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NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Contents

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PUBLISHER'S NOTICE

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However, correspondence should normally be sent to the Secretary:

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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.html
Editorial enquiries and items for submission to this journal should be submitted as text or LaTeX files to r.mclachlan@massey.ac.nz

EDITORIAL

NZMS ENDOWMENT FOR STUDENT SUPPORT

At its last council meeting for 2002, the NZMS Council approved the establishment of a separate fund, the NZMS Endowment for Student Support. The rules for this fund are only two: that the capital be prudently invested in perpetuity, and that the investment proceeds be used to support tertiary mathematics students in New Zealand.

There were two pressing reasons for establishing this fund. First, all our income from subscriptions and interest is fully committed. The standard travel support of $500 that we can offer to graduate students is starting to look rather small, and it is a bit sad not to be able to support other activities like conferences with anything more than a token amount. Second, we felt that it would be great to be able to eventually do something for undergraduates, who of course face hefty student fees and pressure from all quarters to do supposedly more vocational degrees.

I also have a more personal reason, which is a desire to do something more concrete for the NZMS. If you read back over the early issues of the newsletter, it's clear that the society was founded and run in the early days with a rush of enthusiasm typical of any new project. Our current bank balance is a lasting testament to the work of those founders. But, increasingly at the Colloquium for example, I see the old guard, the students, and no one in between. (OK, there could be lots of reasons for this, like too much else going on at the same time. Apparently the Swiss national maths colloquium once reached a low point of

only three attendees, the secretary, president, and incoming president.) I feel in some obscure way that my future career (and hence salary) in New Zealand is tied to the success of New Zealand mathematics. Certainly if I were to rank my loyalty to my department, university, and subject, I know which would come first, and I guess most of us would concur. Probably we have all considered working overseas and so have come to strong reasons for staying here.

Thanks to unrelenting legwork by your doughty treasurer Rua Murray, the Society has now been granted tax-deduction status for any donations. Rebates of up to 33% of any donations are granted up to a maximum annual donation of $1500. However, I should say that the whole rebate system is under review and although the rebate ceiling might be raised, it also might become harder for us to retain this status. I would therefore like to call on everyone to donate for this tax year immediately!

In time we will plan a coordinated fund-raising campaign. In the meantime I suggest that we start immediately now that we have tax-deduction status. I remember that Canterbury in their centennial campaign were able to raise about $450 per staff member---a respectable sum, but still only a modest percentage of the staff's salary. We all know how US higher education is kept going by massive private support; Gerald Moore of Intel recently gave US$600m to Caltech, and the endowment of the American Mathematical Society is about US$50m. We hardly have that kind of money or tradition here. Still, it's not unreasonable to expect the richer (i.e. employed) part of our membership to donate $50-$100 a year and in that way the endowment could be functioning in a very short time. Many of us already get our memberships essentially for free, by paying through a university account.

That's it guys. Rua is waiting!

Robert McLachlan
Massey University

PRESIDENT'S COLUMN

It was fantastic to see Vaughan Jones' enormous contribution to New Zealand mathematics being rewarded by the equivalent of a knighthood in this years' Honours list. He will be in New Zealand for his investiture as a Distinguished Companion of the New Zealand Order of Merit. Great stuff and well deserved!

It was especially rewarding to attend the lecture by the first of this years NZMS speakers, John Butcher of Auckland University. This is, of course, just one example of John's many years of service to the mathematical community in New Zealand.

I am sure that we all look forward to the visits by Jim Geelen of Waterloo, who is a rising star in world mathematics, and currently has a prestigious Sloan Fellowship.

A major event on the mathematical horizon is ICIAM 2003 in July in Sydney. This is one of the largest meetings in World Mathematics, and we cannot expect such an event again in our region in the foreseeable future. It is also the 6th joint meeting of the NZMS and the Australian Mathematics Society. Because of this a good percentage of next year's NZMS budget for support of mathematics in New Zealand has been committed to this meeting. We will be supporting a NZMS Speaker, who will be Cheryl Praeger. Cheryl is well known to many of you and has a longstanding connection with New Zealand. Additionally we will be providing grants in aid of up to $500 for this conference. There will be up to 20 of these grants. Graeme Wake has an article in the Newsletter about this.

As our annual Colloquium for 2003 will be embedded into ICIAM, the Council urges all of its members to attend. While ICIAM is an applied mathematics conference, the organizing committee has made sure that there is a wonderful pure mathematics stream with a stellar group of speakers. The speakers include Charles Feffermann, Hillel Furstenberg, Hendrik Lenstra, Cheryl Praeger, Wilfred Schmidt, in addition to the 27 ICIAM speakers. Have a look at the site http://www.austms.org.au/iciam2003/ for more information; and get your applications for support in as soon as you can. We are especially keen to see students go, since it is unlikely that they will ever see another meeting of this magnitude during their tenure as students.

Following discussions with Vitali Milman (President of the Israel Math Society), we are planning a joint meeting with the Israel Mathematical Society in February 2004. (This will be in addition to the Colloquium, which will be at another time that year.) This is still in the final throes of being organized, so watch this space for the announcement, but pencil the time in your diaries. This as definitely a real initiative; Israel is a mathematical superpower. It has similar arrangements with France and Germany.

The New Zealand Institute for Mathematics and its Applications (NZIMA) is now open for business. This

is the new Centre of Research Excellence whose establishment was announced by the Government earlier this year. Marston Conder has travelled throughout New Zealand promoting this. It is open to all, and the NZIMA looks forward to receiving proposals for supporting excellent research in all areas of mathematics. Its international advisory board currently consists o

- Andreas Dress (Universität Bielefeld),
- Peter Hall (CMA, Mathematical Sciences Institute, ANU),
- Gus Lehrer (University of Sydney),
- Cheryl Praeger (University of Western Australia),
- Dale Rolfsen (University of British Columbia),
- Mike Saunders (Stanford University)
- Michael Singer (MSRI, Berkeley, California),
- Bruce Weir (North Carolina State University), and
- Keith Worsley (University of British Columbia).

Look at the web site http://www.nzima.auckland.ac.nz for details.

The NZ Mathematics Research Institute (NZMRI) is having its annual meeting in New Plymouth in January 2003. The area is Combinatorics and Combinatorial Aspects of Biology. As usual, there are a fine group of speakers. You should refer to the web site http://www.mcs.vuw.ac.nz/

A reminder to register early, as spaces will be limited. In February there will be a related Phylogeny meeting in Kaikoura, about which you should contact Mike Steel at Canterbury University.

Also keep in mind our next Forder Lecturer, Caroline Series from Warwick University. Caroline will give her first talk in Auckland on Monday the 22nd of September 2003 and her last talk in Dunedin on October 17th. Shaun Hendy is organizing her visit. Shaun also represented the NZMS at the Royal Society's recent meeting of the constituent societies. One idea debated there was that of the Royal Society organizing large joint meetings between multiple constituent societies. These might have greater media impact as well as encourage multi-disciplinary research. Such meetings might occur in 2003. The Council would be interested in hearing your views on this matter.

Associate Professor Andy Philpott has been elected to the Council of the Royal Society to Chair the Mathematical and Information Science and Technologies Electoral College.

From all this, we can see that the state of mathematics is relatively healthy in New Zealand. There are some possible clouds on the horizon. Major changes to university funding are being worked on. The move to targeting more funds in a "performance based model" was not unexpected in that England and Australia do the same. Mathematics could possibly do well from this arangement provided that the driver is based around excellence; as witnessed by the CoRE success.

It might be much more difficult for mathematics if the driver is simply numbers based, more like the Australian model; which I regard as a disaster. We will also need to keep our wits about us with the foreshadowed changes to funding categories. The Council is concerned about this, and will be making submissions where it can. These submissions will be based around the Government's initiative into science and information, and the mathematical support needed for that venture.

Finally, a reminder that the next event on the NZ mathematics horizon is the Colloquium which will be 1-5 December at Auckland University, organized by David Gauld. There will be special sessions on mathematics education and in dynamical systems. The announcement is in the Newsletter. See you there!

Rod Downey
Victoria University

LOCAL NEWS

AUCKLAND UNIVERSITY OF TECHNOLOGY

Applied Mathematics Department

At the Auckland University of Technology the Applied Mathematics department, within the Faculty of Science and Engineering, is a specialised co-operative team that provides service teaching, a consultancy service and supervision for student projects. In addition, the department is involved with the development of new modules from level 2 (pre-degree) to level 8 (masters degree). Our teaching occurs in a large variety of mathematics, statistics and computing modules over all the faculties of our university from levels 1 to 8.

These modules form parts of degree, diploma or certificate courses. The major bachelor's degrees in

Engineering, Science and Business all have a strong mathematical or statistical component. To a lesser extent, but it is growing, the department is also involved in providing a statistical consultancy service to both staff and students doing research. Our consultancy service has also attracted two outside clients in the last year. Currently our department has developed a degree pathway in Applied Maths within the Bachelor of Applied Science. Our pathway consists of five strands; computational maths, statistics, quality, financial maths and operations research.

We now have 15 distinct modules being taught in our pathway plus a final year project which is more than 2/3 of the degree. Next year we plan to develop two advanced modules in financial mathematics and operations research. In addition, there is a module in statistics currently under development for the Masters of Applied Science. Our department provides the supervision for third year projects in the Bachelor of Applied Science.

A major development being undertaken at present is the creation of a Computer Science pathway involving modules in computing, statistics, computational mathematics and operations research within our new Bachelor of Engineering Technology (BET) starting next year. We see this development as having plenty of potential for growth. The size of our department is 300 EFTS, which represents a growth of 50% over the last 8 years. Currently staffing levels are 11 full-time and 9 part-time.

In summary, the Applied Mathematics department at AUT is well positioned for further growth in both teaching and research activities.

Murray Black

UNIVERSITY OF AUCKLAND

Department of Computer Science

Gregory Chaitin, a leading researcher in computability and randomness at IBM Thomas J. Watson Research Center, has been appointed as a Visiting Professor for 4 years.

Ewan Tempero (formerly at VUW) has been appointed as Associate Professor. John Morris is a new Associate Professor in the Computer Science department. He has arrived from the University of Western Australia, and will be based at Tamaki.

Mark Wilson, who had been lecturing in Computer Science and in Mathematics, has been appointed as Senior Lecturer. Chia-Yen Chen has joined the Computer Science Department as a Lecturer. Yen will be based at the Tamaki campus, where she is completing her PhD under the supervision of Reinhard Klette.

John Grundy has been promoted to Professor of Electrical and Electronic Engineering and Computer Science. He is also the foundation Director of the BE degree in Software Engineering.

In New Scientist for April 6, the cover story featured the work on quantum computers by Boris Pavlov (Department of Mathematics) and by Cris Calude. They shew that, IF a quantum computer could operate in infinitely many quantum states, THEN the Turing barrier on computability could be evaded. Their work has been rigorously reviewed and accepted by a major journal.

Gregory Chaitin's concept of an "Omega number" for each programming language has greatly interested many computer scientists and mathematicians. Recent work on Omega numbers by him and by Cris Calude has stimulated the French computer scientist J.-P. Delahaye to write an article in the French edition of Scientific American: "Les Nombres Om éga", Pour la Science, May 2002, pages 98--103.

The end of the first semester was celebrated by screening a recording of the off-Broadway musical "Fermat's Last Tango", with script by Joanne Sydney Lessner and music by her husband Joshua Rosenblum. The performance was introduced by Cris Calude and Garry Tee. The show is a witty fantasia, based on Andrew Wiles's proof of Fermat's Last Theorem. The fictional character Daniel Keane (a thinly disguised version of Andrew Wiles) earns overnight fame when he presents his findings. However, fanfare soon gives way to doubt, when the spirit of Fermat discovers a hole in Keane's proof, and Keane is pursued by the Furies from the media. The solitary pursuit by Keane to correct this flaw results in a love triangle involving himself, his wife, and mathematics---the story of which is brought to life by Fermat and his immortal friends from the "AfterMath", namely: Pythagoras, Euclid, Newton, and Gauss.

Seminars

Dr Jaroslav Opatrny, "Routing in wireless ad hoc networks with irregular transmission ranges"

Professor Amnon Bar, "The MOSIX resource sharing algorithms for scalable cluster computing "

Beryl Plimmer, "Computer-aided sketching for form design "

Professor Gregory Chaitin, "Paradoxes and randomness", and "Foundations of mathematics; meta-mathematics "

Roland Kaschek (Massey University), "A generalized view of behaviour inheritance "

Associate Professor Marie-Laure Mugnier, "A graph-based approach to knowledge representation and reasoning "

Professor Michel Chein, "A subject-centered document retrieval model based on knowledge graphs "

Lyndon Drake, "Using inference to improve search on SAT problems "

Associate Professor Violet R Syrotiuk, "MERIT: a scalable approach for protocol assessment "

Professor Nazim H Madhavji,"Software gerontology and immortality "

David Moore, "Fundamental limits on blocking self-propagating code "

Colleen Shannon, "Code-Red: spread and victims of an internet worm "

Dr Richard Dearden (NASA), "AI on Mars: autonomy for planetary rovers".

Department of Mathematics

Vaughan Jones was appointed a Distinguished Companion of the New Zealand Order of Merit, in the Queen's Birthday Honours.

James Sneyd has now settled in, as Professor of Applied Mathematics and Head of the Applied Mathematics Unit.

Dr Jozef Siran (Slovak Technical University) and Eamonn O'Brien have been appointed as Associate Professors.

Dr Warren Moors (Waikato) and Dr Anthony Blaom (Princeton) have been appointed as Lecturers. Dr Blaom has now arrived in this Department.

Daniela Rovere is now the Departmental Manager.

Dr Ganesh Dixit formally retired on July 12, with an Indian feast laid on by his family. Ganesh will be continuing his association with the Department.

Immediately following the 17th Summer Conference in Topology and its Applications (northern summer), a symposium was held on July 5 to celebrate David Gauld and Ivan Reilly on attaining the age of 60. In the morning, Sina Greenwood spoke on "Microbundles, manifolds, metrisability and my mentor", Abdul Mohamad spoke on "David Gauld as a supervisor and collaborator", Jiling Cao spoke on "Ivan Reilly as a supervisor and collaborator", and Peter Nyikos spoke on "Update of a 1903 theorem by G. H. Hardy". After lunch in Old Government House, Paul Hafner spoke "In praise of geometry", Vamanmamurthy told "How David and Ivan took me on a research quantum leap", and John Butcher spoke on "Topology and Numerical Analysis: living with the enemy".

Pam Hurst has been since 1994 a Tutor and then a Senior Tutor in the Wellesley Programme. She was farewelled in June when she left to join her husband Bob, who has been appointed as Research Fellow in the Department of Physics at the University of Canterbury.

John Butcher has received a copy of a new book by Hairer, Lubich and Wanner on Geometric Integration of Differential Equations (Springer-Verlag, 2002). Gerhard Wanner paid a visit to Auckland in 1973, during which he went with John to visit Professor Forder (then aged 84) in Selwyn Village. Gerhard Wanner was very impressed to see that wonderful old man in a tiny room filled with mathematics books. reading a Russian text about category theory, which was fairly new at that time. The opening lines of the preface to the new book by Hairer, Lubich and Wanner quote from the conversation between HGF and Gerhard: "They throw geometry out the door, and it comes back through the window".

C. J. Goh was an adjunct professor here, during which he was writing (with X. Q. Yang) the book "Duality in Optimization and Variational Inequalities". That has now been published by Taylor and Francis, London and New York, 2002.

In the Faculty of Architecture, Property, Planning and Fine Arts, Mark Poletti won the award for best PhD thesis, with his thesis "The Performance of Multichannel Sound Systems", which was supervised by George Dodd (Acoustics Research Centre) and Colin Fox. Mark's thesis is a very mathematical analysis of Variable Room Acoustics Systems (where microphones, loudspeakers, and intervening electronics are used to vary a room's natural acoustic) including possible "colouration" of the sound. A key result is the development of a "Unitary Reverberator", in which microphones and speakers on a wall are controlled in a way that acoustically simulates the wall opening into a virtual volume; thereby increasing reverberation time in a seemingly natural way. Visitors to VUW will be able to listen to a trial system in the Adams Concert Hall, and there is a chance that the Aotea Centre's awful acoustic might be improved by an installation of this system. Mark works for IRL, commercializing his system.

At the presentation of the award, an examiner was quoted as saying that Mark's thesis "might well be referred to as the Principia of room acoustic enhancement systems"!

The University has established a prize in memory of Margaret Morton. The regulations took a while to formulate and then a lot longer to be accepted by the University, but they are now in place. The regulations state that "The Prize will be awarded annually to the female student with the most potential to succeed in Mathematics Education, or Discrete Mathematics (including Graph Theory)". The first recipient of the prize is Caroline Yoon, who is now studying for her PhD in Mathematics Education at Purdue. During a visit to Auckland she was presented with the Prize at an afternoon tea in the Common Room.

The New Zealand Mathematical Olympiad Committee is delighted that Simon Marshall of Onslow College, Wellington has won a gold medal at the 43rd International Mathematical Olympiad. This is the first time that a New Zealand student has had such a success. The team was placed 34th, out of teams representing 82 countries.

Bill Barton went to the Philippines for two weeks in February to see Willy Alangui and his field work on the mathematical concepts involved in rice terracing, and for some of his own research on mathematics in indigenous languages. At Easter he went to Spain for his Marsden Project research on Topology and Language, then to Denmark for the Third International Conference on Mathematics Education & Society, where he gave a paper on the Mathematics Enhancement Project in Manukau schools. He was interviewed by Robin Williams for an Australian Radio Science programme.

Paul Bonnington gave talks at the conferences: Com2Mac Conference on Graphs and Combinatorics, Postech, Pohang, Korea, July 8--10; and Sigmac02: Symmetries in Graphs, Maps and Complexes, Aveiro, Portugal, July 15--19.

John Butcher gave a lecture at the ANZIAM annual conference at Canberra in February. Between April 20 and May 5 he visited several institutions in Taiwan, including Academia Sinica and the University of Taipei, and gave lectures at 5 places. In June he visited Humboldt Universitat zu Berlin, and was an invited speaker at a Symposium at Universite de Geneve on scientific computation.

Bruce Calvert visited Jacob Katzenelson at the Technion in Haifa, in December 2001.

Marston Conder has been on study and research leave in the first semester, and although much of his time has been taken up with preparing the case for establishment of the NZIMA and its selection as a Centre of Research Excellence and subsequent contract negotiations, he has also been able to make some good progress on his research: on semisymmetric graphs, regular Cayley maps, automorphisms of Klein surfaces, as well as very recent work on groups expressible as a (non-direct) product of two abelian subgroups. He took part in the NZMRI meeting on mathematical statistics at Napier in January and the Phylogenetics meeting at Whitianga in February, and spent part of March in Madrid working with co-authors on surface automorphisms. He spent most of June in the USA and Canada with visits to the MSRI at Berkeley and Fields Institute in Toronto, as well as an AMS-IMS-SIAM Joint Summer Research Conference on "Groups, Representations and Cohomology", and he was an invited speaker at a conference on "Symmetries of Graphs, Maps and Complexes" at Aveiro (Portugal) in July.

Colin Fox has been invited as a researcher to the Probability and Statistics Department of CIMAT (Centro de Investigacion en Matematicas) in Guanajuato, Mexico, where he expects to spend much of the second semester.

David Gauld attended the Eighth Summer Workshop of NZMRI at Napier in January. Since then he has been busy with (amongst other things) organizing the 17th Summer Conference in Topology and its Applications (northern summer, that is).

Norm Levenberg was an invited speaker at the Nordan conference in Complex Analysis, at Reykjavik in

March. In May he was an invited speaker at the special session in potential theory at the AMS meeting in Montreal, and an invited speaker at the Several Complex Variables Meeting in honour of L. Gruman, at Toulouse. In June he was an invited speaker at the special session on analysis at the CMS meeting in Quebec.

Gaven Martin was a Visiting Professor at Syracuse University in November--December 2001, then he was a member of the Institut Mittag-Leffler from January to March 2002. He was the Van Vleck Scholar at Wesleyan University in April, and he was CNRS Professor at Universit é d'Lille in June--July 2002. He was the keynote speaker at a conference on Conformal Mappings and Probability at Tennerife. He presented colloquia at Technical University Stockholm, two at University of Helsinki, Technical University of Helsinki, four at Institut Mittag-Leffler, two at Wesleyan University, two at University of Texas-Austin, and two at Université d'Lille.

Alastair McNaughton presented the paper "Adjacency Constraints in Forest Harvesting" (with Geoffrey Page and David Ryan) at the ORNZ Conference.

Geoff Nicholls was on sabbatical leave for the first semester, with the Mathematical Genetics group in the Department of Statistics in the University of Oxford from March to May.

Greg Oates visited Ateneo de Manila University, Philippines under the auspices of the Asia 2000 Foundation in December 2001; and also visited University of Philipines Baguio and The Universiti Brunei Darussalam on the same trip. He taught some demonstration lessons using graphics calculators to undergraduate calculus classes, and gave two presentations; one involving the use of technology and curriculum stemming from his PhD research, and the other on his role as Director of the Mathematics Learning Centre, regarding the student support structures which we operate here at Auckland.

Barbara Miller-Reilly and Ivan Reilly were on Research and Study Leave for the first semester. They spent a month in California based at UC Davis, and two months at the University of Michigan---Ann Arbor. Ivan attended the Spring Topology Conference at Austin Texas in March, and Barbara attended the annual meeting of NCTM and its associated research pre-session at Las Vegas. They also visited the University of Colorado at Denver, and Portland State University and Lewis & Clark College in Portland Oregon.

Philip Sharp was on leave at Queen's University, Canada from early December 2001 to early June 2002. While there he collaborated with astronomers Martin Duncan and Paul Wiegert on numerical methods for modelling the close approach of two or more asteroids. He visited Remi Vaillancourt in the Department of Mathematics at the University of Ottawa, Wayne Enright and Ken Jackson at the Fields Institute (University of Toronto), Jim Verner in the Pacific Institute of Mathematical Sciences (Simon Fraser University) and David Spencer in the Department of Aerospace Engineering at Pennsylvania State University. He gave seminars at Queen's University, the University of Toronto and Simon Fraser University, and gave a paper at the Southern Ontario Numerical Analysis Conference. While transiting in Los Angeles, he visited NASA's Jet Propulsion Laboratory and met with Paul Chados who works on methods for estimating the probability that an asteroid will hit the Earth, with Myles Standish who produces ephemerides of the Moon, the planets and other bodies in the Solar System, with Kevin Grazer a member of the Cassini team, and Fred Krogh, a consultant for JPL. Concern was expressed at these meetings that the integration software used by Chados and Standish was out of date. Phil Sharp took the opportunity to establish a collaboration with Krogh and Chados on updating the software, and a sizable portion of his leave was spent on that collaboration.

Arkadii Slinko attended the NATO Advanced Research Workshop at Istanbul (in December 2001) on the topic: "Mathematical Theories of Allocation of Discrete Resources", where he gave a talk on "Ranking of Multisets and Committees", jointly with Prof Murat Sertel of Bogazici University of Istanbul.

Wiremu Solomon (with Ilze Ziedins and Heti Afimeimounga) presented a paper on "The Downs-Thomson effect, uniqueness and stability in a simple traffic network", at the conference on Stochastic Processes and Applications 28, held at Melbourne in July.

Steve Taylor attended ANZIAM 2002 in Canberra, where he presented a paper on "Boundary control of a rotating Timoshenko beam", co-authored with Stephen Yau, a former MSc student. He also attended MISG 2002 at Adelaide.

Mike Thomas gave an invited plenary talk on Procedural and Conceptual Use of CAS at the teachers' conference on Computer Algebra in School Mathematics, at Swinburne University, Melbourne, on 2001 December 8. The conference was organized by Prof Peter Jones, and was attended by around 100 people including teachers from every Australian State and representatives from Singapore, and some other Asian countries. From December 9 to 15 he was an invited participant in The Twelfth International Congress of Mathematical Instruction (ICMI) Study entitled The Future of the Teaching and Learning of Algebra,

held at The University of Melbourne. Conference attendance was limited to 100 and was by invitation only, based on submitted papers and reputation in the field. There were only two delegates from NZ. Mike was invited to be joint leader of the Computer Algebra System (CAS) working group, with this role including being author, with Barry Kissane, of a chapter in a study volume on algebra to appear in the ICMI Study Series. He gave a presentation on the two papers below at the conference, as well as part of the CAS working group's plenary presentation on the future of CAS in mathematics learning: "Building a conceptual algebra curriculum: The role of technological tools", and (with David Tall) "The long-term cognitive development of symbolic algebra".

Shayne Waldron attended the International Conference on Constructive Function Theory at Varna in Bulgaria (June 12 to July 3), after which he visited H. Rosengren in Gothenberg and M. Revers in Salzburg.

Andrei Korobeinikov is now an NZ FRST PostDoctoral Fellow at the Mathematical Institute of Oxford University.

Professor Myung Hyun Cho, from Wonkwang University, is visiting for a year. Professor Charles Leedham-Green (Queen Mary College, London) is visiting for 6 months. Professor Hans-Peter K ünzi (University of Cape Town) is here as a University of Auckland Foundation Fellow. Anna Torstensson, a PhD student from one of our Universitas 21 partners, Lund University in Sweden, has returned to this Department. She is an algebraist and will be here for about 6 months. She'll be working with Gaven Martin and Marston Conder, and also teaching paper 109 with Alastair McNaughton at the Tamaki campus.

Recent visitors include Dr Majid Ali (Oman University), Prof Arjeh Cohen (Eindhoven University of Technology), Prof Szymon Dolecki (University of Burgundy), Prof Paul Gartside (University of Pittsburg), Prof Jiang Shou-Li (Shandong University), Prof Jacob Katzenelson (Technion, Haifa), Prof Colette Laborde (Universit é de Grenoble), Dr Scott Murray (University of Sydney), Prof Peter Nyikos (University of South Carolina) and Dr Colva Roney-Dougal (University of Sydney).

Colin Fox and Andrea now have a daughter Ella Ming-Li, born on May 29.

Seminars

Professor Vladimir Golubyatnikov (Sobolev Institute of Mathematics, Novosibirsk), "On reconstruction of multidimensional objects from tomography-type projection data" and "Multidimensional cone-beam tomography algorithm "

Judy Paterson, "What do we learn from teachers' responses during professional development which uses the learning of mathematics content as a starting point?"

Nicolette Moir, "A new `fifth' order method for solving ordinary differential equations "

Dr David McIntyre, "Topologizing a set to make a given function continuous "

Dr Robert McKibbin (Massey University---Albany), "Immersion, dispersion, inertia 'n coercion---naturally "

Dr Tsukasa Yashiro, "Constructing surface knots "

Alan Simonsen, "Reality and vision in the Danish curriculum: heading towards the virtual school "

Jianhua Gong, "Quasiconformally homogeneous manifolds "

Professor Tom Berger (Colby College, Maine), "Fascinating geometry", and "An amazing algorithm: Risch integration "

Dr Kerry Richardson (Yokohama National University), "Katetov's problem and Michael's question "

Greg Oates, "Technology and curriculum development: Designing a framework for investigation "

Professor Peter Hunter (Bioengineering Research Group), "Modelling cell, tissue and organ function; an overview of the mathematical challenges "

Dr Ye Yoon Hong, "Building Newton-Raphson concepts with CAS "

Dr V P Karassiov (Lebedev Physical Institute, Moscow, & University of Waikato), "Dual algebraic pairs and polynomial Lie algebras in quantum optics and many-body physics "

Professor Ivan Reilly, "Topological reflections on a research and study leave "

Dr Paul Bonnington & Dr Jamie Sneddon, "Two topics in graph theory "

Professor Brent Carswell (University of Michigan), "Invariant subspaces of the Hardy and Bergman spaces "

Dr Rachel Weir (University of Virginia), "Extremal functions in weighted Bergman spaces "

Alan Gil de los Santos, "Teacher perspectives on derivative "

Professor Michael D Plummer (Vanderbilt University), "On the connectivity of graphs embedded in surfaces "

Professor Hans-Peter A Künzi (University of Cape Town and University of Auckland Foundation Fellow), "Cocompactness and quasi-uniformizability of completely metrizable spaces "

Dr Colva Roney-Dougal (University of Sydney), "The primitive permutation groups of degree less than 1000 "

Professor Peter Nyikos (University of South Carolina), "Classic problems---25 years later", "Type 1 manifolds", and "Linearly Lindel of spaces "

Professor Szymon Dolecki (University of Burgundy), "Method of multisequences "

Dr Scott Murray (University of Sydney), "Computing in groups of Lie type "

Professor Arjeh Cohen (Eindhoven University), "Making mathematics more meaningful by computer interaction "

Professor Colette Laborde (Universit é Joseph Fourier & Institute for Teacher Education, Grenoble), "Dynamic Geometry: creating effective interaction between students and core ideas in undergraduate mathematics "

Professor Paul Gartside (University of Pittsburg), "(Yet) more on M1-M3 "

Dr Arkadii Slinko, "Two solved and two unsolved combinatorial problems in voting theory".

Department of Statistics

Michael Black, currently completing his PhD at Purdue University, has been appointed as Lecturer.

Dr Rachel Fewster came here as a Postdoctoral Fellow for 2 years, and then gained a 3-year contract as Lecturer. After 1 year on that contract, she has now been appointed as a full Lecturer.

Associate Professor Stefan Steiner (University of Waterloo) is visiting for a year, at the Tamaki campus.

Seminars

Professor J A John (University of Waikato), "Crossover designs in clinical trials".

Professor Estate V Khmaladze (VUW), "On martingale transforms and goodness-of-fit methods in the general regression problem".

Dr Paul Damien (University of Michigan), "Stochastic Simulation".

Dr Gerald Cheang (Nanyang Technological University, Singapore), "Beyond Black-Scholes".

Associate Professor Stefan Steiner (University of Waterloo), "Seven habits of highly effective industrial problem solvers: an overview of statistical engineering (Shainin methods)".

Professor David ,R Brillinger,(UC---Berkeley), "Mutual information: a unifying concept in random process analysis".

Dr Claude Belisle (Universit é Laval, Canada), "Convergence properties of hit-and-run samplers".

Ru-Shuo Sheu, "Reservoir control problems".

Applied Probability & Applied Mathematics Joint Seminars

Professor Mike O'Sullivan (Engineering Science), "A polynomial-time method for dynamic programming over an infinite time horizon".

Dr Stephen Joe (Waikato University), "Construction of quadrature rules for numerical integration in hundreds of dimensions".

Dr Wiremu Solomon, (Work in progress with Heti Afimeimounga and Ilze Ziedins.) "The Downs-Thomson Effect. Uniqueness and stability for a user-determined equilibrium in a simple traffic network with a state-independent probabilistic policy".

Dr Les Foulds (Waikato University), "Bookmobile routing and scheduling in Buskerud County, Norway".

Dr Geoffrey Pritchard, "The electricity seller's Psi".

Edward Abraham (NIWA, Wellington), "Growing with the flow: two-dimensional stirring and phytoplankton dynamics".

Dr Sharon Browning (North Carolina State University), "Pedigree genetic data analysis with crossover interference".

Garry J. Tee

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Congratulations to Beverley Horn on her winning a Research Award for 2002, to support her PhD research on modelling during decompression illness.

Congratulations to Simona Vita on two counts. First, she has successfully defended a second doctoral thesis (this time in theoretical computer science), at the University of Bucharest. Secondly, she has been awarded an NZ Science & Technology Post-doctoral Fellowship for three years from 1 November 2002. Her research programme with Douglas Bridges will be "Foundations of Constructive Topology".

Associate Professor Noriaki Suzuki is visiting the Department from Nagoya University, Japan. He is here to work with Neil Watson on the potential theory of the heat equation, and is giving a series of seminars on "Mean value and uniqueness properties for solutions of PDE".

Seminars

Darryl MacKenzie (Proteus Research & Consulting Ltd, Dunedin), "Estimating site occupancy and related parameters when species are not detected with certainty "

Mark Boyce (University of Alberta), "RSF Applications for Cumulative Effects Analysis, PVA, and Conservation Planning "

Professor John Butcher (University of Auckland), "Numerical methods for ordinary differential equations in the 20th century "

Dr Peter M Schuster (Ludwig-Maximilians Universitat, Munchen), "Ring Spectra Without Points "

Associate Professor Noriaki Suzuki (Nagoya University, Japan), "Mean value and uniqueness properties for solutions of PDE", "Inverse mean value property for harmonic functions", "Mean value property for temperatures", "Inverse mean value property for temperatures", "Mean valu property for solutions of wave equation", "Local Hopf lemma", "Harmonic extension and uniqueness theorem "

Professor Fred Richman,(Florida Atlantic University), "A division algorithm", "Transient states in finite Markov chains", "The ascending tree condition "

Professor Jim Oltjen (University of California, Davis), "Dynamic Modeling Animal Growth and Body Composition".

Charles Semple

INDUSTRIAL RESEARCH LIMITED

Applied Mathematics Team

IRL has a new CEO, Nigel Kirkpatrick. Mr Kirkpatrick has spent most of his career in Unilever since graduating from Otago University. Most recently he was based in Zurich as global innovation leader for DiverseyLever. He started at IRL in May and takes over from Geoff Page, who left IRL in December 2001.

IRL hosted a joint workshop between ANZIAM and the NZ Hydrological Society on "Mathematical Modelling in Hydrology". There were 20 attendees from all over the country and several international visitors. Details of the workshop can be found at the Hydrological Societies website (http://www.hydrologynz.org.nz/society-workshops.html). The workshop will be held again in two years time.

Shaun Hendy spent a week in the UK, visiting the Chemical Laboratory at Cambridge and the Department of Materials at Imperial College in London. He then spent two weeks visiting the Centre for Nanoscale Physics at the University of Alberta in Canada. While there he had the opportunity to meet with the director of the new Canadian National Institute of Nanotechnology, Dr Dan Wayner. The new institute will eventually have 30-35 full-time research staff and will be located on the University of Alberta campus. Graham Weir and John Burnell attended the World Congress on Particle Technology in Sydney from 22-25 July. John gave a talk entitled "The Slumping of Powders in Cylinders".

Shaun Hendy

MASSEY UNIVERSITY

Institute of Fundamental Sciences (Palmerston North)

Mathematics

Welcome to Tammy Smith who joined us on the 1st of July as a lecturer. We hope that you will find your new work a challenge. Then, farewell to John Giffin who bravely crossed Cook Straight to take up his position in the Management Science group, Dept of Management, Faculty of Commerce. We will miss John. One warning: make sure that you are able to differentiate between `less' and `fewer', otherwise trouble with John.

Robert McLachlan is enjoying Geneva *en famille*. At the 60th birthday conference for Gerhard Wanner there were a record 5 New Zealanders: Robert, John Butcher, Nicollette Moir, Will Wright, and Grant Lythe, a former Auckland student now a lecturer in applied mathematics at the University of Leeds. A highlight of the conference was carting baby Helena up to 2350m at Lac Blanc, just a few kilometres across the Chamonix valley from Mont Blanc. (In the words of Gerhard, a scientific exchange at the highest level). Also in Geneva, another former Auckland student, Robyn Curtis, has just successfully defended her PhD thesis on `Hecke algebras associated with induced representations' *C. R. Acad. Sci. Paris, Ser. I* 334 (2002), 31--35). Other advantages of Geneva include the library (collected works of everyone right to hand, with 4250 journals online) and hearing Vaughan Jones give a seminar in French.

The Allan Wilson Centre for Molecular Ecology and Evolution is now operational, with building renovations of the Centre coming to completion. It is situated on the top-floor of Science Tower D, which is adjacent to both the Mathematics and Biology offices and will accommodate local staff, postdocs, students and visitors of the Centre and offices for administration. Mike Hendy is one of the co-directors, and together with PhD student Paul Gardner and programmer Tim White, will join with their Biology colleagues shortly. It is expected that an advertisement for Post-Docs, PhD students and technicians will appear shortly on their website http://awcmee.massey.ac.nz/ An official opening is being planned for September. The total projected CoRE funding for the Allan Wilson Centre for 6 years has just been announced as $17M, including approximately $5M for capital equipment. Major capital equipment items include DNA sequencing facilities, X-ray crystallography and a 128 node Beowulf cluster (parallel computer) which will be built at Massey's Albany campus.

Meanwhile Paul Gardner is nearing the completion of his northern tour. He visited Amherst on his way to Sweden. His poster presentation at the "RNomics and Functional Genomics" meeting in Stockholm received a prize of 1000 Kronor! He has since been working with Vince Moulton and Kathi Huber (Uppsala) and Sverker Edvardsson (Sundsvall), and will be visiting the Universities of Bochum and Bielefeld in Germany on his return journey in August.

Mike Carter managed to dodge some of the winter weather by attending the 2nd International Conference on the Teaching of Mathematics at the Undergraduate Level, held in Hersonissos, Crete, from 1--6 July.

The weather there was utterly boring---a cloudless sky every day, temperatures in the 30s, little or no wind. While hordes of holidaymakers from northern Europe lay on the beaches all day, diligently acquiring an (almost) all-over tan, several hundred conscientious mathematicians and mathematics educators spent their time in a very new and impressive conference centre. There was plenty to occupy them: 10 invited talks, 3 panel discussions, 6 workshops on the use of graphics calculators, and nearly 400 contributed papers offered in 11 parallel sessions running for 5 days. With so many parallel sessions, there was always something of interest to hear about, and often there were difficult choices to be made. Mike's paper "Service with a Smile" on the rationale and philosophy of service teaching seemed to be well received, and distinguished itself amidst a throng of high-tech presentations by using only six overheads and no computer facilities. But generally technology was much in evidence, and "interactive learning" was the buzzword. The next in this particular series of meetings is to be held in Istanbul in 2006. The first was held in 1998 on the island of Samos. If nothing else, mathematics educators know how to pick good conference venues.

Congratulations to Brett Ryland who was awarded an MSc(1st class honours) in Mathematical Physics. The title of his thesis was Nonholonomic Dynamical Systems. Brett is currently employed as Research Assistant in the "Magnetic Resonance of Materials" Laboratory under Professor Paul Callaghan who is the Director of the "MacDiarmid Institute for Advanced Materials and Nanotechnology".

Gillian Thornley and her PhD student Padma Senarath attended the "Finsler Geometry Workshop" held at the Mathematical Sciences Research Institute (MSRI), Berkeley (June 3--7). The MSRI building was having a noisy face-lift so most of our sessions were held in the Lawrence Berkeley National Laboratory which sprawls along the nearby hillside. This gave us the opportunity to experience US government security, travel on the free on-site and off-site buses (no footpaths there), and to speculate on the building numbering system (or lack of it). The Workshop brought together specialist geometers and people involved in areas where Finsler geometry is, or could be, used.

Our VC departed Massey on the 9th of July. With the recent resignation of the VC at the University of Canterbury one could almost infer that there is a demand for ex-VC's of NZ Universities in Oz.

Tammy, Padmanathan Kathirgamanathan and Patrick Rynhart attended the "Mathematical Modelling in Hydrology Workshop" held early July at the IRL Gracefield Research Centre at Lower Hutt.

Kee Teo will be going to Singapore (mid-November to mid-February) to work with Professor Koh of the National University of Singapore and Associate Professor Dong of Nanyang Technological University on Chromatic Polynomials.

Seminars

Professor John Butcher (New Zealand Mathematics Society Visiting Lecturer, University of Auckland), "Numerical methods for ordinary differential equations in the 20th century".

Dr John Hudson, "98 years of the Poincar é Conjecture".

Professor Marston Conder, "Explaining NZIMA---Opportunities in the Mathematical Sciences".

Graduate Seminar Series

Patrick Rynhart, "Mathematical modelling of granulation".

Professor Mike Hendy, "Counting gene duplication trees".

Brett Ryland, "Nonholonomic dynamical systems".

Dr Rissa Ota (Institute of Molecular Bio- Sciences), "An example in phylogenetic analysis of the relationship of Bayesian and maximum likelihood methods".

Jonathan Marshall, "Computing volumes and surface areas of convex polyhedra".

Seung-Hee Joo, "Integrable homogeneous Hamiltonian and Contact systems".

Padmanathan Kathirgamanathan, "Source term estimation of pollution from an accidental release".

Serguei Norine, "Characterization of pfaffian cartesian graphs".

Sebastian Link (Department of Information Systems), "Axiomatizing functional dependencies in the Higher-Order-Entity-Relationship Model".

Donna Giltrap, "Downdraft gasification of bio-mass".

Associate Professor Charles Little, "Even circuits of prescribed clockwise parity".

Marijcke Vlieg-Hulstman

Institute of Information and Mathematical Sciences (Albany)

Mathematics

The Institute will soon be building a 128 node parallel computer. This is expected to be the most powerful computer in New Zealand when it is completed. The computer is being jointly funded by the Allan Wilson centre and Massey University. This development is a great recognition of the work by the mathematics group to promote parallel computing.

Winston Sweatman has recently joined the Institute. Winston's research interests are in mathematical modelling, stellar dynamics and numerical computation. He was previously a lecturer at Napier University in Scotland where he was an active member of the Edinburgh Mathematical Society and managing editor of the society's journal, The Proceedings of the Edinburgh Mathematical Society. Winston's first visit to New Zealand was to compete for Scotland in Judo at the 1990 Commonwealth Games where he won a silver medal, so needless to say he arrived with a positive impression of New Zealand.

Seminars

Mick Roberts (AgResearch, Wallaceville),"Ban-dung bugs (The dynamics of dengue)".

Ron J Litchford (NASA), " Future Space Transportation: A Propulsion Research Prospective".

Mike Meylan

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

The Head of Department Vernon Squire has been heavily involved in the organization of the 2--6th December, 16th IAHR Symposium on Ice, which was originally expected to attract about 60 abstracts and over 230 were submitted. While it is unlikely that all the submitted abstracts will turn into registrations---indeed some potential attendees have already pointed out that the airfares are causing them difficulty---Vernon is still expecting a reasonable turnout. He is editing the proceedings; a mammoth task as most of the people submitting papers do not use LaTeX and are using Word instead. Vernon has learned quite a lot of Word, including the amazing result that single-spaced actually looks like double spaced in some East Asian versions of Word, and that occidental word cannot change the setting without extra modules being installed.

Vernon and Tim Williams participated in ISOPE 02, the 12th conference in a series on offshore and polar engineering, which took place in KitaKyushu, Japan in late May. At that meeting Tim presented his first paper at an international conference on what happens to waves when they hit an oblique crack in sea ice. The paper went down well and Tim was considerably more relaxed afterwards, looking forward immensely to his post-conference holiday in Japan, where he took in a World Cup soccer match and watched a few other matches on TV.

Vernon, John Enlow and Gerrard Liddell spent a hectic few weeks preparing software for `Get on Board Science', the University of Otago's contribution to the International Science Festival held in Dunedin between 4-5 June. They chose the theme of the mathematics of satellite image processing, using images that Vernon obtained from a friend at NASA's Jet Propulsion Laboratory of waves off Big Sur in California and ice floes in the Arctic. John surfed the waves, Gerrard deformed the ice, and Vernon located features, and they wrote appropriate software in MATLAB to entertain the masses. The days were pretty full on (and long), although it has to be said that the more gee whiz exhibits, e.g. animals in cages, fishes in tanks, electron microscopes, and virtual reality rooms, attracted the largest crowds. It was hard work and somewhat of a relief to be able to cross it off the list on Vernon's whiteboard.

The Department is being reviewed this year, which involves several staff putting together a self-review document before a small committee meets sometime in November to discuss how the Department of Mathematics and Statistics at Otago could be made a better place. This is a time consuming but, hopefully, rewarding task. With the IAHR conference a couple of weeks later, Vernon, at least, is beginning to believe that things might have been scheduled a little better!

Our postgraduate students have recently moved to a new Annex house just a few doors north of their previous accommodation. This was appropriately "house-warmed" and in the summer we hope to utilise the barbeque (which we are sharing with the previous inhabitants in exchange for storage) on the spacious back lawn. An appropriate name for this building is being sought.

Boris Baeumer gave a well received hour-long presentation at the Joint Workshop of ANZIAM and the New Zealand Hydrological Society on "Mathematical Modelling in Hydrology"" in Lower Hutt on Monday July 8th, followed by a short presentation at the Western Pacific Geophysics Meeting in Wellington, July 9-12, on "Mobile Solute Transport vs. Total Solute Transport". However, the main contribution came from his 4 month old son who managed to heckle and shout down the Speaker of the House at the parliamentary reception of the WPGM meeting...

Richard Barker and Claire Cameron held a workshop at Victoria University on analysing mark recapture data using the computer program MARK. The workshop was co-taught with Shirley Pledger from VUW. Because of demand for places, two workshops were run back-to-back making for an exhausting week. More than 40 took part with about half the participants from the Department of Conservation and the remainder coming from Universities and Research Institutes from all over New Zealand and Australia.

John Harraway attended ICOTS6 in Cape Town, South Africa, 7--12 July. He presented a paper in the session Statistical Training and Education in Environmental Settings and organised the session on Multivariate Statistics. The conference, with about 500 participants, was held at the Holiday Inn, Strand Street in downtown Cape Town. Both the Local Organising Committee and the International Programme Committee were responsible for a very well organised conference with a wide range of papers. ICOTS7 will be held in Brazil in 2006. John spent four days at Monkey Mia 800 km north of Perth on his way to South Africa seeing the field work being carried out on dolphin behaviour by a PhD student with whom John has previously collaborated.

Derek Holton has been on study leave in Melbourne and Chichester for the first semester. While in England, Derek also attended the Mathematical Association Annual Conference at Reading and the 2nd International Conference on the Teaching of Mathematics in Crete, Greece during the first week of July. More news on these events may come later, when Derek has had time to catch his breath!

John Curran is on Study Leave in Galway from July until October and at the University of Plymouth until early January 2003. He also attended the 2nd International Conference on the Teaching of Mathematics in Crete at the beginning of his leave.

Visitors.

Mel Nyman from Alma College, Michigan, spent his sabbatical leave at Otago during the first semester. This was Mel's second sabbatical visit here (the first was fourteen years ago). This time he collaborated with Robert Aldred and helped teach the MATH 151 paper. Mel's research interests are the teaching and learning of undergraduate mathematics as well as the mathematical modelling of the growth of seaweeds. Mel was a popular visitor and we were sorry to see him leave.

Seminars

Nicholas Dudley Ward (University College London (and Auckland)), "Wavelets, Bergman Spaces and Zero Sets "

Dr Robert Aldred, "Counting cycles in cubic graphs "

Professor M Nyman (Alma College, Michigan), "Is it Grade Inflation or are the Students Really Better?"

Dr Boris Baeumer, "Transport and Dispersion in Fractal Media "

Ruben Roa, "Complex Ecological Patterns Explained with Simple Math "

Professor M Nyman (Alma College, Michigan), "Developing and Assessing Students' Calculus Sense & at no extra charge---A Few Comments on MATH 151 "

Dr Gerrard Liddell, "Group Bases and Rubik's Cube "

Professor John Butcher (Department of Mathematics, University of Auckland (NZMS Visiting Lecturer)), "Numerical methods for ordinary differential equations in the 20th century "

Michael D Plummer (Department of Mathematics, Vanderbilt University), "On the Connectivity of Graphs Embedded in Surfaces "

Ruben Roa, "Generalized Mortality Rates from Size Distributions "

Prof Marston Conder (The University of Auckland), "NZIMA, its aims and activities and opportunities, and about how staff and students can apply for funding to run programmes or support their research "

Claude Bélisle (Université Laval), "Convergence Properties of Hit-and-Run "

Paul Buckland, "Modelling power flows in the national grid "

Dr Michael Meylan (Institute of Information and Mathematical Sciences, Massey University (Albany)), "The Application of Spectral Theory to Linear Water Waves".

Preliminary presentations of fourth year mathematics projects: the students, supervisors and topics are -

James Douglas (Supervisor: John Clark), "Free Modules "

Katie Enlow (Supervisor: John Shanks), "Circular Arguments "

Ben Handley (Supervisor: Hans van Ditmarsch, Computer Science), "A Combinatorial Application to Coding Theory "

Tim Woodhams (Supervisor: Hamish Spencer, Zoology), "Modelling of Sex-Altering Selfish Genetic Elements".

Preliminary presentations of fourth year statistics projects: the students, supervisors and topics are -

Vanessa Cave (Supervisor: David Fletcher), "Matrix Population Models "

Mark Wohlers (Supervisor: Fred Lam), "Testing for synergy "

April Patrick (Lamonis Kavalieris), "Rain".

StatChat

Richard Barker, "Advantages of Bayesian Methods Illustrated using Mark-Recapture Data".

Lenette Grant

UNIVERSITY OF WAIKATO

Department of Mathematics

More staffing changes are occurring in our department. Warren Moors will be leaving us at the end of the year to take up a position at the University of Auckland. He has made an excellent contribution to the department's research, teaching, and administration and we are obviously going to miss his skills. However, his new position will no doubt be of benefit to his research and we wish him well for the future.

A replacement for Warren has been advertised with a closing date of 16 September. Those readers interested in the position can find further information at the WWW address www.waikato.ac.nz/hrm /vacancies/220308.html

Congratulations are due to Frances Kuo who has just passed the oral examination for her PhD.

In early June, Sean Oughton travelled to the Bartol Research Institute, University of Delaware, for two weeks of collaboration there. Prior to attending the "Solar Wind 10" conference in Pisa, Italy, he spent the intervening weekend in London where he went to a lively pub to watch England beat Denmark in the football World Cup. In Pisa he presented an invited talk on "Waves and Turbulence in the Solar Wind". Sean also attended the Western Pacific Geophysics Meeting of the American Geophysical Union in Wellington in July, where he gave an oral presentation entitled "Heating the Solar Corona: Can low-frequency Alfv én waves drive quasi-2D turbulence heating?".

Kevin Broughan and Rua Murray are now both on study leave while Ian Hawthorn has finished his. Kevin will spend six months at the University of Columbia pursing his research in number theory. During his study leave, Rua will visit the University of Victoria on Vancouver Island as well as the University of Memphis (order your Elvis souvenirs now!). Rua also plans to spend some time at the University of Canterbury.

We have had a number of visitors in the past few months. Ernie Kalnins has had Valery Karassiov visiting him for three months from mid-May. Valery is from the P N Lebedev Physics Institute in Moscow. Also visiting Ernie was his former post-doc, Jonathan Kress, who spent two weeks here in July. Stephen Joe had James Lyness from Argonne National Laboratory here for a week in June while Ian Craig had Yuri Litvinenko from the University of New Hampshire, Durham, visiting for three weeks in late July and early August. Our former colleague Ali Jaballah is visiting us until 20 August. Meanwhile, Ian Hawthorn's visitor, Tom Berger, left for home in mid-July after having been here since early February.

Seminars

J Leslie (Howard University, Washington DC), "Lie's third theorem in supergeometry "

E Hitzer (Fukui University), "Geometric algebra (Clifford algebra) "

T Berger (Colby College, Maine), "An amazing algorithm: Risch integration".

Stephen Joe

Department of Statistics

Waikato recently hosted the one-day New Zealand Statistical Association Conference. This was held in conjunction with a one-day workshop on Data Mining presented by Geoff Holmes and Bernhard Pfaringer, of the Computer Science Department here at Waikato. Both days were well attended.

During the study break, members of the department also took the opportunity to attend some overseas conferences. Dave Whitaker, Nye John, Murray Jorgensen and Judi McWhirter, together with PhD students, Carole Wright and Khangelani Zuma, attended the 16th Australian Statistical Association Conference which was held in Canberra. Bill Bolstad was an invited speaker at ICOTS-6, which was held in Cape Town. Also attending ICOTS, was Bruce Millar, who is currently employed on a part-time basis as a tutor in the department. Lyn Hunt travelled to Knoxville, Tennessee and presented a paper at the Statistical Data Mining and Knowledge Discovery Conference.

Nye John is currently on leave. He is visiting Europe at present and attended IBC2002 in Frieberg, Germany. His term as Chairperson of the department was originally to end at the end of the year and so he stepped down from this position to coincide with the start of his Sabbatical. Dave Whitaker has been appointed as the new Chairperson.

Murray has returned from his sabbatical. He spent most of his time away in Canada, visiting with Prof Bill Reed, in the department of Mathematics and Statistics at the University of Victoria. He also attended several conferences including the International Conference of Robust Statistics (ICORS2002) in Vancouver, the 13th Annual meeting of the Statistical Society of Canada in Hamilton, Ontario, and also the Mixture Models and Bump-Hunting and Measurements Error Workshop in Cleveland Ohio.

And last but not least, James Curran is off to Venice Italy, early September, where he is an invited speaker at the International Conference on Forensic Statistics.

Seminars

Professor Jock MacKay (Institute for Improvement in Quality and Productivity, Dept of Statistics and Actuarial Science, University of Waterloo, Ontario Canada), "Some Issues in Variation Reduction "

Dr Murray Jorgensen, "Using Finite Mixtures to Robustify Statistical Models "

Associate Professor Stefan Steiner (Institute for Improvement in Quality and Productivity, Dept of Statistics and Actuarial Science, University of Waterloo, Ontario Canada), "Seven Habits of Highly Effective Industrial Problem Solvers: An Overview of Statistical Engineering (Shainin Methods) "

Professor Nye John, "Crossover Designs in Clinical Trials".

Judi McWhirter

VICTORIA UNIVERSITY OF WELLINGTON

School of Mathematical and Computing Sciences

While we have had a 3% drop in total student numbers from last year, the shift from domestic to international students means the drop in income is insignificant.

Thanks to Richard Arnold and Megan Clark, an agreement has been negotiated with the Public Health Intelligence unit in the Ministry of Health for annual prizes and scholarships to the value of $30,000 (for the next 10 years) for statistics students, especially those undertaking study related to public health statistics.

Rod Downey went to a conference on computability and complexity in analysis in Malaga, as part of ICALP, and gave two talks. Denis Hirschfeldt from U Chicago and Geoff Laforte from Western Florida are visiting.

Following the recent completion of his PhD, Wu Guohua has just been awarded a postdoctoral fellowship from the Foundation for Research Science and Technology. There were 49 candidates, and Guohua was one of the 12 selected. Guohua will be working with Rod Downey on the topics related to algorithmic randomness and complexity in the next three years.

We are delighted to welcome Matt Visser to the mathematics group. Matt arrived in June, and plans to attend a conference in Crete (tough job eh?) in September called "Quantum Gravity and Random Geometry". Details of this conference may be found at: http://www.inp.demokritos.gr/~savvidy/eurogrid2002.html

Matt got his masters (with distinction) here in 1981, and his PhD at UC Berkeley, then went to USC, Los Alamos National Lab, and the University of Washington. His interests lie in General Relativity, Quantum Field Theory, and Cosmology.

Mark McGuinness is to visit KAIST in South Korea, to teach and research in industrial and applied mathematics, for several months a year over a three-year period. He also plans to go back to Oxford for a visit in January, to work with Andrew Fowler on modelling cardio-respiratory systems.

John Randal was appointed to teach the "commerce" stream of STAT 193 in place of Ross, who has been contracted to the Banner (student database) project for a few months as well as continuing with timetable construction. Congratulations also to John on his appointment to a lectureship in the School of Economics and Finance.

Wellington Statistics Group

The Wellington Statistics Group (WSG) is a recently formed local branch of the NZ Statistical Association (at present, WSG is the only local branch of the NZSA). It is hoped that the WSG will increase appreciation of the relevance and applicability of statistics and will further develop the links between statisticians in the Wellington region. Membership of the group is currently free and is not restricted to NZSA members.

The Group was proposed at a meeting held on 8 August 2001, organised by David Vere-Jones. That meeting was addressed by the Government Statistician, Brian Pink, on the topic, "The Impact of IT on Official Statistics".

Organisation of WSG is by a committee, with current members: John Haywood (Convenor), Alistair Gray, Ian West

Dissemination of information to members is by an email distribution list, with automated subscription (subject to approval, by the convenor currently) and automated removal. The list is hosted by the School of Mathematical and Computing Sciences at Victoria University of Wellington. At present there are approximately 240 subscribers.

WSG have received initial financial sponsorship from NZSA and additional support from Victoria University of Wellington, in the form of free (at least, not charged for) use of lecture theatres for WSG meetings.

The Group has also heard from the following speakers, in addition to Brian Pink:

16 October 2001
Dean Hyslop, Principal Advisor, NZ Treasury.
"Understanding Changes in the Distribution of Household Incomes in New Zealand Between 1983-86 and 1995-98".
(joint research with Dave Mare)

6 December 2001
Brian Bull, National Institute of Water and Atmospheric Research
"Catch-at-age data from New Zealand fisheries"

(joint research with Dave Gilbert, also NIWA)

21 February 2002
Richard Arnold, Victoria University of Wellington
"Bayesian spectral analysis of white dwarf light curves"
(joint research with Tony Vignaux and Denis Sullivan, also VUW)

The next meeting is scheduled for Wednesday 24 July, at 6 pm in Lecture Theatre 3, Old Government Buildings, 15 Lambton Quay, Wellington (home to Victoria University's Law Faculty):

24 July 2002
Jean Thompson, Statistical Consultant, JAD Associates, Wellington.
"'Real world' statistical data and the role of the consultant statistician"

Anyone interested is welcome to attend. At the same meeting there will also be time scheduled for small-group discussions of statistical problems/experiences raised by group members.

Any NZMS members who are not on the WSG mailing list, and who wish to receive further information on future WSG activities, are welcome to contact John Haywood directly (email: John.Haywood@vuw.ac.nz).

Seminars

Professor Estate V Khmaladze, "On martingale transforms and goodness of fit methods in general regression problem "

Vladimir Golubyatnikov (Institute of Mathematics, Novosibirsk Science Centre), "Reconstruction of multidimensional objects from tomography-type projection data "

Vladimir Golubyatnikov (Institute of Mathematics, Novosibirsk Science Centre), "Reconstruction of multidimensional objects from tomography-type projection data "

Professor K H Pollock (North Carolina State University, USA), "Capture-recapture methods: A review of survival and movement estimation models "

Professor John Butcher (2002 NZMS Lecturer, Auckland University), "Numerical methods for ordinary differential equations in the 20th century "

Ross Renner, "Modelling and Analysis of Compositional Data: Resolving a compositional dataset into convex combinations of a fixed set of extreme compositions "

Professor Estate V Khmaladze, "Local point processes near boundaries of sets "

Alexander S Kechris (Caltech), "Logical aspects of the classification problem of finite rank torsion-free abelian groups "

Joshua Leslie (Howard University), "A Remark on a Possibly Non-Hausdorff Lie Group "

Jacek Krawczyk, "Use of Coupled Incentives to Improve Diffusion of Environment Friendly Technologies "

Vladimir Uspenskiy (Ohio University, USA), "Compactifications of topological groups "

Joshua Leslie (Howard University), "A Remark on a Possibly Non-Hausdorff Lie Group "

Vladimir A Uspensky (Moscow University), "Algorithmic Roots of Gödel Incompleteness Theorem "

Raymond Mooney (CS, University of Texas, Austin), "Text Mining with Information Extraction "

Professor Marston Conder (University of Auckland), "Explaining NZIMA---Opportunities in the Mathematical Sciences "

Associate Professor Serge Demidenko (Massey University, Palmerston North), "Essentials and Challenges of Electronic Testing "

Richard Dearden, "AI on Mars: Autonomy for Planetary Rovers "

Jose M Turull Torres, "Relational Databases and Homogeneity in Logics with Counting "

Professor Harold Thimbleby (University College London), "The Next Generation Tour "

Dr Vladan Devedzic, "What Does Current Web-based Education Lack?"

Wu Guohua, "Interactions between the c.e. degrees and the d.c.e. degrees "

Assoiatec Professor Henry B Wolfe (Dept of Information Science, University of Otago), "An Introduction to Computer Forensics--- Non-Cryptanalytic Attacks "

Jeremy Ginsberg, "The Digital Michelangelo Project: 3D Scanning of Large Statues "

Petr Hlineny, "Using Computers in Mathematical Research"

Mark McGuinness

Continued

Number 85 August 2002

NEWSLETTER

OF THE

NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

Continued

CENTREFOLD

Vladimir Pestov

Within a month of one another in early 1992 two outstanding mathematicians from different parts of the world arrived in Wellington to join the Department of Mathematics at Victoria University. One, Geoff Whittle, was the subject of Centrefold earlier this year. The other was Vladimir Pestov, whose departure in June this year to take up a chair of mathematics in the Department of Mathematics and Statistics at the University of Ottawa, brought to a close a remarkable 10 years' contribution to mathematics in New Zealand. Vladimir has been proud to describe himself as a `naturalized Kiwi of Siberian extraction' and we will continue to claim him as one of us. He remains an Honorary Research Associate at Victoria while his research student Aleksandar Stojmirovic completes his PhD.

Vladimir's appointment as a lecturer at Victoria was his first permanent position outside the fSU. Born in 1956, and brought up in Tomsk, he increasingly found life in the Soviet Union oppressive and became a

strong anti-communist. This did not affect his admiration for the Russian system of mathematics education. While at school, Vladimir was involved in the All-Union Mathematics Olympiad. His father was an associate professor of mathematics at Tomsk State University, and following in his footsteps, Vladimir completed his BA Honours in mathematics there in 1978, followed by 18 months as a junior researcher. One can imagine that his early pleasure in problem-solving was something he wished to transmit to others---he rapidly established problem-solving classes in probablility for senior students.

His accomplishments enabled him to enrol for a PhD at Moscow State University, the most prestigious school in the country. His topic was topological groups and his supervisor, the famous topologist Professor A. V. Arkhangel'skii. He was already proving significant new theorems and had several publications to his name within 18 months of arriving in Moscow. His doctorate was awarded in 1983, after which he returned to Tomsk to a position in the Department of Mathematical Analysis, where by 1988 he had risen to the position of Dozent (roughly Associate Professor). During this time, he continued to prove significant and difficult results on topological groups.

Vladimir's wife, Irene (Irina), an outstanding student of applied mathematics in Tomsk, joined him in Moscow. Their children, Xenia and Slava were born in Tomsk either side of his PhD studies. Back in Siberia, Irene held a number of positions as a research scientist. Vladimir's interest in Australia and New Zealand also dates from this time. Increasingly frustrated by life in the Soviet Union, he listened to the BBC World Service and taught himself English. He tried to obtain travel visas to attend conferences outside the SU. In 1988 he took up a position at the Novosibirsk Science Centre as a visiting researcher in the Functional Analysis Laboratory.

Mathematically, Vladimir's interests developed in two new directions. He became interested in `supermathematics'. The mathematics is motivated by quantum field theory in which fermionic degrees of freedom are coupled with the bosonic ones. This requires the incorporation of anti-commuting quantities, thus extending standard objects into "super" ones. But this gives rise to subtle mathematical questions about the nature of space and, for example, to consideration of `pointless' models of space. The other branch of his development was in the area of non-standard mathematics. Abraham Robinson's amazing construction of a rigorous basis for the idea of infinitesimals resolved a centuries' old conundrum about the fundamentals of analysis. Rather than dealing simply with limits of superalgebras, one could construct directly from the Grassmann algebra $L(q)$ for q infinitely large, a nonstandard hull which would be an infinite-dimensional supermanifold with remarkable properties.

Finally, in 1990 and the era of *perestroika*, Vladimir was granted a visa to travel to Genoa, where he embarked on a longlasting and fruitful collaboration with Ugo Bruzzo. Mathematicians from the West were exposed to his ideas for the first time at a conference on non-standard analysis at Oberwolfach. One of the world experts on superanalysis, Bryce DeWitt commented that "Pestov has a clearer grasp and broader knowledge of superanalysis than anyone else". The also attested to his superb grasp of the English language! From Genoa, he obtained a temporary position at the University of Victoria in Canada, and from there at last to Wellington where he was joined by his family.

Vladimir made an immediate impact. His enthusiasm was infectious. Problem classes were established for students, research seminars for staff and graduates. He developed impeccable course notes in 2nd and 3rd year analysis and introduced over a number of years several new and innovative Honours courses. He can be justly proud of the quality of his teaching. Students find him motivating, challenging, witty and provocative (as do his colleagues!). He continued to produce an outstanding quality and quantity of research which in 1995 earned him the NZMS Award for Mathematical Research.

In 1997 Vladimir was awarded a Marsden Fund grant for a project entitled Foundations of Supergeometry, through which he attracted to Victoria two post-doctoral fellows, first Warren Moors (NZMS Research Award winner in 2001) and subsequently Finlay Thompson. During this period, his interests in topological dynamics and fixed points developed and he was able to solve a series of long-standing problems in that area and in the more familiar territory of Banach and enveloping algebras, two dating back to Stanislaw Mazur's 1935 Scottish Book. He had also been promoted to reader, so re-attaining the seniority he had when he left the fSU.

Irene, having completed a PhD under Mark McGuinness and Graham Weir, had moved to Canberra where she was working at the Department of Agriculture, Fisheries and Forestry. Vladimir was able to spend some periods with her and was a Visiting Fellow in the Computer Sciences Laboratory at ANU. These various interests and influences led him again in a new direction, this time into finite, but high-dimensional structures where the strange `concentration of measure' phenomenon appears. This has been another instance where Vladimir has been able to bring together ideas from a diverse range of areas to make fundamental contributions.

Out of the apparent abstraction has grown a project with remarkable potential for application, namely the development of algorithms in data-mining with particular emphasis on proteomics. Here he has

collaborated with Bill Jordan from the School of Biological Sciences and their joint PhD student Aleksandar Stojmirovic. The data live in a high-dimensional space and the understanding brought about by the measure-theoretic approach provides insights that will enable the fundamentally combinatoric algorithms that currently exist for extracting useful information about protein structure to be refined. Vladimir was awarded a second Marsden grant in 2001 to pursue these ideas, and also received a VUW Merit Award for Excellence in Research.

Vladimir once described himself as opinionated, independent-minded, sometimes difficult to deal with. He has a natural antipathy for authority. All these traits are very healthy in a society that is currently inclined towards conformity and bureaucracy. They will be missed by his colleagues at Victoria and throughout New Zealand. So too will his enormous breadth of knowledge, his inventiveness and humour. Just as his twin star, Geoff Whittle, was recently promoted to Professor, Vladimir too thoroughly deserves this accolade from Ottawa. We wish him and Irene well there and will welcome them home to Wellington whenever they are able to visit.

Peter Donelan
Victoria University of Wellington

Centrefolds Index

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
University of Auckland
(email: alcorn@math.auckland.ac.nz)

Betounes D, Mathematical computing. An introduction to programming using Maple. 412pp.
Bialnicki-Birula A, Algebraic quotients. Torus actions and cohomology. The adjoint representation and the adjoint action. (Encyclopaedia of Mathematical Sciences, 131) 242pp.
Bourbaki N, Elements of Mathematics. Lie groups and Lie algebras. 300pp.
Buff R, Uncertain volatility models - theory and applications. (Springer Finance) 244pp.
Burger M, Rigidity in dynamics and geometry. 492pp.
Corless RM, Essential Maple 7. (2nd ed) 282pp.
Davies B, Integral transforms and their applications. (3rd ed) (Texts in Applied Mathematics, 41) 367pp.
Deitmar A, A first course in harmonic analysis. (Universitext) 151pp.
Fernholz ER, Stochastic portfolio theory. (Applications of Mathematics, Stochastic Modelling and Applied Probability, 48) 177pp.
Haigh J, Probability models. (Springer Undergraduate Mathematics Series) 256pp.
Hairer E, Geometric numerical integration. (Springer Series in Computational Mathematics, 31) 515pp.
Hilton P, Mathematical vistas. (Undergraduate Texts in Mathematics) 335pp.
Holme A, Geometry. Our cultural heritage. 378pp.
Jost J, Compact Riemann surfaces. (2nd ed) (Universitext) 278pp.
Kallenberg O, Foundations of modern probability. (2nd ed) (Probability and its Applications) 638pp.
Korte B, Combinatorial optimization. (2nd ed) (Algorithms and Combinatorics, 21) 530pp.
Krizek M, 17 lectures on Fermat numbers. (CMS Books in Mathematics, 9) 257pp.
Lang S, Algebra. (3rd revised ed) (Graduate Texts in Mathematics, 211) 914pp.
Matsuki K, Introduction to the Mori program. (Universitext) 478pp.
Okubo A, Diffusion and ecological problems: modern perspectives. (2nd ed) (Interdisciplinary Applied Mathematics, 14) 467pp.
Parker C, Symplectic amalgams. (Springer Monographs in Mathematics) 361pp.
Peyret R, Spectral methods for incompressible flows. (Applied Mathematical Sciences, 148) 432pp.
Pugh CC, Real mathematical analysis. (Undergraduate Texts in Mathematics) 437pp.
Puig L, Blocks of finite groups. (Springer Monographs in Mathematics) 213pp.
Rosen M, Number theory in function fields. (Graduate Texts in Mathematics, 210) 358pp.
Ryan RA, Introduction to tensor products of Banach spaces. (Springer Monographs in Mathematics) 225pp.
Sandmann K, Advances in finance and stochastics. 312pp.
Sell GR, Dynamics of evolutionary equations. (Applied Mathematical Sciences, 143) 670pp.
Sorin S, A first course on zero-sum repeated games. (Mathematics and its Applications, 37) 204pp.
Whitt W, Stochastic-process limits. (Springer Series in Operations Research) 602pp.

A First Course in Discrete Mathematics
by I. Anderson, Springer Undergraduate Mathematics Series,
Springer-Verlag London, 2001, 200pp, DM 59.00. ISBN 1-85233-236-0.

Discrete mathematics has been the subject of many a text, yet there is little agreement as to precisely what it comprises. Perhaps that is part of the charm of the subject---when one picks up a book on discrete mathematics one never knows what will fill its pages. The variety of potential topics makes it hard to write on this subject so as to please everyone. Despite the abundance of choice, it often seems difficult to find a text that is completely suitable for the course one has in mind. And so this review begins with a description of the material Anderson covers. The basic principles of counting occupy the first chapter, as one would expect. The binomial coefficients are introduced here. The second chapter is devoted to recurrence relations, and includes discussions of generating functions and Catalan numbers. Graph theory is the subject of the next two chapters. Most of the standard topics are covered, such as paths, trees, bipartite graphs, planarity, Eulerian and Hamiltonian graphs and the travelling salesman problem. Some work on partitions appears in Chapter 5, and is applied to vertex and edge colourings of graphs. Stirling numbers also make their appearance here. The inclusion-exclusion principle is left to the following chapter, where it is applied to the enumeration of surjections and labelled trees and to the menage problem. Hall's theorem on systems of distinct representatives is expounded in Chapter 7, and is applied to Latin and magic squares. The two remaining chapters are concerned with 1-factorisations and designs, respectively. The former are motivated by scheduling problems. The climax of the book is the application of Hadamard matrices to the construction of the perfect Golay code.

Personally, I like this book. We have now used it successfully for a third year paper at Massey. The choice of topics seems very suitable, though some lecturers might prefer to have a wider selection of topics available or to have more depth in those that are presented. (The placement of the inclusion-exclusion principle in Chapter 6 seems a little odd---I prefer to teach it earlier, after recurrence relations but before graphs.) Aimed at students of mathematics rather than computer science, the writing is careful and clear and is supplemented by exercises at the end of each chapter. Solutions to the exercises are given at the end of the book. A bibliography is included for those interested in reading further.

Though the book does not cohere particularly well, it shares this fault with virtually every other book on discrete mathematics that has ever been written. Its major strength lies in the clarity and accuracy of the exposition.

Charles Little
Massey University

The *N*-Vortex problem, Analytical Techniques
by Paul K Newton, Applied Mathematical Sciences, 145,
Springer-Verlag, 2001, 415pp, DM 138.99. ISBN 0-387-95226-8.

This book is an introduction to current research on the *N*-vortex problem of fluid mechanics. While there have been books that cover this subject written in the recent past none of these books discusses the recent literature on integrable and non-integrable point vortex motion in any depth. The goal of this book is to describe the Hamiltonian aspects of vortex dynamics in such a way that graduate students and researchers can use this book as an entry level text to the rather large literature on integrable and non-integrable vortex problems. The study of vortex dynamics uses techniques that have widespread applicability to problems in dynamics and modern applied mathematics. These include integrable and non-integrable Hamiltonian methods, geometric phase space methods including KAM theory and singular perturbation theory. In the first chapter there is a discussion of the two main themes of the book namely, vorticity dynamics and Hamiltonian systems. The second chapter covers what is known concerning the *N*-vortex problem in the plane with no boundaries as given in classical works. The three vortex problem is fundamental to the development of the subject one reason being the fact that the interactions of the general *N*-vortex problem can be written as interacting triads. The 4-vortex problem is also discussed in some detail and in particular the method by which this problem can be reduced from four degrees of freedom to two. The proof of the non-integrability of the restricted 4-vortex problem is given using Melnikov theory. Chapter 3 discusses vortex problems in the plane with boundaries. Classical methods such as the method of images and conformal mapping are reviewed at first. The explanation of non-integrability is then explained as being due to the lack of symmetries in a closed domain. In chapter 4 vortex motion on a sphere is described. The integrability of this problem, classification of equilibria as well as the nonequilibrium process of 3-vortex spherical collapse are all described in this chapter. There is some discussion of what is known about the instantaneous streamline topologies that are possible on the sphere along with a general classification of topologies for the 3-vortex problem. Some discussion is given of how this might relate to weather patterns. In chapter 5 a discussion of geometric phases for

vortex problems in the plane is given following the author's original work[1]. Their role in determining the growth rate of spiral interfaces in vortex dominated flows is decribed in the context of several prototypical configurations. Chapter 6 presents an overview of statistical mechanics treatment of point vortex motion. This is work that leads from the original investigations of Onsager[2]. Chapters 7 and 8 deal with extensions of the basic theory. In chapter 7 the assumption that the vorticity is concentrated at singular points is relaxed and the dynamics of vortex patches in the plane are thereby described. The work of Kida[3] in which an exact elliptical patch is derived in the presence of time independent background strain and vorticity is explained. Other topics covered in this chapter include the moment model of Melander, Zabusky and Styczek[4] in which a self consistent Hamiltonian system is derived for the interaction of vortex patches under the assumption that the patches are nearly circular and well separated. Also discussed is the shear layer model introduced by Newton and Meiburg[5] base on a viscously decaying spatially periodic row of vortices. Chapter 8 deals with vortex filament dynamics in three dimensions. At first the localised induction equation for the evolution of a thin isolated film is discussed. The equations governing the evolution of the curvature and torsion of the filament are derived and special solutions discussed such as circular rings, helices etc. The transformation of these equations to the nonlinear Schrodinger equation is described in some detail. Higher order theories that include vortex core structure and self stretching mechanisms are described and a simple model of interacting nearly parallel filaments is presented. The book finishes with the so called vorton model which has been used recently for numerical calculations. The book is well written with each chapter containing useful biographical notes and exercises. Of particular note is the extensive list of seven hundred and seventy four references!

. *Hannay-Berry phase and the restricted three vortex problem*. P.K. Newton, Physica D79, 416-423, 1994.
2. *Statistical hydrodynamics*. L. Onsager, Nuovo Cimento 9, supp. no. 2, 279-287, 1949.
3. *A vortex filament moving without changes of form*. S. Kida, J. Fluid Mech., 112, 397-409, 1981.
4. *A moment model for vortex interactions of two dimensional Euler equations. Part 1. Computational validation of a Hamiltonian elliptic representation*. M.V. Melander, N.J. Zabusky, A.S. Styczek, J. Fluid. Mech. 167, 95-115, 1986.
5. *Particle dynamics in a viscously decaying cat's eye: The effect of finite schmidt numbers*. P.K. Newton, E.H. Meiburg, Phys. Fluids A 3, 1068-1072, 1991.

Ernie Kalnins
Waikato University

Stamping through Mathematics
by R J Wilson,
Springer-Verlag, 2001, 126pp, DM 49.11. ISBN 0-387-98949-8.

Readers of Springer-Verlag's mathematics common room coffee table publication *The Mathematical Intelligencer* will be familiar with its regular feature "Stamp Corner" by Robin Wilson. For the main part based on his column, Wilson has now authored the lavishly produced *Stamping through mathematics*.

The book has full-colour illustrations of nigh on 400 postage stamps which illustrate a mathematical theme. The format of the main body of the text has a righthand page of stamps on a particular topic, accompanied by a lefthand page giving some mathematical background to the illustrations, and over 50 topics are covered in this way. The topics begin chronologically, with the first 13 taking us up to the Middle Ages, via Egyptian, Greek, Chinese, Indian, early American, and Islamic mathematics. There then follows several pages on the influence of art, map-making, navigation, and astronomy on mathematics. As one would expect, Newton and the calculus also feature strongly, as does the Age of Enlightenment in Europe and what Wilson refers to as the liberation of algebra and geometry in the 1800's by Gauss, Abel, Galois and others. More modern mathematics and mathematicians are also featured later, including the statement of Fermat's Last Theorem (with acknowledgement to Andrew Wiles) on a Czech stamp and Polish stamps picturing Banach and Sierpinski. Statistics and its founders (including Florence Nightingale) are also covered. There are also a few topics covered which I personally think are rather tenuous, including twentieth century painting, metrication, and stamps which have unusual mathematical shapes (rather than the run-of-the-mill rectangular).

Certainly the book will have more appeal to mathematicians if, like myself, they have also an interest in stamp-collecting. (My secret is out!) However, although the mathematical content is predictably limited, the accompanying illustrations would certainly be useful for insertion in an all-too-often dry undergraduate lecture. (Who said philately will get you nowhere!?) In this regard, the reader may wish to visit the following web page of algebraist Jim Kuzmanovich at Wake Forest University, North Carolina, from where one can download full-coloured files picturing stamps featuring a large number of mathematicians and mathematical themes:

http://www.math.wfu.edu/ kuz/Stamps/stamppage.htm

There is even a regular news sheet for collectors of mathematical stamps, called *Philamath*, mentioned in Wilson's preface and linked in the above website. Let me close this review by saying that the title page of *Stamping through mathematics* actually illustrates a 1971 stamp of Ernest Rutherford, commemorating his birth. Sadly, the stamp is Russian (although New Zealand did produce a similar one) and below it is the following quote from Rutherford: "*All science is either physics or stamp collecting*."

John Clark
University of Otago

CONFERENCES

17th "SUMMER" TOPOLOGY CONFERENCE
Auckland, 1--4 July 2002

Auckland was host to the 17th in the series of Summer Conferences on Topology and Its Applications. This conference is usually held in late June or early July, and is usually held in the USA, although there have previously been conferences in the Netherlands, Canada and Mexico. Forced to change either the date or the name of the conference, we compromised by using quotation marks: we trust all our visitors understood that this is indeed our winter here and that if they come back in February it will be a lot warmer!

The conference featured special sessions in five areas: Applications in Computer Science, Dynamical Systems and Topology, Function Spaces, Set Theoretic Topology and Topological Groups and Semigroups and Their Actions. There were 8 plenary speakers, 12 other invited speakers, 42 contributed talks, and 10 other participants.

While everyone will have their own highlights when looking back at the conference, the most significant talk was surely that of Robin Knight of the University of Oxford, who announced his recent discovery of a counterexample to the Vaught Conjecture in Mathematical Logic. This asserts that any theory in a countable first order language has either countably many or $2^{\aleph_0}$ many countable models. Knight has constructed an example in which the number of models is precisely $\aleph_1$, so the Vaught Conjecture is true only if the Continuum Hypothesis is true.

As well as the academic programme, of course, there was a social side to the conference. A number of participants took part in working weekends on the bird sanctuary island of Tiritiri Matangi before and after the conference, and many went on wine-tasting or sightseeing tours on the Wednesday afternoon. The conference dinner was held at Duders on the North Shore, so most participants took the Devonport ferry to get there and back. And it all proved too much for two participants, who finished the conference in style by leaving the final talk and going to the Sky Tower to make the 192 metre Sky Jump.

A major issue in organising an international conference like this is the cost of bringing invited speakers to New Zealand: most of the invited speakers were offered only their local costs during the conference. Many of the invited speakers were able to attend as part of longer visits funded by Marden Fund grants. Others were supported by grants from The University of Auckland Foundation, the New Zealand Mathematics Research Institue and the New Zealand Mathemtaical Society. Further grants were made by the Mathematics Departments of Auckland University and Waikato University and the Centre for Discrete Mathematics and Theoretical Computer Science at Auckland University. Finally, the United States National Science Foundation made a significant contribution which was used to support student participants. The organisers are very grateful for all this support.

David McIntyre
The University of Auckland

AUSTRALASIAN BRIDGING MATHEMATICS NETWORK TENTH CONFERENCE

The Australasian Bridging Mathematics Network is a forum for all teachers and researchers working in the area of developing, providing and researching bridging mathematics support for students either in tertiary studies or wishing to access tertiary studies.

Every two years the network holds a conference. This year it was jointly organised by staff involved in bridging mathematics at Manukau Institute of Technology, Auckland University of Technology, University of Auckland and UNITEC Institute of Technology. It was held from July 4--6 at UNITEC Institute of Technology in West Auckland.

Fifty delegates from New Zealand, Australia and the Cook Islands (1) attended. There were three superb

keynote addresses. Stuart Middleton, Executive Director of Student Affairs at Manukau Institute of Technology, spoke at the opening dinner. His address both entertained and inspired delegates with comments on attainment in and attitudes towards mathematics, notions of bridging and the close links between mathematics and language. Stuart Laird, in charge of first year mathematics in the Engineering School at the University of Auckland, discussed the need for clarity about the philosophy of each bridging course with a carefully thought out mix of developing confidence, a survival level of functioning and some global understanding in the subject. He emphasised the need to talk to students about the learning process and demonstrated the effectiveness of using powerpoint as a teaching tool. Mary Jane Schmitt from Massachusetts, USA, reported on her work creating and piloting materials designed to encourage the development of adults' mathematical thinking. Her address was hands-on with delegates undertaking some of the activities.

Delegates to the conference had the option of presenting refereed or non-refereed papers and workshops. Some of the positive feedback about these sessions was: high quality and practicality of the papers; good mix of practitioners and researchers; focused content; a safe, non-judgemental environment---a good opportunity for new presenters.

Some of the benefits delegates reported in attending this conference were: recommitment to working with students for academic excellence and equity; to have a go at using powerpoint; to use layman's language in teaching; to use writing tasks in maths classes; a renewed commitment to making the effort.

The next Australasian Bridging Maths Conference will be held in 2004 (location unknown at present). If you wish to be kept informed join the Australasian Bridging Mathematics Network listserve by sending an e-mail to Majordomo@usq.edu.au (without a subject). In the body of the email write: `subscribe bmn` followed by your e-mail address. Do not have anything after your e-mail address---if you have a signature, turn it off.

Janet Hogan
Co-convenor of the conference organising committee
Learning Support Lecturer at UNITEC

REPORT OF THE 25TH MATHEMATICS EDUCATION RESEARCH GROUP OF AUSTRALASIA INC (MERGA) CONFERENCE

The 25th Mathematics Education Research Group ofÊ Australasia Inc. (MERGA) Conference was hosted by the Mathematics Education Unit of the Mathematics Department at The University of Auckland from July 7th--10th 2002, and Dr Mike Thomas, of the Mathematics Education Unit, was the conference convenor. The conference was sponsored by Texas Instruments, The New Zealand Ministry of Education and the Mathematics Department at the University, and thanks are due to them for their support.

The Mathematics Education Research Group of Australasia is an international body which provides a voice in primary, secondary and tertiary mathematics education matters, and which aims to encourage and promote quality research in these areas. MERGA also seeks means of implementing research findings at all decision levels concerning the teaching of mathematics and the preparation of mathematics teachers. The annual conference of the Group facilitates the renewal of friendships and, in a collegial atmosphere, welcomes newcomers to the field.

This was only the second time in 25 years that the MERGA conference had been held in New Zealand, the previous occasion being in Rotorua in 1997. The 223 delegates to the conference came from such widespread parts of the world as France, Germany, Mauritius, Brunei Darussalam, Samoa, and USA, as well as Australia and New Zealand. In addition it was pleasing to see around 40 school teachers present along with theÊ researchers.

MERGA25 provided opportunities for mathematics teachers, educators and curriculum developers to contribute and listen to plenary and research presentations and to be actively involved in workshops, panels and special interest groups developed around the conference theme of Mathematics Education in the South Pacific. There were 81 full refereed papers presented, along with 22 short communications and a number of workshops.

Keynote Speakers included Professor Colette Laborde, of L'Institut Universitaire de Formation des Maitres, Grenoble, France, who spoke on The Process of Introducing New Tasks Using Dynamic Geometry Into the Teaching of Mathematics; Mary Jane Schmitt, of TERC, Cambridge, Massachusetts, USA whose talk was titled Seeking Interventions to Improve Adult Numeracy Instruction in the United States: Hybrids Only Need Apply; Gill Thomas, from Dunedin College of Education, New Zealand who described the progress of Early Numeracy Project; and Karoline Afamasaga-Fuata'i, of the National University of Samoa, who gave a Samoan perspective on Pacific mathematics education. All of these

talks were interestingly presented and very well received at the conference.

The Teachers' Day on Tuesday with its Pasifika Forum was a highlight of the conference. As part of the forum a panel discussion took place, where Karoline Afamasaga-Fuata'i (Samoa) was joined by speakers Tupene Baba (Fiji), Linita Manu'atu (Tonga), and Tony Trinick (Maori), and the session was chaired by Vavatau Taufao (Samoa).

The conference was considered a great success both academically and socially, with many positive comments received by the organizing committee from the delegates.

Garry Tee
The University of Auckland

2002 MATHEMATICS COLLOQUIUM

The 2002 Mathematics Colloquium will take place at the University of Auckland from Sunday evening 1 December to Thursday afternoon 5 December. In addition to having the usual programme of invited speakers and contributed talks we are planning two special sessions: a Mathematics Education Day and a Dynamical Systems Day. More details are being made available at the website: www.math.auckland.ac.nz/colloquium.

THE SIXTH AUSTRALIAN/NEW ZEALAND MATHEMATICS CONVENTION & NEW ZEALAND MATHEMATICS COLLOQUIUM 2003

will be held as one of many embedded meetings in conjunction with:

Details and registration are available on the conference web page: www.iciam.org

This opportunity has been taken so as to enable as many people in the region as possible to take advantage of the hosting of a major International Mathematical Sciences Congress nearby. Australian-New Zealand Mathematics Conventions have been held regularly on one side of the Tasman or the other, since 1978. The last such occasion (the fifth convention) was in Auckland in 1997. A full weeks' program covering **all** areas of Mathematics will be included, with noteworthy invited speakers (one of whom will be supported by the NZMS), minisymposia, student presentations (including the award of the Aitken prize), etc. The Society hopes as many NZ based mathematicians and postgraduates will take the opportunity of attending and contributing. It hopes that Departments will endeavour to provide a higher degree of financial support than usual.

The NZ Mathematical Society has created a special fund to assist students to attend the Convention and Congress. This involves use of part of the accumulated "colloquium float". Up to 20 grants of $NZ500 are available on application to the Secretary of NZMS using the form on pages 31--32 of this Newsletter.

List of Embedded Meetings (to date)

- Australia-New Zealand Mathematics Convention (incorporating the Winter meeting of Australian Mathematical Society and the annual New Zealand Mathematics Colloquium)
- 2003 Computational Techniques and Applications Conference
- 17th National Congress of the Australian Society for Operations Research
- 5th Biennial Engineering Mathematics and Applications Conference
- 2nd National Symposium on Financial Mathematics
- The 2003 meeting of ANZIAM will be completely integrated within ICIAM 2003.

Early registration is recommended as there is an "early-bird" discount (which applies up to November).

Graeme Wake
University of Canterbury
Immediate Past President, NZMS

NZ APPLIED MATHEMATICIANS IN OXFORD

An opportunity of a gathering of 3 NZ Applied Mathematicians in Oxford in April 2002.

From L to R: Emeritus Professor David Spence, ex University of Auckland and retired as Professor of Applied Mathematics at Imperial college, London. Professor Graeme Wake, Professor of Applied Mathematics, University of Canterbury & Visiting Fellow, All Souls College, Oxford 2001--2. Emeritus Les Woods, ex University of Auckland and retired as Professor of Mathematics, University of Oxford.

A celebratory symposium for Professor Woods' 80th birthday is scheduled for December 2002 in Oxford. Both Professors Spence and Woods live in Oxford.

Conferences in 2002

September 29 -- October 3 (Brisbane) **5th Biennial Conference of the Engineering Mathematics and Applications Conference** email: Mike Pemberton (mrp@maths.uq.edu.au) website: http://www.icms.com.au/emac2002

September 30 -- October 3 (Newcastle) **46th Annual Meeting of the Australian Mathematical Society** email: austms@newcastle.edu.au website: http://maths.newcastle.edu.au/austms

October 4--6 (Coolangatta, Gold Coast) **3rd UQ Mathematical Physics Workshop** email: cmpworkshop@maths.uq.edu.au website: http://www.maths.uq.edu.au/~cmpworkshop

December 3--5 (Singapore) **International Conference on Scientific and Engineering Computation (IC-SEC 2002)** email: Dr W Summerfield (Honorary Secretary, ANZIAM) (william@maths.newcastle.edu.au) website: http://www.ic-sec.ihpc.a-star.edu.sq

December 9--13 (Dunedin) **SEEM 4: Fourth Conference on Statistics in Ecology and Environmental Monitoring** December 4--6: **Pre-Conference Workshop on Matrix Population Models**) See April Newsletter for fuller details. email: (igoodwin@maths.otago.ac.nz) website: http://www.maths.otago.ac.nz/SEEM4

Conferences in 2003

January 4--11 (New Plymouth) **NZMRI Workshop on Combinatorics and Combinatorial Aspects of Biology** See April Newsletter for fuller details. email: Geoff Whittle (geoff.whittle@vuw.ac.nz)

July 7--11 (Sydney) **Fifth International Congress on Industrial and Applied Mathematics** (including the 6th Australia--New Zealand Mathematics Convention, which incorporates both the New Zealand Mathematics Colloquium and the Annual Meeting of the Australian Mathematical Society) website: http://www.iciam.org

NOTICES

AITKEN PRIZE (NZMS STUDENT PRIZE)

The New Zealand Mathematical Society offers a prize, known as the Aitken prize, for the best contributed

talk by a student at the annual New Zealand Mathematics Colloquium.

Named in honour of the New Zealand born mathematician Alexander Craig Aitken, this prize will be offered for the eighth time at the 2002 Colloquium to be held at University of Auckland, December 2002.

The prize will consist of a cheque for NZ$250, accompanied by a certificate. Entrants for the prize must be enrolled (or have been enrolled) for a degree in Mathematics at a university or other tertiary institution in New Zealand in the year of the award.

During the Colloquium, they should give a talk on a topic in any branch of the mathematical sciences.

A judging panel will be appointed by the New Zealand Mathematical Society Council, and make recommendations to the New Zealand Mathematical Society President and Vice-President for the prize. Normally the prize will be awarded to one person, but in exceptional circumstances the prize may be shared, or no prize may be awarded.

Entrants should clearly indicate their willingness to be considered for the prize when they register their intention to contribute a talk at the Colloquium.

NOTICE OF ANNUAL GENERAL MEETING

The Annual General Meeting of the New Zealand Mathematical Society will be held during the 2002 New Zealand Mathematics Colloquium at University of Auckland, December 2002. The exact time and place of the AGM are currently being arranged. Items for the Agenda should be forwarded by Monday 21 October 2002 to the New Zealand Mathematical Society Secretary, Dr Charles Semple, Department of Mathematics and Statistics, University of Canterbury, Private Bag 4800, Christchurch (fax number: (03) 364 2587, email address: c.semple@math.canterbury.ac.nz. Colloquium.

CALL FOR NOMINATIONS FOR NEW ZEALAND MATHEMATICAL SOCIETY COUNCIL POSITIONS

As the terms of office of the Immediate Past President (Graeme Wake) and three Council members (Bill Barton, Robert McLachlan, and Charles Semple) come to an end in 2002, nominations are called for the resulting vacancies on the New Zealand Mathematical Society Council:

(i) Incoming Vice-President.
(ii) Council members (three), including Secretary.

The term of office of the Incoming Vice-President is one year, after which that person is expected to become President for a two-year period, and then Immediate Past President for a further year.

The term of office of a Council member is three years. Council members may hold office for two (but no more than two) consecutive terms.

Nominations should be put forward by two proposers. The nominee and the two proposers should be current Ordinary or Honorary members of the New Zealand Mathematical Society. The nominations, including the nominees consent, should be forwarded by Monday 4 November 2002 to theNew Zealand Mathematical Society Secretary, Dr Charles Semple, Department of Mathematics and Statistics, University of Canterbury, Private Bag 4800, Christchurch (fax number: (03) 364 2587, email address: c.semple@math.canterbury.ac.nz. If nominations are sent by email, the two proposers and the nominee should each send separate email messages to the Secretary.

NZMS RESEARCH AWARD

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

The NZ Mathematical Society Research Award for 1999 was made to: Mike Steel (University of Canterbury) for "his fundamental contributions to the mathematical understanding of phylogeny", demonstrating a capacity for hard creative work in "combinatorics and statistics" and an excellent understanding of the "biological implications of his results".

The award for 2002 will be announced at the 2002 Mathematics Colloquium in Auckland in early December. Other recipients to date have been John Butcher and Rob Goldblatt (1991), Rod Downey and Vernon Squire (1992), Marston Conder (1993), Gaven Martin (1994), Vladimir Pestov and Neil Watson (1995), Mavina Vamanamurthy and Geoff Whittle (1996), Peter Lorimer (1997), Jianbei An (1998), Mike Steel (1999), and Graham Weir (2000), Warren Moors (2001).

Call for Nominations 2002/2003

Applications and nominations are invited for the NZMS Research Award for 2003. This award will be based on mathematical research published in books or recognised journals within the last five calendar years: 1998-2002. Candidates must have been residents of New Zealand for the last three years. Nominations and applications should include the following:

- Name and affiliation of candidate.
- Statement of general area of research.
- Names of two persons willing to act as referees.
- A list of books and/or research articles published within the last five calendar years: 1998-2002.
- Two copies of each of the five most significant publications selected from the list above.
- A clear statement of how much of any joint work is due to the candidate.

A judging panel of three persons shall be appointed by the NZMS Council in advance of the receipt of nominations. The judges may call for reports from the nominated referees and/or obtain whatever additional referee reports they feel necessary. The judges may recommend one or more persons for the award, or that no award be made. No person shall receive the award more than once.

The award consists of a certificate including an appropriate citation of the awardee's work, and will be presented (if at all possible) around the time of the AGM of the Society in 2003.

All nominations (which no longer need to include the written consent of the candidate) and applications should be sent by 31 March 2003 to the NZMS President, Rod Downey, at the following address:

Professor Rod Downey, School of Mathematical and Computing Sciences, Victoria University of Wellington, PO Box 600, Wellington, New Zealand

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

PhD TEACHING ASSISTANTSHIP

Applications are invited for a Teaching Assistantship at the University of Auckland's Tamaki Campus. The successful applicant will be expected to enroll for a PhD degree in mathematics at the University of Auckland and teaching duties will involve part-time teaching and tutoring of undergraduate mathematics courses.

The Mathematics Department at Auckland occupies both the larger City Campus and the new Tamaki Campus, which is a short (free) shuttle ride from the City Campus. Students at Tamaki are able to enjoy the features of the Tamaki Campus while still having the facilities of the City Campus, including university courses, available to them.

Applicants who are interested in research in one of these areas are encouraged to apply: Applied PDEs, applied functional analysis and numerical solution of ODEs.

A package consisting of a scholarship and a salary for teaching duties totalling up to $14,000 is available.

Enquiries may be made to Dr Steve Taylor (s.taylor@auckland.ac.nz, telephone (09) 373 7599 extension 6622).

MATHEMATICAL MINIATURE 18

Some applications of Bernoulli numbers

The coefficients of $z^n/n!$ in

$$\frac{z}{\exp(z)-1} \qquad (1)$$

are defined to be the Bernoulli numbers B_n. The expression $z/2 + z/(\exp(z) - 1)$ is an even function, as we easily check by changing the sign of z and rearranging. Hence, apart from $B_1 = -\frac{1}{2}$, all odd numbered Bernoulli numbers are zero. The first few even numbered members of the sequence are found to be

$$B_2 = \frac{1}{6}, \quad B_4 = -\frac{1}{30}, \quad B_6 = \frac{1}{42}, \quad B_8 = -\frac{1}{30}, \quad B_{10} = \frac{5}{66}, \quad B_{12} = -\frac{691}{2730}.$$

I well remember, in about 1957, using a formula based on $1+z/(1-z/2+z^2/12-z^4/720+\cdots)$, as an alternative to $1+z+z^2/2+z^3/6+\cdots$, to compute the exponential function. It mightn't seem much today, but my subroutine took 8ms to do what otherwise would have taken 15ms per evaluation.

What if we interpret *z*, not as a complex number, but as the operator d/dx ? We should then interpret $\exp(z)-1$ as the forward difference operator because the terms in the expansion of $\exp(d/dx)Q(x)$ are formally the same as in the Taylor expansion for $Q(x+1)$. We can then interpret

$$Q(x) = \frac{\frac{d}{dx}}{\exp(\frac{d}{dx}) - 1} P(x) \quad (2)$$

as being equivalent to the equation $Q(x+1)-Q(x) = P'(x)$ so that $P(x) = $ $P(x) = \int_x^{x+1} Q(t)dt$. Expand (2) term by term, rearrange and we find

$$\frac{1}{2}(Q(x)+Q(x+1)) = \int_x^{x+1} Q(t)dt + \frac{1}{2!}B_2(Q'(x+1)-Q'(x)) + \cdots .$$

Add this formula for $x = 0, 1, ..., n - 1$ and we have a formula for the error in the trapezoidal rule approximation for integrals, otherwise known as the Euler-Maclaurin sum formula

$$\frac{1}{2}(Q(0)+Q(n)) + \sum_{i=1}^{n-1} Q(i) - \int_0^n Q(t)dt = \sum_{i=1}^{\infty} \frac{1}{(2i)!} B_{2i}(Q^{(2i-1)}(n) - Q^{(2i-1)}(0)).$$

Obviously there are convergence questions but they disappear if *Q* is a polynomial. For example, the well-known formulae for $\sum_{i=1}^{n} i^k$ can easily be derived for $k = 1, 2, ...$. Thus

$$\sum_{i=1}^{n} i^4 = \frac{1}{5}n^5 + \frac{1}{2}n^4 + \frac{1}{2!}B_2(4n^3) + \frac{1}{4!}B_4(24n) = \frac{1}{30}n(2n+1)(n+1)(3n^2+3n-1).$$

If the trapezoidal rule is adapted to the computation of the integral of a periodic function in the form

$$\int_0^{2\pi} f(\theta)d\theta \approx \frac{2\pi}{n} \sum_{k=0}^{n-1} f\left(\frac{2\pi k}{n}\right), \quad (3)$$

then the series expansion for the correction is formally zero, if the periodic function *f* is analytic. This formal result translates into an asymptotic formula for the error not like a power of n^{-1}, as in classical quadrature formulae, but like $\exp(-a\,n)$, where a depends on the integral being evaluated.

The following table shows the computation of $\int_0^{2\pi} (5+3\cos(\theta))^{-1} d\theta$ (for which the exact answer is p/2), using (3) with a sequence of *n* values.

n	*approximation*	*error*
1	0.78539816339745	-0.78539816339745
2	1.96349540849362	0.39269908169872
4	1.61006623496477	0.03926990816987
8	1.57127522811404	0.00047890131914
16	1.57079639977590	0.00000007298100
32	1.57079632679490	0.00000000000000

Another important interpretation of (1) is found by replacing *z* by the linear operator $X \mapsto [A, X]$, where [.,.] denotes the commutator [*A*,*X*] = *AX* - *XA*. This means that *1* corresponds to the identity operator and z^2 corresponds to $X \mapsto [A,[A,X]]$.. The derivative of exp(*A*) with respect to *A* is found to be

$$\lim_{\epsilon \to 0} \frac{1}{\epsilon} \left(\exp(A + \epsilon X) - \exp(A) \right) = \left(X + \frac{1}{2!}[A, X] + \frac{1}{3!}[A, [A, X]] + \cdots \right) \exp(A). \qquad (4)$$

In geometric integration, the inverse of the linear operator represented by the first factor on the right-hand side of (4) is needed. This is found formally as

$$X \mapsto X - \frac{1}{2}[A, X] + \frac{1}{2!} B_2 [A, [A, X]] + \frac{1}{4!} B_4 [A, [A, [A, [A, X]]]] + \cdots .$$

In all these diverse applications, the unifying themes are Bernoulli numbers and the expansion of (1).

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