NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Contents

PUBLISHER'S NOTICE

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

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However, correspondence should normally be sent to the Secretary:

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Department of Mathematics and Statistics,
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NZMS Council and Officers

President Professor Graeme Wake (University of Canterbury)
Incoming Vice President Professor Rod Downey (Victoria University)
Secretary Dr Charles Semple (University of Canterbury)
Treasurer Dr Rua Murray (University of Waikato)
Councillors Dr Bill Barton (University of Auckland), to 2002
Professor Douglas Bridges (University of Canterbury)
Dr Peter Fenton (University of Otago), to 2003

EDITORIAL

"EVERYWHERE DENSE, BUT MEASURE EPSILON"

One of the ways in which Maori traditions have influenced the whole of New Zealand society is the widespread adoption of the principle that everyone should be allowed to stand up and have their say. We all frequently experience this in every meeting we go to, and although we may moan about it afterwards, I don't think anybody would consider sacrificing the principle. We saw it again at the panel discussion on the State of Mathematics in New Zealand, thoughtfully included by the organisers of the recent Colloquium at the University of Waikato, and reported on by Rua Murray in this issue. One question raised towards the end was that of gender equity—why are there no women on the panel? Where are all the women lecturers?—and thus it is with fingers trembling at the keyboard that I take up the thorny issue of women in mathematics.

Even the most cursory study—such as that undertaken by me in the last few days—reveals that a huge amount of attention has been given to this issue over the years and around the world. Some reading and some discussion has caused my own opinion on New Zealand's record on women in mathematics to range from appalling, to very bad but

about par, to finding some grounds for optimism. Let's begin.

First, the bad news. A quick scan of the NZ universities' web pages (mathematics only) gives a count of 5 women out of 107 staff with grade lecturer and above. (More careful counts have been done by Margaret Morton and Gillian Thornley in 1993 (Newsletter No. 58) and 1997 (No. 70).) On the other hand, 14 out of 17 university tutors are women, some of whom have PhDs. Together with the fact reported by Jeff Hunter at the panel discussion that 23% of the country's PhD students are women, it looks like we are failing to employ those women, or are tracking them into second-grade jobs with heavy teaching loads and little opportunity to develop their research.

On the other hand, our record is not so bad internationally. A very interesting article in the *Notices of the AMS* from January 1999 (*AWM in the 1990s: A Recent History of the Association for Women in Mathematics* by J E Taylor and S M Wiegand; http://www.ams.org/notices/199901/awm.pdf, see also the Association at http://www.awm-math.org) covers pretty well all aspects and shows the heroic efforts undertaken by that organisation. PhD-granting institutions in the United States in 1995 had 45% women undergraduates, 23% women graduate students, and 6% tenured staff, but, notably, 37% women part-time staff. Job-hunting PhDs might believe that affirmative action makes life cruisy for women but there is no evidence at any level to support this. Comparisons to other countries (cold, northern countries like Finland and Switzerland had 2% women staff; warm, southern countries like Italy and Portugal more than 35%, oh, for a beaker full of the warm south) make our profile look very much in line with the United States. It seems that we'd better get cracking and replicate those heroic efforts here.

In fact, someone has. A few phone calls ("Who should I talk to?") lead me to Liz Godfrey, long-time Women in Science and Engineering Advisor for the University of Auckland and now Associate Dean of Engineering. Consider the situation she faced 10 years ago. There were almost no undergraduate women engineers (maybe 4%?), almost no women PhD students, and only one woman engineering lecturer. Now there are 9 women lecturers out of 96 and the undergraduate percentage is up to 20%. How was this brought about? Apart from the existence of her position, already a sign of institutional support, her methods included Girls Open Days, focussing on getting undergraduate numbers up, creating a positive climate in which all these graduates, where ever they ended up, could act as ambassadors, extended job searches in which all staff knew to keep their eyes open for likely applicants, headhunters, and strong encouragement of prospective graduate students. On one occasion women were ranked 1 and 2 for a job, and she was able to get the Dean to create a second position. Incidentally, Liz Godfrey approved of tutor and part-time jobs: provided there's sufficient Head of Department support, these can provide a 'tutor-track' leading to lectureships.

In mathematics we stand at something of a threshold. The last few years have not been good ones for hiring, with shrinking departments and people hanging on to their jobs. This might explain our poor performance recently. But the same demographics mean that the infamous bulge is nearing retirement, creating opportunities for the future. With planning and foresight and flexibility, we should be able to create a soft landing and also ensure good career prospects for some of our excellent graduate students and Aitken Prize winners—55% of whom are women.

Robert McLachlan

PRESIDENT'S COLUMN

NEW ZEALAND MATHEMATICAL SOCIETY

PRESIDENT'S REPORT 1999–2000

This report covers the period from the last NZMS Annual General Meeting in July 1999 to 20 November 2000. The longer period occurred as a result of the decision to hold the 2000 NZ Mathematics Colloquium (at which the NZMS AGM for the year is being held) in November, rather than July.

VISITING LECTURERS

1. The NZMS Visiting Lecturer for 2000 was Professor John Guckenheimer, Cornell University, United States who toured New Zealand during May–June. His area of interest is dynamical systems theory and applications. He also was a visiting Erskine visitor to the University of Canterbury and spoke at the Wellington/Manawatu Applied Mathematics Day 2000. We thank all those involved in coordinating these arrangements. The tour was very successful.

2. Forder Lecturer 2001, has been confirmed as Dr Tom Körner of Cambridge University and will tour New Zealand in July–August 2001. We are seeking British Council support for this visit and Dr Peter Fenton, University of Otago has agreed to act as overall coordinator of this visit. The London Mathematical Society will advise us of a list of possible recommendations for the Forder Lecturer 2003 early in 2001. We are able to make suggestions for this list to the LMS (see note elsewhere).

MEMBERSHIP

We have been actively recruiting members this year and we are urging members to bring membership to the attention of colleagues, students, etc. The promotion of the Society and Mathematics generally remains a priority of Council. Our membership is now 239, up from 226 in 1999. A form for membership is available.

Professors Butcher and Wake have become Accredited Fellows of the Society at the July 1999 meetings. No new applications for accreditations were received in the last year.

Honorary Life Membership was bestowed on Professor David Vere-Jones, founding President of the NZMS on his retirement from Victoria University of Wellington in January 2000. The Society, represented by the President, was privileged to speak on behalf of the Society about David's contribution to New Zealand Mathematics and the Society at a function in his honour in Wellington on 31st January 2000.

NZMS RESEARCH AWARD

The award for 1999 was to Associate-Professor Mike Steel of the University of Canterbury "for his fundamental contributions to the mathematical understanding of phylogeny, demonstrating a capacity for hard creative work in combinatorics and statistics and an excellent understanding of the biological implications of his results".

The outcome of the 2000 Award round will be announced at the Colloquium Dinner on 28th November. The Council approved an independent panel of three leading New Zealand Mathematicians to assist in the recommendation. Thanks to those who assisted us with the process. Nominations for the 2001 Research Award will remain open until 31 March 2001.

AITKEN PRIZE

This prize is for the best talk(s) by a student at the Colloquium. At the July 1999 meeting in Christchurch, the prize was won jointly by:

Britta Basse   University of Canterbury
            "Mathematical modelling for conservation: predator control via secondary poisoning"
Jamie Sneddon University of Auckland
            "Domination conditions for tournaments".

The quality and number (27 in 2000) of student talks is pleasing and augurs well for the future vigour of our subject.

GRANTS Council made the following grants between 1 July 1999 and 20 November 2000:

	$
NZ Journal of Mathematics	3,000
NZ Mathematics Colloquium 1999	2,900
Research and Conference Grants	500
Student Travel Grants	4,000
	$10,400

MATHEMATICAL AND INFORMATION SCIENCES ADVISORY COMMITTEE, RSNZ

1. Council appointed the President and Professor Gaven Martin (Auckland) as the NZMS representatives on this Committee. A meeting was held in March 2000 which discussed among other things

   – The Marsden Fund (Note: there were nine grants from the Mathematical and Information Sciences pool in 2000)
   – Conference Coordination. Professor Jeff Hunter continues as Chair of MISAC for another year until 2001.

2. **Fellowships of the Royal Society of New Zealand**

   In November 2000, the following two members were elected to Fellowships of the Royal Society of New Zealand:

   Professor Douglas Bridges of the University of Canterbury for his work on constructive mathematics;
   Professor Michael Hendy of Massey University for his work on the application of graph theory to

evolutionary trees.

We extend our congratulations. No fellows were elected from the Mathematical Sciences in 1999.

RELATIONSHIP WITH AUSTRALIAN MATHEMATICAL SOCIETY

Agreement was made by the two Presidents to have observers at each others Council meeting. Professor Gaven Martin represented NZMS at the July 2000 meeting of Australian Mathematical Society.

AUSTRALIAN–NEW ZEALAND MATHEMATICS CONVENTION

We have received an invitation to participate in another Convention with our Australian Colleagues. The options are:

  (i) Australian Mathematics Society, "Winter Meeting", Newcastle, September 2002; or

  (ii) within ICIAM 2003, Sydney, 7–11 July 2003.

Option (i) will be in the pattern of the previous such meetings (Christchurch 1978, Sydney 1981, Sydney 1985, Canberra 1988, Auckland 1997) but the timing could be a problem with semester breaks.

Option (ii) will give the opportunity of also meeting simultaneously with Australian Mathematics Society, ANZIAM, OR Society of Australia, and the Australian Computational Techniques groups etc, all within the International Congress of Industrial and Applied Mathematics (ICIAM), which is meeting in the Southern hemisphere for the first time. This conference is being hosted by ANZIAM, as a Division of Australian Mathematics Society.

This will be before the Colloquium Business Meeting in Hamilton on 27th November. (Note: that meeting chose option (ii).)

ACKNOWLEDGEMENTS

1. **Editorship of the Newsletter**
   Professor Mike Hendy completed his six year term as Editor of the Newsletter in December 1999. We thank him most warmly for the excellent job he did in this respect. Council appointed Dr Robert McLachlan, also of Massey University, as Editor to succeed Mike, and we thank Robert for taking up the task so willingly and so well.
2. **Council Members**
   Professor Rob Goldblatt (Outgoing Vice-President), Dr Mick Roberts (Treasurer) and Dr Dennis McCaughan (a Council Member) all complete their terms on Council at this time. We thank them all for their many contributions to the NZMS and to mathematics in New Zealand.

To all those Council Members continuing, we thank you for your ongoing support and look forward to the new members of Council from November 2000.

We note with sadness the deaths this year of long-time NZMS members and active leaders in the mathematical arena: Dr Margaret Morton (University of Auckland) and Associate-Professor Bruce Robson (Lincoln University).

Thank you to all members of NZMS for your support of myself in the role as President.

Graeme Wake
President

LOCAL NEWS

AGRESEARCH
AgResearch
Mathematical Biology

Welcome to Paul Shorten who started work as a Post-Doc with the AgResearch Mathematical Biology Group at Ruakura in September. The Ruakura part of this group attended the 5th International Conference on Complex Systems in Dunedin in November. Meanwhile the Wallaceville section went their separate ways, Mick Roberts to the Mathematics Colloquium at Waikato University, presenting a paper "Diabetes, sloth and obesity: *IPRM* models of population health", and Glenn Fulford to the Australasian Wildlife Management Society Conference in Queenstown presenting a paper "A spatial model for Tb control in possums". Wallaceville has hosted two visitors from the UK, Jane White from the Mathematics Department of the University of Bath spent three weeks working with Mick Roberts in July, and Roger Bowers from the Mathematics Department at Liverpool University spent a day with us in November.

Statistics

Ken Dodds was invited to help teach a course (QTL Mapping I) at the Summer Institute in Statistical Genetics, Raleigh, North Carolina. He also attended the QTL Mapping II module and visited researchers in the Statistical Genetics Program. Ken is the secretary of the Association for Advancement for Animal Breeding and Genetics which is holding its next conference in Queenstown in August 2001. He has been appointed as an associate editor of the Journal of Agricultural, Biological and Environmental Statistics which is published jointly by the American Statistical Association and the International Biometric Society. David Baird visited England in May and June where he continued work on the development of GenStat at Rothamsted. Dave Saville (Lincoln) had a hot, humid week in Tokyo in mid-August at the International Association of Statistical Education Round Table Conference on the Teaching of Statistics to Researchers. He delivered an invited paper "A hands-on, interactive method of teaching statistics to agricultural researchers." This paper described his experiences of running annual winter workshops in statistics over the last 23 years. While in Tokyo, he also presented a paper at the Institute of Statistical Mathematics entitled "Fisher's geometric view of the linear model p-value."

Seminars

Roger Bowers (University of Liverpool), "Adaptive dynamics and the evolution of host resistance to microparasites".

Mick Roberts

UNIVERSITY OF AUCKLAND

Department of Computer Science

Seminars

Dr Paul Bonnington	(Department of Mathematics), "Triangulated graphs".
Professor Walker White	(Cornell University), "Properly Hyperarithmetic algebraic properties".
Dr Paddy Krishnan	(University of Canterbury), "Automatic synthesis of schedulers in timed systems".
Dr David McIntyre	(Department of Mathematics), "Only few graphs have bounded tree width".
Dr Bakhadyr Khoussainov,	"Graph Algorithms", "k-trees and superperfection", and "Superperfect graphs".
Dr Emilia Mendes,	"Hypermedia measurement and prediction".
Dr Frank Stephan	(University of Heidelberg), "Mathematical boundaries of learning".
Klaus-DieterSchew	(MasseyUniversity),"Some thoughts on logical foundations of generalized object-oriented databases".
Sebastian Link	(Massey University), "An arithmetic theory of constructing reinforcement".
Ulrich Guenther,	"A recursive similarity measure for similarity searches in text or DNA strings".
Professor Christian Collberg	(University of Arizona), "AlgoVista—a search engine for computer scientists".

Department of Mathematics

Dr Margaret Morton went to the University of Texas at Austin in October 1999, to deliver a series of seminars on graph theory. But she became unwell there, and was not able to complete that series. She then stayed with a son and daughter in Los Angeles, and in December she was found to be in an advanced stage of cancer. In February 2000 she returned to Auckland with her daughter and two sons, and her brother Professor Donald James came on leave from Pennsylvania State University for the second half of this year. Margaret Morton died on August 31, at the age of 55. An obituary article is published elsewhere in this Newsletter.

Margaret Morton was a member of the committee organizing the conference on Algebraic and Topological Methods

in Graph Theory, to be held in this Department on December 11–15. That conference will now be dedicated to her memory, with some of her colleagues giving lectures about her on Tuesday December 12.

National Radio broadcasts a daily item "Golden Kiwi" about some eminent New Zealander. Each item lasts about four minutes, and it is broadcast a few times during the day. On Sunday October 22 Vaughan Jones was the subject, with the producer interviewing him about his work on knots. In the National Radio science programme "Eureka" on November 12 (repeated on November 13), 15 minutes were devoted to interviewing Leslie C. Woods, graduate from Auckland University College and Emeritus Director of the Mathematics Institute of the University of Oxford. The interview concentrated on his work as consultant on plasma stability to the thermonuclear power project at Culham Laboratory. After 22 years he concluded that the Tokomak design is inherently unstable, and he advised that it should be abandoned. The thermonuclear establishment did not welcome that advice from their long-term consultant!

Saraswathi Kota successfully defended her PhD thesis on the role of affective factors in problem solving. Kerry Richardson successfully defended his PhD thesis on Topological Languages and the Normal Moore Space Conjecture. Another 28 candidates are now working for their PhD degrees.

Recent visitors to the Department include Dr Janet Ainley (Warwick University), Professor Len Bos (University of Calgary), Professor Nathaniel Friedman (University of Albany SUNY), Professor Paul Gartside (Oxford University & the University of Pennsylvania), Professor Koeno Gravemeijer (Freudenthal Institute, The Netherlands), Professor Donald James (Pennsylvania State University), Dr Keith Jones (Southampton University), Dr Zorana Lazarevic (University of Alaska at Fairbanks), Dr Volker Mayer (University of Lille, France), Professor Tomas Pisanski, President of the Slovenian Mathematical Society (Ljubljana University), Dr Seppo Rickmand (University of Helsinki), Professor Mark Watkins (University of Syracuse), and Professor Mark Curtis Wilson (University of Montana).

Dr Abdul Mohamed is now a lecturer at the Sultan Qaboos University of Oman. He will be back in the next millenium, to teach a course on topology in the second semester of 2001.

The Vice-Chancellor's University Development Fund has granted $30,000 to Dr Bill Barton, to support his project on the Department of Mathematics Schools Initiative.

The 2nd Twilight Mathematics Conference was held here on October 6. The speakers included Dr Keith Jones, Murray Britt, Dr Janet Ainley and Professor Koeno Gravemeijer.

The TIME 2000 conference on Technology in Mathematics Education, and the Margaret Morton Memorial conference ATMGT2000 on Algebraic and Topological Methods in Graph Theory, will both be held here on December 11–15. The ANODE 2001 conference on Numerical Methods for Ordinary Differential Equations will be held here on 2001 January 8–12, with the invited speakers Professor Wayne Enright (Toronto), Dr Francesca Mazzia (Bari), Dr Gustaf Soderlind (Lund) and Professor Peter van der Houwen (Amsterdam). The NZMRI Summer Workshop 2001 on Operator Algebras will be held at Stoke, near Nelson, on 2001 January 4–11.

In 1999 Dr Joel Schiff and his wife Christine discovered asteroid 12926, at their computerized backyard observatory. Now that the asteroid's orbit has been established, the International Astronomical Union has accepted their choice of name for it. The have named it Brianmason in honour of Brian Mason, who graduated from Canterbury University College in 1936. He became a leading researcher on meteorites, and he is still active in the Department of Mineral Sciences at the Smithsonian Institution in Washington DC.

Seminars

Professor David Gauld,	"Highlights of TOPO-2000 at Oxford, Ohio".
Professor Jerry Vaughan	(University of North Carolina at Greensboro), "Introduction to linearly stratifiable spaces 1 & 2 & 3 & 4".
Dr Theresa P. Vaughan	(University of North Carolina), "On union-closed families".
Professor Len Bos	(University of Calgary), "A semi-simple method for pricing an option bias on a mean-reverting asset".
Professor Mark Wilson	(University of Montana), "Asymptotics of multivariate sequences: analytic aspects".
Dr Colin Fox,	"Exact MAP states and perfect expectations: Greig Porteous and Seheult revisited".

Dr David McIntyre,	"Finite intervals in posets of regular topologies", and "New insights into Balogh's Dowker space" (2 parts).
Dr Bill Barton, Dr Keith Jones	(Southampton University) & Mac McKenzie, "Reports from the Ninth International Congress on Mathematics Education".
Dr Arkadii Slinko,	"General impossibility theorems and beyond".
Dr Janet Ainley	(University of Warwick), "Exploring the transparency of graphs and graphing".
Dr Denis Labutin	(ANU), "Potential theory for fully nonlinear equations".
Dr Stuart Scott,	"Nearring Theory" (9 lectures).
Greg Oates,	"The impact of graphics calculators in undergraduate mathematics".
Dr John McKenzie,	"A computer program for Identifying Kleinian groups".
Dr Koeno Gravemeijer	(Freudenthal Institute, The Netherlands), "Symbolising and modeling in exploratory data analysis: A report on a study with 12- and 13-year-old students".
Dr Maxine Pfannkuch,	"Statistical Thinking in empirical enquiry", and "Using student evaluations to assess high school mathematics teachers: Looking for the X in exemplary."
Dr Zorana Lazarevic	(University of Alaska, Fairbanks), "Preimages of shrinking spaces", "Introduction to partition relations", and "The work of Aldis" (Aldis Lecture 2000).
Dr Paul Gartside	(Oxford & Pittsburg Universities), "Universal Sets".
John Allan-Rae	(AUT) & Louise White (Rosmini College), "Asian success in our schools - a challenge?".
Kerri Spooner,	"Effective teams; what contributes to good group dynamics in an industry team, compared to those of student mathematics groups".
Dr Harsha Patadia	(The M.S. University of Baroda, India), "A strategy for mastery learning".
Dr Ralph Stohr	(UMIST, Manchester), "Free Lie algebras as modules for finite groups".
Camille Nakhid,	"The cultural and institutional factors responsible for the level of achievement of Pasifika students in secondary school mathematics".
Professor Wilhelm Kaup	(University of Tübin-gen, Germany), "Bounded symmetric domains in finite and infinite dimensions".
Professor Hideki Omori	(Science University of Tokyo), "Generalised Lie groups and applications".
Rosheen Gray, Karyn Woodruffe, &	**Kerri Spooner,** "Reports from the Royal Society Teacher-Fellows in Mathematics in 2000".
Professor Nathaniel Friedman	(University of Albany SUNY), "Construction of mixing transformations for ergodic theory".
Dr Bill Barton,	"A report on the First Brazilian Ethnomathematics Conference".

Department of Statistics

Dr Robert Gentleman has resigned from the Department, and he is now a Professor in the School of Health at Harvard University.

Dr Rachel Fewster, who was a Postdoctoral Fellow here, now has a 3-year contract as Lecturer.

Seminars

Dr Geoff Nicholls	(Department of Mathematics), "The problem of estimating ratios of normalising constants", and "Bridge estimators for Bayes factors".
Associate Professor Brian McArdle,	"Coarse Fishering: the F statistic, likelihood ratios and Bayes factors".
Professor Mark Wilson	(University of Montana), "Probability generating functions for multivariate distributions".
Artemiza Filimon,	"Models of the optimal form of interest rate targeting".
Dr Colin Fox	(Department of Mathematics), "Concert hall acoustics and number theory".
Dr James Sneyd	(Massey University), "Travelling waves of calcium: experiments and bifurcations".
Dr Arkadii Slinko	(Department of Mathematics), "A generalization of the Komlós theorem on random matrices".
Dr Matthias Ehrgott	(Department of Engineering Science), "Multi-criteria combinatorial optimisation".
Dr Mike Steel	(University of Canterbury), "Parsimony, likelihood and the role of models in molecular phylogenetics".
Dr Allen Rodrigo	(School of Biological Sciences), "Modelling the population dynamics of HIV".
Dr Paul Cowpertwait	(Massey University), "A space-time Neyman-Scott model of rainfall and a scaling law for the extreme values".
Tava Olsen	(Department of Engineering Science), "Dynamic scheduling of multi-class systems with setups: fluid limits and lower bounds".

Garry J. Tee

INDUSTRIAL RESEARCH LIMITED

Applied Mathematics Team

Two students have joined us for the summer: Steven Archer, who is a PhD student at Victoria University, has been working with John Burnell and Steven White on their geothermal preprocessor, and Annette McIvor, from Massey University, who is working with Shaun Hendy on modeling atomic force microscopes. Also, we have a German student, Susanne Heinz, from the Stuttgart Technical College, working with Graham Weir on granular mixing problems as part of the practical requirements for her diploma.

Steven White and Warwick Kissling attended the Geothermal Workshop in Auckland in October. Steve is currently attending a workshop at the University of Utah on the sequestration of CO_2 in geologic formations. Graham Weir attended the annual American Institute of Chemical Engineers meeting in Los Angeles in November and was our only representative this year at the Mathematics Colloquium in Hamilton. Shaun Hendy attended the Psi-k 2000 conference on electronic structure calculations, which was held in Schwaebisch Gmund (near Stuttgart, Germany) in August. He also managed to squeeze in visits to the University of Alberta in Canada, Rutgers University in New Jersey, Imperial College in London and the Theoretical Condensed Matter Group at Cambridge University.

Warwick Kissling examined a PhD thesis "Structural Analysis of Radar Meteoroid Orbital Data" by David Galligan at the Department of Physics and Astronomy at Canterbury. He'll now be much better prepared for his own PhD defense, which is looming sometime next year. Warwick continues to keep up his interests in astronomy, and earlier this year was rewarded by having an asteroid named after him! This prime piece of real-estate is now called (4409)Kissling, and orbits the sun at approximately 3 AU.

Shaun Hendy

MASSEY UNIVERSITY

Institute of Fundamental Sciences

Mathematics

"To be or not to be that **was** *the question…".*

Well, the repositioning exercise (the 2000 one…) is now behind us and also a horrible year described by the Principal of the Palmerston North Campus as challenging and successful…. Originally, we had to lose two SL positions but there is reprieve as Robert McKibbin is going to Albany. From Dean:

"Robert is leaving the Institute of Fundamental Sciences at the end of this year on transfer to Albany where he will be positioned in the Institute of Information and Mathematical Sciences. Robert came to Massey University from the University of Auckland in 1991 to join the staff of the Department of Mathematics as a Senior Lecturer. He was promoted to Associate Professor in 1996 and one month later was appointed to the vacant Chair of Applied Mathematics, becoming part of the Institute of Fundamental Sciences in the restructuring of 1998.

Robert's research achievements, particularly in the modelling of geothermal phenomena, are of very high international standing and have added to the research prestige of the Institute. He is Director of the Centre for Mathematical Modelling which will move with him to the Albany campus.

Since 1998 Robert has been the Mathematics Discipline Leader, a role to which he has brought his excellent administrative skills. He has led by example and made a significant contribution at management level in the Institute. His leadership and promotion of the discipline is also recognized more widely; for example, he is Chair of the New Zealand Branch of Australian and New Zealand Industrial and Applied Mathematics. Robert's expertise as a teacher is held in very high regard by students and staff. He has supervised several PhD students at Massey while based on the Turitea campus.

We shall miss you very much in IFS, Robert. Our loss is a major gain for mathematics at Albany. However, your academic activities will, no doubt, transcend administrative boundaries and continue to influence the development of mathematics on the wider scene. We wish you and your family well and look forward to maintaining personal contact with you. Thank you most warmly for your contributions to IFS".

Mike Hendy has nearly completed his 11 month Visiting Professorship at the University of Greifswald, in northern Germany. He will return to PN at the conclusion of their winter semester in February. He has learned a lot about the very different systems of teaching and examining there, particularly impressed with a public PhD defense! Mike had several familiar faces visit for a research workshop he organized in September, with Kathi Huber and Vince Moulton coming from Sweden, and Andreas Dress from Bielefeld. There was a 30% increase in the number of mathematical biology students enrolling for this, the third year that this undergraduate degree has been offered there. Professor Michael Baake, from Tuebingen, has been appointed as the new Professor of BioMathematik, but unfortunately for Mike, will not arrive there until April. Beth and Mike are looking forward to returning to a warmer climate, having endured a dismal European summer!

We welcome back Barbara Holland from her study in Germany. Between April and October of this year Barbara went on a journey to Europe. The trip was mostly funded by the DAAD (German academic exchange program) and enabled her to stay in contact with Mike Hendy who is currently in Greifswald. Barbara also received financial support from a Student Travel Grant, courtesy of RECOMB2000, Andreas Dress in Bielefeld and Vincent Moultan's STINT grant while she was in Sweden.

On the way to Europe Barbara went to the RECOMB2000 (Computational Molecular Biology) conference in Tokyo. Here she presented a talk on "Multiple optima of the maximum likelihood method in phylogenetics". This was also attended by visiting Professor Benny Chor. He was the main author of their paper and made sure Barbara was thoroughly coached for this talk. An interesting feature of the conference was the amount of head-hunting going on by American Biotech companies such as Celera.

While in Europe Barbara spent time in three main centers: Greifswald, Bielefeld and Sundsvall (Sweden) and gave talks at four mini symposia in these places. Topics ranged from "Measuring the rate of evolution using cryopreserved ancient penguin mtDNA", "The utility of Distance Corrections to sequence data", and "Metrics, Ultrametrics and the Farris transformation".

Barbara also attended the international meeting of Classification Societies. This was held in Namur, Belguim in July. They had an invited session on Phylogenetic methods where Barbara gave a talk on "Distance corrections" and apparently ended up do presenting Mike Hendy's talk on "Multiple Optima of Maximum Likelihood" as well.

Robert McLachlan and Matt Perlmutter went to Melbourne for a couple of weeks in September to do research with Reinout Quispel. In addition to the 'tram theorem' (proved on the number 86 tram to Bundoora) they saw Nelson Mandela, Rubin 'The Hurricane' Carter, and cult film icon Wally Shawn. Now, could that have happened in Palmerston North?

Robert McLachlan is organizing an "ANU National Research Symposium in Geometric Integration" to be held in Melbourne December 10–16. These symposia are a valuable source of conference funds, you can get A$7500 for a meeting held in Canberra or A$5000 for a meeting held outside Canberra, assuming you have an Australian colleague. (He thinks A$2500 is a small price to pay to swap Lake Burley-Griffin for Brunswick Street).

Fiona Wharton (nee Taylor) has successfully defended her thesis titled "Search and Rescue Management: Modelling and Development of Heuristic Strategies within a Simulation Environment". Congratulations Fiona!

Padma Senerath recently gained her MSc with her thesis titled "Fundamentals of Riemannian Geometry and its Evolution". Congratulations Padma! Padma intends to carry on into a PhD.

Igor attended the 16th IMACS World Congress, Lausanne, Switzerland, August 21–25, 2000. Then later he attended the 13th International Conference on Domain Decomposition Methods, Lyon, France, October 9–12, 2000, where it rained every day. Thus an excellent time for Mathematics and/or wine tasting.

On the 26th of November a big exodus took place from Palmerston North. At regular intervals cars (fully laden) left for the New Zealand Mathematics Colloquium held in Hamilton. Mike Carter being aware of the possible connection between global warming and CO_2 emission went by train both ways. There was a big attendance from the PN Campus (19) and the total number of Massey delegates was boosted by the Albany Mob. We congratulate Barbara Holland and Patrick Rynhart on winning the Aitken Prize. Well done!

In addition to the Aitken Prizes, Massey made a clean sweep of the inaugural Te Aroha Prize. Out of all the participants, only Charles Little and Robert McLachlan made it to the summit (950m) in the 86 minutes allowed. Well done lads!

Speaking about prizes, Patrick also won the prize for the best presentation in the Mathematical Modelling and Simulation section of the New Zealand Engineering and Technology Postgraduate Conference which was held a week before the Colloquium.

We all enjoyed the Colloquium and wish to thank the organizing (and colleagues) committee for all their hard work.

In September promotions were awarded to Igor Boglaev and Charles Little (within the Senior Lecturer grade) and to Robert McLachlan (to Associate Professor).

Seminars

Professor Robert McKibbin,	"On predicting the distribution of volcanic ash 'fallout'".
Mike Carter,	"Believing the Axioms".
Bruce van-Brunt,	"On a Singular Sturm-Liouville Problem involving an Advanced Functional Differential Equation".
Professor H.G. Roos	(Technical University of Dresden, Germany), "Layer adapted meshes for convection-diffusion problems: robustness, super-convergence, gradient recovery".
Professor Paul Farrell	(Department of Mathematics and Computer Science, Kent University, OH, USA, "Issues in Configuring PC (Beowulf) Clusters".

Graduate Seminar Series

Qian Zou	(Institute of Technology & Engineering, Massey University), "Development of a CFD Model for Simulating Airflow, Heat, and Moisture Transfer in Horticultural Packaging Systems during Produce Cooling".
Paul Gardner,	"The brave New World of ncRNA and the genome Projects".
Mike Meylan	(Institute Of Information and Mathematical Sciences, Massey University, Albany), "Wave Scattering in the Marginal Ice Zone".
Vic Duoba,	"Numerical Solution of Singularly Perturbed Partial Differential Equations".
Mark Johnston	(Landcare Research, Palmerston North), "Models of Gully and Landslide Erosion".

Deborah Kelly,	"Modelling the flight of a hydrothermal eruption ejecta".
Seung-Hee Joo,	"Contact systems and geometric integration".
Barbara Holland,	"A Tree Construction with Bounded Error".
Amsha Nahid,	"Modelling of Poi Dancing".

Marijcke Vlieg-Hulstman

Institute of Information and Mathematical Sciences

Mathematics

James Sneyd recently organised a conference on Calcium Dynamics at the Max Planck Institute for the Physics of Complex Systems, in Dresden, Germany. Approximately 50 scientists, from all parts of the world attended this meeting, which was one of the most significant calcium dynamics conferences this year. Speakers included some of the best-known experimentalists in the field, as well as some of the leading theoreticians. The goal was to bring together experimentalists and theoreticians in an informal atmosphere so as to stimulate interdisciplinary interactions and collaborations. From that point of view the meeting appears to have been a great success. Plans are already underway to repeat the conference on a regular basis, the next time being in two or three years. James was the ANZIAM speaker at NZMC 2000, held at the University of Waikato.

Mike Meylan has been given a one month fellowship to visit the Ship Research Institute in Japan to pursue his research on the effect of waves on ice sheets. He is also visiting Kyushu University for one week.

Shaun Cooper is well into his leave at the University of Michigan. He writes that things are going well there with the three projects he is working on. He attended a q-series conference in Illinois at the end of October. He is due back, fully refreshed we hope, in February 2001.

This is the final contribution written by Adrian Swift, your Albany correspondent. As many of you know, I have decided to retire to Waiheke Island at the end of the year. No doubt I will be able to persuade one of my colleagues to take over next year.

Robert McLachlan	(Institute of Fundamental Sciences, Massey University–Turitea Campus), "What is geometric integration?"

Adrian Swift

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

The new Bachelor of Applied Science degree has been "launched" appropriately. There are nine majors available in this four-year degree programme which links applied science and technology with business skills. The Department will teach papers for the Computational Modelling major.

Vernon Squire (our leader) has recently been awarded a Marsden Grant that includes a research fellow and subcontracts to Auckland and Massey. (As Vernon is overseas at present details are scarce.)

A new scholarship – the Beverly Trust Fund PhD Scholarship – has been established this year by the Beverly Trust Fund and the Department of Mathematics and Statistics to encourage and support Doctoral students in the study of Mathematics and Statistics. The scholarship comprises a $13,000 living allowance and the payment of domestic tuition fees. It has a tenure of 3 years or until the thesis is submitted (whichever period is the shorter). Applications are sought from students wishing to enrol for the PhD degree in Mathematics or Statistics in an area of research that complements existing research strengths in the Department.

Michael Albert has resigned his Senior Teaching Fellow position to take up a lecturing position in the Department of Computer Science here at Otago. He is not moving far – just a couple of buildings away! Michael has been a member of the NZIMO Committee and this year was Team Leader at the recent IMO in Korea (see his report below).

Tony Dixon is going further afield – to Perth. Tony has been employed as a Postdoctoral Fellow working with Vernon Squire. One of Tony's claims to fame is his organisation of the Rugby Super 12 competition within the Department. We hope he can continue it next year by email!

Darryl MacKenzie has resigned his Statistics Research Assistant position to go to the Patuxent Wildlife Research Center in Laurel, Maryland, USA. Darryl will continue with his study for a PhD in Statistics at Otago, however.

>From July 14–26 Michael Albert attended the 41st International Mathematical Olympiad, held in Taejon, Korea, as the leader of the New Zealand team. Prior to the examinations themselves, the leaders are sequestered to select problems from a short list prepared by the host country. The leaders' site was a training facility for government service workers in information and communications (at least that was the official story). It was brand new, and a combination between a university campus, and a luxury hotel.

The prettiest problem on this year's paper was the following (paraphrased for compactness): There are n fleas arranged in a line. A flea can jump from left to right over any other flea, and moves a distance beyond that flea equal to s times the original distance between the two fleas. For what values of n and s is it possible for all the fleas to move an arbitrary distance to the right?

Our team results this year were somewhat disappointing, with only one honourable mention among the six team members. In part this was due to the fact that we had a very young team, and in part due to the difficulty of the paper. The Korean hosts organized an excellent event, and Michael commends them for their efforts.

John Clark attended the 3rd International Palestinian Conference in Bethlehem, Palestine, from 9–11 August. He had earlier attended the 2nd Conference in the series back in 1998 and was pleased to see how much relations had improved between the Palestinians and the Israelis in the two year gap. The recent violence has come as quite a shock to him.

John Enlow, a PhD student, attended the 16th IMACS World Congress 2000 in Switzerland in the last week of August this year. Set in the beautiful town of Laussane, Switzerland, the conference attracted around 500 mathematicians and computer scientists. A wide range of interesting and informative talks were given on mathematics and computers in simulation during the days, and the evenings were filled with social events such as a cruise on Lake Geneva and a concert by the Mont-Blanc Symphony Orchestra. John gave a talk on mathematical modelling of surfactant liquid crystals, and enjoyed receiving positive feedback and helpful suggestions on his work.

David Fletcher visited the Macaulay Land Use Research Institute in Aberdeen in September, working with Jon Yearsley on sensitivity analysis for density-dependent population models. During his stay he enjoyed the delights of hill climbing and witnessed the national panic arising from the petrol blockades. He then went to EURING 2000, the regular conference on mark-recapture data, held at Point Reyes, near San Francisco, stopping off en route to give seminars, (and enjoy the local wildlife) in Colorado and Wyoming. This stopover allowed him to visit Bryan Manly, recently settled into his new life as a consultant in Laramie. At EURING 2000 he presented work jointly with Richard Barker and Paul Scofield, a PhD student, on estimating density-dependence using mark-recapture data. The location of the conference was eerily similar to the Otago Peninsula (without the fresh winds!) and included the delights of watching humming birds at close range.

John Harraway was invited to attend the IASE Round Table Conference on Training Researchers in the Use of Statistics hosted by the Japanese Institute of Statistical Mathematics in Tokyo, August 7–11, 2000. The Conference with 40 participants from 18 countries discussed appropriate training of researchers in different subject areas, how technology is affecting the training of researchers, the role of consulting as part of the teaching and learning process and international experiences in the training of researchers in a broad range of subjects.

Derek Holton attended the 9th International Congress on Mathematical Education (ICME), Tokyo, Japan. This conference is held every four years and usually attracts thousands of participants from all countries and all levels of education. This year the numbers were down a little but probably because people were concerned at the cost. The conference itself was held in a conference complex that had multi-storey hotels (at ridiculous places) and a conference area that would have covered downtown Dunedin.

He says, "Oh yes, and the conference was good as usual for talking to people and catching up with old friends and colleagues. I'm afraid for me the conference started off slowly – I wasn't all that impressed by the first day. However there were some later plenary sessions that were quite outstanding."

Derek also attended the meeting in Boston for a Report on Trends in International Mathematics and Science Study. TIMSS has now changed its meaning somewhat but the effect for certain school students will be much the same. An expert panel met in Boston for three days recently to look into the 'curriculum' for the 2003 study that will affect 'grades' 4 and 8. About 30 countries will most likely take part. He says, "Again this meeting, though of course hard work, was of most value to me personally because of the people that I was able to meet and talk to. The business is to be followed up by work 'at home' looking at possible problems, and then another 3-day meeting in Amsterdam in May. You can see that it's a terrible committee to be on."

Seminars

 Ruben Roa,   "Combining geostatistics and mixture distribution analysis to map the age structure of a marine

Christopher Small	(Department of Statistics, University of Waterloo, Ontario, Canada), "Anomalous solutions in statistical estimation: examples and home-brewed remedies".
Paul Bonnington	(Department of Mathematics, University of Auckland), "Exponential families of non-isomorphic triangulations of complete graphs".
Colin Fox	(Department of Mathematics, University of Auckland), "The MAP state".
Anthony R. Olsen	(USEPA Western Ecology Division, Corvallis, Oregon, USA), "National Environmental Statistics: Importance of monitoring designs based on probability surveys".
Samuel Manda	(Department of Statistics, University of Auckland), "A comparison of methods for analysing a nested frailty model to child survival in Malawi".
Kaye Stacey	(University of Melbourne), "How students think about decimals".
Bruce van Brunt	(Massey University), "Some generalizations to the pantograph equation".
John Enlow,	"Mathematical Modelling of Surfactant Liquid Crystal X-ray Diffraction".
Dave Elkin,	"Paths in Forests".
Jean-Dominique Lebreton	(Centre d'Ecologie Fonctionnelle et Evolutive, Centre National de la Recherche Scientifique, Montpellier, France), "Multistratum recapture models: modelling incomplete individual histories".
Jean-Dominique Lebreton	(Centre d'Ecologie Fonctionnelle et Evolutive, Centre National de la Recherche Scientifique, Montpellier, France), "Demographic Models for Subdivided Populations".

Lenette Grant

UNIVERSITY OF WAIKATO

Department of Mathematics

Most of us are now recovering from the running of the 2000 Colloquium. We're glad that so many in the mathematical community came to join us for this annual event. A report on the Colloquium appears elsewhere in this issue.

The Colloquium was certainly successful for us in terms of the Aitken prize. Congratulations go to Sivajah Somasundaram for being one of the winners of this prize. Also, Frances Kuo was highly commended.

Congratulations to Ian and Alison Hawthorn on the birth of their son, Jonathan on October 9. Jonathan weighed 8lb 6oz (or 3.8 kg) at birth.

Congratulations also to Warren Moors and Rua Murray. With effect from 1 February next year, Warren will become a Senior Lecturer and Rua will be above the bar on the Lecturer's scale.

Our university will begin offering a Bachelor of Engineering degree from next year. Our department will be involved with the engineering science programme and in the mathematics required for the other programmes in the BE. The fact that the BE degree is being offered is due in no small part to the hard work of Kevin Broughan who was deeply involved in all the processes and procedures leading to the degree's approval.

Alfred Sneyd is still on study leave, but is now physically back here after having spent four months in France.

Matthew Pearce recently completed his MSc. He is now on a PhD scholarship doing postgraduate studies at Bristol University in the UK.

Pavel Winternitz will be visiting Ernie Kalnins for over three weeks in December. This visit is supported by Ernie's Marsden grant.

Seminars

M. Faausu,	"Two aspects of dynamical systems in their application to economic modelling".
K. Shanks,	"Arbitrage theory and pricing project".
J. Kang,	"Economic significance of the Frobenius root".
G. Tee	(University of Auckland), "Traditional Chinese mathematics".
M. Pearce,	"The stochastic Korteweg-de Vries equation".
N. Cherry	(Lincoln University), "Evidence that electromagnetic radiation is genotoxic: The implications for the epidemiology of cancer and cardiac, neurological and reproductive effects".
S. Smith	(University of Waterloo), "Killing spinors and integrability for systems of complex linear PDEs".
M. Wilson	(University of Montana), "Asymptotics of multivariate sequences".

Stephen Joe

Department of Statistics

The second half of 2000 has been relatively uneventful. Nye John, Murray Jorgensen and James Curran have all spent short periods overseas, Nye and Murray in Australia and James in Northern America. Judi McWhirter attended the one-day NZ Statistical Association Annual Conference, held in Christchurch in September. Lyn Hunt has returned from Sabbatical, part of which she spent at The University of Queensland working with Professor Kaye Basford. David Whitaker will be on leave during the first half of 2001.

The Department welcomes Khange Zuma who has arrived from South Africa to commence his PhD with Bill Bolstad. Khange has an MSc in Biostatistics from Limburgs University, Belgium.

Bill Bolstad, Lyn Hunt, Murray Jorgensen and Khange Zuma have recently attended the Biostatistics Workshop on Generalised Linear Models, which was run by the The Clinical Trials Research Unit, Faculty of Medicine, University of Auckland.

Seminars

Dr David Fournier	(Otter Research, Victoria, British Columbia), "Automatic differentiation (AD) - Why doesn't everyone do it?"
Dr Matthias Ehrgott	(Engineering Science Department, University of Auckland), "Multiple objective combinatorial optimization."
Professor J A John,	"Updating formulae in an analysis of variance model."
Dr James Curran,	"Statistical problems in forensic science."
Dr Murray Jorgensen,	"Using multinomial mixture models to cluster Internet traffic."
Dr D. Raghavarao	(Temple University, USA), "Some applications of orthogonal arrays."

Judi McWhirter

VICTORIA UNIVERSITY OF WELLINGTON

School of Mathematical and Computing

Sciences

Rod Downey was in the midwest (Notre Dame) visiting Peter Cholak, who was once a postdoc with Rod, and is now in a tenured position there. Denis Hirschfeldt has agreed to stay at Victoria University of Wellington till January, before leaving for Chicago.

Geoff Laforte from Western Florida will visit for a month in December.

In June Megan Clark went to the United Kingdom on a British Council sponsored visit to work at the University of the South Bank and the Open University on a joint NZ-UK project on graphics calculators also involving Bill Barton and Mike Campbell from Auckland University. In August Megan was invited to give a Regular Lecture at the 8th International congress on Mathematics Education on the effects of expectation and cultural misunderstanding on mathematics performance and participation. One of Megan's PhD students, Fiona Walls also gave a poster presentation at this conference on her work tracking and monitoring the progress in mathematics of a group of 7 year olds for three years. Also at this conference Megan was elected one of the co-editors (with Sharleen Forbes of Statistics New Zealand) of the Newsletter of the International Organisation of Women in Mathematics.

Megan has been appointed to the Numeracy Development Project Reference Group by the Ministry of Education. In her capacity as Bevan Werry Fellow for 1999/2000 she has given addresses to the Waikato Mathematics Association and the Taranaki Mathematics Association in October on her work with Maori and Pacific Island students of mathematics.

Dr Janet Ainly of Warwick University visited the Mathematics Education Centre in October and gave a seminar on Graphing as a Computer-Mediated Tool.

Two MSc students in the School gave presentations at the Wellington Mathematics Association professional development day on 28 October: Robin Averill on her investigation into the adequacy of New Zealand Secondary Schools Schemes of Work for Year 9 Mathematics and Andrew Tideswell on his work with Graphics Calculators. Andrew is studying for his MSc under Lindsay Johnston on a Study Award for Teachers.

The Statistics and Operations Research Group welcomed the arrival of I-Ming Liu in July. I-Ming comes to us from Waikato with expertise in categorical data and new twins! We are very pleased to have her with us. She is currently working on a Marsden project in Linguistics with Professor Laurie Bauer.

Vladimir Pestov was a fully supported invited speaker at the International Conference on Infinite Dimensional Lie Groups in Geometry and Representation Theory, held at Howard University (Washington, D.C.) from August 17 to 21. Afterwards he visited Thierry Giordano at the University of Ottawa for a few days for joint work. He also spent a week at the University of New South Wales collaborating with Michael Cowling, and another week with the ANU Data Mining Group. From late September on, Vladimir has spent one month on a visiting position at the Institut des Hautes Études Scientifiques (l'IHES) in Bures-sur-Yvette as a guest of Misha Gromov. One of the most interesting things going on at l'IHES right now is a new programme on functional genomics set up by Gromov in collaboration with Alessandra Carbone and François Képès, and in accordance with Gromov's conviction that modern mathematics needs to look for cardinally new applications. The details of the programme can be found at: http://www.ihes.fr/manifestation/Sgenomique.html. After a brief visit to the Database Group of the University of Bologna, Vladimir has come back to VUW in time to do prodigious amounts of marking, as well as to work together with Finlay Thompson and Oscar Adolfo Sanchez Valenzuela (Centro de Invstigación en Matemáticas, Guanajuato, Mexico), on unitary representations of supergroups.

Finlay Thompson spent the first week of October working in Portugal with Marco Mackaay and Roger Piken on non-Abelian gerbes and related ideas around the differential geometrical concept of 2-holonomy. He also gave an invited talk to the IX th Oporto Meeting on Geometry Topology and Physics. Afterwards Finlay stayed in Trieste, Italy, working with Ugo Bruzzo and others at SISSA, where he gave another seminar. The last week of his stay coincided with the Workshop on Algebraic Geometry and Physics 2000 (WAGP2000). Support was provided by Universidade de Lisboa, SISSA and the Marsden project on Supergeometry.

A number of us attended the New Zealand Mathematics Colloquium at the University of Waikato late in November. Student talks were presented by Young Hong, Steven Archer, Todd Rangiwhetu, and Guohua Wu. Other talks came from Finlay Thompson, Mark McGuinness, and John Harper. And what a well-organised Colloquium this was, with transport to and from the airport laid on, accommodation all organised, and great food for morning and afternoon teas. The 40 minute tea breaks were an excellent chance to catch up with old(ish) friends.

Kerry Landman from the University of Melbourne visited Mark McGuinness for a week in November, to work on cooking sloppy rice and on solar radiation in sea ice. Mark is planning to visit Pat Langhorne at the University of Otago in December to discuss travelling brine pockets in sea ice, and will attend the Mathematics-in-Industry Study Group (together with Young Hong) in Adelaide late in January, followed by the ANZIAM meeting in the Barossa Valley.

Seminars

| **Arkady Leiderman** | (Ben-Gurion University of the Negev, Israel), "Kolmogorov's superposition theorem and its applications". |

John Hine,	"Role Based Access Control in Large Distributed Systems".
Carroll Morgan (UNSW), Annabelle McIver, Jeff Sanders (Oxford),	"Lectures on Probability and Computing".
Professor Rick Thomas	(University of Leicester), "Automatic groups and semigroups".
Dr Barry Blundell,	"Volumetric Visualisation: the past, present and future".
Walker White	(VUW-SMCS and the University of Dallas), "Properly Hyperarithmetic Algebraic Properties".
Professor Klaus-Dieter Schewe	(Information Systems, Massey, PN), "Some Thoughts on Logical Foundations of Generalized Object Oriented Databases".
Sebastian Link	(IS, Massey, PN), "An Arithmetic Theory of Consistency Enforcement".
James Noble,	"Exclusion for Composite Objects".
Vladimir Krichtal	(Transpower New Zealand Ltd), "The Feasibility of a Successive Linearisation (SL) approach to Solve the SPD Non-Physical Losses Problem".
Professor D. Raghavarao	(Department of Sta-tistics, Temple University, Philadelphia), "Effect of Patient/Investigator Perception and Bias on commonly used tests in Double Blind Studies".
Petr Hlineny,	"Crossing-Critical Graphs have Bounded Path-width".
Jim Neyland,	"The Legislative Narrative in Mathematics Education: Towards an Ethical Critique".
Professor Dirk van Dalen	(Utrecht University), "The Mathematical Universe According to Brouwer".
Dr Janet Ainley	(Institute of Education, University of Warwick), "Graphing As A Computer-Mediated Tool".
Professor Frank Stephan,	"Decisive Learning".
Professor Ian H. Witten	(University of Waikato), "Browsing around a digital library".
Denis R. Hirschfeldt	"The Structure of the Solovay Degrees of Computably Enumerable Reals".
O.A. Sanchez Valenzuela	(CIMAT, Guanajuato, Mexico), "The physical ideas behind supersymmetry".
A. Rod Gover	(University of Auckland), "Electromagnetism, Elliptic Systems and Tractor Calculus".
Hideki Omori	(Science University of Tokyo), "One must break symmetry in order to keep associativity (An introduction to non-commutative differential geometry)".
Professor Vaughan Jones	(University of California, Berkeley), "Operator algebras I, II & III".
Stuart Madnick	(Sloan School of Management, MIT), "The Challenge of Large-Scale Semantic Heterogeneity".

Neville Davies (Nottingham Trent University), "Detecting outliers in time series without having to fit models".

Kev Salikhov (Director, Kazan Physical-Technical Institute), "Quantum Computing".

Mark McGuinness

THE CRAWLER

The *Newsletters* are now back on the Web, at http://ifs.massey.ac.nz/mathnews/NZMSnews.htm, although we had trouble finding the sources of some of the old ones. I hope in the future this may be a useful searchable resource.

News of the untimely deaths of two New Zealand mathematicians reminded me of two other recent deaths that could be said to be untimely. On 31 July the brilliant Caltech harmonic analyst Thomas Wolff was killed in a car crash in Bakersfield, California, aged only 46. An obituary and moving tribute can be found at http://www.math.caltech.edu/wolffobit.html. At the other end of the life table, Dirk Struik died on 21 October aged 106. (Many of you will know his classic text *Lectures on Classical Differential Geometry*.) Professor Struik must be one of the few scientists to speak at their own 100th birthday celebrations! One daughter, Rebekka, was a mathematician at the University of Colorado when I worked there in the early 90's—even she was quite old then. I was intrigued to read at http://www-math.mit.edu/people/struik-obituary.html that another daughter, Gwendolyn Bray, is an ecologist living in New Zealand.

Mathematics was in the headlines in NZ recently, starting with an opinion piece by Derek Holton in the New Zealand Herald which prompted a peurile and offensive editorial in reply. Two Auckland staff members took on the challenge of tearing this to shreds, presumably after cooling off for at least a little while. I've archived the debate at http:/www.massey.ac.nz/~RMcLachl/herald.html.

Others have also been writing letters. I read in the "Math in the News" digest run by the American Mathematical Society (http://www.ams.org/new-in-math/mathdigest/index.html) that William Thurston (UC Davis) had written to the New York Times on 6 October. A search tracked down the letter:

> As a mathematician, I was interested when, in the debate, George W. Bush described Al Gore's economic figures as "fuzzy math" (front page, Oct. 4). But I was chagrined when Mr. Bush left it at that. Although he repeated the phrase several times, he never discussed specific problems with Mr. Gore's reasoning or his figures, nor did he offer any alternatives. I gradually came to understand that by "fuzzy math" Mr. Bush meant, "Math is confusing and fuzzy, so ignore it."
>
> This is dismaying to see in a man who says he will be a leader of educational reform. We can at least be thankful that if elected, Mr. Bush intends to assemble panels of experts that will presumably know how to work out numbers when economic crises arise.

There's a brilliant site at the MSRI (www.msri.org) where they have archived streaming video versions of hundreds of their seminars ranging back over several years. At last something to use that G4 Mac the department bought you for. I had a look at one that I had enjoyed live, at a *Mathematics in the Media* conference in 1998, a talk by Larry Gonick of *A Cartoon History of the Universe* fame, himself a Harvard mathematics PhD dropout. I jumped at the chance to see one of my heroes in the flesh! He starts out telling the following story:

This is a story about the death of Archimedes. Archimedes lived about 200BC in Syracuse, a huge Greek city in Sicily, and at that time the Romans were expanding their empire, and they had besieged and finally capture Syracuse. And the story goes, as it's come down to us, that Archimedes was sitting—I guess I'll make him reclining—doodling, doing some geometry in the sand, when a Roman soldier came and said, "Hey you, get up!" Archimedes said, "Just a minute, let me finish what I'm working on," and the soldier killed him, cut his head off. And that's the story that's come down to us, and it has a moral that goes with it. And the moral is, Greeks with their theoretical understanding of mathematics, were good, the Romans were meatheaded, only interested in engineering, who didn't appreciate genius, and the guy couldn't recognize what was in front of him.

Also, this is an image of the mathematician, somebody who's wrapped up in pure geometry—Archimedes is so wrapped up in pure geometry he doesn't notice there's a sword descending on his head. Now, how many of you know the whole story? The *rest* of the story is that Archimedes was a great engineer, there's the Archimedes screw and he discovered the principle of the lever, and in fact, he was close to the King or Tyrant of Syracuse—he was responsible for building the defensive engines that held the Romans off for three years. So the Romans had a good deal of reason to be angry with him. And for all we know, what he was doing down here was designing some gear ratios—he may have been working on some engineering drawing for some last ditch defense. Who knows? The point is, he was not a pure mathematician lost in thought. I'd like to use that as a way of thinking about mathematics and mathematicians. The final thing about the story is, it's been spun in a certain way. So this suggests that behind the Roman soldier there was an observer, a journalist if you will, who was taking it all down. Now that journalist of course spun it in this particular way, and left out the details.

Shame on us all at the Colloquium for not shouting out "14" in unison when Vaughan Jones asked for the next number in the sequence 1, 1, 2, 5. (OK, it's not much to go on, but given that he was asking, there could only be one reply.) They are of course the famous Catalan numbers, and the On-Line Encyclopedia of Integer Sequences (http://akpublic.research.att.com/ ~njas/sequences/index.html) reveals a thousand different applications, including some nice pictorial interpretations at http://forum.swarthmore.edu /advanced/robertd/catalan.html. I know I should have known, since a computational linguist asked me just a few months ago about how many ways parenthesis could be inserted in a sentence in order to score different parsings. Again, the Catalan numbers.

Well Paul Erdös may have worked productively until 83 (and Dirk Struik until 106) but for most of us, the Key Performance Indicators would have tailed off well before then. To see if you're over the hill, check out "Are Mathematicians Past Their Prime at 35?", an article from the Chronicle for Higher Education, sent in by alert reader Matt Perlmutter (aged 31), at http://www.massey.ac.nz/~RMcLachl/overthehill.html.

Robert McLachlan, R.McLachlan@massey.ac.nz

MATHEMATICS IN NEW ZEALAND: MORE THAN YOU EXPECT

—report of a panel discussion held at the University of Waikato during NZMC2000

This year's Mathematics Colloquium featured a new attraction: a panel discussion about professional issues for mathematicians in New Zealand, chaired by Robert McLachlan and entitled "The state of mathematics in New Zealand". The Colloquium committee convened this event in response to the lingering feeling—shared by many—that our jobs are getting gradually harder, and that a widening gap is opening between mathematics in New Zealand and the rest of the world. Perhaps the most negative picture one could distill from the proceedings is that our institutions are given insufficient money, which is then distributed inequitably and spent badly on educating ever decreasing numbers of graduating students of steadily falling quality. If this is the background picture, then it is my great pleasure to report that mathematics in New Zealand is—like recently re-branded Hamilton—more than you expect.

The format of the session was a panel discussion, chaired by Robert McLachlan (Massey). The panellists were: Professor Jeff Hunter (Massey at Albany, Convener of RSNZ Mathematical and Information Sciences advisory committee), Professor Vaughan Jones (UC Berkeley, Fields Medallist), Professor Ivan Reilly (Auckland), Dr Mick Roberts (AgResearch), and Professor Graeme Wake (Canterbury, NZMS President). Each panellist made a brief presentation about their views of the state of mathematics in NZ. Approximately 45 minutes of discussion followed.

Several factors were identified which negatively influence the mathematical environment in New Zealand. A recurrent theme was that there is simply not enough money put into the mathematical sciences in New Zealand; relative to OECD averages, the NZ government spends a low proportion of GDP on research, NZ industries under-invest in research, and the teaching of mathematics is under-supported (Jeff Hunter quoted a recent UK study in which the actual cost of delivering mathematics-based teaching programmes was found to be 28% higher than courses in the humanities, whereas no funding differential exists in NZ). Moreover, the EFTS based funding system for education distorts the distribution of money within institutions. A number of participants also mentioned that mathematics is not highly valued in New Zealand society (Vaughan Jones pointed out that this is in marked contrast to the United States and other OECD economies), and that industry take-up of mathematics-based research is low (Graeme Wake). Mick Roberts observed that this is not because NZ has no need for mathematics- based activities, but is more likely caused by many practitioners disguising (or fudging) the mathematical content of the work they do (I recall a description of most "risk analysts" in NZ essentially being "people in suits applying first-year probability incorrectly"). Finally, when it comes to Universities, two demographic factors were emphasised: 1/ a very large proportion of academic staff are male, pakeha, and will reach retirement age within the next ten years; 2/ that demand for higher education has increased dramatically over the last few decades (from 5% of the school-leaving cohort in 1960, to around 30% today). One consequence of this (clearly elucidated by Ivan Reilly) is that the job of an academic mathematician is now (or ought to be) very different to what it has historically been.

Beyond the difficulties mentioned above, further problems are lurking on the horizon. Our government's enthusiasm for the "knowledge economy" has the potential to direct research funds away from pedagogical research (presently funded by PGSF and Marsden) towards more explicitly "product oriented" technological development. This may well diminish mathematics funding. There is also impending danger of a staffing crisis in our universities. Since most OECD economies have a similarly imminent retirement bulge, international demand for qualified and competent academic staff has begun to increase. With other economies and societies giving higher value to mathematics than is presently the case in New Zealand, our ability to attract and retain good staff is going to be severely compromised. This risk is somewhat ironic, since the large number of student attendees at this year's Colloquium illustrated that we are now graduating good quality research students in quite high numbers. These students quite rightly worry about where their jobs are going to come from; at this juncture the answer probably lies in good quality Universities and high-tech industries in other countries.

Of particular concern to several participants was the sharp "pyramid" of student distribution. In spite of a very large first year student EFTS base, most mathematics departments in NZ graduate a small number of under-graduate students each year. Moreover, many of these graduates do not find themselves well-equipped with marketable employment skills, and so return to further study almost by default. Consequently, we maintain elaborate, good quality post-graduate teaching programs for a comparatively small number of students. Some contributors expressed the view that these programmes consume a disproportionate share of teaching funds, at the expense of undergraduate programmes. If this is so, then university mathematics departments must bear some responsibility for the state of things.

However, like many attendees of this discussion, I believe we have every reason to be optimistic. While mathematics has seen a steady decrease in graduating students, the number of students taking mathematics-based degree programmes (Engineering, Computer Science, Information Technology, and even some variants of Business) has sharply risen over the last five years. This, together with the rise in post-graduate student numbers in the mathematical sciences means that New Zealand ought to be en route to a more educated and "high-tech" society; if those of us in university mathematics departments can impart to this increasing pool of students an enduring enjoyment and respect of mathematics, then our future should be very secure indeed. Some other reasons for optimism are already here. Although the Marsden Fund is intensely competitive and disburses a comparatively small total sum, a lot of good research is done with that money; this point was made by several participants. Mathematics is in very good shape internationally (a point made by several panellists and speakers from the floor), and this will eventually flow through to NZ; indeed, the public profile of science has already begun to increase here with publicity around the "knowledge economy" and the Royal Commission on Genetic Engineering (Mick Roberts).

Marston Conder reported that the government's Tertiary Education Advisory Commission (TEAC) will likely recommend some changes to the present EFTS based funding system for universities, and that the importance of research-based teaching in universities is likely to be emphasised—perhaps with additional money to follow.

Overall, the colloquium committee feel that this session was immensely useful in airing many of the issues that we face as mathematicians in New Zealand today. In spite of the many external challenges which were identified during the discussion, it is clear that the state of mathematics in New Zealand is not too bad. Indeed, in the Universities, we are also facing some opportunities: we have a large potentially captive audience for mathematics—we need to teach them things that they genuinely enjoy and respect. We also need to explore ways of securing for New Zealand the talents of the many able PhD students and postdocs that we now have.

Rua Murray

BOOK REVIEWS

SPRINGER-VERLAG PUBLICATIONS

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

<div align="right">

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

</div>

Aldous JM, Graphs and applications. 444pp.

Arnold D, Abelian groups and representations of finite partially ordered sets. (CMS Books in Mathematics, 2) 244pp.

Bao D, An introduction to Riemann-Finsler geometry. (Graduate Texts in Mathematics, 200) 431pp.

Bapat RB, Linear algebra and linear models. (2nd ed) (Universitext) 130pp.

Baumann G, Symmetry analysis of differential equation with Mathematica. 521pp.

Borwein JM, Convex analysis and nonlinear optimization. (CMS Books in Mathematics, 3) 273pp.

Bressoud D, A course in computational number theory. 367pp.

Buminovich LA, Dynamical systems, ergodic theory and applications. (2nd ed of *Dynamical systems II*) (Encyclopaedia of Mathematical Sciences, 100)) 459pp.

Burger E, The heart of mathematics: a guide to effective thinking. (Textbooks in the Mathematical Sciences) 680pp.

Bürgmisser P, Completeness and reduction in algebraic complexity theory. (Algorithms and Computation in Mathematics, 7) 168pp.

Carter M and van Brunt B, The Lebesgue-Stieltjes integral: a practical introduction. (Undergraduate Texts in Mathematics) 228 pp.

Diestel R, Graph theory. (Graduate Texts in Mathematics, 173) 313pp.

Euler L, Foundations of differential calculus. 194pp.

Gerhard J, MuPAD tutorial. 361pp.

Harris JM, Combinatorics and graph theory. (Undergraduate Texts in Mathematics) 250pp.

Hartshorne R, Geometry: Euclid and beyond. 526pp.

Hawkins T, Emergence of the theory of Lie groups. (Sources and Studies in the History of Mathematics and Physical Sciences) 564pp.

Hedenmalm H, Theory of Bergman spaces. (Graduate Texts in Mathematics, 199) 286pp.

Herman J, Equations and inequalities: elementary problems and theorems in algebra and number theory. (CMS Books in Mathematics, 1) 344pp.

Hindry M, Diophantine geometry. (Graduate Texts in Mathematics, 201) 558pp.

Jones GA, Information and coding theory. (Springer Undergraduate Mathematics Series) 210pp.

Korte B, Combinatorial optimization: theory and algorithms. (Algorithms and Combinatorics, 21) 530pp.

Lee JM, Introduction to topological manifolds. (Graduate Texts in Mathematics, 202) 385pp.

Lemmermeyer F, Reciprocity laws: from Euler to Einstein. (Springer Monographs in Mathematics) 487pp.

McCarthy JM, Geometric design of linkages. (Interdisciplinary Applied Mathematics, 11) 320pp.

Mei Z, Numerical bifurcation analysis for reaction-diffusion equations. (Springer Series in computational Mathematics, 28) 414pp.

Naber GL, Topology, geometry, and gauge fields: interactions. (Applied Mathematical Sciences, 141) 443pp.

Narkiewicz W, The development of number theory: from Euclid to Hardy and Littlewood. (Springer Monographs in Mathematics) 448pp.

Osborne MS, Basic homological algebra. (Graduate Texts in Mathematics, 196) 365pp.

Pelsser AAJ, Efficient methods for valuing interest rate derivatives. (Springer Finance) 172pp.

Poizat B, A course in model theory. (Universitext) 443pp.

Quarteroni A, Numerical mathematics. Texts in Applied Mathematics, 37) 654pp.

Ribenboim P, My numbers, my friends: popular lectures on number theory. 375pp.

Ribes L, Profinite groups. (Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge, 40) 435pp.

Robert AM, A course in p-adic analysis. (Graduate Texts in Mathematics, 198) 437pp.

Serre J-P, Local algebra. (Springer Monographs in Mathematics) 129pp.

Smith G, Topics in group theory. (Springer Undergraduate Mathematics Series) 255pp.

Springer TA, Octonions, Jordan algebras, and exceptional groups. (Springer Monographs in Mathematics) 208pp.

Stubhaug A, Called too soon by flames afar: a biography of Niels Hendrik Abel. 580pp.

Waldeschmidt M, Diophantine approximation on linear algebraic groups: transcendence properties of the exponential function in several variables. (Grundlehren der mathematischen Wisssenschaften, 326) 633pp.

Advanced Engineering Mathematics: Analytical and Computational Methods

by G.B Gustafson and C.H Wilcox. Texts in Applied Mathematics 28,

Springer-Verlag, New York, 1998, 755 pp, DM 124.00, ISBN 0-387-98265-5.

This is a book written as a text in advanced engineering mathematics. It covers the usual range of topics, namely ordinary differential equations, Laplace transforms, linear algebra, vector analysis, partial differential equations of mathematical physics, Fourier analysis, Sturm-Liouville theory and boundary value problems. In giving an exposition on these topics a balance is usually required between theory and the actual numerical solution of a given problem and this book makes a conscious effort to incorporate that balanced viewpoint. This has become a more relevant issue in recent times as modern engineers consider a problem to be solved only when a method of producing a solution via computer has been obtained. With this in mind much attention is given to the numerical solution of problems such as the solution of boundary value problems. Indeed the book starts with a chapter on numerical analysis. The book achieves quite a good balance between required elements of theoretical understanding and the implementation of numerical methods to solve problems. While most examples of the mathematics presented are familiar (e.g. diffusion and vibration problems) there are some novel examples such as the demonstration that X-ray diffraction and crystal structure can be thought of as examples of vector analysis. This is quite a good book on the subject of engineering mathematics. It is written in such a way that a satisfactory course on the subject can be given using this book irrespective of whether the intention is to give a short, normal or intensive course. There is an ample supply of exercises together with answers and hints to selected exercises at the end of the book. In keeping with modern editions of text books there are additional exercises with Maple notes available on a related website. In summary a good book which engineering students should find gives them a grasp of ideas of mathematics as well as the use of techniques of numerical analysis to make solutions of engineering problems a reality.

Ernie KalninsUniversity of Waikato

Euclid – The Creation of Mathematics

by Benno Artmann,

Springer-Verlag, New York, 1999, 350 pp. DM 98.00. ISBN 0-387-98423-2.

This book is essentially a Kontiki Tour of Euclid's Thirteen Books of the Elements. According to Artmann's Preface, it is a book aimed at "all lovers of mathematics. It is an attempt to understand the nature of mathematics from the point of view of its most important early source." Artmann often assumes that the reader has Heath's translation and commentary to hand, so we might be tempted to ask why we would need yet another guide. A partial answer could be that Artmann, either in his text or in his bibliography, gives us access to more recent scholars' views of Euclid. Artmann's own answer is that whereas Heath is "primarily concerned with individual definitions, theorems and proofs" (page 313), this book is more concerned with "the general mathematical outlines of the text, …the relative importance of the various propositions or theories and …general features of mathematics" (page xvi).

So Artmann discusses what he sees as the most significant or interesting results from the Elements, with the remaining propositions usually receiving only passing mention. We might not always agree with his choices (for example, I was a little shocked that Proposition IX, 35 – about the sum of a geometric progression - was not thought worthy of comment), but most of the famous results are discussed. Scattered through the book, also, is a series of sixteen essays on such topics as Pythagoras, squaring the circle, problem-solving versus theory-building, polygons after Euclid, the power of generalization, beauty in mathematics, the role of definitions in mathematics, and "taming the infinite". These place the Elements in the context of later developments in mathematics, or philosophize about aspects of mathematics itself.

The style of writing is rather like Asger Aaboe's in his nice little book [1]. Euclid here is "read, interpreted and commented upon from the point of view of modern mathematics" (page vii). Thus, some of Euclid's arguments are rephrased in algebraic terms (as Aaboe does in his chapter about Euclidean mathematics) "in order to facilitate understanding for the modern reader" (page 42). I must admit to feeling somewhat ambivalent about this. I'm not sure that modernizing Euclid's proofs actually makes them easier to follow. I remember being impressed, when I first read it, with the clarity of Aaboe's exposition of Euclid's construction of a regular pentagon (Proposition IV, 11). But when I came to present the original to some students this year, I felt Euclid could stand on his own two feet and was, in many ways, easier to follow. Of course, it could have been familiarity that made it easier for me, and that I needed someone like Aaboe or Artmann to ease me into Euclid's way of thinking. However, there is something distracting, and even complicating, about using algebraic symbolism to "clarify" Euclid's geometric arguments. Not only does it distort the presentation of Euclid's results, but it assumes a facility with algebraic manipulation which many non-professional readers may lack. I wonder sometimes whether we wouldn't do better to "regress" to pre-algebraic reasoning for many of our students, so that proofs could regain their use as methods of convincing the audience, instead of being methods of mystification. I was interested to see a similar idea echoed in a paper [2] given to me recently by Mike Thomas. Here James Kaput, under a heading "Curricular Implications: Moving Past the Algebra Bottleneck", writes rather provocatively:

"No one should presume to challenge the power of algebra, and indeed, much mathematics absolutely requires algebra, including most of classical mathematics. Rather, we can and should challenge its currently dominant place in the curriculum as a prerequisite for access to other important mathematics by students who will never need the specialized techniques that the algebra makes possible."

In some cases Artmann digresses substantially from the actual content of a particular Book to discuss related issues. Thus the difficult Book X receives a scant six pages of direct commentary (along with references to four or five recent studies of this material). But this is followed by an extensive discussion of the author's own theory as to why Theodorus might have been able to prove that, in modern terms, the square roots of 3, 5, …, 17 are irrational, and yet he was not able to progress any further. Similarly, the actual content of Book XI is glossed over to make way for a discussion of the precursors of Book I, the idea being that Book XI reads like a primitive version of (the three dimensional equivalent of) Book I.

It is not always clear what audience Artmann has in mind when he is trying to explain the significance of Euclid's work. Much of the text could be read and enjoyed by high school teachers or beginning undergraduates, but every now and then there is an example which puts the discussion beyond their reach. Thus, to illustrate how theorems progress from being goals (answers to questions) to being tools (used to suggest or answer further questions), Artmann uses the example of Lagrange's Theorem, the goal of the first part of a first course in group theory, but also the spur to Sylow's Theorems (another goal, but also an indispensable tool in still further theorems). Group theory, this time the finite subgroups of the special orthogonal group, arises again in the discussion of the modern view of the Platonic solids in Book XIII. Although this level of abstract algebra probably is part of the intellectual baggage of a mathematics graduate in Europe, I doubt if the same is true in New Zealand.

In the end, despite my grizzles, what we have here is a good introduction to the Elements. In style I did not find it quite as readable as Aaboe's chapter on Euclid, but it is of course much more comprehensive and up-to-date. Reading this book would, I think, be excellent preparation for tackling some of the more scholarly modern works about the Elements mentioned in Artmann's bibliography, by authors like Fowler, Knorr, Mueller and Netz.

[1] Asger Aaboe, "Episodes from the early history of mathematics", Mathematical Association of America, 1964.
[2] James Kaput, "Representations, Inscriptions, Descriptions and Learning: A Kaleidoscope of Windows", Journal of Mathematical Behaviour, 17 (1998) 265-281.

John Hannah   University of Canterbury

Applied Geometry for Computer Graphics and CAD

by D. Marsh. Springer Undergraduate Mathematics Series

Springer-Verlag, London, 1999, 288pp, DM 59.00, ISBN 1-85233-080-5.

Imagine you are a student again, about to enrol at university. You enjoyed mathematics, like playing with computers and you want an exciting job when you have finished your degree. The universities themselves don't seem to offer many employment opportunities—in any case it takes so long to train and doesn't pay well enough. What could you use the mathematics for? Everywhere you look—on TV, at the movies, in magazines, on the web—people are doing amazing things with computer graphics and that needs mathematics, doesn't it? You wonder if you can do that at university. A quick check around the university websites reveals (as well as a number of broken links, some weird

search engines and unhelpful course guides) several good hits. There are courses and programmes in computer graphics and in computer–aided design. Some even look quite mathematical, though oddly they don't seem to be taught by mathematicians. Slightly reluctantly, you decide you had better enrol for a computer science degree. Would it have made a difference if you had encountered this book, a mathematics course that had this book as a text or best of all degree course dedicated to computer graphics with a sound mathematical basis?

Marsh's book derives from a course taught to a combination mathematics, computing and engineering students at Napier University in Edinburgh. Its background requirements are no more than first–year mathematics: vectors, matrices and calculus. The applied geometry of the title includes linear transformations and elementary differential geometry of curves and surfaces. Easily accessible to mathematics and engineering students, this might well be mathematically beyond the reach of many second-year computer science students. However, the emphasis is probably more on computer-aided design (CAD) than graphics.

The first four chapters of the book address linear transformations of the plane and space, leading up to the composition of transformations known as the viewing pipeline. The viewing pipeline determines the rendering of an object in space onto a flat computer screen. The use of matrices explicitly as geometric transformations of various kinds would probably interest and challenge students whose three–dimensional intuition is frequently weak. On the way one has been introduced to some interesting geometric ideas: the projective plane and space, Plücker line coordinates and the effects of foreshortening. There are, inevitably, lots of matrices evident with explicit matrix calculations. (The Matrix is, as you know, every nerd's favourite movie, with lots of great computer graphics.)

Chapters 5 to 8 deal with plane curves, Bézier curves and B–splines. These are polynomial or piecewise polynomial curves that are determined by a set of control points and perhaps additional parameters. So they are smoothings of polygonal curves, and have numerous nice properties. In particular they determine arbitrarily complicated smooth curves with relatively small amounts of data. The relevant properties are carefully detailed here and examples given. However I think most students would like a fuller motivation and some real–world examples. The material on B–splines looks particularly daunting conceptually and notationally and could perhaps have been presented in less generality.

Chapter 9 presents an extension of these ideas to surfaces, and the final chapter concerns the differential geometry of curves and surfaces with brief reference to the examples of Bézier and B–spline curves and surfaces.

Marsh's book is a worthwhile attempt to draw together mathematically oriented material relevant to computer graphics and CAD. Nevertheless it illustrates the difficulty of placing this material in the curriculum. Books quite similar in content, but aimed at a more advanced audience, have been around for 15 years or more. It certainly seems like a good idea to make these ideas accessible at an earlier stage. Yet as a budding computer graphics or industrial designer, you would probably be disappointed not to have seen the mathematics applied to create your own computer–generated character or car, nor to have met techniques, like ray tracing, that help convert the mathematically defined object into something real–looking. On the other hand the serious mathematics student might want a more thorough theoretical development. In this book, the mathematics is certainly in charge. The interspersed applications are largely driven by the mathematics and the exceptions—applications in robotics and computer–aided design—barely whet the appetite. In a rapidly developing field, the contents are by no means new, another necessary consequence of aiming at the less experienced student. Applications of differential geometry to computer vision, image analysis or implicit surface methods might still have fitted in here and brought the mathematics closer to the applications.

So this may not be quite the book that meets your needs or expectations as you position yourself for a job with Peter Jackson, Porsche Design or Animation Research. But returning to reality, it is a timely reminder that the classical (pre 21st century?) mathematics that forms the basis of our degrees can be given a new and attractive focus.

Peter Donelan
Victoria University of Wellington

CENTREFOLD

Margaret Morton 1944–2000

With much sadness we report the death of our friend and colleague, Dr Margaret Morton, aged only 55, after a short battle with cancer this year. Margaret was Secretary of the NZ Mathematical Society from 1993 to 1995.

Margaret was an amazing person—highly intelligent and determined. After years of raising a family and then moving back home to New Zealand from the US in the early 1980s, she set out to establish an academic career at the University of Auckland while in her 40s. This was no mean feat! In addition to teaching and more general service, Margaret wanted to fully engage in research, in both pure mathematics and mathematics education. The fact that she succeeded in all these areas is a tribute to Margaret's tenacity and inner strength, as well as her natural ability.

Margaret was a student at the University of Auckland in the 1960s, and went on to complete a PhD at Pennsylvania State University in 1975, the first woman graduate of the University of Auckland to receive a PhD in Mathematics. She subsequently worked part-time as an Instructor in colleges and universities in Pennsylvania and Texas. After returning to Auckland, she worked as a Programmer before being appointed to a Tutorship in the Mathematics Department here. She was promoted to a Lectureship in 1991, and to a Senior Lectureship in 1998.

Following an early publication in 1976, Margaret returned to research in the late 1980s and went on to publish two mathematics textbooks, ten papers in mathematics education, and eight papers in graph theory, most of these in the last five years.

Margaret's work in mathematics education spanned several areas, particularly gender issues, performance in national examinations, graduate student support and supervision, and collaborative tutorials. Her co-authors include Sharleen Forbes, Alan Lee, Barbara Miller-Reilly, Greg Oates, John Pemberton, Heather Rae, Ivan Reilly and Gillian Thornley. Up to the time of her death Margaret was also acting as co-supervisor for Barbara Miller-Reilly's PhD research in mathematics education.

In graph theory Margaret undertook joint work with several people locally and overseas, including Professors Brian Alspach (Simon Fraser), Neal Brand (Texas), Marston Conder (Auckland) and Cheryl Praeger (Perth). More recently, she and her Auckland colleague Dr Paul Bonnington won a Marsden Fund grant, in 1998. Margaret was one of very few women mathematicians to have received a grant of this kind. Although Margaret was always modest of her abilities and the results of her research, what she achieved was phenomenal.

A conference is to be held at the University of Auckland in mid-December on Algebraic and Topological Methods in Graph Theory, and the organisers have decided to dedicate the conference to Margaret, and to hold a half-day special session in her honour.

Margaret's concern with the lack of women in science and engineering saw her serve on many committees within the university and nationally. She spent more than a decade as a core member of EQUALS, a mathematics teachers' network for teachers at all levels concerned with equity issues in mathematics education. This group had a profound and positive impact on Margaret, as it did on many women in the mathematical sciences in New Zealand at that time.

At Auckland Margaret made us all sit up and re-think what we do in the Mathematics Department. She helped us learn to see things from many perspectives (not just our own), and was a wonderful advocate for students and for younger staff. She did a fantastic job as Teaching Coordinator, helping introduce much better feedback mechanisms and well thought out processes for maintaining and improving our teaching resources. She was also a champion for new appointments, and especially the need for mentoring of new staff. Margaret was very direct and generous in her support of others, leaving behind her many strong friendships. As one woman colleague said "I am very grateful for the gift of her friendship and will remember her always with great affection and love."

Margaret was a plucky and sporty person with a wide range of personal interests, especially outdoor activities such

as tennis, walking, kayaking and golf. She particularly loved the ocean.

Margaret has three children (David, Robyn and Andy) to whom she was devoted. They describe her as fair, non-judgemental and always ready to help them out. In their own words, they "couldn't have had a better mother—she was the best".

Marston Conder
Barbara Miller-Reilly
Constance Brown
Gaven Martin

Centrefolds Index

CONFERENCES

REPORT ON THE 2000 NEW ZEALAND MATHEMATICS COLLOQUIUM

The 2000 New Zealand Mathematics Colloquium was held at the University of Waikato during the period 27-29 November, with a welcoming reception held on the evening of the 26th. The Colloquium has traditionally been held in May or the middle of the year. This year, because of the difficulty in obtaining university accommodation, the event was shifted to the spring time. This new timing will continue for at least another year as Massey University (Palmerston North campus) will hold the 2001 Colloquium in early December next year.

There were seven invited speakers in total giving talks in a wide range of areas of mathematics:

John Cleary (University of Waikato), **Building a mind: a long unfinished tale with mathematical interludes**

Nat Friedman (University at Albany, New York), **Hyperseeing, hypersculptures, knots, and minimal surfaces**

Peter Jackson (University of Auckland), **Engineering modelling and the America's Cup**

Vaughan Jones (UC Berkeley and University of Auckland), **Planar algebras**

Ernie Kalnins (University of Waikato), **Relativity, black holes and quantum mechanics**

James Sneyd (Massey University, ANZIAM Speaker), **Mathematical models of travelling calcium waves**

Alf van der Poorten (Macquarie University, NZMS Speaker), **Quasi-elliptic integrals**

There were a total of 109 registrants which included 38 students and the seven invited speakers. The number of contributed talks was 63 including 26 student talks. 23 of these talks were entered for the Aitken prize for the best talk by a student. This year there were three winners: Barbara Holland and Patrick Rynhart, both of Massey University, and Sivajah Somasundaram of the University of Waikato. Also, Frances Kuo of the University of Waikato was highly commended.

The large number of contributed talks meant that four parallel sessions had to be timetabled. This combined with the constraints imposed by the timetabling of the talks entered for the Aitken prize inevitably meant that some participants had to make a choice when there were two talks of interest at the same time. It also meant that there were early starts in the mornings which were not to everyone's taste.

A panel discussion on the State of Mathematics in New Zealand was held on the Monday and a number of issues were raised. A report on this discussion appears elsewhere in this Newsletter. On Tuesday morning there was a panel discussion on the effect of the new NCEA qualification on university entry requirements.

In conjunction with the Colloquium a meeting of representatives of the mathematics sections of Auckland, Massey, Canterbury, Otago, and Waikato universities took place, with discussion of staffing, enrolments, academic developments and budgetary matters. A report on this meeting will be published in a future Newsletter.

The Colloquium Business Meeting was held again this year before the NZMS AGM as a separate session. It was agreed at this meeting that the 2003 Colloquium should be held together with the winter meeting of the Australian Mathematical Society to form the Sixth Australasian Mathematics Convention. This Convention would be an embedded meeting in ICIAM 2003 to be held in Sydney 7-11 July. There will be a number of other meetings embedded in ICIAM which have been agreed in principle such as the Computational Techniques and Applications Conference and the Conference of the Australian Society of Operations Research.

The NZMS Research Award for 2000 was announced at the Colloquium dinner on the Tuesday evening. It was awarded to Graham Weir of Industrial Research Limited.

There were two excursions on the Tuesday afternoon; one to Te Aroha for a bush walk and one to the Waitomo Caves. Over 30 of the participants went on these excursions. The weather was quite changeable during the colloquium and it was fortunate that the rain didn't start for the Te Aroha excursionists until they were on the bus taking them back to Hamilton. For those not going on an excursion, a Mathematics Video Festival was available on the Tuesday afternoon.

Mathematics books from Harcourt and Pearson Education New Zealand were on display during the first two days of the Colloquium.

Overall the Colloquium was a success with nearly everything running smoothly. We are grateful to the following sponsors: ANZIAM for supporting the ANZIAM Speaker (James Sneyd), the BNZ for supplying stationery, the New Zealand Mathematical Society for providing financial support not only to the NZMS Speaker (Alf van der Poorten), but also to enable students to attend the Colloquium, and the University of Waikato for giving a grant-in-aid.

Our thanks also to the Chairs of the sessions who contributed to the smooth running of the Colloquium. Last, but not least, we are also grateful to the postgraduate students from the Dept of Mathematics who helped us with the tasks which were important for the overall running of the colloquium. These included helping out at the registration desk, transporting people, packing the satchels, etc.

2001

January 29–February 2 (Adelaide) **The Mathematics-in-Industry Study Group 2001**
homepage: `http://www.unisa.edu.au/misg`

February 3–7 (Barossa Valley, South Australia) **ANZIAM 2001: The 37th Applied Mathematics Conference**
email: `anziam2001@maths.adelaide.edu.au`
homepage: `http://www.maths.adelaide.edu.au/anziam2001`

July 1–5 (Kruger National Park, South Africa) **Warthog Delta'01: Third Southern Hemisphere Symposium on Undergraduate Mathematics Teaching**
email: `samern@scientia.up.ac.za`
homepage: `http://science.up.ac.za/delta01`

July 1–6 (Great Keppel Island, Queensland) **International Conference on Optimization in Industry**
contact Dr Victor Korotkich
email: `v.korotkich@cqu.edu.au`
homepage: `http://optimization.cqu.edu.au/`

July 16–18 (Brisbane) **The 10th Biennial Computational Techniques and Applications Conference**
homepage: `http://conference.maths.uq.edu.au/ctac2001/`

SYMPOSIUM IN HONOUR OF EMERITUS PROFESSOR DAVID VERE-JONES
Victoria University of Wellington, New Zealand.

General invitation to all David's many friends and colleagues.

David Vere-Jones will be 65 years of age on 17 April 2001. This Symposium is being held at Victoria University of Wellington, New Zealand, to celebrate the occasion and to acknowledge David's many far-reaching contributions across a broad spectrum in probability, statistics and the mathematical sciences

The dates of the Symposium are from midday Thursday 19 April 2001 to midday Saturday 21 April 2001 and the Symposium will partially overlap an international statistical seismology workshop held at the same venue. Further details are given on the web site `www.statsresearch.co.nz`

MINUTES

Minutes of the 26th Annual General Meeting
6.00 pm, Monday 27 November 2000
University of Waikato

Present. G. Wake (Chair), D. Alcorn, I. Boglaev, K. Broughan, J. Butcher, M. Carter, R. Downey, D. Gauld, R. Goldblatt, W. Halford, J. Harper, Y. Hong, J. Hudson, J. Hunter, S. Joe, E. Kalnins, G. Liddell, C. Little, M. McGuinness, D. McIntyre, R. McKibbin, R. McLachlan, A. McNaughton, R. Murray, V. Pestov, K. Pledger, M. Roberts, C. Semple, G. Tee, F. Thompson, G. Thornley, G. Wu.

Apologies. B. Barton, D. Bridges, M. Conder, V. Kirk, D. McCaughan, D. Wall.

1. **Minutes of 25th Annual General Meeting.**

 It was moved from the Chair that the minutes of the 25th Annual General Meeting of the NZMS be accepted. The motion was carried.

2. **Matters arising from the minutes** (numbers refer to items of the 25th Annual General Meeting).

 3(b)(ii) Professor Graeme Wake has contacted the President of the Korean Mathematical Society to indicate that we may be interested in joining the Asian Mathematical Union, but wanted further details as there were uncertainties such as the likely costs. We are still waiting for a reply.

 There were no other matters arising.

3. **President's report.**

 (a) The President's report was delivered to the meeting. It will appear in the NZMS Newsletter (as the President's column) and will also be available at the NZMS web page.

 (b) It was moved from the Chair that the report be accepted. The motion was carried.

 (c) In addition to the report, it was noted that two of our members Margaret Morton and Bruce Robson have passed away in the last year. Our deepest sympathies go to their respective families.

4. **Treasurer's report.**

 (a) The Treasurer's report was delivered to the meeting and the financial statements were distributed to the members.

 (b) The following items were raised from the floor.

 (i) NZMS support for students to ICIAM (2003).

 (ii) Publications as possible sources of income.

 (iii) Perhaps spending some of our capital on sponsored mathematically based activities.

 (c) It was moved (Roberts and McGuinness) that the statements be accepted. The motion was carried.

 (d) We thanked Dr Mick Roberts for his role as Treasurer of the NZMS.

5. **Membership Secretary's report and annual subscriptions.**

 A report from the Membership Secretary, Dr John Shanks, was delivered by the Chair. It was moved from the Chair that the report be accepted, and that (i) there be no increase in NZMS subscription rates and (ii) the offer of one year free membership now applies to all students (not just postgraduates). The motion was carried.

6. **Election of Incoming President and two Council members.**

 (a) The terms of office of Professor Rob Goldblatt (Immediate Past President), Dr Dennis McCaughan, and Dr Mick Roberts (Treasurer) have now ended. This has resulted in three vacancies on Council including Incoming President.

 (b) Nominations received at closing date: Incoming President - Professor Rod Downey and Dr Mick Roberts; Council - Dr Peter Fenton and Dr Rua Murray.

 (c) Dr Peter Fenton and Dr Rua Murray were unopposed and thus duly elected to the NZMS Council. On the new Council, Dr Rua Murray would be the Treasurer.

 (d) An election (secret ballot) for the Incoming President was held. It was moved from the Chair that Professor David Gauld and Dr Stephen Joe be the scrutineers for this election. The motion was carried.

 (e) Professor Rod Downey was elected Incoming President.

 (f) It was moved (Harper and Wake) that the ballot papers be destroyed. The motion was carried.

7. **Appointment of auditors.**

 It was moved (Roberts and Harper) that the current auditors, McKenzie McPhail (4th floor, Farmers Mutual House, 68 The Square, Palmerston North), be reappointed for another year. The motion was carried.

8. New Zealand Journal of Mathematics.

(a) David Alcorn delivered a report to the meeting.

(b) It was moved from the Chair that the report be received. The motion was carried.

9. Forder Lecturer 2001.

(a) Dr Tom Körner, Department of Pure Mathematics and Mathematical Statistics, Cambridge University will tour New Zealand in July 2001.

(b) Dr Peter Fenton (University of Otago) has agreed to act as overall coordinator for this visit.

(c) The New Zealand Association of Mathematics Teachers has indicated that they would like Dr Korner to give an invited talk in their upcoming conference "A Mathematics Odyssey" to be held in Wellington, 3-6 July 2001.

(d) The NZMS are currently accepting nominations for the next Forder Lecturer. Nominations will close with the NZMS Secretary at 31 January 2001.

10. 2001, 2002, 2003 Mathematics Colloquium.

The following decisions were made at the Colloquium Business Meeting held immediately prior to the AGM.

(i) For 2001, the colloquium will be held at Massey University (Palmerston North), December 2001. The convenor is Dr Charles Little.

(ii) For 2002, the colloquium will be held at the University of Otago.

(iii) For 2003, the New Zealand Mathematical Society will join the Australian Mathematical Society in hosting the 6th Australasian Mathematics Convention as part of ICIAM 2003 which is to be held in Sydney, 7-11 July 2003.

11. General Business.

Dr Stephen Joe will make the "list of visitors to New Zealand" available on the NZMS web page.

The meeting closed at 6.45 pm.

<div align="center">

Minutes of the 43rd Council Meeting
2.00 pm Sunday 26 November 2000
University of Waikato

</div>

Present. Graeme Wake (Chair), Rob Goldblatt, Stephen Joe, Mick Roberts, Robert McLachlan, Charles Semple, Alf van der Poorten (Australian Mathematical Society observer).

Apologies. Bill Barton, Douglas Bridges, Dennis McCaughan.

1. **Minutes of 42nd Council Meeting.**

It was moved from the Chair that the minutes of the 42nd Council Meeting of the NZMS be accepted. The motion was carried.

2. **Matters arising from the minutes** (numbers refer to items of the 42nd Council Meeting).

4(a)(ii) It was agreed that if the Aitken Prize was shared, then each person would receive $250.

4(a)(iii) "…new initiatives such as undergraduate scholarships" will be discussed on Monday 27 November 2000 at The State of Mathematics in New Zealand discussion.

8(c) Professor Graeme Wake contacted the President of the Korean Mathematical Society to indicate that we may be interested in joining the Asian Mathematical Union, but wanted further details as there were uncertainties such as the likely costs. We are still waiting for a reply.

14 Dr Robert McLachlan reported on the New Zealand Association of Mathematics Teachers AGM which was held in Palmerston North, 18 November 2000.

3. **Formal ratification of earlier decisions made by e-mail.**

It was moved from the Chair that the following decisions by e-mail be ratified.

(i) Grants of $500 made to the following applicants: Britta Basse, Mark Harmer, Abdul Adheem Mohamad, and Cameron Mouat (Council Meeting November 1999); Ben Handley and Mark

McGuinness (Council Meeting July 2000).

(ii) President of the NZMS will be one member of the Royal Society Electoral College for Mathematical and Information Sciences (Council Meeting November 1999). Note that Professor Gaven Martin served as the other NZMS nominee in 2000.

(iii) Professor David Vere-Jones be made an Honorary Life Member of the NZMS (Council Meeting November 1999).

(iv) The NZMS will give $1500 to support a speaker at this year's Colloquium and $1000 to support student participation (Council Meeting July 2000).

(v) We now allow anonymous nominations for the NZMS Research Award. However, if successful, the nominated person must be told before any announcement is made (Council Meeting July 2000).

(vi) The NZMS will give $1000 towards the production costs of the New Zealand Journal of Mathematics. This allocation is for the 2000/2001 year (Council Meeting July 2000).

The motion was carried.

4. President's report, Treasurer's report, and Membership Secretary's report.

(a) Note an amendment to the President's report: Dr Bruce Robson (Lincoln University) died recently in Christchurch. The NZMS expresses its deepest sympathies to his family. It was moved from the Chair that the President's report be received. The motion was carried.

(b) It was moved (Roberts and Joe) that the audited financial statements be received. The motion was carried.

(c) It was recommended (Roberts and Goldblatt) that there be no increase in NZMS subscription rates, but the offer of one year free membership now applies to all students (not just postgraduates).

(d) It was moved from the Chair that a subcommittee (Dr Robert McLachlan, Dr Mick Roberts, and incoming Treasurer) review the New Zealand Mathematical Societies' financial portfolio. The motion was carried.

(e) It was moved from the Chair that the Membership Secretary's report be received. The motion was carried.

(f) The Membership Secretary, Dr John Shanks, was thanked for his report and work during the year, and was invited to continue as the Membership Secretary of the NZMS. Lastly, we request that the number of NZMS Fellows be included in future reports.

5. Requests for financial assistance.

The applications for financial assistance were considered. After some discussion, the following grants were approved.

Sharleen Forbes $500

Andrei Korobeinikov $500

Warren Moors $500

6. Nominations for Incoming President and two Council positions.

(a) The terms of office of Professor Rob Goldblatt (Immediate Past President), Dr Mick Roberts (Treasurer), and Dr Dennis McCaughan have ended.

(b) Nominations received at closing date: Incoming President - Professor Rod Downey and Dr Mick Roberts; Council - Dr Peter Fenton and Dr Rua Murray.

7. NZMS Visiting Lecturer 2000.

Professor Graeme Wake thanked everyone involved with the success of Professor John Guckenheimer's visit to New Zealand earlier this year. Note that an article written by Professor Guckenheimer appears in the August 2000 issue of the newsletter.

8. Forder Lecturer 2001.

(a) Dr Tom Körner, Department of Pure Mathematics and Mathematical Statistics, Cambridge University will tour New Zealand in July 2001.

(b) Dr Peter Fenton (University of Otago) has agreed to act as overall coordinator for this visit.

(c) The New Zealand Association of Mathematics Teachers has indicated that they would like Dr Korner to give an invited talk in their upcoming conference "A Mathematics Odyssey" to be held in Wellington, 3-6 July 2001. Provided this did not interfere with the NZMS arrangements and the NZAMT gave some financial support for Dr Körner's visit, we agreed in principle to the additional engagement.

(d) It was noted that half of the support given by the British Council for Dr Körner's visit is expected to be returned.

(e) It was moved from the Chair that arrangements (a)-(d) be ratified. The motion was carried.

(f) Lastly, it was agreed that Dr Robert McLachlan would put in the next newsletter a call for nominations for the next Forder Lecturer. Nomination will close with the NZMS Secretary at 31 January 2001.

9. NZMS Research Award 2000.

The NZMS Research Award 2000 will be announced at the Colloquium Dinner (Tuesday 28 November 2000).

It was moved from the Chair that the 2000 recipient together with two members of this year's judging panel make up the judging panel for 2001. The motion was carried.

10. Aitken judging panel.

(a) Arranged by Dr Stephen Joe, Dr Charles Semple, and Professor Graeme Wake, this year's Aitken Prize judging panel is Professor David Gauld (convener), Dr Allison Heard, Dr Mark McGuinness, Dr Vladimir Pestov, and Dr Graham Weir.

(b) It was moved from the Chair that the panel be ratified. The motion was passed.

11. Election of Incoming President and Treasurer.

(a) If elected to the NZMS Council, Dr Rua Murray would take on the position of Treasurer.

(b) An election for Incoming President will be held at the NZMS Annual General Meeting (27 November 2000).

12. 2001, 2002, 2003 Mathematics Colloquium.

(a) The New Zealand Mathematics Colloquium 2001 will be held at Massey University (Palmerston North), December 2001. The convener is Dr Charles Little.

(b) The New Zealand Mathematics Colloquium 2002 will be held at the University of Otago. We considered Walter Bloom's invitation to join the Australian Mathematical Society in hosting the 6th Australasian Mathematics Convention in Newcastle in 2002. However, the dates of the proposed convention were unsuitable.

(c) On behalf of Walter Bloom (Vice-President, Annual Conferences, Australian Mathematical Society), Professor Alf van der Poorten invited the New Zealand Mathematical Society to join the Australian Mathematical Society in hosting the 6th Australasian Mathematics Convention as part of ICIAM 2003 which is to be held in Sydney, 7-11 July 2003.

(d) It was moved (Roberts and McLachlan) that the Council recommended to the Colloquium Business Meeting and NZMS AGM that we accept the offer outlined in (c). The motion was carried.

13. General Business.

(a) Professor Alf van der Poorten reported on the recent Australian Mathematical Society Council Meeting. In particular, commenting on
  (i) the trend towards electronic journals and the effect this will have on the Australian Mathematical Society, and
  (ii) the move by the Australian Mathematical Society towards specialist sessions within their general meetings.

(b) Dr Stephen Joe raised two issues from members of his department:
  (i) The cost of Anton and the possibility of New Zealand mathematics departments collectively writing an on-line "first year text".
  (ii) The possibility of "tele-seminars" if an overseas visitor is only able to visit one or two New Zealand mathematics departments. Professor Alf van der Poorten indicated the potential costs of such a scheme and outlined possible solutions.

(c) Dr Robert McLachlan wondered what had happen to the "list of visitors to New Zealand". Dr Stephen Joe would make this available on the NZMS web page.

(d) Professor Graeme Wake indicated that he may be unable to attend next year's AGM due to overseas commitments in the latter half of 2001.

The meeting closed at 5.10pm.

NOTICES

NZMS RESEARCH AWARD

This annual award was instituted in 1990 to foster mathematical research in New Zealand and to recognise excellence in research carried out by New Zealand mathematicians.

The NZ Mathematical Society Research Award for 2000 was recently made at the 2000 Mathematics Colloquium to Graham Weir (Industrial Research Limited) "for his wide-ranging in-depth contributions to applied mathematical modelling covering a diverse range of phenomena including geosciences, structure of materials, corrosion theory, and the flow of granular material."

Other recipients to date have been John Butcher and Rob Goldblatt (1991), Rod Downey and Vernon Squire (1992), Marston Conder (1993), Gaven Martin (1994), Vladimir Pestov and Neil Watson (1995), Mavina Vamanamurthy and Geoff Whittle (1996), Peter Lorimer (1997), Jianbei An (1998), and Mike Steel (1999).

Call for nominations 2000/2001

Applications and nominations are invited for the NZMS Research Award for 2001. This award will be based on mathematical research published in books or recognised journals within the last five calendar years: 1996-2000. Candidates must have been residents of New Zealand for the last three years.

Nominations and applications should include the following:

1. Name and affiliation of candidate.

2. Statement of general area of research.

3. Names of two persons willing to act as referees.

4. A list of books and/or research articles published within the last five calendar years: 1996-2000.

5. Two copies of each of the five most significant publications selected from the list above.

6. A clear statement of how much of any joint work is due to the candidate.

A judging panel of three persons shall be appointed by the NZMS Council in advance of the receipt of nominations. The judges may call for reports from the nominated referees and/or obtain whatever additional referee reports they feel necessary. The judges may recommend one or more persons for the award, or that no award be made. No person shall receive the award more than once. The award consists of a certificate including an appropriate citation of the awardee's work, and will be presented (if at all possible) around the time of the AGM of the Society in 2001.

All nominations (which no longer need to include the written consent of the candidate) and applications should be sent by 31 March 2001 to the NZMS President, Graeme Wake, at the following address:

Professor Graeme Wake
Department of Mathematics and Statistics
University of Canterbury
Private Bag 4800
Christchurch, New Zealand

Please consider nominating any of your colleagues whose recent research contributions you feel deserve recognition!

FORDER LECTURESHIP 2001

The Forder Lectureship was established in 1985 following a bequest to the London Mathematical Society from the late Professor Henry George Forder (Professor of Mathematics at the University of Auckland 1934-55).

Under the terms of this Lectureship, every two years an eminent mathematician in the United Kingdom is selected (by the London Mathematical Society Council in consultation with the NZ Mathematical Society Council) to tour New Zealand for a period of three to four weeks and to give lectures in the six main NZ university centres.

The first Forder Lecturer was Professor Christopher Zeeman in 1987, and was followed by Professor Sir Michael Atiyah in 1989, Professor Peter Whittle in 1991, Professor Roger Penrose in 1993, Professor Elmer Rees in 1995,

Professor Ian Stewart in 1997, and Professor Sir Michael Berry in 1999.

Dr Tom Körner, Department of Pure Mathematics and Mathematical Statistics, University of Cambridge, has been appointed as Forder Lecturer 2001. He will come in mid-July 2001 for about 4 weeks. The contact person for his visit is Peter Fenton (University of Otago). Here is the pen portrait he provided:

Dr Körner is a reader at Cambridge University and Director of Studies at Trinity Hall. His research lies mainly in Fourier analysis and particularly in some of the more exotic behaviour of Fourier transforms One advantage of the choice of this topic is that it is a French specialty enabling him to spend some time working in France. He has published an advanced text on Fourier analysis and a popular text on mathematics called 'The Pleasures of Counting'.

His talks include public lectures (*How to hunt a submarine*), general talks (*Marrying, choosing, voting*; *Why are we not all called Smith?*; and *From waves to wavelets*), and colloquia (*From pollen to the stock exchange* (Brownian motion); *Molehills out of mountains* (analysis); *Rearranging Fourier series*; and *A theorem of Mensov*).

FORDER LECTURESHIP 2003

In February 2001 the NZMS Council nominates candidates for the 2003 Forder Lecturer to the LMS Council, who also make their own nominations. The NZMS then orders the list and the LMS selects the actual lecturer. Please forward any suggestions to the secretary, Stephen Joe, by the end of January.

COLLOQUIUM 2001

The next Colloquium will be held at Massey University, Palmerston North, in the first week of December 2001. Please forward suggestions for Invited Speakers and names of any international visitors you are expecting to Robert McLachlan at `R.McLachlan@massey.ac.nz`.

GRANTEE REPORTS

Ben Handley

In February this year I attended Financial Cryptography '00, in Anguilla, British West Indies, to present a paper on an anonymity-preserving membership proof. The location itself was interesting as, despite the region's reputation for sun and sand, it rained heavily for a lot of the time. There were also occasional problems with power, with the lights going out for about five minutes at one point, until the backup generator started.

The conference itself was quite unusual, with the participants coming from academia and industry in fairly equal numbers. While this meant that there was more time spent on companies describing their upcoming products than I would have liked, it also meant that the papers presented tended to be practical and relevant to the real world, as I think cryptography should be. The papers themselves were high quality overall, helped by the growing popularity of the conference, meaning that they only accepted one third of the submissions.

The strangest part of the conference was the rump session, which involved eight presentations of varying seriousness, ranging from a demonstration of an interesting electronic cash idea, to an simple mathematical curiosity (given a weighted coin, with probability $p \neq \frac{1}{2}$ of landing heads up, two players, A & B, try to determine which side it favours. They each flip it once, but A is allowed to watch B's flip while B is not allowed to watch A's. Contrary to what you might expect, this does not give A any advantage). Along the way there were some rather ridiculous ones that defy description. Things like this, and the cypherpunk/civil libertarian contingent, gave the conference a unique atmosphere.

I found the huge number of jobs available in cryptography amazing. While most of them are computing-oriented, there is still a shortage of mathematicians. As an example, there were six companies that said they may be able to give me summer jobs, and I have taken one of them up. It was great to learn that taking mathematics has not reduced my job prospects, which is very useful when people ask questions such as "But what will you do with a mathematics degree?".

Mark McGuinness

I would like to say thanks to the NZMS for helping with costs for my attendance at two conferences in Fairbanks, Alaska in July this year. The first conference, an IUTAM conference on Scaling Laws in Ice Mechanics and Ice Dynamics, covered a wide range of (for me) new material, and brought home to me the large range of scales and complex dynamics involved, particularly in the Arctic, with sea ice formation and rafting. The second conference, on Sea Ice and its Interactions, was more general, and I presented a poster on the heating of sea ice by solar radiation, in collaboration with Joe Trodahl (Physics, VUW), who also presented a talk on the thermal conductivity of sea ice. This conference was a great opportunity to connect with people I had previously only known through seeing their names as authors on papers I was reading, and reinforced for me and for Joe that the work we are doing is of interest

to a number of people involved in both Arctic and Antarctic research. The long flight was in my eyes made worthwhile, and the visits to Denali National Park and the Trans-Alaska Pipeline were just icing on the cake.
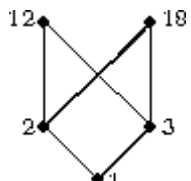
MATHEMATICAL MINIATURE 13

The inverses of some triangular matrices and the Möbius function

Let $(S, \leq)$ denote a partially ordered set and, for $i, j \in S$, let $m_{ij} = 1$, if $j \leq i$, and zero otherwise. Assume that the members of S are ordered in such a way that M is lower triangular with 1 on the diagonals. If S is not finite but has a minimum element, then M is an infinite matrix and represents a linear operator on the set of sequences indexed by the elements of S. Let $\tilde{m}_{ij}$ denote the (i, j) element of M^{-1}.

In the following two examples, $\leq$ is defined by divisibility. In the case of Example 2, this is defined, not in the ring $\mathbb{Z}$, but in $\mathbb{Z}[\sqrt{-3}]$ (a ring which does not enjoy the benefits of unique factorization) and the five elements attached to the vertices of the graph are in the order $1, 2, 1 + i\sqrt{3}, 1 - i\sqrt{3}, 4$
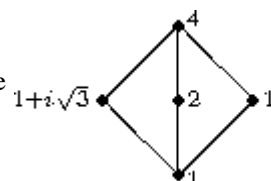
Example 1

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \end{bmatrix} \quad M^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ 1 & -1 & -1 & 0 & 1 \end{bmatrix}$$
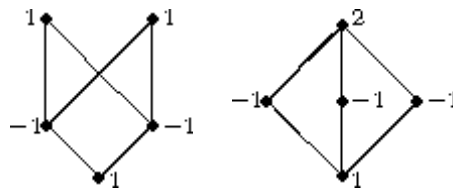
Example 2

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \quad M^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 1 & 0 \\ 2 & -1 & -1 & -1 & 1 \end{bmatrix}$$

If $j \leq i$ with $j \neq i$ we define the interval $[j, i]$ as the set consisting of each vertex x such that $j \leq x \leq i$. Because row j of M is orthogonal to column i of M^{-1}, it follows that

$$\sum_{j \leq x \leq i} \tilde{m}_{x,j} = 0.$$

This enables the elements in column i of M^{-1} to be evaluated recursively. In Examples 1 and 2, the calculations of the first columns of M^{-1} are represented on the graphs as shown in the following diagrams

Now consider a countably infinite partially ordered set, where S consists of all sequences of non-negative integers, $(i_1, i_2, \ldots)$, where all but a finite number are zero, and $j \leq i$ means that $j_k \leq i_k$ for all $k = 1, 2, \ldots$. We can order the elements of S so that each element eventually arises, by associating with $i \in S$ a sequence number $n(i)$ equal to

$$n(i) = \prod_{k=1}^{\infty} p_k^{i_k},$$

where $p_1 = 2, p_2 = 3, p_3 = 5, \cdots$ is the sequence of primes. For any $i \in S$, we will conventionally write i_k, not only to represent component number k, but also the member of S formed from i by replacing every component, except number k, by zero.

If $\theta \in S$, then the sub-graph associated with the interval $[j + \theta, i + \theta]$ is isomorphic with the subgraph for the interval $[j, i]$. Hence, $\tilde{m}_{i,j}$ is a function only of $i - j$. In the interpretation provided by the mapping $i \mapsto n(i)$, this means that $\tilde{m}_{i,j} = \mu\big(n(i)/n(j)\big)$, where μ is said to be the "Möbius function". We will show that $\mu(2^{i_1} 3^{i_2} 5^{i_3} \cdots)$ is zero if any of $i_1, i_2, i_3, \ldots$, exceeds 1 and otherwise is equal to $(-1)^{i_1 + i_2 + \cdots}$. To calculate the first column of M^{-1}, and hence the value of $\mu(m)$ for m a positive integer, we first consider the case that only one of the i components is non-zero — this corresponds to the evaluation of μ for a prime power. The sub-graph consists of a chain with integers 1 attached to the root, -1 to its neighbour and 0 attached to each other vertex. Now consider an interval $[j, i]$, with $j = (0, 0, \ldots)$ and $i = (i_1, i_2, \ldots, i_N, 0, 0, \ldots)$. For x in $[j, i]$, let $\psi(x)$ denote the value attached to the corresponding vertex in the sub-graph representing $[j, i]$. The fact that $\psi(x) = \prod_{k=1}^{N} \psi(x_k)$, follows by induction because the sums of $\psi(y)$ and $\prod_{k=1}^{N} \psi(y_k)$ over all $y \in [j, x]$ are each zero and because the individual terms are equal if $y \neq x$. Hence $\tilde{m}_{j,i} = \prod_{k=1}^{N} \tilde{m}_{j,i_k}$.

If f is a function on the positive integers and F is defined by

$$F(n) = \sum_{d \mid n} f(d),$$

this can be written as $F = M f$ and we have the inversion formula

$$f(n) = \sum_{d \mid n} \mu\left(\frac{n}{d}\right) F(d),$$

which is another way of writing $f = M^{-1} F$. Applications abound in number theory.

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