Number 88 August 2003

NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Contents

ISSN 0110-0025

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:

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

However, correspondence should normally be sent to the Secretary:

Dr Shaun Hendy
Industrial Research Limited
Gracefield Research Centre
P O Box 31310, Lower Hutt
s.hendy@irl.cri.nz

NZMS Council and Officers

President	Associate Professor Mick Roberts (Massey University, Albany)
Outcoming Vice President	Professor Rod Downey (Victoria University)
Secretary	Dr Shaun Hendy (Industrial Research Limited, Lower Hutt)
Treasurer	Dr Rua Murray (University of Waikato)

Councillors	Dr Michael Albert (University of Otago), to 2006 Dr Shaun Hendy (Industrial Research Limited), to 2004 Professor Gaven Martin (The University of Auckland), to 2005 Dr Warren Moors (The University of Auckland), to 2006 Dr Charles Semple (University of Canterbury), to 2005 Dr Tammy Smith (Massey University, Palmerston North), to 2005 Professor Geoff Whittle (Victoria University), to 2004
Membership Secretary	Dr John Shanks (University or Otago)
Newsletter Editor	Professor Robert McLachlan (Massey University, Palmerston North)
Legal Adviser	Dr Peter Renaud (University of Canterbury)
Archivist	Emeritus Professor John Harper (Victoria University)
Visitor Liaison	Dr Stephen Joe (University of Waikato)
Publications Convenor	Dr David McIntyre (University of Auckland)
Webmaster	Dr Stephen Joe (University of Waikato)

Newsletter Correspondents

Sub-Editors

Book reviews	Mr David Alcorn (University of Auckland)
Conferences	Dr Michael Carter (Massey University)
Mathematical Miniatures	Emeritus Professor John Butcher (University of Auckland)

Honorary Correspondents

Murray Black	Mathematics (Auckland University of Technology)
Michael Doherty	Statistics NZ (Wellington)
Lenette Grant	Mathematics and Statistics (University of Otago)
David Harte	Statistics and Operations Research (Victoria University)
Shaun Hendy	Industrial Research Ltd (Lower Hutt)
Stephen Joe	Mathematics (University of Waikato)
Geoff Jones	Statistics (Massey University)
Mark McGuinness	Mathematics (Victoria University)
Judi McWhirter	Statistics (University of Waikato)
Mike Meylan	Mathematics (Massey University, Albany)
Donald Nield	Engineering Science (University of Auckland)
Aroon Parshotam	Landcare (Palmerston North)
Charles Semple	Mathematics (University of Canterbury)
Ken Louie	AgResearch (Ruakura)
Garry Tee	Mathematics (University of Auckland)
Wynand Verwoerd	Mathematics and Statistics (Lincoln University)
Marijcke Vlieg-Hulstman	Mathematics (Massey University, Palmerston North)

Web Sites

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

EDITORIAL

AUSTRALIA

Despite the attendance of nearly 1700 mathematicians at ICIAM in Sydney last month, I'm afraid one of the participants didn't make it. He tried to board a plane carrying a sharp instrument, a compass. Worse than that, on searching his bags he was found to be a member of the radical group Al Gebra. He has now been charged with possessing instruments of maths instruction.

For me one of the highlights of ICIAM was a talk by Adam Spencer, Australia's number one mathematics comedian. He adapted well to an audience of professional mathematicians and had us all in stitches for an hour. (In fairness to Adam, the above joke is not one of his). He's on the Australian youth radio network JJJ every morning and has developed a bit of a cult following. How we need someone like him over here!

In fact, thanks to the magic of time zones, you can even listen to him over the internet at work while you're preparing your calculus lectures. I've tried it and it works.

There was also some really great publicity material distributed by various maths departments, for example by UNSW who claim they are now #14 in the world for research impact. Other highlights were Jennifer Chayes, the head of Microsoft Research, speaking on phase transitions in combinatorial optimization, and Wilfried Schmid of Harvard. When he saw what his daughter was bringing home from school he took a bit of a break from Lie groups to look into maths education and let me tell you, what he saw was not pretty. Taken as whole, however, the invited speakers seemed to be having trouble pitching their talks at the right level for such large audiences. Also on the debit side is all the extra CO_2 emitted bringing all those people to Sydney. Was it worth it? (Am I turning into an old crusty?)

Congratulations to Hyam Rubinstein (Melbourne) on his election to the Australian Academy of Science. Many will remember his outstanding lecture at our Colloquium in 2001. The AAS is an extremely selective body, with only 300 members (compare the Royal Society of London's 3000+).
Low-dimensional topology is having an exciting time currently, with Perelman's proof of the Poincaré conjecture holding up well (www.nytimes.com/2003/04/15/science/15MATH.html).

The Australian Mathematical Society's *Gazette* reports that 4 Australians have made it into a list of the 250 most-cited mathematicians world wide. The list itself makes interesting reading, mixing prolificness and mega-stardom in different proportions. The Australians are Edward Dancer (dynamical systems), Peter Hall (statistics), Iain Raeburn (C* algebras), and Ian Sloan (numerical analysis). An impressive performance and not one that I know our members are going to take lying down.

* * *

I've been thinking lately about enrolments. Of course our livelihoods these days are very directly connected to total enrolments—at Massey we receive weekly updates throughout the year— but I am thinking now about numbers just of maths and of maths honours majors. If these decline too much we have in a sense failed professionally. Talking to colleagues it seems to be a problem throughout New Zealand, and indeed throughout the world—even the Netherlands is in the process of closing several departments— and Steven Krantz, never at a loss for words, has some thoughts on the matter at www.ams.org/notices/200307/commentary.pdf ("For Whom the Bell Tolls", Notices AMS August, 2003, p. 765). As Mike Meylan commented, it would be worth simply trying some radical strategy for a few years to see if it works—what can we lose? Perhaps here in New Zealand we should start by gathering some firm data on actual numbers of graduates over the past decade, and see where to go from there.

Robert McLachlan
Massey University

PRESIDENT'S COLUMN

The society's AGM was held on July 9 in Sydney, in conjunction with ICIAM. I was not able to attend the meeting, and I would like to thank Graeme Wake for chairing it. Council now consists of two members from each of Auckland, Victoria and Massey Universities, one from each of Canterbury and Otago Universities, and one from IRL. A by-law requires that at least two council members should be from the North Island, and at least two from the South Island. I seem to recall a former requirement that one council member should be from industry (in the broadest sense), and I believe that I may have been the first incoming vice-president who was outside the university system when elected.

It is very easy to perceive the NZMS as a society for university mathematicians, especially from the outside. That is not the intention. The purposes of the society are, according to the constitution

1. To promote research in the mathematical sciences and to promote the development, application and dissemination of mathematical knowledge within New Zealand.
2. To assist mathematicians in New Zealand to maintain effective cooperation with one another and with mathematicians and mathematical societies in other countries, and to facilitate collaborative research in the mathematical sciences as a consequence of such cooperation.

I have spent a considerable time as the only mathematician on a CRI campus. In that situation you hear references to "scientists and mathematicians", or the derogative "scientists and modellers". It took considerable effort to overcome this division, and much time was spent advocating for the mathematical scientist to be part of the research team rather than an external consultant. At the same time it was necessary to maintain contact with the discipline of mathematics, which is where the NZMS comes in through the newsletter, the support for the colloquium and other activities. It may be that the majority of

our members work in relatively large university maths departments, but the society's role in promoting communication and collaboration is especially important for those away from the main centres of mathematical activity.

We have just experienced the vast ICIAM and its associated and spin-off meetings, but looking ahead there are plenty of events to plan your summer holidays around. You can spend January in Nelson at NZMRI 2004 - Computational Algebra, Number Theory and Geometry, staying on for the NZIMA Logic and Computational Programme. You can then travel to Auckland for the Mathematics in Industry Study Group, cross the Tasman to ANZIAM 2004 in Hobart, and return in time for the Victoria International Conference. Further details of all these meetings may be found elsewhere in this issue or on the NZMS website, but their abundance demonstrates the currently healthy situation of mathematicians talking to other mathematicians, to biologists and to industry.

As well as keeping mathematicians in touch and collaborating the NZMS makes two important awards. This year's winner of the Aitken Prize for the best student talk at the colloquium is Cynthia Wang, a graduate student at Massey University (Albany) working under the supervision of Mike Meylan. Her talk `Modelling a plate of arbitrary shape in infinitely deep water using a higher order method' was praised by the committee for its clarity and quality of visual aids, as well as the technical difficulty of the subject. This year's winner of the New Zealand Mathematical Society Research Award is Rod Gover from Auckland University. The award is made "For highly original contributions in conformal differential geometry, that has led to the solution of some outstanding and difficult problems." Cynthia and Rod will be presented with their certificates at the Royal Society of New Zealand Awards Night in Science and Technology in November. This is another opportunity for the society to showcase the achievements of New Zealand mathematics to the scientific community and the media. Our congratulations go to both these high achievers.

Mick Roberts
Massey University, Auckland

PRESIDENT'S REPORT 2002-2003

This report covers the period from the last AGM in December 2002 till July 2003. Of course the reason that the period is not a full year is that the AGM is being held in Sydney as part of a meeting embedded in ICIAM. Congratulations to the organizers of this very large meeting.

I should add as preamble that this is my final report as President of the NZMS. I wish to thank the councillors for all their time and effort devoted to the NZMS. Since the time I took over from Graeme Wake, so much has changed on the mathematical landscape in New Zealand. I think that there is some acknowledgement that we are an important part of New Zealand's intellectual capital. It is good to see things like the New Zealand Institute for Mathematics and its Applications centre of research excellence coming into existence. We must all work to take advantage of our opportunities here. I think that there is still a worry about the general support of *industrial* mathematics within New Zealand, and I hope that we can address this in the next few years.

Forder Lecturer 2003
The 2003 Forder Lecturer for 2003 will be Caroline Series of the University of Warwick. She will be here in September or thereabouts. Precise details will be coming out soon. As we said last year, the British Council, which has previously supported this activity, has declined to support Professor Series. The LMS is committed to this scheme and is looking into the matter for future lecturers.

Membership
Membership is now 234. This is essentially the same as last year.

Fellowship of NZMS
Jeff Hunter became a new Fellow of the NZMS for his excellence and his service to our mathematical community. This award was presented at last year's Colloquium Dinner.

NZMS Research Award
The 2002 award went to Bakhadyr Khoussainov from the University of Auckland Computer Science Department. The 2003 award will be announced at the Awards dinner at the Embedded Colloquium.

We thank this year's committee of Mike Steel, Gaven Martin and Vernon Squire who assisted with the selection process.

Aitken prize
The 2002 Aitken prize for the best student talk at the 2002 Colloquium was Sivajah Somasundaram of The University of Waikato.

Highly commended were the talks of Jonathan Marshall, Krasimira Tsaneva-Atanasova and Priscilla Tse.

Thanks to the committee of Rick Beatson, Shaun Cooper, Gaven Martin, and Mick Roberts (convener) who made these fine selections from a very good range of student talks.

The recipient of the 2003 award will be invited to a black tie awards night (see the Royal Society item) in November.

Performance Based Research Fund
The PBRF is now in full swing, with its heavy bureaucracy. I believe the excellence of New Zealand Mathematics will shine through and it will be a good thing for us, after the initial pain. Thanks to Vernon Squire for agreeing to chair this important committee.

Bernard Neumann
A good mathematical friend of New Zealand, Bernhard Neumann passed away on the 21st October, 2002. We knew Bernard not just through the legend, but because of his openness, friendliness, and mathematical vigour which lasted till the end. The society sends commiserations to his family.

Math Olympiad
New Zealand also did well at the Math Olympiad
obtaining its highest ever placing of 34th out of 84, and its first ever gold medal to Simon Marshall of Onslow College, Wellington. There are a dedicated group of people involved in this, lead by Michael Albert of Computer Science in Otago. The council has voted to commit to supporting this each year in the future.

Royal Society of New Zealand
The RSNZ has had a number of changes in its relationship with its constituent bodies. Shaun Hendy and Geoff Whittle have represented the NZMS in several discussions. More on this soon.

There were 10 new Marsden grants in 2002, including 3 new fast starts, and a number of new faces.

Awards Night
The Royal Society has decided to highlight the achievements of members of the constituent societies at a back tie awards night. This will be at the Stamford Plaza Hotel in Auckland on the 13th November, and we will have our Aitken Prize and Research Award being (re-)presented at this event, which has invited media coverage.

Congratulations
Two prominent New Zealand mathematicians have been appointed to personal chairs around the country, congratulations Mike Steel and Robert McLachlan.

NZMS Grants
The council decided to devote a considerable amount to supporting ICIAM and particularly student travel to that. Council made the following grants in 2002-3 (to date):

i. Ordinary student travel grants $500 (1 grant)
ii. International Mathematics Olympiad $500
iii. Maths Colloquium 2002 $2500 (NZMS Speaker $1500, student support $1000)
iv. NZMS speaker at the Aust/NZMC during ICIAM2003 $1702 (being $AU1500)
v. ICIAM travel grants $8600 (8 student grants of $1000,
one other grant of $600)
vi. NZ Journal Mathematics $1000 (for 2002-3 year)

TOTAL $14802

Note, for the 2002 calendar year (up until the present time) the society gave 3 student grants. 2 of the 3 were made in July, and were included in last year's report. So the figures given above will disagree with the Treasurer's report for the 2002 year.

Other expenditure of interest: NZMS Lecturer $966 and Aitken Prize $250.

The total donations to the NZMS Endowment for Student Support in 2002 were $1799, plus $7057 from the colloquium float.

Centre of Research Excellence
Last year there was the exciting news that there have been the formation of two CoRE's of relevance to the NZMS.

One was the NZIMA headed by Vaughan Jones and Marston Conder, as directors, and with a large group of New Zealand mathematicians on the governing board. Funding for 2003 was provided to the following programmes: Numerical methods for evolutionary problems (John Butcher, Auckland) - middle part of 2003, Phylogenetic genomics (Mike Steel, Canterbury) - first half of 2003, Logic and Computation (Rob Goldblatt, Wellington) - late 2003 and early 2004, Modelling cellular function (Nicolas Smith, Auckland)

Most of these are now under way, and there are a number of upcoming related conferences and workshops particularly in early 2004 in Nelson, Kaikoura and Wellington.

There were two visiting Maclaurin Fellowships: David Evans (University of Bristol), first half of 2003 and who attended the NZMRI meeting in New Plymouth; and Richard Laugesen (University of Illinois at Urbana), first half of 2003. The inaugural NZ based Maclaurin Fellow was Rod Downey Victoria University (2003).

The Allan Wilson Centre for Molecular Ecology and Evolution is also hosting programmes of interest to our members in 2003+ including the phylogeny meeting in Kaikoura.

The current round of decisions for funding 2004+ is under way, and the CoRE seems to be fulfilling its initial promise to provide great support for national mathematics within New Zealand.

The Australian Government has recently decided to have a similar, but more focused, CoRE based in Canberra.

NZMRI Summer Meeting
This was held in splendid weather in New Plymouth. There were a stellar group of speakers in the area of mathematical and combinatorial biology. Next year's one will be in Nelson.

Australian-NZ Mathematical Societies and ICIAM 2003
At the time you read this report, this meeting should be underway. The NZMS speaker for this meeting is Cheryl Praeger who has quite significant NZ connections down through the years.

VIC 2004
As an initiative of the NZMS, the NZIMA, and the Israel Math Society, there will be an international meeting in Wellington, with speakers Rod Downey (Victoria University), Vaughan Jones (Berkeley), Victor Palamodov (Tel Aviv University), Andre Nies (Auckland University), Janos Makowsky (Technion), Robert McLachlan (Massey University), Ran Raz (Weizmann Institute), and Hugh Woodin (Berkeley), and a large number of special session speakers. This looks a really successful initiative, and we may well see another such jointly sponsored meeting, perhaps in Israel, in a couple of years time. See www.mcs.vuw.ac.nz/~mathmeet

Special Thanks

Council members Peter Fenton and Rua Murray are finishing their terms after sterling service. Thanks to them. Thanks especially to Rua as retiring long-suffering Treasurer.

Also welcome to Mick Roberts, incoming President.

Rod Downey
Victoria University of Wellington

LOCAL NEWS

AGRESEARCH

Congratulations to Harold Henderson, a biometrician on the Ruakura campus who is the 2003 recipient of the NZSA Campbell Award

http://www.stat.auckland.ac.nz/nzsa/award.shtml the premier award of the NZ Statistical Association.

Congratulations also to Katarina Domijan, who was awarded second place in the Hoare Research Software Student prizes at the NZ Statistical Association conference in 2003. The prizewinners gave presentations on their thesis research Second: Katarina Domijan, graduated MSc (Hons) from The University of Waikato in October and now works at AgResearch Ruakura.

The NZSA conference was also attended by Zaneta Park-Ng, Lilian Morrison, Roger Littlejohn, Martin

Upsdell and David Baird (who addressed the Young Statisticians group).

Ken Dodds is attending the XIXth International Genetics Congress in Melbourne.

Paul Shorten from the Mathematical Biology Group travelled to France in June, 2003 to present a paper at the 4th international conference on Predictive Modelling in Foods in Quimper, France. Paul also visited the Toulouse National Veterinary and Agronomy schools and the Herbivore, Feeding and Environment groups at the INRA research institutes in Clermont-Ferrand and Rennes to discuss milk lipid modelling.

Ken Louie

THE UNIVERSITY OF AUCKLAND

Department of Computer Science

Congratulations to Gillian Dobbie and Bakh Khoussainov, who succeeded in getting through the preliminary round of the Marsden Fund this year.

Seminars

Dr David Stanhill, "The wavelet transform and multi-resolution analysis", and "The wavelet transform - some advanced topics".

Johnson Chen, "Object-embedding panoramic images".

Xiang Lin, "Target positions self-calibration".

Professor Lyle Noakes (University of Western Australia), "Rigid body interpolations and Riemannian cubics".

Volker Rodehorst (TU Berlin), "Close-range auto-calibration using projective geometry".

Dr Bruce Mills (Massey University - Albany), "Entropy and parsing algorithms".

Associate Professor Bakhadyr Khoussainov, "Games played on finite graphs", and "Automatic structures".

Yuman Huang, "Measuring the pupil size of a human eye".

Sasha Rubin, "Proving non-automaticity".

Dr Ulrich Spiedel, "A Shannon entropy for finite strings", and "DARTH - A framework for the design of database driven websites through a web browser".

Garry J. Tee

Department of Mathematics

Dr Shixiao Wang (Advanced Engineering Technology, USA) has accepted the offer of the Industrial Mathematics Lectureship. He expects to start in Auckland on November 1. Dr Mike Meylan (Massey University - Albany) has accepted the offer of the Applied Mathematics Lectureship. He will start in Auckland on August 1.

Dr Hannah Bartholomew has arrived, as Lecturer in the Mathematics Education Unit.

Congratulations to the following colleagues who succeeded in getting through the preliminary round of the Marsden Fund this year:

Fast Start: Maxine Pfannkuch
Standard: John Butcher (with Will Wright as one of the AIs)
Standard: Colin Fox (with Boris Pavlov and Geoff Nicholls as AIs)
Standard: Warren Moors and Ivan Reilly (with Jiling Cao as AI)
Standard: Jozef Siran and Paul Bonnington

Congratulations to the following colleagues who were successful in the latest round of grants from the University of Auckland's Staff Research Fund (administered by the University's Research Committee): Maxine Pfannkuch ($9238), Ivan Reilly ($4050), Arkadii Slinko ($2100), David Smith ($1800), Steve Taylor ($5000), Mike Thomas & Ye Yoon Hong ($21000).

Our Staff-Student Consultative Committee have once again won an award in the WAVE Student Friendly Awards, recognizing excellence in student representation. The winners for semester one 2003 were:
1st Place (Winner of $250) - BBIM Tamaki
2nd Place (Winner of $150) - Art History
3rd Place (Winner of $100) - Mathematics
We have previously been first and second.

ICIAM 2003. The 5th International Congress on Industrial and Applied Mathematics was held at Sydney on July 7 to 11. That congress incorporated the 6th Australian & New Zealand Mathematics Convention, the 11th Computational Techniques and Applications Congress, the 6th Engineering Mathematics and Applications Conference, the 17th National Conference of the Australian Society for Operations Research, and the 2nd National Symposium on Financial Mathematics. Members of these Departments contributed the following talks:

Alona Ben Tal (Bioengineering), "Mathematical modelling of the cardio-respiratory system".

Bruce Calvert, "Infinite nonlineear resistive networks after Minty", and "Large networks of multiterminal resistors".

Nicoleen Cloete, "Fitting a distribution over random graphs to data".

Marston Conder, "The New Zealand Institute of Mathematics and its Applications (NZIMA)".

Colin Fox (& **Andres Christen**), "Markov chain Monte Carlo using approximate likelihoods".

Rod Gover (& **Kengo Hirachi**), "Conformally invariant powers of the Laplacian - a complete non-existence theorem".

Geoff Nicholls (& **Ian McKeague, Kevin Speer**), "Physics-based Bayesian inference from oceanographic data".

Geoff Nicholls & **Russell Gray**, "Building and fitting a model of human vocabulary change".

Boris Pavlov, "Resonance scattering in networks", and "Zero-range potentials with inner structure-fitting parameters".

Andy Philpott (Engineering Science), **Geoff Pritchard** (Statistics) (& **Philip J. Neame**), "Long-term hydro scheduling in a pool market".

Ilze Ziedins (Statistics) (& **Brad Luen, Kavita Ramanan**), "Multicasting and phase transition in tree loss networks".

This year's Mathematics Education Research Group of Australasia (MERGA) conference was held at Geelong, Australia between the 6th and 10th of July . It was attended by Bill Barton, Willy Alangui, Shehenaz Adam, Greg Oates, Viliami Latu, Hannah Bartholomew and David Godfrey from the Mathematics Education Unit, and all of them thoroughly enjoyed the occasion. Keynote addresses were given by Anne Watson, who spoke about opportunities to learn mathematics; Hillary Hollingsworth, who spoke about "The TIMSS 1999 video study"; and Susan Matthews, Peter Howard and Bob Perry, who spoke about "Enhancing Aboriginal Students' Mathematics Learning". The highlight of the week was that our Shehenaz Adam won the Early Career Award for her paper and presentation! That award, for excellence in writing up and presenting a piece of mathematics education research, encourages new researchers in mathematics education. It consists of a plaque and a prize of A$500, which were presented at that annual conference. Bill Barton in February conducted two teacher workshops on "Ethnomathematics in the curriculum" at Male and Mahibadoo (in The Maldives), and at the European Conference on Research in Mathematics Education (held at Bellaria, Italy), he gave a presentation on "Investigating the relationship between English language and mathematical learning: developing profiles". At the University of Pisa in March, he gave a public seminar (with Professor Phil Clarkson, ACU St Patrick's) on "Mathematics and language: matematica e lingua". He visited Granada University from March to May, and gave there a seminar on "Lenguaje Y Matemáticas / Language and Mathematics". In April he gave a seminar at Ankara University on "Topology and language", and at Charles University (Prague) he gave a Presentation to pre-service teachers. In May, Bill attended the Meeting of the International Programme Committee of ICME—10 (at Copenhagen), he was a Plenary Panel Member at the Malmo Mathematics Education Conference (Malmo, Sweden), and he gave a seminar on "Lenguaje Y Matemáticas / Language and Mathematics" at the University Autonoma of Barcelona. In June he gave a seminar on "Langage et Matématique / Language and Mathematics" at Grenoble University, a presentation on "Lenguaje Y Topología / Language and Topology" at the Fifth Iberoamerican Conference on General Topology & Its Applications, a seminar on "Language and

Mathematics: What everyday talk tells us" at London University, and he gave an invited presentation "Mathematical discourse in different languages: implications for mathematics teachers" at the Midsummer World Mathematics Education Conference at Goteborg, Sweden, Midsummer World Mathematics Education conference. Bill rounded off a very busy month of June with an invited keynote presentation and summing up on "Mathematics Education and Indigenous People: What does international research and teacher experience tell us?" at the Saami Conference on Ethnomathematics at Jukkasjärvi in Sweden, June. In July at the MERGA—26 conference at Geelong, he gave a Presentation on "The Mathematics Enhancement Project: using concepts of cultural conflict, critical mathematics education, and didactic contract".

Paul Bonnington spent two weeks in June at the National University of Yokohama (by invitation), visiting Professor Seiya Negami and Professor Atsuhiro Nakamoto to initiate a joint research project. At the 5th Slovenian International Conference on Graph Theory (at Bled, Sloveni) he presented a talk "Toroidal triangulations are geometric". In July, he was invited to spend a week visiting Dr Primoz Potocnik and Professor Bojan Mohar at the University of Ljubljana.

Nicoleen Cloete gave a lecture on "Fitting a distribution over random graphs to data" at ICIAM in July 2003.

Marston Conder took part in a conference on "Groups and Computation" at Columbus (Ohio) in March, and another on "The Graph Theory of Brian Alspach" at Simon Fraser University (British Columbia) in May. The latter was sponsored by the Pacific Institute of Mathematical Sciences, and so he had a good opportunity to visit their offices and see how PIMS works. In Europe for three weeks in June and July, Marston was an invited speaker for a small conference "Algebraic Combinatorics on the Adriatic Coast" at Koper (Slovenia), a speaker at the 5th Slovenian Conference on Graph Theory at Lake Bled (Slovenia), a speaker and member of the Scientific Committee at a conference on "Conformal Geometry, Discrete Groups and Surfaces" held under the auspices of the Banach Center and the Polish Academy of Sciences, at the Mathematical Research and Conference Center at Bedlewo (Poland). At ICIAM in July, Marston took part in a minisymposium on mathematical research institutes. Finally, some mathematical news: Colin Maclachlan and Marston have used group-theoretic techniques to construct a compact orientable hyperbolic 4-manifold of volume $32p^2/3$, which is the smallest known volume for such 4-manifolds.

Sina Greenwood attended the Conference in Honor of Alexander Arhangelskii in New York, June 29 to July 3.

Norm Levenberg has attended the following conferences this year: Midwest Several Complex Variables, University of Notre Dam (in March), AMS Regional meeting, Indiana University (in April); and Constructive Approximation at Vanderbilt University, NORDAN (Several Complex Variables) at Visby, and Analysis Conference in honor of L. Carleson, Royal Institute of Technology (KTH), Stockholm, all in May.

Gaven Martin was at the Princeton Institute for Advanced Study in May/June. He gave colloquia there and at Syracuse University. He attended the annual Miller Symposium in the Basic Sciences, held at a beautiful resort on the Californian coast. He was in Helsinki/Jyväskylä in June, as an invited speaker at the 20th Nevanlinna Colloquium and a plenary speaker at the conference "Geometric Function Theory: Future Trends".

Warren Moors gave an invited talk on "Small sets associated with weak Asplund spaces", at the conference on "Small sets in analysis" at the Technion (Haifa), June 24 to July 1.

Greg Oates attended the MERGA conference held in Geelong in early July. He was invited to be one of the speakers in a plenary debate at the closing ceremony for the conference.

Eamonn O'Brien gave an invited lecture entitled "Aspects of matrix group recognition" at the "Groups and Computation" meeting, at Ohio in March 2003.

Philip Sharp had study leave in the US and Canada mid-April to mid-May. While there he continued collaboration with Drs Martin Duncan and Paul Wiegert of the Department of Physics at Queen's University, Kingston. He also gave a seminar in the Department of Mathematics & Statistics at the Univerity of Ottawa, and he attended a conference on dynamical astronomy at Cornell University. Philip was scheduled to give a seminar in the Department of Computer Science at the University of Toronto; but three days before he left New Zealand, the University of Auckland, concerned over the spread of SARS, imposed what amounted to a travel ban on Toronto.

Shayne Waldron attended the conference on "Advances in Constructive Approximation" at Nashville, then visited Pete Cazassa (University of Columbia, Missouri), attended a conference at Dagstuhl in honour of the (formal) retirement of Carl de Boor (his advisor), and then visited Allal Guessab

(University of Pau), Marco Vianello and Stefano di Marchi (Universities of Padua and Verona), and Kurt Jetter's group in Hohenheim.

Tsukasa Yashiro has departed, for a Post-Doctoral Fellowship at Osaka University.

Recent visitors include Dr Majid Ali (Sultan Qaboos University, Oman), Dr Hermann Brunner (St Johns College, Newfoundland), Associate Professor Andreas Cap (University of Vienna), Professor Paul Gartside (University of Pittsburgh), Professor Simon Gindikin (Rutgers University), Professor Tim Goodman (University of Dundee), John V. Matthews 3rd (Duke University), Dr Larry Peterson (University of North Dakota), Professor Harvey Schmidt (Lewis & Clark College, Portland, Oregon), Professor Jim Verner (Simon Fraser University), Professor Peter Webb (University of Minnesota). Tim Marshall and Vladimir Oleinik are long-term visitors.

Seminars

Sepideh Stewart, "Difficulties in the acquisition of linear algebra concepts".

Dr Tsukasa Yashiro, "Triple point numbers of surface-knots", and "Surfaces in 4-space".

Professor Steven R. Bishop (University College London), "Nonlinear dynamics and its applications".

Dr Holly Gaff (University of Tennessee - Knoxville), "A tick-borne disease model - spread and control of Ehrlichiosis".

Professor Andy Philpott (Department of Engineering Science, and Yacht Research Unit), "Optimization, probability, and the America's Cup".

Dr Alastair Rucklidge (University of Leeds), "Infinities of stable periodic orbits in systems of coupled oscillators".

Professor Alexander Dimitrov (Montana State University), "Analysis and modeling of sensory systems through information distortion".

Dr Mike Meylan (Massey University - Albany), "Application of spectral theory to linear water waves".

Dr Scott Parkins (Department of Physics), "Quantum chaos with ultra-cold atoms".

Dr Sina Greenwood, "Brunnian rings".

David Godfrey, "Student understanding of equations".

Professor James Sneyd, "Neither an ant nor a spider be: historical vignettes in mathematical physiology" (The Aldis Lecture for 2003).

Dr Philip W. Sharp, "Close approaches in N-body simulations of the solar system".

Sivajah Somasundaram (The University of Waikato), "Recent results on weak Asplund spaces".

Alan Gil delos Santos, "Representational ability and understanding of derivative".

Professor Myung Hyun Cho (Wonkwang University), "Topological operations of iterated star-covering properties and star-covering properties of s-products".

Dr John Enlow (University of Otago), "Modelling surfactant liquid crystal structures".

Dr Shixiao Wang (Advanced Engineering Technology, USA), "Solving physical and industrial problems with mathematical methods".

Dr Andrei Korobeinikov (University of Oxford), "Long-term coexistence of two competing spatially distributed species".

Dr Warren B. Moors, "A characterization of the Namioka Property".

Dr Nicholas Dudley Ward, "What I got up to in the City of London".

Sasha Rubin, "Automatic algebraic structures".

Dr Chris Messom (Massey University - Albany), "Trends in supercomputer technology".

Dr Mike Thomas, "The role of representation in understanding functions".

Professor John Butcher, "Stability and accuracy of numerical methods for initial value problems".

Judy Paterson, "Listening to teacher talk, easier said than done".

Professor David Schaeffer (Duke University), "A well-posed BVP for a hyperbolic equation with Dirichlet boundary conditions".

Professor Peter Webb (University of Minnesota), "Computing resolutions for group cohomology".

Dr Lawrence J. Peterson (University of North Dakota), "A Mathematica-based approach to conformal geometry".

Dr Simon Gindikin (Rutgers University), "Manifolds of rational curves, twistors, solitons", and "Complex crowns of Riemann symmetric spaces".

Dr Andreas Cap (University of Vienna), "Geometry of 2nd-order ODE's and parabolic geometries".

Professor Tim Pedley (Cambridge University, Rutherford Lecturer 2003), "Modelling pattern formation in suspensions of swimming micro-organisms".

Professor Nathan Kutz (University of Washington), "Local and nonlocal mean-field theory in N-body quantum mechanics: applications to Bose-Einstein condensates in standing light waves".

Associate Professor Bakhadyr Khoussainov (Computer Science), "Games, automata, and complexity".

Professor Ivan Reilly, "The language of topology: A Turkish case study".

Professor Matthias Langer (Vienna University of Technology), "Resonances and spectral concentrations of a Sturm-Liouville problem depending rationally on the eigenvalue parameter".

Professor Malcolm Brown (Cardiff University), "Some inverse spectral problems for the Sturm-Liouville equation".

Professor Boris Pavlov, "Techniques of intermediate operators in perturbation theory".

Dr Marie Hofmannova (Charles University, Prague), "Attitudes of mathematics and language teachers towards new educational trends".

Professor Paul Gartside (University of Pittsburgh), "Free subgroups of Polish groups".

Garry J. Tee

Department of Statistics

Marti Anderson and Russell Millar got married on April 12.

Chris Triggs has been appointed as Assistant Dean of Science - Tamaki.

At ICIAM 2003, Geoff Pritchard (with Andy Philpott & Philip J. Neame) spoke on "Long-term hydro scheduling in a pool market", and Ilze Ziedins (with Brad Luen & Kavita Ramanan) spoke on "Multicasting and phase transition in tree loss networks".

Staisticians Maxine Pfannkuch,Ross Parsonage and Christine Miller,celebrating at the Beehive

A statistics teaching programme at The University of Auckland's Department of Statistics has won one of New Zealand's most prestigious teaching awards, a National Tertiary Teaching Excellence Award for collaboration in teaching.

The first-year statistics teaching programme was originally developed ten years ago to cope with the huge numbers of students taking the course, and to ensure the consistency and ongoing improvement of the learning resources in the department.

More than 3700 students take first year statistics papers at the University every year. In 2002, these enrolments involved 17 streams spread over three semesters, four campuses, 14 lecturers, 29 tutors, 25 laboratory demonstrators and 60 student markers.

Department of Statistics Head Chris Wild says the department developed a team-based model to cope with the large numbers of students and teachers involved.

"There is little point having one course taught superbly to one group of students by one teacher. Our aim was to capture the good ideas permanently into a system that everyone used, so the courses improved each time they were taught, regardless of who taught them," says Professor Wild.

New improvements include the development of an interactive CD-Rom that contains a full set of lecture slides, videoclips, interactive worksheets and a soundtrack.

The University of Auckland Vice-Chancellor Dr John Hood says the award is welcome recognition of the very strong emphasis the University places on the quality and innovative nature of its teaching programmes.

"Statistics is the backbone of much of the research undertaken at the University, so it is important that a wide group of students are enthused and encouraged to carry on in the subject," says Dr Hood.

Professor Wild says the key to the success of the programme has been the sharing culture and selflessness teamwork within the Department.

"We wouldn't be at the point we are today, where we can cope with the huge numbers of students, without the teamwork and systems we now have in place. This has enabled us to build a set of tools that is far richer than any of us could have produced alone."

A 10-member team from the University was presented with the award at a ceremony at Parliament on Monday June 23. The award includes a $20,000 grant.

Seminars

Derek Law, "Recent developments of data visualization tools".

Professor Pip Forer (School of Geography & Environmental Science), "Subtleties of space: gaps in the armoury of geographic".

Dr Geoff Pritchard, "Stochastic methods in finance".

Dr David Boyce (University of Illinois at Chicago), "Congestion management by road pricing: implications for urban travel forecasting models".

Dr Gerald Cheang Hock Lye (Nanyang Technological University, Singapore), "An introduction to exotic options", and "A simple approach to pricing options with jumps".

Garry J. Tee

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Professor Brian Sleeman (University of Leeds) is currently visiting the department for 6 weeks. He is an Erskine Visitor visiting David Wall. Also, Dr Daniel Sjoberg (University of Lund) is currently here visiting David.

Douglas Bridges is currently on Sabbatical as a DAAD Gastprofessor in the Mathematisches Institut of Ludwig-Maximilians University, Munich. He tells us that the culture, weather, scenery and beer there are fantastic. The northern hemisphere conference season is starting and this will take him to Oviedo, Spain

(Logic, Methodology and Philosophy of Science), Cincinnati (Computability and Complexity in Analysis), Scotland (British Logic Colloquium), and Rostock (German Mathematical Society Annual Meeting). Last month he had Hajime Ishihara, Robin Havea (USP, Fiji), and Luminita Simona Vita (UC) visitng him at the same time to work together on foundations of analysis and topology.

Seminars

Dr Alastair Rucklidge (University of Leeds), "Infinities of stable periodic orbits in systems of coupled oscillators".

Alistair Smith, "Optimal marine farm structures".

Dr Frank Lad, "Learning from the probability assertions of experts".

Dr Philip Sharp (University of Auckland), "Close approaches of the many kind".

Professor Timothy J. Pedley (University of Cambridge), "Mathematical modelling of blood flow in arteries".

Professor Tim Goodman (University of Dundee), "Asymptotic normality, wavelets and Heisenberg's uncertainty principle".

Professor Brian Sleeman (University of Leeds), " The war on cancer: A mathematical challenge".

Charles Semple

INDUSTRIAL RESEARCH LIMITED

Applied Mathematics Team

This year's FRST bidding round is a significant one for IRL with some notable changes in direction taking place. Indeed, much of the Applied Maths Team's funding is up for grabs this year. We will be bidding in a number of new areas including nutraceuticals, microfluidics and nanofacturing. We will also be trying to strengthen our activities in materials modelling. Wish us luck!

Graham Weir, Shaun Hendy and John Burnell attended ICIAM 2003 in Sydney in July. Graham and Shaun both gave talks in the "Mathematics and Mechanics of Granular Materials" minisymposium which was well attended throughout the week. One participant noted that this was the best series of seminars on granular materials he had ever attended.

Joanna Atkin left us in June to start her PhD studies in physics at Columbia University in New York. Joanna was with us for six months mainly working with Shaun Hendy on modelling the growth of passive films. Sadly, one of our German interns, Adrijana Juricev, has returned home after the sudden death of her mother. Our other German intern, Eva Kaiser, will stay at IRL until January.

Finally, Steve White made another trip to Lihir in Papua New Guinea. Steve was also in the US in May attending a conference in Washington and visiting Lawrence Livermore National Lab where he gave a talk.

Shaun Hendy

MASSEY UNIVERSITY

Institute of Fundamental Sciences (Palmerston North) Mathematics

Our congratulations to Kee Teo who has been elected as the mathematics discipline leader starting next year when Mike Carter retires. We wish Kee all the best.

We welcome back Robert McLachlan from a year sabbatical in Oslo. Robert surely must `enjoy' the New Zealand winter after a long and dark one in Oslo. He spoke at the conferences "Innovative Time Integrators for PDEs" in Amsterdam, "Geometric Integration" in Cambridge, "MAGIC '03" in Rondablikk (like the NZMRI workshops, but with skiing instead of surfing), and "Geometric Integration for PDEs" in Oslo.

Our congratulations to Paul Gardner who successfully defended his PhD thesis "Simulating the RNA-world and Computational Ribonomics". Currently Paul is in Bielefeld, Germany, and has started a six-month postdoc and then he will to go to Halifax, Canada, for a further postdoc. We wish him all the best with these positions.

Professor Graeme Wake in South Korea at the Korean Industrial Mathematics Initiative

ICIAM provided a great opportunity to catch up with 44 members of the New Zealand mathematical community as well as our colleagues from Australia and around the world. Among these it was good to see an old friend and Massey MSc graduate Anton Selvaratnam who is currently teaching at Avondale College in Cooranbong and who attended the ICIAM education day. The weather was perfect on Sydney's Darling Harbour, with sunny days and temperatures consistently near 20. From Massey, PN Robert McLachlan (with Fiona and Helena) and Tammy Smith attended and half of the 8 New Zealand student presentations at ICIAM were given by Massey, PN students. Patrick Rynhart spoke on "Liquid bridges between three particles", Seung-Hee Joo on "Contact systems and contact integrators" , Padmanathan Kathirgamanathan (Kathir) on "Source parameter estimation of atmospheric pollution from accidental releases of gas" and Jonathan Marshall on the "Analyticity of solutions to functional differential equations." Congratulations to Jonathan Marshall on being recognized by the NZMS for his "highly commended" talk. All who attended were impressed by his confident, even and careful presentation, as well as for the way he explained a difficult problem in a manner easy for a general audience to understand. Tammy Smith would also like to thank Mark McGuinness, David Wall and Paul Hafner for their help in judging this year's Aitken Prize.

Kathir also attended the MODSIM (Modelling and Simulation in Australia and New Zealand) 2003 held at Townsville, Australia, from 14-17 July. He presented a paper (published in the proceedings) titled: "Inverse modelling for identifying the origin and release rate of atmospheric pollution."

Igor Boglaev, Robert McLachlan and Seung-Hee Joo went up north to attend "Anode (Auckland Numerical Ordinary Differential Equations) 2003", the last one out of a series of four. This conference was in honour of John Butcher's 70th birthday. Robert was an invited speaker and spoke about "Runga-Kutta-Nyström methods and the entropy of classical mechanics". Igor spoke about "Monotone iterates for non-linear singular perturbed problem".

Bruce van-Brunt was an invited speaker at the Industrial Mathematics Initiative held at the Korea Advanced Institute of Science and Technology in Djeon, Korea. Bruce spoke about "Flexible Surface Design" and applications of differential geometry in surface design.

Charles Little has been appointed as a managing Editor of the Australasian Journal of Combinatorics. This appointment is a direct reflection of his international standing in this field. Well done Charles.

Mike Hendy writes: "INSTITUT HENRI POINCARE, Paris, May-June 2003. I was fortunate to participate in the "Programme: Genomics, Mathematics and Informatics" at the "Centre Emile Borel" of the "Institut Henri Poincaré" at the "Universite Pierre et Marie Curie", in Paris last month. Of particular note to me personally, was that the French mathematician, Jacques Hadamard, was one of the committee of three that established the Institut (with Carnegie Foundation support) in the 1930's. (Hadamard's outstanding conjecture, published in 1893, has been pivotal in my own research in phylogenetics in the past 15 years. I was particularly thrilled to meet a retired physicist who had known Hadamard, "very tall, very genial, and lived to 98", I was informed). The Poincare Institut compares itself with similar centres such as Isaac Newton, Cambridge, MSRI, Berkeley and RIMS, Kyoto. The Borel Centre runs thematic programmes ranging from 2 to 6 months on various subjects in mathematics and physics. These invite participants, mostly young researchers from the Paris area, to attend series of lectures and workshops of invited experts from around the world. My invitation was for four weeks, to give four 2-hour lectures, and to present a 75 minutes' overview at the workshop, and to interact with the young researchers there. I was also able to attend lectures of other invitees present for that month. These included David Bryant* (PhD from Canterbury, my doctoral grandson) who is now at McGill in Montreal, together with others from US, Canada, France and Poland. I found this setting much more conducive to presenting deeper theoretical results, given the audience was mostly mathematical. The Borel Centre had 2 floors of the building, and each afternoon at 16:30, coffee and biscuits were available in the common room together with black and whiteboards, where informal "petit seminars" were encouraged, where we (presenters and students) encouraged to speculate and debate controversial issues. My time there concluded with an one

week workshop with 15 invited presenters and more than 200 registrants. As well as David and I, Mike Steel* and Vince Moulton* were presenters, and in the audience were other kiwi-philes including Dietmar Cieslik* (Greifswald) and Sagi Snir* (Tel Aviv). The opening presentation was Emeritus Professor Walter Fitch, the "grand-father" of phylogenetics who gave a historical perspective of the field. Walter, although a biochemist by training, was one who had encouraged mathematicians into this field. My first weekend I visited Daniel Huson*, who is now Professor of Bioinformatics at Tübingen, a very old delightful city near Stuttgart, where DNA was first identified. On the second weekend I made a moving pilgrimage to the 1st world war battlefields at Passchendale near Ypres in Belgium, (a much greater loss of life of NZ'ers in one day than at Gallipoli) on my way to Bielefeld, where I spent 2 days working with Andreas Dress*. My third weekend was spent working with Sagi Snir, who is completing his PhD under Benny Chor* in Tel Aviv. As I had declined an invitation to visit Tel Aviv at this time, Sagi made the trip to Paris, where we were able to make considerable progress on a problem he had been struggling with since his visit to NZ 16 months ago.

(*—For those who don't know these people, they have all been visitors to us at Massey during the last 3 years.)"

Barbara Holland will be attending WABI 2003—Workshop on Algorithms in Bioinformatics which is being held in Budapest, Hungary from 15-20 September. Barbara will be presenting a talk on "Visualizing large sets of trees." After the conference she will be heading up to Uppsala to work with Vincent Moulton and Katharina Huber for a few weeks. Vince and Kathi have both been regular visitors to Massey over the last few years.

Seminars

Professor Mike Hendy, "Hadamard matrices".

Dr John Hudson, "Orbifolds and wallpaper".

Associate Professor Charles Little, "A new proof of a characterisation of Pfaffian bipartite graphs".

Dr Mike Carter, "Eudoxus: The evidence".

Associate Professor Igor Boglaev, "Monotone iterative algorithms for nonlinear differential equations".

Jonathan Marshall, "A method of Frobenius for functional differential equations".

Professor de Witt Sumners (Florida State University), "DNA Topology".

Professor Tim Pedley FRS (Professor of fluid mechanics, Cambridge University (2003 Rutherford Lecturer), "Mathematical modelling of blood flow in arteries".

Dr Barbara Holland, (Allan Wilson Centre, Massey University), "Consensus networks".

Dr Kee Teo, "Graph polynomials related to chromatic polynomials".

Marijcke Vlieg-Hulstman

Institute of Information and Mathematical Sciences (Albany) Mathematics

Mick Roberts attended the WHO global meeting on the epidemiology of SARS, Geneva in May, and the WHO global conference on "SARS—where do we go from here?", in Kuala Lumpur in June. In KL he gave a paper in the modelling workshop session.

Carlo Laing attended the SIAM Conference on Applications of Dynamical Systems in Snowbird, Utah in May, giving two invited oral presentations and a poster. He then attended a 5-day workshop on Symmetry and Bifurcation in Biology at the Banff International Research Station (BIRS) near Calgary, giving an invited presentation. BIRS is a recently-opened joint US/Canada maths research centre, with a spectacular setting in the Canadian Rockies.

Carlo Laing, Robert McKibbin, Winston Sweatman, Cynthia Wang, and Graeme Wake all attended the 5th International Congress on Industrial and Applied Mathematics, Sydney, Australia, during July. Graeme gave a talk in the Inverse Problems symposium entitled "A mollified method for the solution of the Cauchy problem for the convection-diffusion equation" and was co-author of two other presented papers. Carlo gave two talks. Winston's talk was on "Cosmic Billiards: Features of the Symmetrical One-dimensional Newtonian 4-body problem". Robert McKibbin gave two talks, on "Slugging in oil-gas pipelines" and "Discovering the source of current-borne particles from their deposition patterns", and was also a co-author on another paper presented by one of his PhD students (Patrick Rynhart from IFS, PN).

At the New Zealand Mathematics Colloquium, held in conjunction with ICIAM, Cynthia Wang's presentation won the Aitken Prize for the best student paper.

Graeme Wake and Carlo Laing both attended the Modelling Cellular Function conference run by the NZIMA CoRE on Waiheke Island, 14th-18th July. Both gave talks with Graeme talking on "Cell-population dynamics".

Winston Sweatman (together with D.C. Heggie) gave a poster presentation on "The wake of a body moving through a stellar distribution" in the "Dynamics and Evolution of Dense Stellar Systems" session at the 25th General Assembly of the International Astronomical Union, Sydney, Australia, on 18th July. Jeff Hunter and Barry McDonald attended the New Zealand Statistical Conference at Palmerston North, 2-4th July. Barry presented a paper "Applying multidimensional scaling to the Party Vote: 2002 New Zealand Election". Graeme Wake had a contribution (presented by Dominic Lee, together with Andrew Rudge, Geoffrey Chase, Irene Hudson, Geoffrey Shaw, Lucy Johnson all from the University of Canterbury) on "Dynamic Model Assessment Using a Probability Band for Local Linear Kernel Regression with an Application in Agitation-Sedation Modeling". Jeff was re-elected onto the Executive Committee (with continuous executive involvement since 1992!).

Mick Roberts gave a presentation at ESR Science Centre, Kenepuru, Wellington on July 23 on "A mathematician in Asia—dining on dengue and supping with SARS".

Denny Meyer presented a seminar at RMIT Melbourne on 1st July on "Cointegration for Count Data".

Paul Bracewell spoke on 21 July in the Informal Statistics seminar series on the "HM algorithm test for redundancy".

Visitors
Steve Coombes (Loughborough University), July 18--22 with Carlo Laing. Steve gave a Seminar on "Dynamics of the Thalamus: Arnol'd tongues, Clustering and Travelling Waves".

John Casti (Santa Fe Institute), Distinguished Visitor to IIMS, gave a seminar on 23 July on "Socionomics: An Emerging Science of Human Events".

Seminars

Professor William Duke (Department of Mathematics, UCLA, USA), "Reciprocity laws, elliptic curves, and the Riemann hypothesis".

Professor David G. Schaeffer (Duke University, North Carolina, USA), "A two-current model for the dynamics of cardiac membrane".

Dr Mike Meylan (Massey University—Albany), "Application of Spectral Theory to Linear Water Waves".

Mike Meylan

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

Must be a quiet time just now, probably the lull before the PBRF and Marsden storms. Like Otago, no doubt all universities have been gathering information about research output, peer esteem and the contributions to the research environment of their academic staff. Like Otago, some staff have submitted Marsden proposals and are waiting for the various panels (especially MIS) to meet to get their results. Along with some teaching, this is basically what Vernon has been involved in with very little else to report.

Richard Barker visited the Authur Rylah Institute for Environmental Research in Victoria, Australia. There were two visits: one from April 7--17 and another from June 9--20, which continued collaboration on capture-recapture models.

Derek Holton has given the following account of the NZAMT8 Conference:

`I went to the New Zealand Association of Maths Teachers conference in Hamilton (8 to 11 July) because the NZ Olympiad Committee had obtained a grant from the Ministry and it seemed appropriate to tell teachers about the work that is being done by that group. So, along with Alan Parris of Linwood College, Christchurch, I gave a workshop on the Olympiad generally.

Over 350 people attended the conference that had a theme of Magic. This theme was taken up by all of the plenary speakers in one way or another. The most subtle of these was when Jeff Witmer took a random sample of teachers by selecting a red or a black card at random from a pack. Surprisingly (?) only red cards were drawn.

There were an incredible number of workshop presentations. I think something like 10 were on at any one time. One of interest to academics was on the NCEA. Teachers discussed the pros and cons of the new certificate. Whether you might think that it is good or bad, the products of it are coming to a university near you in 2005. Staff involved in first year courses need to get a handle on what it will mean for selection into the various first year papers.'

Sutha Sritharan has left her Teaching Assistant position to go back to Sri Lanka to finish her MSc in Statistics.

Lisa Avery replaced Sutha as a Teaching Assistant as from mid-July. Lisa is also continuing her MSc in Statistics.

We farewelled in July our three visitors who had spent the first half of the year in the Department: Jill Dietz, Jennifer Hoeting, and Geof Givens, who all return to the USA.

Seminars

John Williams (Department of Marketing), "Structural equation models for heterogeneous data: a finite mixture model approach".

Geof Givens(Colorado State University, USA), "Statistics and the whaling debate at the International Whaling Commission: Bayesian simulation modeling and decision making".

Eric Pandiscio(University of Maine, USA), "Dynamic geometry software and teachers' conception of proof".

Sutha Sritharan "Bootstrap autoregressive order selection".

Hans van Ditmarsch(Department of Computer Science), "Topics in proof visualization".

Ian Westbrooke(Science and Research Unit, Department of Conservation), "Assessing the impact of a possum control poison operation on tomtits".

Chris Linsell (Dunedin College of Education), "Teaching and learning early algebra: what's the problem?".

Robert Lewis, "Assessment in mathematics at the senior years in the english-speaking Carribbean high school".

Katrina Sharples (Department of Preventive & Social Medicine), "A statistical perspective on study design".

Julie Anderson (Dunedin College of Education),"The impact of the intermediate number project on teacher classroom practice. (A Case Study)".

Laimonis Kavalieris, "State space models for time series".

Dr Gill Thomas (Dunedin College of Education), "Learning Objects: What are they and who needs them?!".

Fred Lam, "Fieller's interval".

Bryan Manly (Western EcoSystems Technology Inc. Laramie, Wyoming), "Statistics by the hour".

Matthias Futschik (Department of Information Science), "Normalisation of microarray data and significance testing for chromosomal position of differential gene expression".

Tamsin Meaney (Educational Assessment Research Unit), "How does changing the question result in children changing their answers?".

Dr Hamish Campbell (British Antarctic Survey, Cambridge UK and Portobello Marine Laboratory), "The Eco-physiology of antarctic fish investigation by electronic tagging and power spectral techniques".

Tim Williams, "Scattering of water waves by pressure ridges in Antarctic sea-ice".

Noel J. Walkington (Department of Mathematical Science, Carnegie Mellon University, U.S.A.), "Simulating fluids exhibiting microstructure".

Preliminary presentations of fourth year mathematics projects. The students and topics are -

Timothy Ball, "Much ado about nothing - the Vacuum".

Lauran de Ruiter, "Localizations of rings".

Richard Norton, "Grid generation and redistribution".

Fraser Rew, "Chain conditions on ideals of rings".

Daniel Stride, "Descartes".

Preliminary presentations of honours statistics projects. The students and topics are -

Julia Hall, "Assessing purchasing price parity through nonlinear mean reversion".

Clinton Hayes, "State space modelling and the Kalman filter".

Philip Liu, "Inflation error in New Zealand".

Jason Rabbitt, "Duckworth-Lewis".

Matthew Schofield, "Bayesian models for stochastic volatility".

Lenette Grant

THE UNIVERSITY OF WAIKATO

Department of Mathematics

We welcome Tim Stokes to our department. Tim is from Murdoch University in Perth and further information about him may be found in the New Colleagues section of this Newsletter. During June, Tim had Michael Bulmer from the University of Queensland as a visitor for about a week.

We congratulate Ian Craig on his recent promotion to Professor. His term of study leave has now ended and he is back in the saddle as Chairperson. In June and July, Ian had Yuri Litvinenko from the University of New Hampshire, Durham, visiting for about four weeks. He also had John Brown (Astronomer Royal of Scotland) from the University of Glasgow visiting at the end of July.

Another visitor was Anthony Quas from the University of Memphis. He visited Rua Murray for about a week towards the end of July.

We congratulate David Harder who has now completed the requirements for his PhD degree. He is off to New York for a break.

Alfred Sneyd is now on study leave. He left for Grenoble, France in early June and will be returning in early August. He comments that `there is just too much wine to be drunk, and it's so hot'.

Other travellers in the department include Jacob Heerikhuisen, Stephen Joe, Sivajah Somasundaram, and Tim. They all went across the Tasman to participate in ICIAM and the joint Sixth Australian-New Zealand Mathematics Convention.

After ICIAM, Stephen stayed behind to attend the Mathematics of Computation and Approximation conference held to celebrate the 65th birthday of his former PhD supervisor, Ian Sloan. On returning from Sydney, Stephen attended the ANODE 2003 conference held in Auckland to celebrate the 70th birthday of John Butcher. Because the Dean of the School of Computing and Mathematical Sciences will be on leave until July 2004, Stephen has taken on the position of Associate Dean in the School. His main brief will be to assist the Acting Dean.

Seminars

J. Brown (University of Glasgow), "Black holes—white rabbits".

A. Quas (University of Memphis), "Non-mono-tonicity in voting systems".

R. Kulkarni (Indian Institute of Technology, Bombay), "Iterative computation of eigenelements".

R. Bartnik (University of Canberra), "General relativity and the concept of mass: An introduction".

D. Harder, "Geodesic geometry of some static axisymmetric vacuum spacetimes".

R. Canfield (University of Montana), "Of tilt and twist".

M. Bulmer (University of Queensland), "Equational reasoning as a tool for data analysis".

J. Heerikhuisen, "Magnetic reconnection with a generalised Ohm's Law".

K. Broughan, "The approximation theorem of Dirichlet (and Kronecker) and its application to the Riemann zeta function".

W. Moors (University of Auckland), "Baire category theorem in analysis".

R. Murray, "Orbit statistics for maps with indifferent fixed points".

M. Conder (University of Auckland), "Hurwitz groups with arbitrary centres".

A. Rucklidge (University of Leeds), "Quasipatterns in the Faraday wave experiment".

K. Louie (AgResearch, Ruakura), "Roll me over in the clover-a model for growth of Trifolium repens".

Stephen Joe

VICTORIA UNIVERSITY OFWELLINGTON

School of Mathematical and Computing Sciences

Guohua Wu visited The University of Chicago at the end of May and gave a talk on "Quasi-complements of the cappable degrees". During this visit, he also attended the Annual Meeting of ASL (1-4 June, 2003) in the University of Illinois at Chicago, where he contributed a talk on "Complementing the cappable degrees in the difference hierarchy".

Mark McGuinness was in Oxford for a week visiting OCIAM, at the Korean Advanced Institute for Science and Technology in Taejon, South Korea for a week where he presented an invited talk on "Cooking crispy cereals, cooking sloppy rice, tall tapered feeders and hot-dip cast-iron coatings —Industrial Case Studies from Mathematics-in-Industry Study Groups" to the Industrial Mathematics Initiative 2003, and at ICIAM for a week where he talked about coal volatilisation and about synchronisation between heart-beats and breathing while asleep.

Siofilisi Hingano from Tonga, our former MSc student with Merit (2001), has been awarded a Canada Commonwealth Scholarship to support his PhD studies at the University of Ottawa, once again under Vladimir Pestov's supervision. Aleksandar Stojmirovic, our PhD student, has attended the 18th Summer Topology Conference in Washington, D.C. (July 9-13), where he gave a warmly received talk in the section on applications of topology to computer science, and will spend three months in Ottawa working with Vladimir, who remains Aleksandar's co-supervisor, on his doctoral thesis due to be finished in March next year.

We are looking forward to the visit of Forder lecturer Caroline Series, who will talk about Indra's Pearls at 6pm on Thursday 9 October in the Hunter building, and Kleinian Groups at 4pm Friday 10 October in Cotton 339.

We have welcomed our new Dean of Science, now called Pro-Vice Chancellor, Professor David Bibby from Industrial Research Ltd. There is talk of us coming under the umbrella of our new Pro-Vice Chancellor of Information Technology (Professor Warwick Clegg), together with the School of Information Management, which could be an interesting change.

Seminars

Greg Hjorth (UCLA), "Borel equivalence relations".

Darren Upton(Cambridge University, UK), "Pricing Bandwidth Derivatives".

Eileen Drew (Department of Statistics, Trinity College Dublin), "Career Progression of Women in Academy".

Ian Hodkinson (Imperial College London), "Random Graphs and Canonicity of Algebras".

Tim Pedley (Cambridge University, UK), " Modelling Flow and Oscillations in Collapsible Tubes".

Geoffrey West (Los Alamos; Santa Fe), "The Origin of Universal Scaling in Biology: from Molecules & Cells to Whales & Ecosystems".

Elizabeth Burslem, "Actions of solvable groups on the circle".

Bill Naylor, "Mathematical Markup Languages".

Alan Agresti, "Analysis of Repeated Categorical Measurement Data".

Sebastiaan Terwijn, "Effective Measure and Hausdorff Dimension".

Mark McGuinness

Continued

[ ]

Number 88 August 2003

NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Contents

ISSN 0110-0025

FEATURES

THE NATIONAL COMMITTEE FOR MATHEMATICS (1967-1996)

Author's note: The rapid approach of my retirement has prompted me to delve into some of the more dust-covered corners of my office. In one of these I rediscovered the archives of the National Committee for Mathematics, which I chaired at the time of its demise in 1996. Since many newer members of the NZMS may not have heard of this body, which was among other things involved in the founding of the NZMS in 1974, I thought a few historical notes might be of interest.

Mike Carter

In terms of documentation, the story of the New Zealand National Committee for Mathematics begins with a letter dated 7 February 1966 from the secretary of the International Mathematical Union (IMU) to Professor John Kalman of the University of Auckland, in response to a request for information about the possibility of New Zealand joining the IMU. It was suggested that New Zealand should apply for Group I membership (the same group as Australia), thereby paying the lowest possible annual subscription (Member countries of the IMU fall into five membership groups; the higher the membership group number, the more votes a member country has and the higher its annual subscription is. A country may apply for membership in the group of its choice; approval or rejection of the application is in the hands of the member countries.). It was also explained that adherence to the IMU would be through a committee of the Royal Society of New Zealand (RSNZ), to be called the National Committee for Mathematics, the composition of which would have to be reported to and recognized by the IMU before New Zealand's membership of the IMU could become effective.

The matter was discussed at the first two New Zealand Mathematics Colloquia (in 1966 and 1967), and it was decided to recommend to the RSNZ that New Zealand should proceed with an application to join the IMU. Consequently the RSNZ appointed a National Committee for Mathematics (NCM) consisting of

Professors Simon Bernau (Otago), John Butcher (Auckland), Brian Hayman (Massey) and Gordon Petersen (Canterbury), Mr Doug Harvie (Victoria), Dr Hamish Thompson (DSIR) and the International Secretary of the RSNZ (ex officio). The first meeting of the committee took place in Wellington on 15 December 1967. Hamish Thompson advised members of the date and time by telegram! At this first meeting Simon Bernau was elected as chairman, and a constitution was agreed which included among the objects of the NCM the following:

- To coordinate and promote research in mathematics within New Zealand.
- To encourage scientific discussion and exchange of research findings between mathematicians.
- To act as the New Zealand channel of communications with the International Mathematical Union and other international and national organisations, and to coordinate New Zealand activities in relation to international organisations.
- To make recommendations and reports to the Council of the RSNZ on matters relating to mathematics.

The constitution also laid down that the NCM should comprise 9 appointed members in addition to the International Secretary of the RSNZ. This constitution was approved by the Council of the RSNZ on 15 February 1968, and subsequently three more members were appointed: Professors Desmond Sawyer (Waikato) and Cecil Segedin (Auckland), and Mr David Goldsmith of the Department of Education, Christchurch.

The first matter which the RSNZ brought to the attention of the NCM was a shortage of money! The NCM had asked that funds be made available for its members to travel to the May Colloquium, at which a meeting of the NCM would be held. The response from the RSNZ was that "... the Society will have to live through the next financial year on a smaller budget owing to the restrictions in Government finance. ... as your Mathematics Colloquium is primarily a University activity, Council would expect that the travel expenses of Members of the National Committee would be met from University sources ... I therefore think that the answer in this case is negative" (G W Markham (Executive Officer, RSNZ) to S J Bernau, 26 February 1968.)

At last in July 1968 the NCM was given something to attend to other than its own internal workings. Following an initiative by the National Committee for Geological Sciences, all National Committees were asked to "examine the situation in New Zealand" and report on any gaps there might be in University teaching in their particular fields (Memorandum from RSNZ to National Committees, 15 July 1968.) Lack of travel funds meant that the NCM could not meet to discuss this, so members were asked to send comments to the chairman, who reported these views to the RSNZ in a letter which is worth quoting in full: (S J Bernau to RSNZ, 7 November 1968.)

> "The main problem facing mathematics teaching in the New Zealand Universities is that of recruitment from overseas. There is an immediate and specific need for teachers and graduates in Computer Science and an urgent need to increase the number of mathematicians who are active in research and capable of supervising research students. The chronic shortage of statisticians and well qualified school teachers continues.
>
> We would like to see all University mathematics departments strengthened by the appointment of more, fully-qualified, staff. We feel that this could largely be achieved by normal appointments within the present establishment figures of each department if suitable people could be persuaded to accept positions in New Zealand.
>
> Recruiting problems are, we feel, due mainly to the ridiculously uncompetitive salary structure of New Zealand Universities, the working conditions and facilities implied by these low salary levels (compared with overseas) and also to the rapidly increasing demand for mathematicians in non-academic fields."

Meanwhile New Zealand's application for membership of the IMU was proceeding through the necessarily formalities, and was finally approved on 15 January 1969. The Secretary of the IMU concluded his letter of notification with the words "... I have received many letters warmly accepting New Zealand as a new member of IMU, and no rejection. Therefore, your application is accepted, and I have the honour of welcoming New Zealand as the 42nd member of IMU, in Group I' (Secretary, IMU to Executive Officer, RSNZ, 17 January 1969.)

At the NCM meeting held on 15 May 1969, it was decided that the NCM would circulate a list of research topics and supervisors available in mathematics in New Zealand (This function was later taken over by the NZMS.) Simon Bernau resigned as chairman, as he was leaving New Zealand to take up an appointment at the University of Texas. Brian Hayman took over the chair, and immediately faced the task of gathering data on the names of New Zealand mathematicians to be included in a new (fourth) edition of the World Directory of Mathematicians (the final list comprised 27 names, compared to 11 in

the previous edition).

Efforts to find a delegate to represent New Zealand at the 1970 General Assembly of the IMU in France seemed likely to fail because the inadequacy of the financial support available from the RSNZ, until John Kalman (who would in any case be attending the ICM in Nice) agreed to represent us.

The NCM found little to do over the next few years, apart from recording changes in membership. During 1970 David Goldsmith resigned, and the two vacancies on the NCM were filled by Miss Margaret Ryan (Department of Education, Wellington) and Professor Teddy Zulauf (Waikato). The following year Brian Hayman stood down as chairman and Doug Harvie took over that role. Then in 1972 a constitutional requirement for one-third of the members to retire came into operation; those chosen (by ballot) were John Butcher, Doug Harvie and Desmond Sawyer. They were replaced by Professors John Kalman (Auckland), David Vere-Jones (Victoria) and Bill Davidson (Otago).

Things livened up when the RSNZ received and forwarded to the NCM a letter from Professor C J Seelye, Head of the Mathematics Department at Victoria, conveying this recommendation from a meeting of staff of the Department: "That recognising the time might be appropriate for the formation of a New Zealand Mathematics Society this meeting requests the National Committee for Mathematics to submit to the 1973 Mathematics Colloquium General Meeting a detailed proposal for the formation of such a society" (C J Seelye to RSNZ, 4 September 1972.)

At the request of Cecil Segedin, who was then acting chairman of the NCM (For health reasons Professor Segedin did not in the end accept nomination as chairman and Gordon Petersen was appointed instead.), David Vere-Jones presented the NCM with a very detailed proposal including a draft constitution for a New Zealand Mathematical Society. The reaction was very mixed, several members of the NCM being quite strongly opposed to the formation of such a society, largely on the grounds that the Colloquium was working very well and there were dangers in trying to incorporate it into a larger organisation which was unlikely to bring any additional benefits.

As it happened, the NCM meeting held during the May 1973 Colloquium did not muster a quorum, and so the matter was passed on to the Colloquium AGM without any recommendation from the NCM. That meeting, as we all know, voted to support the formation of a New Zealand Mathematical Society, which held its inaugural meeting the following year.

In 1973, too, came a request from the IMU for data for the next edition of the World Directory of Mathematicians (the New Zealand listing increased to 51). Cecil Segedin resigned from the NCM and was replaced by Mr Steve Kuzmicich (Department of Statistics, Wellington).

At its May 1974 meeting the NCM expressed its concern that the current list of Fellows of the RSNZ did not do justice to the international standing of leading New Zealand mathematicians. Following correspondence with the RSNZ, it was suggested that the best solution would be for the NZMS to become a Member Body of the RSNZ; this would give it the right to nominate candidates for election as Fellows. This was duly done; the application from the NZMS to become a Member Body was approved in October 1975.

In 1975, largely on Gordon Petersen's initiative, the NCM took up the matter of New Zealand becoming a member of the International Committee on Mathematical Instruction (ICMI). Our application was successful and New Zealand became a member in 1976. A Mathematics Education Subcommittee of the RSNZ was set up to liaise between the ICMI and relevant groups in New Zealand.

At this time the archives of the NCM become somewhat sketchy, but it seems that somewhere between the 1975 and 1976 meetings the Committee lost Brian Hayman and Hamish Thompson and gained Professor Graham Tate (Massey) and Dr Mark Schroeder (Waikato). Then the RSNZ decided to reorganise its National Committees and reduce their size to six members. The NCM effectively dissolved in 1977 and did not meet that year; then it reappeared in 1978 with a reduced membership comprising Dr Robert Davies (DSIR), Professor John Kalman (Auckland, chairman), Mr Gordon Knight (Massey), Mr Steve Kuzmicich (Department of Statistics, Wellington), Dr Mark Schroeder (Waikato) and Professor Brian Woods (Canterbury); Steve Kuzmicich retired from the NCM in 1979 and was replaced by Dr Gillian Thornley (Wellington Polytechnic).

The new Committee immediately had to deal with another updating of the World Directory of Mathematicians. The exponential growth of the New Zealand mathematical community continued, there now being 109 New Zealand mathematicians listed.

Dr Graeme Wake, who had represented New Zealand at the General Assembly of the IMU held in Helsinki in 1978, reported back with a recommendation that New Zealand apply to move from Group I to Group II, as Group I was more for developing countries and our mathematical standing made Group II

more appropriate for us. At its 1979 meeting the NCM resolved that this be recommended to the RSNZ and that a case be prepared jointly with the NZMS. This was done and a detailed case was ready early in 1980. However, the RSNZ, at its March 1980 Council Meeting, declined to allow this application to proceed because its limited financial resources meant that it could not afford the increased subscription.

During 1980 Robert Davies, John Kalman and Mark Schroeder all retired from the NCM and were replaced by Professor John Deely (Canterbury), Dr David Gauld (Auckland) and Mr Ken Jury (Ruakura); Brian Woods took over as chairman.

In 1981 the World Directory of Mathematicians again became due for a new (seventh) edition. The New Zealand list continued to grow, though more slowly, reaching 128 this time. Since then the rapid growth in numbers of the New Zealand mathematical community has ceased, and in fact the last edition of the World Directory which the NCM was involved with (the tenth edition, which appeared in 1994) contained only 92 New Zealand names.

From 1982 to 1986 there is a gap in the NCM archives. The brief annual reports which appeared in the Proceedings of the RSNZ for those years show that in fact very little was going on other than the preparation of the World Directory listing. Members came and went; the chair moved from Brian Woods to David Gauld to John Butcher to Gloria Olive. When the NCM awoke from its gentle slumber towards the end of 1986, it consisted of Dr Gloria Olive (Otago, chair), Dr Mike Carter (Massey), Dr Rod Downey (Victoria), Dr Murray Jorgensen (Waikato), Professor Roy Kerr (Canterbury) and Dr Wilf Malcolm (Vice-Chancellor, Waikato).

Gloria Olive celebrated her accession to the NCM chair by writing a brief article about the NCM in the August 1986 Newsletter of the NZMS. The same issue of the Newsletter carried an article by Professor Derek Holton (Otago) urging the sending of a New Zealand team to the 1988 International Mathematical Olympiad to be held in Canberra. Derek discussed the activity that was already taking place and concluded by saying that moves were afoot "via the National Mathematics Committee" to give some sort of formal status to the group of people involved. In fact Professor Gordon Hookings (Auckland), another enthusiast for the Olympiad, had written to Gloria Olive on 9 May 1986 asking the NCM to give its approval to the establishment of a New Zealand Mathematical Olympiad Committee. Gloria responded conveying the whole-hearted support of the NCM, and the Olympiad Committee was duly formed.

The outcome of the first meeting of the Olympiad Committee was a letter to the NCM asking it to "consider a proposal that the New Zealand Mathematical Olympiad Committee become a sub-committee of the National Committee for Mathematics"\footnote{G A Hookings to G Olive, 21 October 1986.}. The NCM duly contacted the RSNZ to find out what they thought of this idea. But the RSNZ felt that the connection between the Olympiad and the IMU was tenuous, and proposed instead that the Olympiad Committee should be affiliated to the NZMS\footnote{S M Usher (Assistant Executive Officer, RSNZ) to G Olive, 3 August 1987.}. The Council of the NZMS in due course (May 1990) agreed to this. Meanwhile our team attended the 1988 Olympiad, being placed 34th out of 49 and gaining one individual silver medal—the first of many successful Olympiad entries.

A unique event in 1988 was the only joint meeting of the Australian and New Zealand National Committees for Mathematics, which took place during the 1988 Mathematical Sciences Congress held in Canberra. A report of this meeting appeared in the NZMS Newsletter, December 1988. There was much goodwill and extensive discussion on the desirability of fostering closer cooperation between New Zealand and Australian mathematics-related societies, but nothing much seems to have come of all this. However, some members of the New Zealand NCM were persuaded by the example of the Australian body that the New Zealand NCM should take a more active role in New Zealand mathematics instead of largely confining itself to IMU matters.

In mid-1989 Gloria Olive retired from the NCM and Mike Carter took on the role of chairman. Other members to retire then or a little later were Wilf Malcolm, Murray Jorgensen and Roy Kerr; the new faces on the NCM were Dr Peter Lorimer (Auckland), Dr Graham Weir (DSIR), Dr Charles Little (Massey) and Professor Derek Holton (Otago).

In June 1989 the NCM received a letter from David Gauld advising that the meeting of Heads of Mathematical Sciences Departments held during the May Colloquium had decided to set up a working party on the funding of the mathematical sciences within New Zealand universities. The views of the NCM were sought, and if it saw fit it was asked to nominate two representatives to this working party. The NCM was supportive, and nominated Mike Carter and Wilf Malcolm to represent it on a body which also included representatives of the NZMS, Heads of University Mathematical Departments, the Operational Research Society of New Zealand and the New Zealand Statistical Association.

After much discussion the working party presented its report in 1990. From the minutes of the 28th Council Meeting of the NZMS (23 November 1990; see NZMS Newsletter, April 1991) we learn that the

report had been circulated to all Heads of Departments, and that "few responses had been received, but were unanimously negative, observing that the report appeared unfocussed, especially on providing reasons for extra funding, and had a whinging tone to it". The working party report seems not to have got much further, but subsequent NZMS Council minutes show that the issue itself certainly did not (and probably never will) go away.

The major initiative of the NCM during 1990 was the push to create a New Zealand subcommission of the ICMI. The functions of such a subcommission would be to maintain liaison with the ICMI and to promote mathematics education within New Zealand. The NCM consulted with the NZMS, the NZAMT and the NZSA and received support from them all. The RSNZ was also supportive and the subcommission was duly established towards the end of 1991 with Megan Clark (Victoria) as convenor.

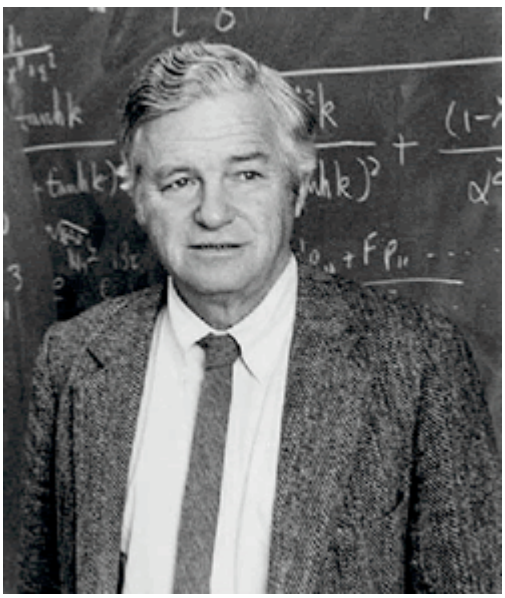
In 1994 the Secretary of the IMU requested New Zealand to consider upgrading its IMU membership to Group II on the grounds of a substantial jump in the quality of mathematical activity in this country; but once again financial considerations obliged the RSNZ to reject the suggestion.

The RSNZ decided in 1995 that the work of the National Committees should be incorporated within its Standing Committees. It established a Standing Committee on Mathematics and Information Sciences, within which Marston Conder took over responsibility for liaison with the IMU. The NCM accordingly ceased to operate in June 1995 and was eventually officially disbanded as from December 1996.

Over the years the NCM attracted some criticism for being unrepresentative and largely self-electing. It was perhaps not entirely clear, either to itself or to anyone else, what its precise role within New Zealand mathematics was supposed to be. But its formation was an essential step in the incorporation of New Zealand mathematics within the international mathematical community, and it was involved in some important initiatives over the years. As well, it quietly continued with routine matters such as the updating of the New Zealand listing in the World Directory of Mathematicians, the appointment of delegates to represent New Zealand at general assemblies of the IMU and the ICMI, and the nomination of New Zealanders for executive positions within these organisations (though our nominations were never successful). At the end it had indeed outlived its usefulness and the decision to disband it was a sensible one accepted as such by all concerned, but its contribution to New Zealand mathematics over the years should not be forgotten.

CENTREFOLD

David Benney



David J. Benney was born in New Zealand and spent most of his early years in Wellington. He was educated at Wellington Boys' College where he excelled in languages! His father, Cecil Benney, was Undersecretary of Mines for many years. Dave Benney graduated from Victoria University of Wellington with a Bachelors in Science (1950) with first class honours in Mathematics and a Master's in Science in (1951). Subsequently he went to Emmanuel College, Cambridge University where he took the Mathematical Tripos. He returned to New Zealand where he taught at Canterbury University College in 1955-56 and then went to the Massachusetts Institute of Technology (1957-59) where he earned a Ph.D. in Mathematics, studying with C. C. Lin. He has been at MIT ever since, holding posts of Instructor, Assistant Professor, Associate Professor, Professor (since 1966) and Head of the Department

(1989-1999).

Dave met his wife Elizabeth at Canterbury when she was finishing her degree. They were on a group ski trip to Temple Basin in 1955 and were married in 1959. Elizabeth Benney is well known for her remarkable accomplishments in the equestrian world and as a published author. They purchased an abandoned 77 acre farm in Upton, Massachusetts and brought it back to life. They built stables, a house, restored fields, installed fences etc. and made it into a beautiful horse farm. While this was in progress they lived in the original hundred year old farm house that was in very rough shape! Dave and Liz have three children and two grandchildren. They frequently visit New Zealand.

There's a lovely story which illustrates Dave Benney's understated character. Dave worked in the garden at the N.Z. Government House during the summer holidays. Sometimes the Governor General, Sir Bernard Freyberg, would walk around and talk about the tomatoes, strawberries etc. with Dave. In the meantime, Dave was nominated for a prestigious scholarship and Freyberg was to be the interviewer. On the day of the interview, Dave worked in the garden and ran home at lunchtime to change into a suit. When the interview started, Freyberg said: "Haven't I met you? You look familiar!" DJB never let on he was his gardener!

In 2002 volume 108 of {\it Studies in Applied Mathematics} was dedicated as a tribute to Benney in recognition for his groundbreaking research contributions to applied mathematics and for being Managing Editor of "Studies" for over 30 years. The volume consists of an expository article by C.C. Lin and eight papers by colleagues and former students of David Benney. Benney's work covers a range of issues of wide interest in physical applied mathematics: basic problems in fluid dynamics including flow stability and transition to turbulence, fundamental phenomena in nonlinear wave motion and asymptotic analysis. A preface article "Research Contributions of David J. Benney" by M. J. Ablowitz, T.R. Akylas and C.C. Lin surveys many of his important research contributions. The present article summarizes some of the earlier review and puts into perspective some of Benney's influential work. The reader is encouraged to consult the above volume, articles and references for more information.

His research work was often carried out in collaboration with his graduate students; he directed 18 Ph.D students. Such collaborations helped bring up younger generations many of whom made significant contributions of their own, thus amplifying the impact of his own effort. He is well-known at MIT as one of the best classroom lecturers at both the graduate and undergraduate levels. In collaboration with his colleague Harvey Greenspan, he co-authored an important calculus textbook which in addition to fundamentals encompasses both mathematical principles and the processes of mathematical modeling. This book combines the 'spirit' of both pure and applied mathematics. The past half century has been a period of rapid progress in understanding nonlinear phenomena, and the work of David Benney is central to this remarkable success. While his papers deal primarily with classical problems in fluid dynamics and nonlinear waves, Benney's work has had lasting impact in various other fields as well, including meteorology, oceanography, optics and plasma physics.

Benney recognized that valuable insights associated with nonlinear phenomena can be gained by working with relatively simple generic evolution equations that capture the underlying physics in certain asymptotic regimes relevant in a variety of physical contexts. This approach to nonlinear problems has proved particularly fruitful, and several of Benney's papers have become true classics.

Benney's work on hydrodynamic stability and transition deals with essentially parallel flows such as that in the boundary layer over a flat plate. Beginning with his doctoral thesis, "On the Secondary Motion Induced by Oscillation in a Shear Flow", Benney made decisive contributions to the theory of transition to turbulence through his studies of the nonlinear interactions of linear instability modes. Benney understood that interacting wavetrains have much in common with coupled nonlinear oscillators, and that the asymptotic procedures (multiple scales, averaging, Poincare frequency shifts etc.) developed for treating oscillator problems could be adapted to handle interacting waves.

The mathematical analysis used to study nonlinear interactions of unstable modes in shear flows was the basis of Benney's seminal work on nonlinear resonant interactions of gravity water waves. The spurious 'secular' growth of certain resonant wave components that had been found in earlier works on water waves was shown to be a manifestation of significant energy exchanges among waves that are members of resonant 'quartets'. This resonance mechanism has wide applicability in nonlinear dispersive wave systems.

In 1964 Benney derived a system of equations approximating the dynamics of three-dimensional weakly nonlinear shallow-water waves and obtained a class of interacting solitary-wave solutions. Solitary waves and their interaction properties have been a topic of keen interest to researchers. Shallow-water waves are disturbances whose lengthscales are long compared to the depth, and different aspects of long-wave phenomena is a subject to which Benney returned periodically. The 1964 work, in particular, made clear why certain classical equations derived by mathematicians in the late 1800's by Boussinesq and by

Korteweg and de Vries were actually generic approximations of weakly nonlinear-weakly dispersive wave phenomena. Hence, these equations applied in many different contexts.

In subsequent work on weakly nonlinear modulated wavepackets in 1967 the celebrated nonlinear Schrödinger (NLS) equation was proposed as the canonical evolution equation governing the propagation of a slowly varying wavepacket envelope. Interestingly enough, the broad validity of the NLS equation was not fully appreciated at first—thirty five years ago, when the NLS equation was viewed as one of several proposed asymptotic approaches for studying the then recently discovered modulational (Benjamin-Feir) instability of nonlinear periodic water wavetrains. However, the NLS equation is now generally understood to be the proper evolution equation governing the envelope of weakly nonlinear wave pulses and, among other applications, has been at the centre of major recent technological advances in fibre optics.

An important extension of the NLS equation to account for three-dimensional modulations of water wavepackets in finite depth was found in 1969. This work pointed attention to the coupling of the envelope with an induced mean-flow component which plays an important part in oblique instabilities of periodic wavetrains in water of finite depth. A coupled system of equations which governs the evolution of the wave envelope and the induced mean flow was derived. A special case of this system which is obtained in the limit of small fluid depth—sometimes also referred to as the Davey–Stewartson equations—has received considerable attention since it is an integrable 2+1 dimensional system and is a prototype model of nonlinear interactions between short and long waves.

Benney made further significant contributions to the theory of long-crested nonlinear waves in 1966. He devised an ingenious perturbation procedure to establish that the Korteweg–de Vries (KdV) equation is the appropriate evolution equation for weakly nonlinear long waves in a variety of flow systems—in the presence of density stratification, shear and rotation. This work went far beyond the classical problem of irrotational waves in shallow water and the result has been of central importance to other areas of fluid dynamics. He employed a similar perturbation approach to analyze waves on thin films, a problem of importance in coating and other manufacturing processes. In this instance, nonlinear, dispersive as well as instability effects are present; the resulting evolution equation has been studied extensively and has brought out a number of interesting physical phenomena.

Benney was also the first to draw attention to nonlinear critical layers in parallel shear flows. In 1969 a class of finite-amplitude neutrally stable shear-flow modes was obtained in which nonlinearity dominates viscosity at the critical layer. These disturbances are governed by an eigenvalue problem quite different from that furnished by the classical linear viscous theory. This interesting possibility is now known to be relevant in various instances, and further studies which include stratification and rotation, as well as unsteady and wavepacket effects have been carried out by many others, including Benney.

In 1970 Benney derived the asymptotic equations governing slowly varying multiperiodic wave trains in a class of nonlinear systems. This was the first time modulations of fully nonlinear multiphase wave systems were obtained, extending earlier work from modulations of singly periodic to quasi-periodic waves. Similar asymptotic equations and their solutions, which involve algebro-geometric constructions, have been actively studied during the past 30 years and are still a topic of considerable interest.

In his seminal 1973 work on strongly nonlinear surface waves in shallow water Benney derived a novel system of nonlinear equations and showed that they admitted an infinite number of conservation laws. This system, which is referred to as the "Benney Equations", have been intensively studied. While its complete solution is still not known, the properties already uncovered are so intriguing that undoubtedly the Benney equations will continue to be carefully investigated for years to come.

During the eighties and the nineties, in parallel with his duties as Department Head of Mathematics, Benney continued his work on nonlinear wave interactions and flow instability. Among other contributions, he pointed out that instabilities with algebraic, rather than exponential, growth can become important under conditions of 'direct resonance' owing to generalized eigenfunctions corresponding to degenerate eigenvalues in non-conservative systems. He also proposed a theory for shear-flow instability that provides an explanation for the significant three-dimensional distortion of the mean flow which has been observed experimentally and which cannot be accounted for by classical weakly nonlinear theories.

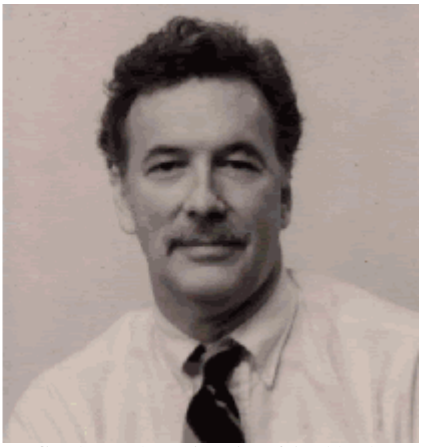
I wish to thank Liz Benney for relating the many interesting personal items to me.

Mark Ablowitz
University of Colorado at Boulder

Centrefolds Index

NEW COLLEAGUES

Hannah Bartholomew The University of Auckland



James Goodman The University of Auckland

Dr Hannah Bartholomew

Dr Hannah Bartholomew joined the mathematics education unit in the Department of Mathematics at The University of Auckland in April. She has a PhD in mathematics education from the University of London, and worked as a Research Associate at King's College London for four years before moving to New Zealand. Prior to that she obtained a BSc in mathematics from the University of Bristol, and an MSc in Pure Mathematics from the University of Manchester. Her research interests include gender issues in mathematics education; the formation of students' identities as learners of mathematics; the impact of grouping students by ability; and the ways in which these issues intersect with the types of understandings that students develop in and about mathematics.

Garry J. Tee

Dr James Goodman

Dr James Goodman joined the Department of Computer Science at The University of Auckland in January 2003 as a Professor. He has moved from the University of Wisconsin-Madison, where he was a member of the Computer Sciences and Electrical and Computer Engineering departments for 23 years. He served as Chair (HoD) of the Computer Sciences department from 1996 to 1999. Jim's research focus is on computer architecture, and specifically memory systems, multiprocessors, and synchronization. He has contributed particularly in the art of snooping caches and other extensions of shared-memory multiprocessing. Recent work has focussed on efficient implementations of transactional memory, providing a clean programming model for multiprogramming.

After he had accepted the position at The University of Auckland, Jim discovered that William Steadman Aldis, the first Professor of Mathematics and Mathematical Physics at Auckland University College (from 1884 to 1893), was the brother of his great-grandfather. This came as a great surprise, since he had not previously known of any relatives in New Zealand, nor of any relatives in the academic community any place in the world.

Garry J. Tee

Tim Stokes
The University of
Waikato

Dr Tim Stokes

Dr Tim Stokes joined the Department of Mathematics at The University of Waikato on the first of April (despite fears it was all a practical joke!), having previously worked at Murdoch University in Perth, Western Australia for nine years.

His first job was as a Post-doctoral Fellow at the University of Tasmania in Hobart, from 1991 to 1993 (where he also completed his BSc and PhD, and indeed was born and raised). His interests at that time were automated theorem proving and algebra, mainly ring theory and universal algebra.

On moving to Perth as a contract Associate Lecturer he continued to work on these areas, until his contract ran out at the end of 1998. He then worked as a Research Associate on several projects at Murdoch, and picked up new interests in such diverse areas as free surface problems in fluid mechanics and modal and temporal logic and their applications in computer science. He kept up his other interests however, and is looking forward to pursuing them more vigorously, whilst maintaining the newfound interests, in the years to come. He is also very much looking forward to exploring all this beautiful country has to offer.

Stephen Joe

BOOK REVIEWS

SPRINGER-VERLAG PUBLICATIONS

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

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

Arveson W, Noncommutative dynamics and E-semigroups. (Springer Monographs in Mathematics) 434pp.
Barbeau EJ, Pell's equation. (Problem Books in Mathematics) 212pp.
Baxter-Hastings N, Worshop precalculus - discovery with graphing calculators. 518pp.
Bloch AM, Nonholonomic mechanics and control. (Interdisciplinary Applied Mathematics, 24) 483pp.
Bonnard B, Singular trajectories and their role in control theory. (Mathématiques et Applications, 40) 357pp.
Brezzi F (ed), Numerical mathematics and advanced applications. Proceedings of ENUMATH 2001. 996pp.
Britton NF, Essential mathematical biology. (Springer Undergraduate Mathematics Series) 335pp.
Chalmond B, Modeling and inverse problems in image analysis. (Applied Mathematics Series, 155) 309pp.
Chung KL, Elementary probability theory. (4th ed) (Undergraduate Texts in Mathematics) 402pp.
Friedman A, Mathematical models in photographic sciences. (Mathematics in Industry, 3) 184pp.

Grünbaum, Convex polytopes. (2nd ed) (Graduate Texts in Mathematics, 221) 568pp.
Heck A, Introduction to Maple. (3rd ed) 828pp.
Herman J, Counting and configurations. (CMS Books in Mathematics, 12) 392pp.
Hohmann A, Numerical analysis in modern scientific computing. (2nd ed) (Texts in Applied Mathematics, 43) 337pp.
Howie JM, Complex analysis. (Springer Undergraduate Mathematics Series) 260pp.
Jäger W, Mathematics - key technology for the future. Joint projects between universities and industry. 732pp.
Joswig M, Algebra, geometry and software systems. 331pp.
Kanamori A, The higher infinite. (2nd ed) (Springer Monographs in Mathematics) 536pp.
Kappeler T, KdV & KAM. (Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge, 45) 402pp.
Kozlov VV, Dynamical systems X. General theory of vortices. (Encyclopaedia of Mathematical Sciences, 67) 184pp.
Lange K, Applied probability. (Springer Texts in Statistics) 300pp.
Lov\'{a}sz L, Discrete mathematics. (Undergraduate Texts in Mathematics) 290pp.
Matousek J, Using the Borsuk-Ulam theorem. (Universitext) 196pp.
Murray JD, Mathematical biology II. (3rd ed) (Interdisciplinary Applied Mathematics, 18) 811pp.
Nazareth L, Differentiable optimization and equation solving. (CMS Books in Mathematics) 256pp.
Parker DF, Fields, flows and waves. An introduction to continuum models. (Springer Undergraduate Mathematics Series) 270pp.
Peller V, Hankel operators and their applications. (Springer Monographs in Mathematics) 784pp.
Phillips GM, Interpolation and approximation by polynomials. (CMS Books in Mathematics) 312pp.
Prigent J-L, Weak convergence of financial markets. (Springer Finance) 422pp.
Suranyi J, Topics in the theory of numbers. (Undergraduate Texts in Mathematics) 287pp.
Xambó-Deschamps S, Block error-correcting codes. (Universitext) 266pp.

Geometric Numerical Integration

by Ernst Hairer, Christian Lubich and Gerhard Wanner. Springer Series in Computational Mathematics, 31. Springer-Verlag, 2002, 515pp, EUR 79.95. ISBN 3-540-43003-2.

The relatively new subject of geometric integration has arisen in response to perceived shortcomings of traditional methods of solving evolutionary problems numerically. The conventional approach is to seek approximations in a single time-step which keep the norm of the error committed small. Assuming that appropriate stability conditions hold, this will mean that the overall error at a fixed output point, after many, but increasingly small, time steps, will converge to zero in some specific manner. For example, the error at the fixed output point can typically be estimated in terms of a specific power of the stepsize.

This approach is too general and heavy-handed in situations in which accuracy in some directions is regarded as more important than in others. In the modelling of a scientific problem for which the solution is known to lie on some manifold, error components normal to the manifold are usually regarded as more serious than errors tangential to it. Thus, even though we can never eliminate computational error entirely, we can often at least preserve geometric or structural aspects of the approximation.

The authors of the present book all work at the forefront of this rapidly developing subject and are also skilled expositors. Accordingly, it is an outstanding contribution to the rapidly growing literature on the subject of geometric integration.

The first chapter introduces some of the questions fundamental to geometric integration by surveying some keys problem areas from the Lotka-Volterra problem in population dynamics, through the Kepler problem and molecular dynamics, to highly oscillatory problems. The second chapter introduces the basic classes of numerical methods that are already known to be useful in geometric integration. These include Runge-Kutta methods and their extensions to second order systems through to composition methods and splitting methods. The third chapter explores order conditions from the classical tree-based approach through to the Baker-Campbell-Hausdorff formula and some of its ramifications. Chapter four is devoted to the study of solutions which evolve on manifolds. On this theoretical basis, the Crouch-Grossman and the Munthe-Kaas generalizations of classical Runge-Kutta methods are introduced. Chapter five makes a special study of numerical methods which are symmetric under time reversibility. Chapter six deals with the important special case of Hamiltonian systems and numerical methods which preserve the symplectic property. Besides being important in terms of applications and the maturity of the mathematical knowledge associated with this problem, this topic is important historically. Amongst the eight further chapters I will make special mention of chapter 13 which deals with highly oscillatory problems. The study of oscillatory systems of this type is of crucial importance because of the need to model such systems in scientific applications with due attention paid to long term behaviour on the one hand and computational efficiency on the other. Important examples are applications to the Schrödinger equation and to transmission in fibre-optic cables.

As I have indicated, each of the authors of this impressive work is, in his own right, at the leading edge of

research in geometric integration. Together they are a superb team. They bring mathematical knowledge, scientific insight and computational experience together in a way that makes for a most successful exposition of this rapidly developing and vital subject.

John Butcher
The University of Auckland

Intuitive Combinatorial Topology

by V. G. Boltyanskiĭ and V. A. Efremovich, translated by Abe Shenitzer,
Universitext, Springer, 2001, 141pp. ISBN 0-387-95114-8.

This is a translation of the Russian original which was published in 1982 and was itself a major revision of the authors' short survey which appeared in instalments from 1957. Since its beginnings in the middle of the 19th century topology (The word 'topology' was apparently first used by Listing in 1847.) has developed to a vast extent. Initially essentially a curiosity (think of the Königsberg bridges which, I concede, were sorted out earlier than the mid-19th century) it soon became a very respectable branch of Mathematics with its deep and challenging problems. Perhaps the most honourable of these problems is the Poincaré Conjecture, first formulated in 1900, reformulated by Poincaré himself in 1904 when he published a counterexample to his original conjecture, and remaining unsolved 99 years later. (Many 'proofs' have appeared in the intervening years, often with lots of accompanying publicity even in the daily press but all, except possibly the latest by Grigori Perelman which was publicised in the *New York Times* on 15 April, 2003, seem to have foundered. Ironically, a natural generalisation of the Poincaré Conjecture to higher dimensions has for long been completely solved, gaining their solvers Fields Medals.)

As the 19th century faded and the 20th raced by topology grew, with a number of distinct subfields developing. One of these is combinatorial topology, which is based on figures made up of closed line segments, closed triangles and their higher dimensional analogues. In a sense it is sufficient to understand combinatorial topology to grapple with the Poincaré Conjecture. Because of the simplicity of the objects studied much progress can be made yet in the sense alluded to in the previous sentence one can understand all topology of the space we supposedly live in from just studying combinatorial objects. Not surprisingly many introductory books on the subject have appeared over the years. My library is pretty small but even there I find about 10 books on the subject starting with a translation as *Elementary Concepts of Topology* of Alexandroff's 1932 book through to Huggett and Jordan's 2001 book *A Topological Aperitif*.

The first chapter, **Topology of Curves**, introduces the topic, discusses some simple topological invariants, including the Euler characteristic of a graph and gives a proof of the classic Jordan Curve Theorem for polygonal curves. (Actually, despite some shaky starts to the proof of the Jordan Curve Theorem (Jordan himself gave a faulty proof) it is relatively simple to prove the result in general. Some of my Auckland colleagues may remember a seminar in which, in the space of an hour, I gave a complete proof from scratch, by which I mean that I assumed only elementary facts about metric spaces and their maps.) The authors then ask the question 'What is a curve?' and this leads them to interesting (not really combinatorial) objects such as the lakes of Wada, Sierpinski carpets, Menger sponges and Peano space-filling curves.

Chapter 2, **Topology of Surfaces**, extends the Euler characteristic then classifies surfaces, with a proof in the case of orientable surfaces. The discussion of vector fields on surfaces includes Poincaré's link to the Euler characteristic and hence indices. There is a nice discussion of the four colour problem/theorem, including the dilemma of the computer-based proof and also the simplicity of the corresponding problem for other orientable surfaces. The hardly fair but nevertheless true proof of the corresponding result for other orientable surfaces is given. As was the case with Chapter 1 there is an excursion into the non-polygonal, in this case Antoine's necklace and a construction of a version of Alexander's Horned Sphere from it. The rest of the chapter is devoted to a quick look at knots with the emphasis being on spanning surfaces. At this point I became a little frustrated: I am used to calling these surfaces Seifert surfaces but in this book not necessarily orientable versions are called Frankl surfaces and even when orientable versions are given there is no mention of Seifert, but nor is there a specific reference to Frankl's work to enable one easily to compare the temporal and other connections between these two authors' work on the subject.

The final chapter is titled **Homotopy and Homology**. The fundamental group is introduced and a heuristic argument is given to identify the fundamental group of the circle. This is followed by a discussion of covering spaces, including a discussion of the fact that the plane is a universal cover of every surface except the sphere and the projective plane. Applications to proving the fundamental theorem of algebra and knot groups are given. There is a good description of $H_1(X)$ and a brief (what else is needed in this context?!) discussion of $H_0(X)$ for a space X, followed by a very brief nod to $H_r(X)$ for x

$\geqslant$2. This, of course, leads again to the Euler characteristic. The chapter ends with brief discussions of fibre bundles and Morse theory (the Euler characteristic again!!).

All of what I have described above is a fairly standard collection of topics which give an enjoyable introduction to low-dimensional topology with hints of the more general. The discussion is clear and it is all superbly illustrated by 200 figures. For me, what sets this book apart from others is the ten page appendix, **Topological objects in nematic liquid crystals**.

Nematic liquid crystals are long molecules whose interactions tend to arrange them in parallel and hence determine vector fields except that the molecules are directionless. This leads naturally to a map to the projective plane and the appendix analyses from a topological point of view the interaction of discontinuities in the map.

Overall I am happy to recommend this book as giving a good introduction to topology of the space we live in through combinatorial topology with some interesting excursions to some of the wild places. I noticed only one misprint (the title of section 1.3 in the table of contents). Perhaps the index could have been more comprehensive to reflect more precisely the wide range of interesting topics, especially those that keep reappearing.

David Gauld
The University of Auckland

CONFERENCES

ICIAM2003
5th International Congress on Industrial and Applied Mathematics
7–11 July 2003, Sydney

ICIAM2003 was a real success for the Applied Mathematicians fortunate to attend this Sydney gathering between July 7 and 11. This was claimed to be the largest mathematical meeting to be held in the Southern Hemisphere, with over 1600 registered attendees. This figure should be a significant underestimation of attendees though, because while it was obvious that many attendees had left by the last day of the meeting, after having delivered their talks and succumbed to the attractions of home or downtown Sydney, the head count at the closing ceremony was 1700.

A large attendance at ICIAM2003 was important because the NZ and Australian Mathematical Societies had underwritten the meeting financially. The concerns raised recently by September 11, Afghanistan, Iraq, SAARS, etc have made international travel more uncertain, and the organisers did face many late cancellations. However, as in show business, things came right on the night, and the Treasurer, Bill Summerfield, was very pleased with the large numbers attending.

I have attended engineering meetings larger than ICIAM2003 before. Specifically, an annual petroleum industry meeting had about 10,000 attendees, and I regularly attend the annual American meeting of chemical engineers which has typically over 2000 attendees. These meetings are very well run, being planned down to the last minute. ICIAM2003 was nothing like this, with a free spirit moving throughout the meeting, giving it a charm and style of its own.

I arrived too late for the opening addresses, and decided to attend a talk from one of the following 43 parallel sessions. The opening speaker (who was also the Session Chair) had trouble with his powerpoint links, and did not start until seven minutes into the talk. That was no problem though, because one of the following speakers had cancelled, and so each of the three speakers in that session had been allocated 40 minutes for their talk by the Chair. While intrigued at this initiative by the Chair, I decided to chill out, and note what developed. None of the audience seemed to be concerned by the time issue, and indeed, they listened very attentively, and were really interested in the new idea being presented, and were keen to hear how it compared with other methods.

After this opening talk, I decided to switch sessions. This is something one should not do at these meetings, because I arrived at the end of the 3rd talk in that session, although the time to switch between the two sessions was only a few minutes. This was a disappointment to me, as I was looking forward to hearing that talk, but I had learned my lesson that one should avoid switching sessions, if at all possible.

A special feature of the first two days of parallel sessions were the student talks. This was a real inspiration to those attending and no doubt to those presenting. The student talks I attended were very well prepared and rehearsed, and a real testament to the students' supervisors. It is clear that ICIAM2003 captured the hearts of many maths students in Australia, and no doubt many from NZ. I met one undergraduate maths student from Adelaide who had paid the attendance costs herself. I am sure that ICIAM2003 will be a pivotal moment in the lives of many of the young (and not so young) applied maths

students fortunate to attend.

The morning and afternoon talks began with Invited Speakers. These talks were on the whole really impressive, outlining the state of play in the latest computational methods, the impact of the net, operations research, multi-scaling, fluid mechanics, pdes, elasto-plasticity, geometry, finance, education, random matrices, biomathematics, meteorology, statistics, ergodicity, turbulence, imaging, communications, stability, and so on. It was clearly impossible to attend all of these invited sessions, and delegates were frequently faced with difficult choices.

In addition to the invited and parallel streams, nine other special sessions were held. There were five embedded meetings: the 6th Australian-NZ Maths Convention; 11th Computational Techniques and Applications Conference; 6th Engineering Mathematics and Applications Conference; 17th National Conference of the Australian Society for Operations Research; and the 2nd National Symposium on Financial Mathematics. As well, there were Industry Day, Education Day, Community Day and a session by the IMU. Then of course the parallel sessions were subdivided into contributed talks, mini symposia and submeetings.

ICIAM2003 was too large to hold on one site, and a 750m walk was needed to switch between venues. Nevertheless, there were excellent opportunities for networking. Morning and afternoon teas were held in the same room as the booths and posters, and so foot traffic to these displays was excellent. A full social program was available, including icebreakers, reception, drama, opera and a dinner cruise.

Looking back, I am sure attendees will rate ICIAM2003 as a real success. There were some quirks, but I am still thinking on some of the ideas which were stimulated by this meeting, and my colleagues are as well. I believe the planning and support in NZ and Australia for ICIAM2003 over the last four years or so has now been justified. ICIAM2003 will certainly have been a major success for mathematics in 2003.

Graham Weir
Industrial Research Limited

REPORT FROM THE NZAMT8 CONFERENCE

The NZ Association of Mathematics Teachers (NZAMT) held their Eighth Biennial Conference in Hamilton from July 8th to 11th, 2003, with the theme "Celebrating the Magic of Maths". With eight plenary speakers and many workshop presenters—14–16 workshops to choose from at every session—it was a very full programme, with plenty to interest teachers at every level. One day there was a special emphasis on primary teachers with appropriate workshops. The trade displays were well visited, especially the stall organised by the Department of Engineering Science of The University of Auckland, which showed some of the opportunities in Mathematics-intensive tertiary study. The weather was kind, and the venue at St Pauls Collegiate School was first-class. The highlight of the social programme was the conference dinner, featuring a Harry Potter theme, held at The University of Waikato Centre of the Performing Arts.

Barbara Miller-Reilly
The University of Auckland

REPORT ON ANODE 2003
14–18 July 2003, The University of Auckland

John Butcher's 70th birthday year was celebrated with the last in the Anode series of conferences. Anode, which stands for Auckland Numerical Ordinary Differential Equations (not Auckland nerds overdoing differential equations, as my son suggested), attracts a significant number of overseas participants who are keen to work with John.

This year the overseas invited speakers, and their lecture series, were: \noindent Hermann Brunner, Memorial University of Newfoundland, Canada, on Collocation methods for Volterra functional integral and integro-differential equations.

Chris Budd, University of Bath, UK, on Geometric integration of ODEs and PDEs, and its applications.

Mari Paz Calvo, University of Valladolid, Spain, on Some aspects of the time integration with Runge-Kutta type methods of evolutionary partial differential equations.

Roswitha März, Humboldt University, Germany, on Differential algebraic equations with properly stated leading term.

In a new departure this year, New Zealand applied mathematicians from various areas were also invited to speak. These were:

Rick Beatson, The University of Canterbury, on Fast computation with radial basis functions for applications to image reconstruction and geophysics.

Ian Coope, The University of Canterbury, on Grids and frames in computational optimisation.

Peter Hunter, The University of Auckland, on Computational modelling in biology: integrating physiological function from cell to intact organs.

Stephen Joe, The University of Waikato, on Construction of good quasi-Monte Carlo rules for functions in weighted spaces.

Robert McLachlan, Massey University, on Runge-Kutta-Nyström methods and the entropy of classical mechanics.

David Ryan, The University of Auckland, on Scheduling problems and the set partitioning model.

Philip Sharp, The University of Auckland, on Realistic test problems for N-body simulations of the solar system.

David Wall, The University of Canterbury, on Computational methods and inverse problems.

Not only did these talks provide a showcase for the wide variety of applied mathematics being studied in New Zealand, but also established some contacts between the speakers and conference participants.

An excursion to the Waitakeres took place on the wettest day of the conference, as per usual, but the rain did hold off long enough for a short bush walk to see several large kauri trees.

At the conference dinner, the tributes made to John Butcher emphasised the esteem in which he held in the numerical ODE community worldwide.

During the week after the conference, a follow-up workshop was held at the Tamaki Campus. This gave an opportunity for those participants who stayed on and the Auckland group to meet in a more informal way, and to understand the work of others in a deeper way.

Thanks are due to the Marsden Fund, for paying the expenses of overseas visitors for the conference, and to New Zealand Institute of Mathematics and its Applications for supporting the post-conference workshop.

Allison Heard
The University of Auckland

MODELLING CELLULAR FUNCTION, ON WAIHEKE

A conference on "Modelling Cellular Function" was held on Waiheke Island from the 14th to the 18th of July. It was funded by the NZIMA and (theoretically) organised by Nic Smith, Peter Hunter (both from Bioengineering, Auckland) and James Sneyd (Maths, Auckland). In actual fact James Sneyd and Peter Hunter did nothing at all, while all the real work was done by Nic Smith and Catherine Lloyd (Bioengineering, Auckland). That being the case, the organisation was superb. One suspects that the conference had a lucky escape. Nic and Catherine had arranged for lots of sun with very little rain, and the Northern Hemisphere visitors (particularly, let me add maliciously, those from Chicago) were impressed by our "typical" Auckland winter weather. We didn't enlighten them.

There were a number of eminent international speakers. James Keener (Utah) spoke about the topology of cardiac defibrillation, Philip Maini (Oxford) enlightened us on tumours, Andrew McCulloch (UC San Diego) gave a wonderful talk on heart models, Peter Deuflhard (Free University of Berlin) talked about designer drugs and how to model them, and Philip Kuchel (Sydney) spoke about a mathematical model of the red blood cell. The programme was filled out with a number of talks from other international and local speakers, and a poster session at which each participant had to give a three minute blurb about their poster. It was an excellent way to learn about a wide variety of mathematical work in biology, and rarely have I attended a conference that has held my interest so consistently.

For some less strenuous entertainment, Pepe, the magician/physiologist from Chicago, showed off his magic tricks at the final dinner. He was persuaded not to saw anybody in half, but did a sort of thingy with blocks and balloons and scarfs and cards that had the assembled multitudes going oooooh aaaaah. He was ably assisted by Catherine (among others) and less ably assisted by someone who wishes to remain anonymous. Just as a side note, it was the considered opinion of the conference that if that same anonymous person is to be asked, firstly, to give after-dinner speeches, and secondly, to assist with magic

tricks, he should be made to pay for his own wine.

Nevertheless, despite those occasional moments, the conference overall was a great success, demonstrating to our visitors the strength of mathematical biology in New Zealand, and giving local students and faculty a valued opportunity to meet some of the most famous people in the field.

James Sneyd
The University of Auckland

KOREAN INDUSTRIAL MATHEMATICS INITIATIVE

Supported in part by the RSNZ, a conference to initiate mathematically based interactions with Industry was held in Daejeon, South Korea 1st-3rd July 2003. This support was provided under the Memorandum of Understanding between South Korea and New Zealand for scientific cooperation.

About 65 persons attended including many graduate students in applied mathematics. This conference was co-directed by Professor Graeme Wake of Massey and Canterbury Universities, who is also Director of the ANZIAM Mathematics in Industry Study Group 2004–5. During the Initiative, case study problems were used to demonstrate the power of mathematically based problem-solving. A plenary discussion at the conclusion of the conference canvassed options for the development of further initiatives in Industrial Applied Mathematics in Korea. In addition to Professor Wake, three other New Zealanders contributed. These were: Associate Professor Mark McGuinness (VUW), Professor Robert McKibbin and Dr Bruce van-Brunt (both from Massey University—Albany and Palmerston North respectively).

The front row is, from left to right:
Dr Bruce van-Brunt (Massey), Professor Jon Chapman (Oxford), Associate Professor Mark McGuinness (VUW), Dr John Donaldson (Tasmania, Australia), Professor Graeme Wake (Massey and Canterbury), Professor Kil Hyun-Kwon (KAIST), Professor Chang Ock-Lee (KAIST), Professor Robert McKibbin (Massey), Professor Ellis Cumberbatch (Claremont, US), Professor Frank Luk (RPI, US).
Other contributors included Professor Henning Rasmussen (UWO, Canada, left) and Professor Larry Forbes (Tasmania, Australia, back left).

Graeme Wake
Massey University, Albany

Conferences in 2003

November 23–27 (Queenstown) **Delta '03**
website: http://www.maths.otago.ac.nz/delta03

Conferences in 2004

January 3–11 (Nelson) **NZMRI meeting on Computational Algebra, Number Theory and Geometry**
website: http://math.auckland.ac.nz/conferences/2004/NZMRI/

January 12–16 (Nelson) **NZIMA meeting on Logic and Computation**
website: http://www.clk.vuw.ac.nz/LandC.shtml

January 18–22 (Dunedin) **Australasian Computer Science Week**
website: http://www.cs.otago.ac.nz/acsw/

February 9–14 (Wellington) **VIC 2004**
website: http://www.mcs.vuw.ac.nz/~mathmeet

February 16–20 (Whakapapa) **Annual New Zealand Phylogenetics Meeting**
website: http://awcmnee.massey.ac.nz/

MINUTES

MINUTES OF THE 29TH ANNUAL GENERAL MEETING
5-45 pm Wednesday 9th July 2003
Harbourside Room 6, Sydney Conference and Exhibition Centre

Present. Charles Pierce, Shaun Hendy, Graeme Wake (Chair), Kathirgamanathan Padmanathan, Ulises Carcamo, Robert McLachlan, Tammy Smith, Rick Beatson, Nicoleen Cloete, Mark McGuiness, Stephen Joe, Alona Ben Tal, Peter Renaud, Aroon Parshotam

Apologies. Robert McKibbin, Marston Conder, David Gauld, Rod Downey, Graham Weir, John Burnell

Shaun Hendy opened the meeting. It was moved (Hendy and Smith) that in the absence of the President and vice-President, Graeme Wake as former President would chair the meeting. The motion was carried.

1. **Minutes of 28th Annual General Meeting**. It was moved (Wake and Hendy) that the minutes of the 28th Annual General Meeting of the NZMS be accepted. The motion was carried.
2. **Matters arising from the minutes** There were no matters arising from the minutes.
3. **Presidents report**.
    a. The report was delivered to the meeting and will appear in the NZMS newsletter.
    b. It was moved (Wake and Hendy) the report be accepted. The motion was carried.
4. **Treasurer's report**
    a. The Treasurer's report was delivered to the meeting and the financial statements were distributed to the members.
    b. It was moved (Wake and Hendy) that the statements be accepted. The motion was carried.
    c. It was moved (Smith and Hendy) that the fees be increased to the following:
        - Ordinary member $36.00 + gst ($34.00 currently)
        - Student member $7.60 + gst ($7.20 currently)
        - O/S students $18.00 + gst ($17.00 currently)
        - Reciprocity $18.00 + gst ($17.00 currently)

    The motion was carried.
5. **Membership Secretary's report and annual subscriptions**. A report from the Membership Secretary, Dr John Shanks, was tabled. It was moved (Wake and Hendy) that the report be accepted. The motion was carried.
6. **Nominations for four Council positions**
    a. The terms of office of Peter Fenton and Rua Murray have ended.
    b. Nominations for the two Council positions received at closing date: Michael Albert (Otago), Rick Beatson (Canterbury), Warren Moors (Auckland) and James Sneyd (Auckland).
    c. Rick Beatson withdrew his nomination at this point. Michael Albert was then elected unopposed as the second South Island council member.
    d. It was moved that Stephen Joe and Rick Beatson act as scrutineers for the election of the remaining Council position (Wake and McGuinness). The motion was carried.
    e. A vote was held between Moors and Sneyd. The vote was tied and it was noted that two ballots were invalid. A second vote was held. The vote was again tied. The result was then decided by coin toss. Warren Moors was thereby elected to Council.
    f. It was moved (Wake and Hendy) to formally thank Rua Murray and Peter Fenton for their contributions during their time on Council. It was noted that Rua Murray efforts as Treasurer had been especially valuable to the society.
7. **Appointment of auditors**. It was moved (Smith and Wake) 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**. This report was not available at this time. It will be distributed to members at a later date.
9. **Forder Lecturer 2003**.
    a. Prof. Caroline Series is the Forder Lecturer for 2003. Shaun Hendy is coordinating her visit

in September and October 2003.
    b. The British Council has declined to support the Forder Lectureship this year. Mark McGuiness suggested that Mick Roberts should approach the British Council next year to ask them to renew their support.
10. **Forder Lecturer 2005**. The Council has recommended Martin Bridson from Imperial College as the 2005 Forder Lecturer.
11. **General Business**. There were several items of general business.
    a. Graeme Wake reported that the next two MISG meetings would be held in Auckland.
    b. Graeme also reported that this year's Rutherford Lecturer was Professor Tim Pedley from Cambridge.
    c. Robert McLachlan noted that the NZ Maths Research Institute (NZMRI) is another local organisation involved in the promotion of mathematics. The NZMRI is one of the partners in the NZ Institute for Maths and its Applications (NZIMA) which has received significant funding from the government as a Centre of Research Excellence. Mathematicians can join the NZMRI by applying to Marston Conder.

The meeting closed at 6-15pm.

The AGM was ratified by the NZMS Council on July 22, 2003.

NOTICES

NZMS RESEARCH AWARD 2003

The New Zealand Mathematical Society Research Award for 2003 is made to Rod Gover from the University of Auckland for his highly original contributions in conformal differential geometry that have led to the solution of some outstanding and difficult problems.

AITKEN PRIZE 2003

The Aitken Prize for the best student talk at the Colloquium is awarded to Cynthia Wang (Massey University – Albany) for her talk "Modelling a plate of arbitrary shape in infinitely deep water using a higher order method." The judging panel had great difficulty separating the top three talks and have awarded Highly Commended to Jonathan Marshall (Massey University – Palmerston North) for his talk "Analyticity of solutions to functional differential equations" and to David Byatt (University of Canterbury) for his talk "Performance of various BFGS implementations with limited precision second-order information."

POSITION ANNOUNCEMENT

The Mathematical Biology Group is seeking a research assistant who can help with

- numerical computation of differential and integral equations
- parameter estimation in dynamical models

and a range of associated tasks.

This position would suit a recent graduate (or near graduate) who has a strong degree with numerate-oriented emphasis. As most of the work involves models of biological processes it would be advantageous if the applicant also had some background in the life sciences. The position would be based at the Ruakura campus of AgResearch, a very pleasant site near The University of Waikato in Hamilton.

Please bring this to the attention of any suitable recent graduates or final year students. Any further enquiries to:

Tony Pleasants, Leader,
Mathematical Biology Group
Ph: (07) 838 5118
Fax: (07) 838 5117
e-mail: tony.pleasants@agresearch.co.nz

AgResearch, Ruakura Research Centre,
Private Bag 3123, East St.
Hamilton

GRANTEE REPORTS

I would like to thank the New Zealand Mathematical Society for providing the summer support of $500 at

The University of Auckland. I finished the reading course successfully on time. The Mathematics Department had been pleased to offer me a tution scholarship and $3000 allowance to continue with my PhD research. Currently I am a graduate student in Mathematics Department at The University of Auckland.

Thank you.

Vishal Goundar
The University of Auckland

REPORT ON ICIAM 2003

The fifth International Congress on Industrial and Applied Mathematics (ICIAM 2003) was hosted by Australia and New Zealand Industrial and Applied Mathematics (ANZIAM) during the week 7–11 July 2003. The conference was held at the Sydney Convention and Exhibition Centre at Darling Harbour, adjacent to the central business district of Sydney. Parallel sessions took place at the nearby Haymarket campus of the University of Technology Sydney.

The conference covered the full spectrum of industrial and applied mathematics focusing on the strong links between applied mathematics, industry and finance. A number of other meetings were embedded within ICIAM 2003, including: 6th Australia-New Zealand Mathematics Convention, 17th National Conference of the Australian Society for Operations Research, 11th Computational Techniques and Applications Conference, 6th Engineering Mathematics and Applications Conference, 2nd National Symposium on Financial Mathematics, the 2003 meeting of ANZIAM and the annual general meeting of the New Zealand Mathematical Society.

There were 27 invited speakers, more than 40 parallel sessions spread over the two sites, minisymposia, an exhibition, a career development workshop (6 July) and three special days: Industry Day (8 July), Education Day (9 July) and Community Day (10 July). These special days provided the opportunity for the mathematical community to meet and engage with others. Over 1500 delegates from around the world attended the conference.

Contributed talks were held every 30 minutes with speakers given 20 minutes to present their material, followed by five minutes of questions and five minutes to get to the next talk. The book of abstracts is over 400 pages long and the conference program is over 200 pages.

As well as the academic programme there was a full social schedule providing plenty of opportunity for people to interact. The optional social programme included: a reception at the Powerhouse Museum, Sydney Harbour Bridge climb, Proof (a play at the Sydney Opera House), a night at the opera, the Down-under Experience, Sydney harbour cruise and Sydney sightseeing tours.

The next ICIAM meeting is in four years time in Zurich 16–20 July 2007.

I would like to thank NZMS for providing financial assistance to attend ICIAM 2003.

David Byatt

REPORT ON ICIAM 2003

I attended ICIAM 2003 in Sydney, July 7–11, along with Massey (Albany) colleagues Mike Meylan, Winston Sweatman, Robert McKibbin and Graeme Wake. The attendance was close to 1700, with seemingly every Australian mathematician in attendance, along with representatives from many other countries. Almost everyone attending gave a presentation, with the result that several times a day one had to choose from a selection of 43 parallel sessions!

I had been asked by SIAM to organise a mini-symposium on "Pattern formation in neural systems", and I arranged for Jack Cowan (Chicago), Carson Chow (Pittsburgh) and Steve Coombes (Loughborough) to speak, along with myself. I was also invited to speak in a minisymposium on "Neuronal and biological dynamical systems".

Overall the conference was a great success, with many opportunities to meet colleagues and make new contacts. I particularly enjoyed some of the plenary sessions, as they often gave insight into other areas of applied maths that I knew little about.

I thank the New Zealand Mathematical Society and Massey University (IIMS) for providing financial support for my trip to Sydney.

Carlo Laing

MATHEMATICAL MINIATURE 21

R gave me a DAE underneath the Linden tree

Most of my life has been concerned with understanding how to solve ordinary differential equations numerically. Just when I think I have got somewhere, I find that some new aspect of the problem has become important and I have to start at the beginning again. So it was when "stiff" differential equations were recognised as constituting a distinct class of numerical problems. I thought I knew something about how to solve the easier non-stiff problems; all one needed was a stable and consistent numerical approximation and this can be turned into an effective algorithm. Most of the traditional numerical schemes are generalizations of the famous Euler method in which the solution at a time value x_n is found by adding to the approximation at x_{n-1} the value of an approximation to the derivative, evaluated at x_{n-1}, and multiplied by x_n-x_{n-1}. If the differential equation is $y'(x) = f(x,y(x))$, and y_n is the approximation to ,$y(x_n)$, then we can write, for the Euler method, $y_n = y_{n-1} + h\,f(x_{n-1}, y_{n-1})$, where $h = x_n - x_{n-1}$. In the special case of the linear problem, $y'(x) = \lambda y(x)$, the recursion for the approximations would be $y_n = (1 + \lambda h)\, y_{n-1}$.

Sometimes, buried in a complicated differential equation system, are components which behave in this fashion. Sometimes, when λ is a (possibly complex) number with negative real part, we are supposed to be approximating a negative exponential so that the effect of these components should be only transitory. However, if λ is outside a disc with centre -1 and radius 1, powers of $1 + h\lambda$ are unbounded and the computed result will be spoilt by the effect of these terms.

In such a situation, the problem will be stiff and it needs to be solved by alternative methods, such as the implicit Euler method $y_n = y_{n-1} + h\,f(x_{n-1}, y_n)$. For this method, the factor $1 + \lambda h$, which was the source of trouble for the forward Euler method, is now replaced by $(1 - h\lambda)^{-1}$, and no harm is done by λ being negative and of large magnitude.

I do not remember when I first became aware of differential algebraic equations, but I know when this crucial event occurred in the life of my colleague and friend Roswitha März of the Humboldt University in Berlin. I was attending a conference in the former West Germany in 1981 when someone asked me if I would like to visit East Berlin, because this person could arrange it for me. With some trepidation, I agreed to fit in with the arrangements that had to be made, and a few days later I first made the acquaintance of Roswitha. I had in my hand a number of reprints of papers by various people and some of these were on the relatively new subject of numerical methods for differential algebraic equations. I gave these to Roswitha in case she could make use of them and she certainly could. She soon became the leader of one of the most productive and insightful research groups working on this subject and I have always been proud of my small role in her introduction to this subject.

Over the last 6 or 7 years we have held a series of "ANODE" (Auckland Numerical Ordinary Differential Equations) workshops and what will almost certainly been the last of these has just finished. It was a delight to welcome Roswitha März, as an invited speaker, at this meeting. In fact it was a triple benefit because Roswitha came with two colleagues, René Lamour and Caren Tischendorf, who are outstanding research workers in their own right.

As an easy introduction to the subject of numerical differential algebraic equations, I will quote an example problem presented by Caren. This consists of the coupled system

$$(1) \qquad (\lambda - 1)y'(x) + \lambda x z'(x) = 0, \qquad\qquad (2) \qquad (\lambda - 1)y(x) + (\lambda x - 1)z(x) = 0.$$

This is a differential algebraic equation because it contains a differential equation together with an algebraic constraint. It is said to be of "index 1" because a single differentiation of (2) and a rearrangement converts it to the differential equation system

$$(3) \qquad (\lambda - 1)y'(x) + \lambda^2 x z(x) = 0, \qquad\qquad (4) \qquad z'(x) = \lambda z(x).$$

If the problem in its original formulation is solved by a natural extension of the implicit Euler method it is found that the z values satisfy the recursion $z_n = (1 + \lambda h)\, z_{n-1}$. It is unfortunate that this is the same recursion that would apply to (4) being solved by the explicit, rather than the implicit Euler method, and is disadvantageous if λ negative with a large magnitude.

One of the main thrusts of the Humboldt group led by Roswitha März, is that this sort of anomalous behaviour is avoided if the problem is formulated differently. What they call "numerically qualified" would cast this example problem in the form

$$\begin{bmatrix} 1 \\ 0 \end{bmatrix} \left(\begin{bmatrix} \lambda - 1 & \lambda x \end{bmatrix} \begin{bmatrix} y(x) \\ z(x) \end{bmatrix} \right)' + \begin{bmatrix} 0 & \lambda \\ 1 - \lambda & 1 - \lambda x \end{bmatrix} \begin{bmatrix} y(x) \\ z(x) \end{bmatrix} = 0.$$

The crucial detail concerning the two matrices $A = \begin{bmatrix} 1 & 0 \end{bmatrix}^T$ and $D = \begin{bmatrix} \lambda - 1 & \lambda x \end{bmatrix}$, is that im($D$) is constant and that ker(A)Åim(D)= $\mathbb{R}$. An implementation of the implicit Euler method using this formulation would propagate only values of $D \begin{bmatrix} y(x) & z(x) \end{bmatrix}^T$, and use the algebraic constraint to evaluate the individual components y_n and z_n.

During an eight month visit to Auckland, Steffen Schulz, a postgraduate student at Humboldt, wrote the Auckland Mathematics report number 497: "Four lectures on Differential-Algebraic Equations". This is a good introduction to the subject and to some of its literature.

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

[ ]