness in the literature are in fact equivalent. In the 1980s, Ivan systematically investigated topological anti-properties. Numerous examples of properties closely related to the notion of continuity of a function between two topological spaces can be found in the literature; but, with his co-authors, Ivan discovered that many of these concepts are not new if one is willing to change the topology on the domain and/or the range. More recently, Ivan has studied generalized closed sets in topological spaces.

Ivan was a foundation member of the NZ Mathematical Society (NZMS) in 1975, and quickly became Treasurer, serving on the Executive Committee of NZMS for five years. He was the first person elected to a two-year presidency of NZMS, 1985–87. His greatest contribution to the society was probably his term as the Publications Convenor in 1982–85. This was a period of significant publication activity in the life of NZMS. A team of authors wrote a first-year university Calculus textbook, which was adopted at 5 NZ universities (and some Australian universities). During that period, there was a new set of curricula in Mathematics and Statistics at senior high school level. When it became clear that commercial publishers would not be able to provide books for the new curricula on time, Ivan set up three writing groups composed of experienced high school teachers and university staff: one for 6th form Mathematics, led by Lindsay Johnson, one for 7th form Mathematics with Statistics, led by Bob Broughton, and one for 7th form Mathematics with Calculus, led by Dean Halford. Ivan was a member of two of these writing groups. In each case, inexpensive books were produced for the first week of classes. These books proved to be extremely popular with teachers and students so that several print runs were required over the next few years. All of this meant significant profit for NZMS (and its sister organization—NZ Association of Mathematics Teachers). The society's share of these profits represents more than 90% of the current accumulated funds of the society. You may wonder where the money for such things as travel grants for graduate students, small research grants, etc., made by NZMS comes from. It is largely the interest on these funds.

In 1986, when Ivan was president of NZMS, Derek Holton asked a favour, namely, would Ivan act as Chair of the newly formed NZ Mathematical Olympiad Committee (NZMOC)? Ivan's response was "No—that is elitism". However, he agreed to do the job for one year. Now, Ivan is still Chair of NZMOC, and is happy to acknowledge that his knee-jerk reaction was wrong. He saw how NZMOC activities provide a challenge that is not available elsewhere to the most talented students of the country. Since that time, many good students have come through NZMOC activities into NZ University Mathematics Departments (and into related subjects). In the last twenty years, Ivan has spent much time trying, with limited success, to raise money and sponsorships for NZMOC. He is also Chair of NZMET (NZ Mathematics Enhancement Trust), which is largely involved with funding NZMOC.

Having been a student at VUW during the headship of J. T. Campbell, it is not surprising that Ivan developed major interests in the educational side of Mathematics. In the late 1980s, Ivan was the departmental member of a triumvirate who set up a joint Diploma in Mathematics Education, involving Auckland College of Education and the University of Auckland's Departments of Educations and Mathematics & Statistics. From the success of that venture grew the Mathematics Education Unit (MEU) founded in 1991, which Ivan headed for its first six years. Ivan was certainly the main player in the creation of the MEU. There is no doubt that he is extremely proud of the way the MEU has developed into a centre of teaching and research excellence. Alistair Scott saw the possibilities early on in the life of the MEU, and predicated (correctly) that Ivan would see this as his major contribution to the Mathematical Sciences in NZ.

Ivan has served in many university committees, starting with a Sub-Deanship of the Science Faculty, UOA. This culminated in Ivan's appointment as Director of the new School of Mathematical and Information Sciences in 1993–4, and at that time he was appointed Professor of Mathematics and Mathematics Education.

Since 1996, Ivan has been the Director of the NZ Study Centre of the University of California's Education Abroad Program (EAP). Now, each year about forty UC students spend a year as exchange students under EAP in a New Zealand university, and reciprocally a similar number of NZ students study at one of the nine UC campuses. This student exchange program is the largest and arguably the most prestigious of all such exchanges which involve NZ universities.

Recently, Ivan has become half-time professor in view of his approaching retirement. He now has more time to enjoy his three children and (currently) three grandchildren. This year, during his final sabbatical leave, Ivan and Barbara plan to celebrate their 40th wedding anniversary in North America, and I am sure that many of their colleagues and friends will share this celebration and give best wishes to the couple. Also, I am sure that many of us look forward to Ivan's continued service and contribution to the NZ mathematical community.

Jiling Cao
The University of Auckland

Features Section continued...

Each management factor was studied separately. For each, records were selected from the database where both levels of the factor were present in the same environment, e.g., sites with and without fertiliser application in a similar geographic area and on the same soil type. Five data blocks (regions/soil types) were available for fertiliser analysis and two for grazing analysis. Two-way analysis of variance (ANOVA) showed that fertilising/oversowing was effective in increasing vegetative cover on all soil types, though the magnitude of that change was greater at low altitude than at high. No difference in revegetation rate could be detected between low intensity grazing (less than one stock unit/ha) and no grazing. No comparison was available between "high" intensity grazing (1–4 stock unit/ha) and no grazing.

The conclusions were:

- A general model was developed for change in percent bare ground, where the significant factors include fertiliser application, starting percent bare ground, annual average temperature and winter rainfall.
- Soil chemistry and physical properties also appear to be important. Further data gathering and analysis is needed to include these in the model.
- Fertiliser application and oversowing has a strong positive effect on revegetation on all soils tested, with the effect strongest at low altitude.
- Little effect on revegetation was observed from de-stocking (from low intensity grazing to none).
- The effects of rabbit control were difficult to interpret, though there seemed to be some extra positive effect on the better soils that were also fertilised.

5. **Implementing Lanier's Patents for Stable, Safe and Economical Ultra-short Wing Vacu- and Para-Planes (Backyard Technology, Queensland)**
Backyard Technology are interested in aspects of aircraft design described by Edward H Lanier in a series of six patents obtained from 1930 to 1933. Lanier's overall aim was to provide an exceptionally stable aeroplane that would both fly normally and recover from undesirable attitudes without pilot aid. Backyard Technology were specifically interested in Lanier's idea of creating a vacuum cavity in the wing by replacing a section of the upper skin of the wing with a series of angled slats, believing that this wing design would give superior lift and stability compared to typical wing designs.

   During our study, buoyancy calculations (using Fastflow), indicated that the effect of reducing air density within the wings would have an almost negligible effect, perhaps lightening the aeroplane by a few hundred grams. The other arguments provided by Lanier for additional lift similarly appear unconvincing.

6. **Modelling the Physics of High Speed Product-Weighing (Compac Sorting Equipment Ltd, Auckland)**
Compac Sorting Equipment Auckland (Compac) manufactures and exports high speed, accurate sorting systems for fruit and vegetables. Their sizers operate at between 10–15 pieces of fruit per second per lane. They weigh each piece of fruit individually, using a pair of cantilever loadcells, in less than 1/10 of a second. Compac wanted a mathematical model of the weighing process, that will help them to accurately weigh heavier fruit (more than 250g) at higher speeds (in less than a tenth of a second). They also asked for help with easing back on the size and stability of the weighing assembly, which would reduce the physical size and manufacturing cost of the overall system. The signal from each loadcell is amplified and low-pass filtered. The tail end of the signal is averaged, to obtain a mass that is required to be accurate to less than 1 g.

   The MISG group studied the frequency components present in the output of load-cells, for various sized fruit running at various speeds. Apart from a high frequency which is of no concern to Compac, it was typically observed two lower frequencies, which reduce as fruit mass increases, causing difficulties with oscillations getting past the analogue filter. An option is to reduce the cutoff frequency of the lowpass filter. However, this might not help at higher operating speeds, as there may not be enough time for the filtered signal to level off.

   They developed models for simple harmonic motion in the vertical direction, as well as a side to side rocking motion between the two load-cells. The modelling suggests that the reduction in the

low frequency is generally to be expected as mass increases. The key parameters are mass (and its distribution), effective spring constant, and effective damping. An option is to stiffen and reduce the effective mass of the load-cells, thereby increasing oscillation frequency and damping. However, stiffer load-cells require greater amplification of the signal from the load-cell and are more vulnerable to drift, thus potentially reducing the overall accuracy of weighing.

A possible strategy is to use the understandings from the modelling, rather than just filtering out the oscillations. We showed that it is feasible to infer key parameter values from the oscillation frequency, damping rate and oscillation amplitude. A joint approach, digitally combining this information with filtered output, might be faster and more accurate than the present setup. In order to do this, a model that takes into account the structure of the loadcells and attached plates has been proposed. This model is more complex than a damped oscillator and involves a few time-dependent frequencies but is a promising direction for continued work.

7. **Determining Temperature Control of Wash Water in a Laundry Environment (Fisher & Paykel Ltd, Auckland)**
Fisher and Paykel (F&P) are developing a new model of washing machine. One of its key features will be that it uses less water. It is important to regulate the operating temperature of washing machines since if they operate hotter than the user selected temperature there is a risk of damage to clothes and if they operate below the user selected temperature there is a risk of incompletely dissolved detergent being sprayed onto clothes, which is also undesirable. F&P seek to improve their temperature regulation strategies from the current state-of-the-art. Further, since the new machine will have a smaller mass of water relative to clothes load, the impact of abnormal clothes loads and of start-up disturbances in water supply temperatures (e.g. cold slugs in hot water supply) on the bulk temperature is greater. Thus a thorough review of temperature regulation strategies is well motivated. A simple control strategy was suggested which uses feedback from a sump temperature sensor was presented. The dynamic model and analysis thereof via the MATLAB code will determine if this strategy is sufficient. Preliminary simulations using this code suggest that in most situations the sump temperature can be controlled to within F&P's specifications (± 2 deg C).

Concluding Remarks
MISG2005 was sponsored by the list on the web page which also has further details on the problems:

`http://misg2005.massey.ac.nz`

The Directors prize for the best remark "Overheard in passing" was awarded to Ron Thatcher (Manchester) and Ken Russell (Wollongong) who were heard to say

"Have we seen the plot yet?" Ron Thatcher

"No we have lost the plot." Ken Russell

The ANZIAM organisation has asked us to do MISG2006 which will be in the same style and location as MISG2005. The dates for this are: -

30 January—3 February 2006

at Massey University, Auckland.

See: `http://misg2006.massey.ac.nz`

Graeme Wake
Director, Centre for Mathematics-in-Industry
Msassey University, Auckland
email: `g.c.wake@massey.ac.nz`

BOOK REVIEWS

PUBLICATIONS

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

Bruce van Brunt
Institute of Fundamental Sciences
Massey University
(email: B.vanBrunt@massey.ac.nz)

SPRINGER-VERLAG PUBLICATIONS

Alexandrov, AD, Convex Polyhedra. (Springer Monographs in Mathematics) 539pp.
Blyth, TS, Lattices and Ordered Algebraic Structures. (Universitext) 310pp.
Choe, GH, Computational Ergodic Theory. (Algorithms and Computation in Mathematics, Vol. 13) 453pp.
Costa, OLV, Discrete-Time Markov Jump Linear Systems. (Probability and its Applications) 286pp.
Diamond, F, A First Course in Modular Forms. (Graduate Texts in Mathematics, Vol. 228) 436pp.
Dickenstein, A, Solving Polynomial Equations. (Algorithms and Computation in Mathematics, Vol. 14) 425pp.
Eisenbud, D, The Geometry of Syzygies, 248pp.
Elaydi, S, An Introduction to Difference Equations, 3rd ed. (Undergraduate Texts in Mathematics) 546pp.
Komornik, V, Fourier Series in Control Theory. (Springer Monographs in Mathematics) 226pp.
Lorenz, M, Multiplicative Invariant Theory. (Encyclopaedia of Mathematical Sciences, Vol. 135) 177pp.
Miller, E, Combinatorial Commutative Algebra. (Graduate Texts in Mathematics, Vol. 227) 426pp.
Renner, LE, Linear Algebraic Monoids. (Encyclopaedia of Mathematical Sciences, Vol. 134) 246pp.
Talagrand, M, The Generic Chaining. (Springer Monographs in Mathematics) 222pp.
Tauvel, P, Lie Algebras and Algebraic Groups. (Springer Monographs in Mathematics) 653pp.

BIRKHÄUSER PUBLICATIONS

Ebenfelt, P, Quadrature Domains and their Applications. (Operator Theory: Advances and Applications, Vol. 156) 305pp.
Rodrigues, JF, Trends in Partial Differential Equations of Mathematical Physics. (Progress in Nonlinear Differential Equations, Vol. 61) 296pp.
Zaharopol, R, Invariant Probabilities of Markov-Feller Operators and their Supports. (Frontiers in Mathematics) 120pp.

GALILEO GALILEI: WHEN THE WORLD STOOD STILL

by Atle Nss, Springer Berlin Heidelberg New York, 2005,
24 figs, VIII, 222 pp., Hardcover: price EUR 29.95. ISBN 3-540-21961-7
Translation of the 2nd edition of "Da Jorden stod Stille" by Atle Nss, © Gyldendal Norsk Forlag AS,
Oslo, 2002, translated by James Anderson

The outline of the story of Galileo is familiar: by relying on experiment and mathematical description rather than ancient authority, he earned the title "father of modern physics" bestowed on him by Einstein; he made significant advances in kinematics; he turned his telescope on the skies and made important observations including the first sighting of satellites orbiting Jupiter; and by defending the Copernican system he incurred the wrath of the Inquisition and was forced to recant under threat of torture.

Nss's book presents the details of this story in a readable and reasonably brief form. It is aimed very much at the general reader and does not claim to be breaking any new ground. Galileo's own published works aside, Nss relies on secondary sources; indeed, apart from acknowledging direct quotations, he hardly ever gives a specific source for statements made, though he does give a reasonably extensive bibliography. Those seeking a substantial scholarly biography of Galileo should look elsewhere.

Nss is at his best when discussing Galileo's dispute with the Catholic Church. He gives the reader a very good insight into the politics and personalities involved, tracking deftly through the complexities of the arguments.

The details of Galileo's scientific work, on the other hand, are treated fairly briefly. Nss makes few mathematical demands on the reader, indeed the book contains only two equations, namely $\frac{2}{T} = \frac{T}{l}$ for the simple pendulum and $s = \frac{1}{2}at^2$ for uniformly accelerated motion. His account is also sometimes misleading. For example, he attributes the Greek cosmological model based on concentric spheres to Ptolemy rather than Eudoxus and Aristotle, and does not make it clear that Ptolemy was concerned not with cosmological theory but with devices allowing the accurate calculation of planetary positions. The uninitiated reader is also likely to be misled by the discussion of Galileo's views on infinity. Nss tells us that Galileo (through Salviati, one of the participants in Galileo's last dialogue on Two New Sciences) 'demonstrates, in a most elegant way, that the concepts "larger" and "smaller" cannot be applied to the infinite', leaving the impression that this was the last word on the matter. Although Nss later points out that Cantor in 1874 proved the existence of *several* (sic) classes of infinity, he does not make it clear that Cantor also found a way of comparing such "classes of infinity" in respect of size.

Finally, I must say that the translator has made a good job of it. The book reads well and the reader would be unlikely to detect that this is a translation unless told. However, I must confess that I am slightly puzzled as to why the book was considered distinctive enough to warrant a translation in the first place.

Mike Carter
Massey University, Palmerston North

CONFERENCES

ANZIAM 2005

The annual conference of ANZIAM is an established annual gathering of applied mathematicians, scientists and engineers with wide-ranging interests. The 41st Australia New Zealand Industrial and Applied Mathematics (ANZIAM 2005) Conference was held in Napier from 30 January to 3 February noon. The venue was the War Memorial Conference Centre on the beachside of the Marine Parade giving (weather permitting) spectacular views over the bay from Cape Kidnappers across to Mahia Peninsula. One lecture room was so close to the sea view that it was like listening to talks in a boat! The meeting was held at a marked occasion for Napier. Those of us who had followed the local news would have been aware that it was exactly 75 years that Napier was hit by an earthquake at 46 minutes and 3 seconds after 10.00 am on Tuesday February 3, 1931, with magnitude 7.8 on the Richter Scale.

ANZIAM is held every four years in New Zealand and in the other years in Australia. It is the custom to have these gatherings at 'remote' tiny places so that the mathematicians can devote their time entirely to proving theorems and solving problems instead of indulging in email and the pleasures of city life. It is usually not always straightforward to get to those resorts from international airports and this is even more difficult on the other side of the ditch. The last venue in New Zealand was Waitangi.

Attendance at the conference was very good from both countries with over 140 registrants and 120 talks with four parallel sessions and these were of a very high standard. There were seven invited talks. Boris Baeumer from the department of Mathematics and Statistics at the University of Otago gave a talk entitled "A random walk to fractal calculus". Sam Howison from the Oxford Centre for Industrial and Applied Mathematics spoke on "challenges and opportunities for mathematicians in the finance industry". Robert McLachlan from the Institute of Fundamental Sciences at Massey University gave a good overview on "geometric numerical integration". Mark Nelson from the School of Mathematics and Applied Statistics, University of Wollongong spoke on "improving the performance of bioreactors". Eugene Parker from the University of Chicago spoke on "the singular property of the Maxwell stress tensor and stellar X-ray coronas". Charles Pearce from the School of Mathematical Sciences at the University of Adelaide spoke on "mathematical rumours". John Tyson from the Department of Biological Sciences, Virginia Tech. talked on "network dynamics and cell physiology". The T.M. Cherry Prize for the best student talk was awarded to Jason R. Looker of the Department of Mathematics and Statistics, University of Melbourne, for his talk, "homogenization of the ionic transport equations in periodic porous media". Honorable mentions for this prize were: Emily Duane, Paul-James White, Maya Ramakrishnan and Jane Thredgold. The Cherry-Ripe prize was won by Kerry Landman. John Butcher got a special prize for his 'essay' on how many mathematicians it takes to change a lightbulb.

Unfortunately, the famous Hawkes Bay weather was not very inviting this occasion. It drizzled on and off which was a pity, especially for the Australian contingent. It also was not very helpful when it came to the excursions. The trip to Cape Kidnappers became a wet and muddy affair. The tour to four vineyards was also a wet affair but more on the inside than the outside.

Thanks to all who attended to make it such a successful event. We all had a wonderful time. We gratefully acknowledge the Royal Society of New Zealand for their generous grant of $NZ 4500 that allowed us to invite our chosen speakers from the Northern Hemisphere, and Industrial Research Ltd., Wellington for funding the Cherry Prize.

We look forward to ANZIAM 2006 in the historic town of Mansfield in Victoria, Australia.

Aroon Parshotam & Marijcke Vlieg-Hulstman
Massey University, Palmerston North

FIRST WORKSHOP ON HIDDEN MARKOV MODELS AND COMPLEX SYSTEMS
Wanaka, 28 June–1 July, 2005

This was the first of two workshops organized under the NZIMA-funded programme `http://www.statsresearch.co.nz/hmm/index.html`.

The venue was the Lake Wanaka centre, which worked well for the small (about 40 people) workshop, although the view from the window could be distracting. With the snow season just opened, the delegates were easily able to find accomodation in the Lake Wanaka Hotel (it had seen better days, but the shower and the central heating both worked just fine), and a number of nearby motels. Walking to the venue in the near-dark for a 9am start was a bit unusual for those not from the deep south.

The first day and a bit was devoted to tutorial presentations on HMMs, the EM and Viterbi algorithms, Point Processes and Semi-Markov Processes. Visiting fellows Rolf Turner, Mark Berman and Emery Brown outlined interesting applications, although the timing vis-a-vis lunch of talks on Coliform data (do-do in the water) and state-space modelling (the picture of a mouse with electrodes in its skull) could be questioned. The many students present were exposed to a rather free-wheeling approach, as the visiting fellows, ably abetted (egged-on?) by David Vere-Jones, Peter Thomson et al made each presentation a truly interactive experience.

Contributed talks on topics as diverse as inference, goodness of fit, neurology, telecommunications, hormones, ion channels and DNA made up the final day. It is hoped that the presenters will be back at the second workshop in December to outline the latest developments, benefitting of course from the first workshop.

Mark Bebbington
Massey University, Palmerston North

SRTL-4: The Fourth International Research Forum on Statistical Reasoning, Thinking, and Literacy
The University of Auckland, 2–7 July 2005

The fourth research forum in a series of international research forums on Statistical Reasoning, Thinking and Literacy (SRTL) took place in at The University of Auckland in July. This particular gathering of researchers has played an important role in advancing understanding of the richness and depth of reasoning about distribution, a key focus of statistics education.

The focus of SRTL-4 on reasoning about distribution emerged from the previous three SRTL conferences. Distribution is a key concept in statistics, and yet statisticians and educators may not be aware of how difficult it is for students to develop a deep understanding of this concept. When students are given tasks involving comparing distributions or making inferences, they often fail to utilize relevant information contained in the underlying distributions. Curricular materials often focus on construction and identification of distributions, but not on what these distributions mean to students and how they interpret them.

Twenty researchers in statistics education from six countries shared their work. Sessions were held in an informal style, with a high level of interaction. With emphasis on reasoning about distribution, a wide range of research projects were presented spanning learners of all ages, as well as teachers. These demonstrated an interesting diversity in research methods, theoretical approaches and points of view.

The programme began with an overview talk by Chris Wild entitled: “A statisticians view on the concept of distribution”. Eight presentations of SRTL-4 were thematically grouped into five clusters. A cluster included one or two ninety-minute research presentations to the entire group, small group discussions, and a whole group reflection on the cluster. All presenters showed a small subset of video segments of their research. The programme ended with three discussants reflecting on reasoning about distribution from research, curriculum, and technology viewpoints.

The research forum proved to be very productive in many ways. Several types of scientific publications will be produced including a CD-ROM of the proceedings, and a special issue of Statistics Education Research Journal (SERJ) on reasoning about distribution.

Maxine Pfannkuch
The University of Auckland

NZSA CONFERENCE
4–6 July 2005.

The memories from the NZSA conference of many participants will relate to travel problems getting out of Dunedin after the conference had closed, but for me (with a purposely booked middle of the day flight the following day) the weather wont tarnish a well run and pleasurable experience.

We were treated to good food, comfortable surroundings, and oh yes, the talks were pretty good too! Time allowed for two keynote speakers each day. These being Emery Brown (Harvard Medical School), Satish Iyengar (University of Pittsburgh, formerly at University of Canterbury), David Baird (AgResearch), Kerrie Mengersen (Queensland University of Technology, formerly University of Newcastle), Rod Ball (ENSIS), and Mark Berman (CSIRO, Australia). A change in format from past years, where 20 minute slots were given to all other speakers and only two sessions where there was a second stream meant the pace was quite high. Tuesday afternoon was given a focus on education, and we were joined by some secondary school teachers.

I thought the calibre of the student presentations was excellent, with the competition for the prize money on offer from Hoare Research Software Ltd being widely distributed. First prize went to Jonathan Godfrey (Massey, Palmerston North), with three runners up—Kala Meurk (University of Canterbury), Alistair Merrifield (University of Sydney), and Andrew Gormley (University of Otago). With a good range of posters this year, a prize was also given to the best student contribution—Matt Davis (University of Otago). I really believe supervisors should encourage their students to present their work, and if they put enough effort into it they can get hold of a prize or two. For those questioning the authors lack of modesty, I can only apologize and tell you that Ive retired from being a candidate for student prizes.

A mighty fine conference dinner held on site (Salmond Hall) was enjoyed by the majority of attendees. As well as the prizes being awarded, the life memberships of former Government Statisticians Steve Kuzmicich and John Darwin were formally announced.

Im sure the good feeling the NZSA conference participants got this year will be translated into a good attendance at next years event which is a joint conference with the Australians. Look out Auckland, the NZSA is coming to town in 2006, and if this years conference is anything to go by, well all enjoy good company and quality talks.

Jonathan Godfrey
Massey University, Palmerston North

Conferences in 2005

27–30 September 2005, in Christchurch: **9th Biennial New Zealand Association of Mathematics Teachers conference**.
`http://www.nzamt9.org.nz/`

22–26 November 2005, on Fraser Island, Queensland, Australia: **DELTA 2005**.
website: `http://www.maths.uq.edu.au/delta05/index.php`

5–7 December 2005, in Palmerston North: **New Zealand Mathematics Colloquium**.
website: `http://mathscolloquium.massey.ac.nz/`

5–9 December 2005, at the University of Queensland, Brisbane: **Thirtieth Australasian Conference in Combinatorial Mathematics and Combinatorial Computing (30 ACCMCC)**.
website: `http://www.maths.uq.edu.au/cdmc/30accmcc.html`

Conferences in 2006

8–15 January 2006, at Taipa, Northland: **NZMRI Workshop on Geometric Methods in the Topology of 3-Dimensional Manifolds**.
website: `http://www.math.auckland.ac.nz/Events/2006/SummerWorkshop/`

12–16 February 2006, in Auckland: **Third International Conference on Ethnomathematics**.
website: `http://www.math.auckland.ac.nz/Events/2006/ICEM-3/`

NZ MATHEMATICS COLLOQUIUM
5–7 December 2005
Massey University, Palmerston North, New Zealand

The 2005 New Zealand Mathematics Colloquium will be held at Massey University, Palmerston North Campus, 5–7 December.

Plenary addresses will be given by

- Professor Peter Kuchment (Texas A & M University)
- Associate Professor Bruce van-Brunt (Massey University)
- Associate Professor Eamonn O'Brien (The University of Auckland, NZMS Speaker)
- Professor Mark Meerschaert (Otago University, ANZIAM Speaker)
- Dr Tatiana Márquez Lago (University of New Mexico, Butcher Prizewinner)

Contributed papers are sought from intending participants. A highlight of the conference will be the award of the Aitken Prize by the NZ Mathematical Society for the best student talk. Social events will include a reception and the Colloquium Dinner. An optional afternoon excursion will explore some of the natural beauties of the Manawatu region in which the city of Palmerston North is located. Meetings of the New Zealand Mathematical Society and the NZ Branch of ANZIAM (Australia and New Zealand Industrial and Applied Mathematics) will be incorporated into the conference.

A theme programme on 'Change in Mathematics Education' will run on Monday 5 December from 1.00–5.00 pm.

A theme programme on 'Dynamical Systems and Numerical Analysis' will run on Monday 5 December from 10.30 am–5.00 pm.

Further information, registration, paper abstract details and accommodation requests are available at the Colloquium website

`http://mathscolloquium.massey.ac.nz/`

Enquiries may be made to the Colloquium Secretary, Toni Wilson, at

`T.J.Wilson@massey.ac.nz`

We look forward to your joining us at the Colloquium on the beautiful Palmerston North campus of Massey University.

Dean Halford
Convenor, Organising Committee

NOTICES

GRANTEE REPORTS

From May 23rd through to May 27th I attended the international conference SciCADE 2005, held this year in Nagoya, Japan. The conference consisted of five parallel sessions of minisymposia and contributed talks interspersed with plenary talks and a special Germund Dalhquist symposium (containing talks from John Butcher, Ernst Hairer, Gustaf Söderlind, Gerhard Wanner and Rolf Jeltsch) to commemorate his work on the numerical analysis of time-dependent problems. With over 200 mathematicians hailing from all over the world, someone made the comment that we had representatives from every continent (though I cannot say I saw anyone from Antarctica).

The conference was a great success with many interesting talks inspiring insightful questions from the audience and several groups splitting off during the breaks to further discuss queries and ideas that couldn't fit into the allocated five minutes of question time at the end of each talk. Thanks to a skilled support crew there were no major dramas from the technology and all the talks ran smoothly (at least in the sessions that I attended). I delivered my talk on the afternoon of the 25th and afterwards, received several comments from members of the audience that they enjoyed it. Later, I engaged in some further discussion with Jason Frank where I learned how a problem I had been struggling with had been dealt with by another author and received a few pointers on directions in which I can continue my research.

On the evening of the 26th, the conference dinner was held in the dining hall of a local hotel. After several small but tasty dishes were brought out and everyone had consumed a few glasses of wine or beer, John Butcher announced that there was to be a singing contest where each country had to sing a song relevant to that country. So the New Zealand group, consisting of John, all his past students and colleagues, a few others and myself sang Pokarekareana. As with the songs from the other countries, it received much applause regardless of how it sounded (singing is not one of my strong points). All in all, it was an enjoyable night and almost everyone made it to the first talk the following morning.

After the conference, I took the opportunity to see some of the sights Japan has to offer, such as the Golden Pavilion and Ryoanji dry garden in Kyoto, the enormous Buddha statue in Nara, Himeji castle in Himeji, the Peace Memorial Park in Hiroshima and the overwhelming crowds, lights and sights of Tokyo's Akihabara ("electric city") before returning to New Zealand.

Brett Ryland
PhD Student, IFS, Massey University

FOURTH ASIAN MATHEMATICAL CONFERENCE 2005

Place and Dates
Singapore, National University of Singapore, July 20–23, 2005

The Scope of the Conference

1.	Algebra and Group Theory	2.	Algebraic Geometry
3.	Analysis	4.	Applications of Mathematics in Sciences
5.	Combinatorics and Graph Theory	6.	Computing/Logic
7.	Differential Equations	8.	Geometry and Topology
9.	Lie Theory	10.	Mathematics Education
11.	Number Theory & Applications	12.	Numerical Analysis
13.	Operations Research	14.	Probability & Stochastic Processes
15.	Scientific Computation	16.	Statistics

The Conference and my presentation
There were about 450 participants from 28 countries at the conference. My presentation went well. There was no difficult question for me. I felt the presentation I gave at this conference was the best among the presentations I gave at other conferences. Because of this conference, I was invited to give a talk about my work at Singapore Polytechnic where I taught before I started my PhD and it was well-attended too.

Although not many people doing the same field as me at the conference, there was a German postdoctoral research fellow from University of Hong Kong using the same equation as me in his work. His presentation was before mine. His work is analysis of advection-dispersion equation. We had a short talk about the equation. Unfortunately, he is using Finite Volume method to tackle the equation, which I am not familiar with.

In addition, the conference has expanded my international network relationships, especially participants from Indonesia, Taiwan, Thailand and Cambodia. Robert McKibbin and Graeme Wake of Massey University were also highly mentioned by the participants from Thailand. They commented that Robert and Graeme gave very good lectures at the university in Thailand.

Leng Leng Lim, Robert McKibbin and Winston L. Sweatman, Modelling volcanic ashfall using partial differential equations. *Fourth Asian Mathematical Conference (AMC2005)*, 20–23 Jul 2005, Singapore, p67–68.

Leng Leng Lim
Massey University, Albany

ICE-EM AUSTRALIAN GRADUATE SCHOOL IN MATHEMATICS

The graduate school was held at the University of Queensland, Brisbane from 4–22 July 2005. This school offered three courses: Dynamical Systems, Algebraic Structures and Stochastic Processes. I attended the Dynamical Systems course which included lectures on Bifurcation Theory and Discrete Dynamical Systems and Chaos. Jeroen Lamb taught the Bifurcation Theory course, while the Discrete Dynamics was taught by James Meiss. The school consisted of two hours of lectures per day with the afternoons devoted to student presentations of their own research work.

This was an excellent opportunity to meet people, talk about our work, learn through the lectures and of course have fun. I am grateful to have had the opportunity to attend this graduate school. I would like to thank the following for financial assistance: The New Zealand Mathematical Society; Department of Mathematics, The University of Auckland; New Zealand Institute of Mathematics and its Applications (NZIMA) and Reinout Quispel.

Elan Gin
The University of Auckland

LETTER TO THE EDITOR

Dear Sir,

With regard to the article on changing light-bulbs: How like an applied mathematician to butcher such a problem. Assumptions such as integrality (presumably over some number field) and existence were not given rigorous justification, etc. etc. Also I would have thought the author would be more aware of such ill posed problems. My first thought on being asked "how many mathematicians does it take to change a light bulb", was to insure well posedness by asking "what into".

Sincerely, Gav Merhtens

MERGA/IOWME Writing Project

Two New Zealand women Mathematics Educators have been chosen to take part in a writing project that will give them the opportunity to publish in a special edition of one of the Mathematics Education Research Group of Australasia's publications (MERGA). These women are Fiona Hagan, a PhD student at the University of Otago, and Sepideh Stewart, a PhD student at Auckland University.

Funds have been made available from the International Organisation of Women in Mathematics Education (IOWME) to fund the project. It will be directed by Helen Forgasz and Margaret Walshaw who are keen to:

- support new and promising women researchers in the development of their research careers;
- introduce new women scholars into the culture of academic publishing and guide them into the conventions of writing for a scholarly journal;
- offer a structure that will help new women researchers produce quality writing; and
- provide support and feedback with a view towards submission of an article in a special issue of one of MERGA's journals.

It is planned to publish the special MERGA journal issue in early 2007.

Fiona and Sepideh will meet with two emerging women Australians at the annual MERGA conference this year and will attend a one day writing retreat before next year's MERGA conference. They will both be mentored by an experienced female mathematics education researcher who will assist them in developing writing skills for publication.

Fiona has been a secondary mathematics teacher for the last 15 years. In 2002 she was awarded a Teacher's Study award and completed a PGDipArts in Education. After being awarded a Beverley PhD Scholarship by the Mathematics & Statistics Department at the University of Otago she commenced doctoral study in the area of girls and mathematics in 2003. She presented a paper "Classics counts over Calculus" at the MERGA conference in 2004, a case study about one of her female students, an able mathematician, who opted out of mathematics after Year 12 to continue with Arts subjects. Fiona's PhD topic is "Mathematics as a 'secondary' subject: A girls' view" where she has been undertaking an ethnographic study of a group of girls in a coeducational school. She has been investigating differences in other curriculum areas with mathematics classrooms and teaching and is trying to conceptualise the idea of 'mathematical space' and how this impacts on girls in mathematics classrooms.

After completing a BSc (1998) followed by an MSc (2000) in pure mathematics from The University of Auckland, Sepideh started work as a tutor in the department. She presented a joint paper with her supervisor Associate Professor Mike Thomas "Difficulties in the acquisition of linear algebra concepts" at the Delta'03 conference. In 2004 Sepideh started a PhD in mathematics education after completing a year of study in that area in 2003. In 2004 she presented a joint paper with Mike in the ATCM conference in Singapore. She has been teaching a stage one mathematics course (Calculus and Algebra) this semester and will be presenting her paper "Concerns relating to the use of CAS at university level" at the MERGA 28 conference, and a joint paper with Mike, at PME 29. Sepideh will also be presenting a joint paper with Mike and John Hannah (University of Canterbury) at the Delta'05 conference. Her PhD topic is "Communicating linear algebra: new representations using CAS". She is currently working on the conceptual understanding of linear algebra concepts using APOS and representation theories and examining the role of instrumentation of technological tools.

Application for membership of the NZMS

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

Membership categories:

(Full details at www.math.waikato.ac.nz/NZMS/NZMS.html)

Ordinary*	$36 p.a.	
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	For overseas residents who are fully paid-up members of societies with which the NZMS maintains a reciprocity agreement (including the American Mathematical Society, the Australian Mathematical Society, the Canadian Mathematical Society, the London Mathematical Society, and the Mathematical Society of Japan).	
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Members can subscribe to the New Zealand Journal of Mathematics (http://www.math.auckland.ac.nz/NZJM/index.html) at a reduced rate.

Members can also elect to make a donation, when paying their subs, to the NZMS Endowment for Student Support.

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

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MATHEMATICAL MINIATURE 27

Germund Dahlquist 1925–2005

One of my first wonders, as I started taking an interest is Numerical Analysis, was a result that has come to be known as the "first Dahlquist barrier". "Barrier" in this sense means a fundamental limitation on what is possible, in terms of two competing aims in the design of good numerical methods. These aims are summed up by the words "order" and "stability". If approximations y_0, y_1, ... are being computed to the solution of an initial value problem, so that y_i is intended as an approximation to $y(x_i) = y(x_0 + ih)$, what is referred to as a k-step method involves an equation

$$\phi(y_n, y_{n-1}, \ldots, y_{n-k}) = 0,$$

as the means of determining y_n. The value of h is the "step-size" and its value indicates how rapidly the solution is progressing in time. A high value of h means that fewer steps are needed to complete the calculation and still arrive at an approximation for some desired value of x. The order is an integer p such that the Taylor expansion of $\phi(y(x_n), y(x_{n-1}), \ldots, y(x_{n-k}))$ vanishes up to h^p terms. It is an easy matter to devise methods for which the order is $2k-1$ but these may not be stable, in the sense that the sequence of y values may not be bounded, even for the trivial equation $y' = 0$. The first Dahlquist barrier maintains that a stable (and therefore convergent) method cannot have order greater than $k+2$, and even this cannot be achieved if k is odd. The standard proof involves a fact about the series expansion of $(1 + t/3 + t^2/5 + \cdots)^{-1}$. If this is $c_0 + c_1 t + c_2 t^2 + \cdots$, then the fact that is used is that $c_i < 0$ if $i \geq 1$. This is required because the expression $z/\log(\frac{1+z}{1-z})$ occurs in the analysis. The coefficient of z^{2n} $(n > 1)$ in the Taylor expansion of this is usually written in the clearly negative form

$$-\int_{-1}^{1} \frac{x^{2n}}{\pi^2 + \log(\frac{1+x}{1-x})^2} dx.$$

This comes from Dahlquist's original work and is based on an elegant use of the Cauchy integral formula. If, like me, you prefer elementary tools where they can be used, such as proof by induction, note that $c_1 = -\frac{1}{3}$ and that, from the t^n and t^{n-1} $(n > 1)$ coefficients of the product $(1 + t/3 + t^2/5 + \cdots)(c_0 + c_1 t + c_2 t^2 + \cdots) = 1$,

$$c_n + \tfrac{1}{3} c_{n-1} + \cdots + \tfrac{1}{2n+1} c_0 = 0, \tag{1}$$

$$c_{n-1} + \tfrac{1}{3} c_{n-2} + \cdots + \tfrac{1}{2n-1} c_0 = 0. \tag{2}$$

Multiply $2n+1$ by (1) and subtract $2n-1$ times (2), and c_n is found to be a positive linear combination of the negative quantities $c_1, c_2, \ldots, c_{n-1}$.

In subsequent work, Dahlquist laid the foundations for the study of A-stable and G-stable methods. These are concerned with the behaviour of linear multistep methods while attempting to solve so-called stiff problems, which can roughly be thought of as highly stable problems whose numerical approximations, by classical numerical methods, are highly unstable. Even though A-stability is defined in terms of linear problems and G-stability in terms of non-linear problems, a remarkable and intricate result, also due to Dahlquist himself, is that these are equivalent. This might seem like a disappointing result and in some ways it is. However, it has led to a wealth of research on other types of numerical methods where both linear and non-linear stability have important and distinct roles.

Every two years an international SciCADE conference ("Scientific Computation and Differential Equations") is held. The first, which was called SCADE, was held in Auckland in 1993. One of the key items in these conferences is the award of the Dahlquist Prize for research in the SciCADE areas of activity. Plans for the 2005 meeting in Nagoya, Japan, were well advanced when Germund Dahlquist died in Stockholm shortly after his eightieth birthday. The organisers of SciCADE 05 decided to rearrange the programme to include a special symposium honouring Dahlquist's life and work. I was privileged to be one of the five speakers given the opportunity to present a tribute to Germund within this forum.

The topic allocated to me was G-stability and its ramifications. I was very pleased with this assignment, especially as I had been present in 1975 when Dahlquist presented his first lecture on G-stability at an international conference in Dundee, Scotland. I decided to call my talk "Thirty years of G-stability", thus mimicking various review seminars that Dahlquist had given with self-deprecating titles such as "33 years of numerical instability". Because the key ideas of G-stability, and their consequences, are so important, I will at least give something of their flavour.

If the differential equation $y'(x) = f(x, y(x))$ has the property that $\langle u - v, f(x,u) - f(x,v) \rangle \leq 0$, then two different solutions cannot drift apart and the aim is to identify numerical methods for which two numerical approximation sequences also cannot drift apart. The standard linear multistep formulation turned out to be inconvenient for analysing this question. Hence, Dahlquist introduced "one-leg" methods, and showed how a stability criterion based on these methods should be interpreted for the closely related linear multistep methods. The criterion Dahlquist gave was later extended by other people to apply to other methods. In the case of Runge–Kutta methods, the criterion involves a certain symmetric matrix M, defined in terms of the coefficient arrays for the method, which must be positive semi-definite for satisfactorily stable numerical behaviour. The matrix M eventually acquired a new life: it must be zero for symplectic behaviour, when the Runge–Kutta method is applied to a Hamiltonian problem. Thus the influence of Germund Dahlquist has spread further than he could have guessed.

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

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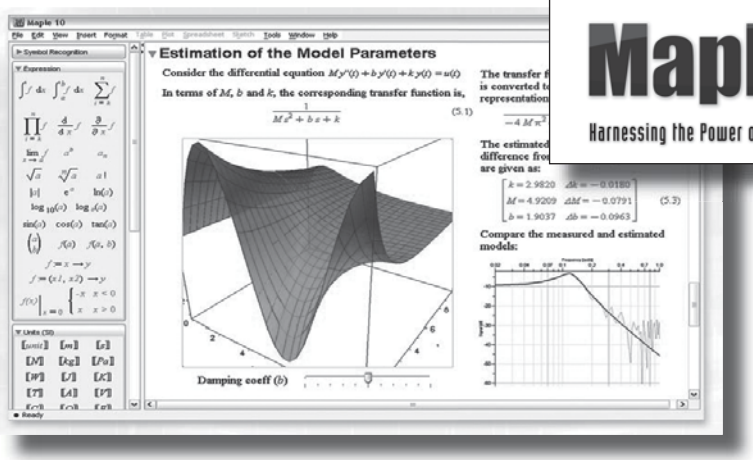

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