THE NEW ZEALAND
MATHEMATICAL SOCIETY (INC.)

NEWSLETTER

CONTENTS

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PUBLISHER'S NOTICE

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Editorial

Foresight or Hindsight?

A review by John Milnor of the biography of John Forbes Nash, jr. ``A Beautiful Mind'' by Sylvia Nasar appears in a recent issue of the Notices of the American Mathematical Society (vol. 45, November 1998). It includes the following paragraph: ``Over the years the developments from Nash's seemingly simple idea [ed. non cooperative game-theory] have led to fundamental changes in economics and political science. Nasar illustrates the dollars and cents impact of game-theoretic ideas by describing ``The Greatest Auction Ever'' in 1994, when the US government sold off large portions of the electromagnetic spectrum to commercial users. A multiple-round procedure was carefully designed by experts in game theory of auctions to maximize both the payoff to the government and the utility to of the purchased wavelengths to the respective buyers. The result was highly successful, bringing more than $10 billion to the government while guaranteeing an efficient allocation of resources. By way of contrast, a similar auction in New Zealand, without such a careful game-theory design, was a disaster in which the government realized only about 15 percent of its expected earnings and the wave lengths were not efficiently distributed. (In one case, a New Zealand student bought a television station license for one dollar!)

Apart from being embarrassed to see my country being used as an example of a fiasco, and disappointed that a potential money earner for our economy has been squandered, I am concerned that current restructuring in scientific research policy may well come from the same planning groups. It would be tragic if New Zealand was held up in the future as an example of how not to go about reforming research policy. Prediction of future trends is very hazardous, both of the economic situation and of scientific developments. (As an aside, one definition of an economist that I have read is ``an economist is a person who explains what will happen with the economy, and then explains why it didn't!'') The foresight programme currently underway is one of these hazardous operations. The New Zealand Science Review issue on ``The Future of Science in New Zealand'' (vol 55(3), 1998) contains some well presented and rather alarmist articles about recent trends in science policy planning. It is well worth reading. Some of the arguments relate to the unpredictability of outcomes from basic science research, a theme that is also well illustrated in the recent article by P. Berg and M. Singer in Science (30 October, 1998).

For tertiary institutions, the government white paper ``Tertiary Education in New Zealand - Policy Directions for the 21st century'' by a panel from the Ministry of Education proposes a change in research funding (pp. 31-33), with the plan to divert a percentage of the funding currently in the bulk grant to universities, into a contestable pool. (Is it not ironic, that this government is trying to persuade our secondary schools into block funding, while the currently bulk funded tertiary institutions are having some funding targeted?) In the white paper, the four criteria for this targeting are ``Demonstrated quality and capacity of researchers'', ``Quality of the proposed research portfolio'', ``Strategic focus'' and ``cost effectiveness'' Clearly there will need to be some administrative and review process by which proposals are vetted. This will be an additional overhead on the fund as well as a time-overhead for the researchers preparing proposals. Although we are later told that ``It will be targeted at basic or pure research'', is this not contradictory to strategic focus? I find it difficult to see how the ``strategic focus'' and ``cost effective'' criteria might be evaluated.

When I began my research career, I was publishing in computational algebraic number theory, with one of the more interesting (to me) applications being the more efficient factorisation of large integers into prime factors. None of my contacts working in this field at that time had any idea that such activity might have a strategic focus, indeed it caught us all by surprise when Rivest et al. published their encryption scheme based on the complexity of known factorisation algorithms. Suddenly there was a practical application for this area. (At this time I was changing my research focus to BioInformatics, partly as I had been unsuccessful at obtaining the computing facilities to compete with my colleagues in North America.) However prior to the Rivest paper appearing, I doubt that any of us could have forecast that this area had a strategic focus.

The mathematical aspects of most of recent technological achievements had been developed before any hint of their specific applicablility became apparent. It is not within our skills to predict these applications. Indeed the applications that could be foreseen are likely to be very limited advances and unlikely to have long-term spin-offs for society. Could (and should) Fourier have known the applications of his transform once high speed computing power became available? If a significant proportion of university research activity has to be measured under a ``strategic focus'' rubric, then I believe much of the current research activity in mathematics would be under threat. It

can only be in hindsight (perhaps even after decades or centuries) that the benefits to society of that activity might be truly measured. What is more certain, is that restrictions on free ranging research, currently available under the umbrella of the university block grant, will, in the long run, be detrimental to society. How this form of targeting affects the educational benefits of research is harder to gauge.

In a recent newspaper column (Manawatu Evening Standard, November 28), Infometrics economist Gareth Morgan is quoted. He argued that the potential for long-term growth is now being gutted by a new twist in the brain drain. He argues ``The theory is that key wealth creating professionals in their mid-thirties are leaving, attracted to better career opportunities and salaries offshore. These look even better since the kiwi dollar has fallen. New Zealand is becoming like Ireland in the early 1980s and at the extreme it could become little more than the final resting place for the retired." The thesis is that this brain drain is different and more deadly economically. The Infometrics economics team says ``there's definitely something going on". It reckons that in the year ended July growth in IT professionals leaving was over 50 percent but overall they make up just a few percentage of emigrants. Science professionals quitting were up around 30 percent, legislators and administrators were up 27 to 28 percent. An age group breakdown showed 11 percent growth in 30 to 35 age group and the same increase in five to 15 years olds, suggesting families were leaving. ``It is a concern in the sense that the people leaving are the more skilled. It comes back to the government setting a policy that makes people feel there's a future in New Zealand."

This is reflected in the alarming sentiment I have heard expressed by some young New Zealand post docs who state that they are not seeking a long term research career in their home country because of the lack of security. (The relatively low wages are only secondary in their consideration, there is a great personal investment required in the continuation of a research career, an investment that won't be made under the prospect of no long term security.) Surely this is an alarming warning, as the current generation of scientists age into retirement, our research skill base will retire with us!

So I ask those planning the restructuring of scientific research structuring to take care, do not become exemplars to the world of how not to fund the research.

Mike Hendy

Local News

UNIVERSITY OF AUCKLAND

Department of Computer Science

Dr Georgy Gimel'farb has taken up his position as Senior Lecturer in the Department of Computer Science of the University of Auckland (Tamaki Campus). His areas of research are probabilistic models and optimization techniques in image processing and computer vision. Recent results have been found for Gibbs random fields with multiple pairwise interactions (analytic and stochastic approximation of the interaction structure and strengths to simulate, retrieve and segment image textures) and on symmetric dynamic programming algorithms to retrieve 3D optical surfaces from stereo pairs.

Dr Gimel'farb received his MSc degree in Computing and Mathematical Devices from Kiev Polytechnical University (Ukraine) in 1962, a PhD in Engineering Cybernetics from the Institute of Cybernetics of the Academy of Sciences of the Ukraine in 1969, and a DSc in Control Engineering Systems from the Higher Certifying Commission of the USSR (Moscow) in 1991.

He was a Leading Research Fellow of the Image Recognition Department of the Institute of Cybernetics of the Academy of Sciences of Ukraine, an invited Professor in medical image analysis at Kiev National University (Ukraine, 1991-1994), and he has worked as an invited researcher at the Computer and Automation Research Institute of the Hungarian Academy of Sciences (1994-1995), Michigan State University (1994), University of Washington (1995-1996), University of Pennsylvania (1996), University of Bonn (1996) and at the National Reseach Centre for Informatics and Automatics (France, 1997).

School of Mathematical & Information Sciences

Congratulations to Prof. Marston Conder (Head of the Department of Mathematics) and to Prof. John Harvey (Department of Physics) on their election as Fellows of the Royal Society of New Zealand, and to Prof. John Boys (Head of the Department of Electrical & Electronic Engineering) for winning the R. J. Scott Medal of the RSNZ. The SMIS and the Department of Physics held a joint celebration for them, in the Physics Common Room.

Department of Computer Science

A conference on ``Image and Vision Computing '98'' was held at Tamaki Campus, on November 15th to 18th. Computer scientists came from all over the world, to present papers, displays and demonstrations on imaging technologies, image analysis, image processing and computer vision.

At the Graduation Ceremony in September 1998, Elena Calude graduated as Ph.D. for her thesis on ``Automata - Theoretical Models for Computational Complexity'', and Asat Arslanov graduated as Ph.D. for his thesis on ``Topics in Algorithmic Information Theory''.

Several conferences on Computer Science will he held here in January 1999. A notice of those conferences is published separately in this Newsletter.

Seminars

Dr Andy Brooks
(University of Strathclyde), ``User perceptions of constraints in CASE tools''.
Prof. Elwyn Berlekamp
(University of California - Berkeley), ``The orthodox method for evaluating game positions''.
Prof. Walter Meyerstein
(University of Barcelona), ``The philosophical debate: from Zeno to Einstein''.
Prof. R. M. Haralick
(University of Washington - Seattle), ``Propagating covariance in computer vision''.
Dr Bob Parslow
(University of Otago), ``New Visions -- a workshop dedicated to improving 3-D perception''.
Dr Chris Jesshope
(Massey University), ``AudioGraph: a simple tool to record real lectures as Web pages''.
Dr Benny Chor
(Technion, Haifa), ``Constructing trees from quartets''.
Dr Christian Collberg,
``On the limits of software watermarking''.
Dr Rick Mugridge,
``Year 2000: computer hiccup or social havoc?''.
Dr Bakhadyr Khoussainov,
``What are computable presentations?''.
Pete Mazany and & See Wong,
``Mike's Bikes - integrated business learning online''.
Asat Arslanov,
``On the phenomenon of incompressibility in local degree theory''.
Dr John R. Mashey
(Silicon Graphics/Cray Research), ``Infrastress 2 - computing beyond 2000''.
Natalie Spooner
``Experiences with developing a software generation system''.
Dr John Grundy
(Waikato University), ``Component-based software development: some issues and experiences''.

Department of Mathematics

Prof. Gaven Martin has been appointed Head of the Department of Mathematics for a 3-year term commencing 1999 February 1st, in succession to Prof. Marston Conder.

A notice is published elsewhere in this Newsletter, about the International Symposium to honour John Butcher on his retirement.

Also, a notice is published separately about the Mathematics Summer Workshop, to be held at Raglan in January 1999.

Dr John Fauvel (Open University) gave two seminars here, as the 1998 NZMS Visitor. For the second seminar, John Fauvel had brought transparencies of pages from two major mathematical books published by Oxford University Press: John Wallis ``A Treatise On Algebra'' (1685) and David Gregory's edition of Euclid's ``Opera Omnia'' in Greek and Latin (1703). He was astonished and delighted to be handed copies of both folio volumes, borrowed from our Library, for him to display at the seminar.

In August, Bill Barton was an invited Plenary Speaker at the First International Conference on Ethnomathematics at Granada, and in September he attended the Mathematics Education and Society conference at Nottingham. Colin Fox spent 3 weeks on the Ross Sea ice shelf, continuing his study of its break-up.

The Mathematics Education Unit has undergone an offical university review, with Prof. Gilah Leder (LaTrobe University), Prof. Kaye Stacey (University of Melbourne) and Prof. David Ryan (Department of Engineering

Science) as the review panel. On November 7 we utilized the presence of Gilah Leder and Kaye Stacey by holding the LOGOS #4 conference on ``Graduate Supervision in Mathematics eDucation", which attracted participants from VUW, Massey University, Waikato University and ACE, as well as local people.

Prof. Manfred Trummer (Simon Fraser University, B.C.) is on leave at Tamaki Campus, where he teaches part of the numerical analysis paper 445.267. Prof. Charles Leedham-Green (Queen Mary and Westfield College, University of London) is visiting until September 1999: his interests are in group theory and computational algebra. He has given here the 1998 Aldis Lecture here, on ``William Steadman Aldis: Senior Wrangler and first Smith's Prizeman". Prof. Volker Mayer of the University of Lille (France) visited Gaven Martin: his research interests include quasiregular mappings and multidimensional dynamics. Prof. Hiroshi Yamaguchi (Shiga University) visited Norm Levenberg: his research interests are in potential theory and several complex variables. Prof. Chaitan Gupta (University of Nevada - Reno) visited for three weeks: he works on ordinary differential equations, and three-point boundary value problems are a current topic. Prof. Sergey Naboko (St Petersburg University) is visiting Boris Pavlov: he works in mathematical physics, system theory and operator theory.

John Butcher supervized both Tina Chan and her husband David Chen for their Ph.D. studies. Tina completed her Ph.D. early in July with her thesis on ``Structures for the Analysis of Numerical Methods ", and a few weeks later David completed his Ph.D. with his thesis on ``The Effective Order of Singly-Implicit Methods for Stiff Differential Equations". Tina and David have returned to their academic positions in Taiwan. Alastair McNaughton has completed his Ph.D., with his thesis on ``Long-term scheduling of harvesting with adjacency and trigger constraints".

Dr Shayne Waldron has recently taken up a Lectureship in the Department of Mathematics at the University of Auckland.

Shayne received a BSc(Hons) in mathematics from the University of Canterbury, and he was a Fulbright Scholar to the United States where he obtained a PhD from the University of Wisconsin-Madison, under the direction of Prof. Carl de Boor. Subsequently he was a Postdoctoral Fellow at the Technion (Haifa), supported by the Israel Council for Higher Education.

His primary research interest is approximation theory, and its connections with numerical analysis and linear algebra. Recent work has involved classical inequalities (Hardy, Schmidt, Wirtinger), and multivariate polynomial interpolation schemes (Kergin, the least). Along with the other members of the New Zealand Approximation Theory Group, he hopes to increase the profile of New Zealand within the approximation theory community through a number of events and visitors to New Zealand, including the forthcoming conference on ``Surface Approximation and Visualisation", to be held at the University of Canterbury in February 1999.

Marsden grants in the Mathematical and Information Sciences.

Congratulations have been awarded to the following members of this department:

Vaughan Jones
, **David Gauld and Marston Conder**, ``Interactions between mathematical physics, topology and group theory".

Marston Conder
, **Eamonn O'Brien and Jianbei An**, ``Effective computational approaches to questions in group theory and applications".

Gaven Martin,
``Geometry and analysis".

Colin Fox and Geoff Nicholls
``New statistical methodologies for physics-based inference".

Dr Ramankutty has left the employment of the University of Auckland.

Seminars

Dr Shaun Cooper
(Massey University, Albany), ``Powers of Euler's product: theorems and conjectures".

Prof. David Gauld,
``Manifolds at and beyond the limit of metrisability".

Prof. Leslie C. Woods
(Balliol College, Oxford), ``Some principles in mathematical modelling".

Dr Margaret Morton,
``Infinite planar graphs".

Dr Bruce Calvert,
``Operating points for infinite networks".

Brian Van Dam,
``Dowker and (a)-Dowker spaces via resolutions".
Prof. Elwyn Berlekamp
(University of California - Berkeley), ``The orthodox method for evaluating game positions".
Dr Colin Fox,
``Physically-based likelihoods for imaging from wave-scattering via sampling".
Dr Jamanadas Patadia
(Maharaja Sayajirao University, Baroda), ``Expansive homeomorphisms on topological spaces", and ``Lacunary Fourier series".
Dr Philip Sharp,
``Websites: information vs presentation and availability".
Dr Chuck Thompson
(University of Louisville, Kentucky), ``Assessing for mathematical competence in students aged 5-14 years".
Dr. Nick Dudley Ward,
``Wavelets and the reconstruction of analytic signals: their uses in the modelling of linear systems".
Abdul Mohamad,
Jiling Cao and Sina Greenwood, ``Conference reports".
Tsukasa Yashiro,
``Immersions of surfaces, Part 1: Deformations of surfaces".
Dr Arkadii Slinko,
``Computable rings, groups and their isomorphisms".
Dr Shane Henderson
(Department of Engineering Science), ``Rostering for call centres".
Prof. Volker Mayer
(Université de Lille), ``Uniformly quasiregular mappings of Lattes-type".
Therese Bousted
(University of Canterbury), ``Computer-based self-study comparison".
Shirley Huag,
``Numerical study of the growth kinetics for TDLG equations".
Dr Patty McKenna,
``Embedding digraphs in orientable surfaces".
John McKenzie,
``Using geometry to classify 3-manifolds: work in progress".
Prof. Michael Saunders
(Stanford University), ``*n* ways to solve least-squares problems".
Prof. W. K. Hayman
(Imperial College), ``Ordinates of successive zeros of the Riemann zeta function".
Abdul Mohamad,
``Diversity of *p*-adic analytic manifolds".
Prof. Boris Pavlov,
``Few faces of Hardy's inequality", and ``Quantum networks with resonance properties".
Dr John Fauvel,
1998 NZMS Visitor (Open University), ``The role of history of mathematics within a university mathematics curriculum for the 21st century", and ``Teaching versus research? the Oxford experiences of John Wallis, J. J. Sylvester and G. H. Hardy".
Prof. Rua Murray
(Victoria University, B.C., Canada), ``Discretization effects in computational dynamical systems".
Kerry Richardson,
``Characterisations of general resolutions".
Dr Alice Niemeyer
(University of Western Australia), ``Recognising classical groups over finite fields".
Garry Tee,
``Brachistochrones under inverse square force".
Mary Talbot,
``Teaching mathematics to different cultural groups".
Prof. H. Yamaguchi
(Shiga University), ``Function theory on moving domains".
Prof. Chaitan P. Gupta
(University of Nevada-Reno), ``A Wirtinger-type inequality and a three-point boundary value problem".
Jiling Cao,
``Generalized metric spaces and topological games".
Prof. Manfred Trummer
(Simon Fraser University), ``Computing Jacobians in spectral methods for differential equations".
Prof. Charles Leedham-Green
(Queen Mary and Westfield College, London), ``William Steadman Aldis: Senior Wrangler and first Smith's Prizeman".
Prof. Reinhard Mennicken

(University of Regensburg), ``On the spectrum of unbounded off-diagonal operator matrices and applications".

Dr Bakhadyr Khoussainov
(Department of Computer Science), ``Computable models of theories".

A-Prof. Malcolm Grimson
(Physics Department), ``The spatio-temporal growth of bacterial colonies".

Prof. Jack Keil Wolf
(University of California at San Diego), ``Line codes, codes for digital storage and Shannon theory".

Andrew Stafford
(Manurewa High School), ``Resourcing mathematics teachers for conceptual computer-based learning".

Dr David McIntyre,
``Souslin trees and forcing".

Dr Alan Champneys
(University of Bristol), ``Solitary waves and fourth-order ordinary differential equations: a review".

Department of Statistics

Congratulations to Dr Chris Wild, who has been promoted to a Personal Chair in Statistics.

Congratulations to Professor George Seber, who has recently won a Distinguished Statistical Ecologist Award. This award is presented every four years by the International Association for Ecology, to people who work in the field of Statistical Ecology. George will be working here part-time, after the end of this year.

Renate Meyer and Russell Millar are currently on leave at Dalhousie University (Nova Scotia), and David Scott is on leave at the University of Melbourne. Ross Ihaka attended the ``Interface '98 Conference" at Minneapolis (May 1998) and the ``Statistical Science and the Internet" conference at New Jersey (July 1998).

In 1999, Ross will attend a jamboree at Vienna, the ``Interface '99 Conference", a meeting of the Omega group, and he will visit Wisconsin. Robert Gentlemen will be on leave next year in Boston, visiting the Department of Biostatistics at Harvard and the Dana Farber Cancer Center.

Dr Stephanie Budgett will return to England at the end of the year, with her husband and their New Zealand-born daughter Laura.

Dr Katrina Sharples (University of Otago) is currently visiting, and is working with Robert Gentleman. Prof. Jack Kalbfleisch (University of Waterloo) is currently working with Chris Wild and Alistair Scott. Duncan Temple Lang (Bell Laboratories) is visiting in November, to work on R with Robert Gentlemen and Ross Ihaka. Bjarke Klein and Claus Dethlefsen, graduate students at Aalborg University (Denmark), are currently visiting.

Alain Vandal and Andrew Balemi have completed their Ph.D. degrees.

Lovina McMurchy has won the Frank Knox Fellowship, to do an MBA at Harvard in 1999.

Seminars

Dr Geoffrey Pritchard,
``Offering strategies in the wholesale electricity market".

Dr Andy Philpott
(Department of Engineering Science), ``Optimal participant behaviour in an electricity market".

Prof. Jack Kalbfleisch
(University of Waterloo), ``The Estimating function bootstrap", and ``Constrained estimation in nonparametric mixture models".

Alain C. Vandal,
``Interval orders and the nonparametric likelihood for interval censored data".

Murray Jorgensen
(University of Waikato), ``Estimation of individual effects by the method of joint maximization".

Dr John Kittelson,
(University of Otago), ``An Overview of the statistical aspects of group sequential trials".

Dr Bill Bolstad
(University of Waikato), ``Why isn't everyone a Bayesian? The Millennium perspective".

Dr Katrina Sharples
(University of Otago), ``Evaluation of surgical interventions: decompression of the cervical spine".

Simon Kjellberg
(Department of Physics), ``New Random Walk methods for modelling turbulent diffusion".

Dr Colin Fox
(Department of Mathematics), ``Is there a formula for average wave propagation?".

Garry Tee

UNIVERSITY OF CANTERBURY

Department of Mathematics and Statistics

Dr Bill Baritompa took two months Erskine leave from mid May to July this year to visit colleagues in the United States and Europe who work in the area of global optimization, and to present papers at various conferences.

Mats Gustafsson, a doctoral student at the University of Lund in Sweden is visiting the department for two months. The department is also enjoying visits from Dr Mark Nelson and Dr Judith Cederberg.

The 1999 New Zealand Mathematics Colloquium is currently scheduled for 7-9th of July 1999 at the University of Canterbury.

An international workshop on mathematics related to evolutionary genetics is being held on March 1 to 5 1999. The workshop is called ``Kaikoura99'' and already has about 50 participants, half of whom come from overseas, including Professor Andreas Dress. For further information contact Dr Mike Steel or see our web page at: `http://www.math.canterbury.ac.nz/kaikoura2.html` *Chris Price*

Professor Wilf Malcolm was previously Professor of Pure Mathematics at Victoria University of Wellington 1973-84, and Vice-Chancellor of the University of Waikato 1985-94. Many readers will know of Wilf's contributions especially in the teaching of mathematics and in the promotion of mathematical logic at Victoria University.. He is attending the 1999 NZ Mathematics Colloquium at the University of Canterbury on 6-9th July 1999 as an invited speaker. We look forward to hearing more from him then. *Graeme Wake*

IRL, Applied Maths

It has been business as usual at Applied Maths for the last few months. Shaun Hendy, who has had a temporary position, was awarded a FRST Post. Doc. for two years to work on granular flows. Stephen White attended the TOUGH2 workshop at Lawrence Berkeley National Laboratory.

In July, Roger Young went to Xi'an, China to transfer reservoir engineering technology as part of a project on the Nagqu geothermal energy development. Warwick Kissling and John Burnell appeared as expert witness in an Environment Court hearing on the Rotorua Geothermal Field. Kit Withers visited the Universities of Unellez and Plymouth

A one day meeting on our deposition was held at Applied Maths, attendees included Rick Sibson and Julie Rowlands from Otago, Bob Braithewaite, Hugh Bibby and George Grindley from IGNS and five Applied Maths staff. *John Burnell*

MASSEY UNIVERSITY

Institute of Fundamental Sciences - Mathematics

For the past 24 years our students have had the benefit of Doug Carian's expertise in the history of mathematics. Doug's paper on History of Mathematics, taught at the College of Education, has also been available extramurally and has been enjoyed by hundreds of extramural students over the years. Those internal students enthusiastic enough to cross the river and attend Doug's classes have also been able to take the paper. Now Doug has retired and after this year his paper will no longer be offered. There are plans for a new paper to replace it in a year or so, but Doug is irreplaceable! His departure brings to a close a long and happy link between what were, until very recently, two institutions. We will miss him.

The creation of the Centre for Mathematical Modelling has now been approved and Robert McKibbin has been appointed as its Director. We wish Robert well in making the Centre a well known entity both nationally and internationally.

Robert McKibbin and postgraduate student Tammy Smith attended the 20th New Zealand Geothermal Workshop 1998 held at the University of Auckland. Robert presented his paper titled ``Fluid flow in a flashing cyclone separator'' and Tammy their joint paper titled ``Towards a hydrothermal eruption flow model''.

Charles Little is going on sabbatical next year (mid-January until mid-December 1999). Charles will be doing research with Franz Rendl on graph theory at the University of Klagenfurt, Klagenfurt, Austria. Charles and Barbara will leave early December to have a few weeks holiday in Canada before going to Klagenfurt. We wish them a good

a trip and stay in Austria and a safe return to New Zealand (hopefully not bitten by the millennium bug).

Debbie Ormsby has recently joined Liz in the office as a secretary. We hope that Debbie will enjoy her work and will be able to put up with a bunch of mathematicians. Liz will be on leave without pay next year. Liz and Craig are going to Australia (biking from Melbourne to Sydney), Africa, UK and Europe. Starting from Amsterdam they will be biking through Europe! They intend to visit Charles and Barbara in Klagenfurt.

Anne and Dean Halford have returned from their thoroughly enjoyable holiday in the UK and Europe. Dean will be back next year part-time.

John Giffin has decided to leave the Institute of Fundamental Sciences. As from 1 January 1999 he will join the Institute of Information Sciences and Technology. He thinks that this Institute has more to offer for Operations Research. John will keep on teaching his OR papers in the mathematics discipline. Apart from his absence at future mathematics meetings we will not really notice that he dwells in a different Institute. However, this will become obvious once we have been relocated with chemistry and physics (sometimes next year). We will surely miss him and his sense of humour and his healthy cynicism.

Glenda Anthony attended LOGOS seminar on Graduate Supervision in Mathematics Education in Auckland this month (7 November). This provided a great opportunity to discuss the practicalities and experiences of supervision in an area thriving with masterate students.

From mid August to mid November this year, Dr. K. Huber visited Dr. V. Moulton at Mid Sweden University, Sundsvall, Sweden, with whom she has had a successful collaboration for many years. During her visit, she also attended the fourth Nordic Phylogenetic Systematics Network Meeting (NPSN 4) at Uppsala University, Uppsala, Sweden, and the third International Conference on Discrete Metric Spaces held at CIRM, Marseille, France.

Nick Allsop returned earlier this month from Germany where he has been completing the technical part of his thesis under the supervision of Professor Jurgen Stuckrad at the University of Leipzig. Nick and Shirley, welcome back to the Southern Hemisphere.

Institute of Information and Mathematical Sciences

Dr Mike Meylan will be taking up a position as Lecturer in Mathematics within IIMS at Albany, commencing 1 January 1999. Mike completed his PhD with Professor Vernon Squire at the University of Otago in 1993, continuing there as a postdoc before moving to the University of Auckland to work with Dr Colin Fox and to do some teaching. His general area of interest is in floating bodies and scattering theory, originally applied to Antarctic sea ice, but his work has much wider applicability. We look forward to his arrival, which will increase staffing of the mathematics group from 3.6 to 4.6.

Seminars

Emeritus Professor Leslie C Woods,
(Balliol College, Oxford), ``The Oxford Tutorial System: Strengths and Weaknesses", and ``Rational Thermodynamics: A failed philosophy".

Kathi Huber,
``The Buneman Graph - A new method to construct it".

Professor Benny Chor,
(Head: Laboratory for Computational Biology Technion, Haifa, Israel), ``Constructing trees from quartets".

David Pidgeon,
``Conservation Laws for Non-Lagrangian Systems".

J Fauvel,
(Open University, England), ``The role of mathematics within a university mathematics curriculum for the 21st century", ``Mathematics in Action: New Zealand Images (Video Showing)" and ``Sir Barnes Wallis, Mathematical and Engineering Genius: Airships, bombs and letters", (Public Lecture, in conjunction with The Royal Society of New Zealand, Manawatu Branch).

Professor Rod Downey,
(Victoria University, Wellington), ``Algorithms for graphs of bounded treewidth".

Grant Lythe,
(Los Alamos National Laboratory, USA), ``The Secret Life of Kinks".

Carmen Molina-Paris
(Los Alamos National Laboratory, USA), ``Geometric Effective Action in Gauge Field Theories"

Marijcke Vlieg-Hulstman

UNIVERSITY OF OTAGO

Department of Mathematics and Statistics

It seems only yesterday that the Department was compiling its previous contribution to the newsletter. Doesn't time pass quickly when you're having fun. The year has so far proceeded without too many hiccups, which is pleasing given that we were blessed with an extra ninety 100-level biostatistics EFTS. We have begun revising our course structure again, a biannual event it seems. This time with some stoic reluctance as we are being asked to adopt the University minimum point value of 6 points for our 200- to 400-level papers. Only two years ago, we decreased the point value to increase flexibility. Such is life and what would keep us busy if we didn't have the little extras. John Clark attended a couple of overseas conferences in August. The first was the International Conference on Abelian Groups and Modules held at the Dublin Institute of Technology, Ireland. The second was the Second Palestinian International Conference on Mathematics held at the Universities of Nablus and Birzeit in the West Bank. (A lengthy interrogation by Israeli security in the departure lounge at Tel Aviv Airport was abruptly terminated after he produced a copy of his Conference talk.)

Bryan Manly has been chosen as the editor for 1999-2001 for the Journal of Agricultural, Biological and Environmental Statistics (JABES), which is published jointly by the American Statistical Association and the International Biometric Society. This journal was started in 1996 as a vehicle for the publication of papers on statistical methods of immediate practical value to researchers and statistical consultants in the areas covered. One of Bryan's goals will be to get the journal more widely read and cited by non-statisticians.

Bryan took part in the fifth International Conference on Teaching Statistics, held in Singapore 20-27 June to talk about the use of projects in teaching sampling methods. He also attended the Joint Statistical Meetings in Dallas from 4-15 August to meet people involved with the production of JABES, and give a talk as part of a special session on developments in randomization methods of inference.

David Fletcher attended the International Ornithological Congress in Durban, South Africa. He did this in his role as statistician with a FRST-funded team from the University's Zoology department that is working on the sustainability of harvesting of muttonbirds (titi) by Maori. The conference was attended by over 900 delegates, and was held at an impressive new conference centre (the Non-Aligned Movement held a congress there the following week). One of the plenary sessions was given by Les Underhill, Professor of Statistics at the University of Cape Town, who provided a good example not only of applying mathematics (to model moult cycles), but also of communicating such work clearly to those of a less mathematical bent. David is now looking forward to a week of fieldwork, banding the muttonbirds, on Stewart Island in January. **Visitors** Dr Richard Anderson-Sprecher of the University of Wyoming is visiting until June 1999. Richard's research interest is applications of statistics, particularly in biology, including the analysis of GIS data on resource selection by animals.

Dr Gary Zerbe of Colorado State University is visiting until August 1999. Gary's research interests are in medical statistics, and uses of randomization inference with general and generalized linear models.

Seminars

Dion Burns,
``Arnold's Stability Method; A Hamiltonian Approach to Fluid Dynamics"
Ross Vennell,
(Dept. Marine Science), `` Dynamics of Tidal Headland Eddies"
Jeff Rosoff,
(Gustavus Adolphus College, St. Peter, Minnesota), ``An Introduction to Vector Bundles in Algebraic Geometry"
Marcus Cambray,
``Hidden Markov Models"
Dave Wilson,
``Skew Polynomial Ring Dependencies"
Bryan F.J. Manly
, ``Analysis of Variance by Randomization with Unequal Variances"
Dr. Rua Murray,
(Centre for Non Linear Dynamics and its Applications, University College London), ``Discretization Effects in Computational Dynamical Systems"
Richard J Barker,
``Efficiency Gain from Additional Information with Accompanying Nuisance Parameters"
David J Fletcher
, ``Using association indices to measure affiliation in social vertebrates"
W. K. Hayman FRS,
(Imperial College, London), ``The growth of solutions of algebraic differential equations"
Emeritus Professor John Selfridge,
(Mathematics Department, Northern Illinois University), ``Developments in factoring and primality testing"
John Fauvel,
(Open University, United Kingdom, New Zealand Mathematical Society Visiting Lecturer), ``The role of

history of mathematics within a university mathematics curriculum for the 21st century", ``Teaching versus research? The Oxford experiences of John Wallis, J J Sylvester and G H Hardy" and ``Scenes from the prehistory of chaos theory: Newton, Raphson and other problem-solvers down the ages"

Lenette Grant

AGRESEARCH

If anyone has done something news-worthy they haven't told me about it! Your correspondent was the sole kiwi at the Symposium on Epidemic Models at Australian Nationa University from 28 September to 2 October. The symposium was organised by Joe Gani, who was an invited speaker at the 1977 colloquium, and was also attended by Valerie Isham, the New Zealand Mathematical Society visiting lecturer in 1996. *Mick Roberts*

VICTORIA UNIVERSITY

School of Mathematical and Computer Sciences

Victoria University of Wellington was the host of the New Zealand Mathematics Colloquium earlier this year, which I am told went off smoothly. This is reported with slightly guilty overtones, since I was overseas and avoided any responsibilities this time.

Comings and Goings

Colin Bailey and Ken Pledger have returned from Study Leave all fired up and raring to go. Geoff Whittle has gone on Study Leave, it seems like forever. He visited Mike Fellows in Victoria, then went to Mexico, and now is in Oxford with Dominic Welsh. Warren Moors is visiting us. He took up a two and a half year Research Fellowship in Mathematics in February, funded by the Marsden Fund, and is working on the project ``Foundations of Supergeometry" directed by Vladimir Pestov. Charles Semple has gone to Christchurch on a postdoc, after completing his PhD thesis on k-regular matroids under Geoff Whittle. Charles has just been awarded the 1998 Hatherton Award by the Royal Society of New Zealand for the best paper by a student registered for PhD at an New Zealand university in physical, earth, mathematical or information sciences.

For Vladimir Pestov, the mid-year break was full of events. First, Vladimir gave a talk at the 1998 Workshop on Operator Spaces at CIRM (Marseille--Luminy) upon an invitation from Gilles Pisier, and then visited the University of Genova for joint work with Ugo Bruzzo and the database theory group at the University of Bologna with a seminar talk. After he came back and did his share of marking, Gaven Martin came down from Auckland for a week of joint work, thus further strengthening links between Victoria and Auckland. Then Vladimir was off again, to give a talk at the 13-th Summer Topology Conference in Mexico city. The conference was dedicated to the 60-th birthday of a prominent set-theoretic topologist, Prof. Alexander V. Arhangel'skii (Moscow and Ohio), who was Vladimir's teacher and supervised his PhD at Moscow University back in 1980-83. Many of Vladimir's Russian topologist friends, presently scattered all over the world, have attended this reunion. The next, 14-th, Summer Topology Conference, to be held in New York City in 1999, will feature Vladimir among the major invited speakers, with the organizers covering most of his travel and accommodation. Vladimir spent the last week of the break at the University of South Australia in Adelaide, where his invited talk marked the inauguration of the Mathematical Analysis Research Group. There he also worked with researchers from the Defence Information Systems Centre and presented some of this recent results at the Australian Defense Science and Technology Organization (DSTO). A considerable fraction of funding came from sources other than Vladimir's Marsden grant, e.g. his Australian trip was fully financed by the host institution.

John Harper is retiring in January 1999, but only from teaching and administration. For the first time he'll be able to go to USA and UK April-September and miss a winter instead of collecting an extra one (present plans include the Oxford Centre for Industrial and Applied Maths, Bristol and Heriot-Watt Mathematics Departments, and Johns Hopkins Mechanical Engineering.)

Reed Solomon is visiting Rod Downey, ex Cornell then here for four months and then to Madison where he takes up a postdoc. Denis Hirschfeldt visited from Cornell for a month. Peter Cholak (and his family) will be visiting Rod over the Christmas break.

Rod spoke at several conferences including the Australian Mathematical Society meeting at Sydney, invited speaker in the special session in combinatorics, and earlier as keynote speaker in the SIAM meeting in Toronto special session in Parameterized Complexity.

Mark McGuinness went to the ``Mathematics In Industry Study Group" in Brisbane in February, and co-moderated the problem on the cooking of rice grist as an adjunct in the brewing of Fosters lager in China and Vietnam. He got to sample the product too. Then on to the ANZIAM conference in Coolangatta to talk about cereal cooking and brine

pockets in sea ice. In July Mark visited Sean McElwain at the Queensland University of Technology in Brisbane and worked on asymptotic simplifications of the solution to a coal pyrolisation problem. When this Newsletter comes out, Mark will be in Australia again, visiting Melbourne (cereal cooking) and Brisbane (modelling the spread of cancer) for six weeks.

Stephen Binns has completed his MA studies supervised by Rob Goldblatt, featuring a research project on ``The Effective Topos''. He is now at Pennsylvania State University, where he has embarked on a PhD in the foundations of mathematics.

Rob Goldblatt was the NZ delegate to the 13th General Assembly of the International Mathematical Union in Dresden in August, and subsequently attended the International Congress of Mathematicians in Berlin.

Thora Blithe retired on 31 March 1998. Our mathematics group is shrinking! No replacements are planned for our retirees.

Jim Neyland has been appointed to a Senior Lecturership in the School of Education, and resigned from his current MCS position at the end of June.

Eunice Mphako has arrived from Malawi to study for a PhD under Geoff Whittle. She is supported by an ODA Scholarship. We have sent her off to Oxford for a month to visit Geoff on his sabbatical!

Books

Rod Downey's book is called ``Parameterized Complexity'', with co-author Mike Fellows. The proofs are in, and the book should be published mid-November.

Rob Goldblatt's book on nonstandard analysis, entitled ``Lectures on the Hyperreals'', has now been published as vol. 188 of Springer-Verlag's Graduate Texts in Mathematics series (ISBN 0-387-98464-X, price US$49.95.

Odds and Sods

Rod Downey just passed his teaching certificate for Scottish Country Dancing.

Rod Downey delivered his Inaugural Address in May as Professor of Mathematics, entitled ``Computation: Limits and Structure''.

Mark McGuinness featured prominently on page two of the Evening Post, and several other New Zealand newspapers, in a brief moment of glory. The item included a photograph of Mark holding up and eating a bowl of cereal, with a piece of chalk in one hand and a nonlinear diffusion equation on the blackboard in the background. The article was about how mathematics has been used to help make crunchier cereal, a neat little news-bite indeed.
Mark McGuinness

UNIVERSITY OF WAIKATO

Department of Mathematics

It is pleasing to report that Ernie Kalnins was successful in the last round of the Marsden Fund. He will be funded for three years on a research project titled `Special functions, superintegrability and separation of variables'. An advertisement for a post-doctoral fellow to work on this project has recently appeared.

Though Graham French officially retired last year, he has been helping us this year with various teaching duties. Starting next year, Graham will take up a three year position as a Senior Tutor (half-time). We are glad to have his continued presence in our department.

The Visiting Lecturer for 1998, John Fauvel, visited at the end of September. His two delightful talks were well received.

About 100 applications were received for the lectureship vacancy. A short-list is currently being prepared. It is hoped that interviews will be completed by the end of November.

Ian Hawthorn spent two weeks in the United States as part of his study leave. While en route to the US, he made a stopover in Hawaii where he took part in a barbershop quartet competition. His quartet came second in the New Zealand division of the competition and overall were fourth or fifth. Kevin Broughan was another member of the department who participated in this competition.

A farewell function for Douglas Bridges will be held towards the end of November. In the meantime, Douglas

continued his collaborative research with Hajime Ishihara (Japan Advanced Institute of Science and Technology) and Peter Schuster (University of Munich). They visited Douglas for two weeks during the latter half of October.

Seminars

B. Khoussainov
(University of Auckland), ``What are computable presentations?".
B. Pavlov
(University of Auckland), ``Harmonic analysis on Riemann surfaces".
J. Fauvel
(Open University), ``Teaching versus research? The Oxford experiences of John Wallis, J J Sylvester, and G H Hardy" and ``The mathematical love letters of Barnes Wallis".
W. Munro
(University of Queensland), ``Quantum engineering and fundamental tests of quantum mechanics".
N. Witte
(University of Melbourne), ``The moment problem, orthogonal polynomial systems, Selberg integrals, statistical expansions, and combinatorics in quantum many-body systems".
N. Dudley Ward
(University of York), ``Wavelets and the reconstruction of analytic signals, with applications to the modelling of linear systems".
Z. Zhang
(Central China Normal University, Wuhan), ``Lecture(s) on quantum computers", ``Introduction to the search for black holes" and ``Lecture(s) on black holes".
L. Staiger
(Martin-Luther University, Halle-Wittenberg), ``The computation of the Haussdorff dimension".

Stephen Joe

Department of Statistics

Recent developments in the department include the appointment of Dr James Curran, to a lectureship. James, a graduate of Auckland University, is due to take up his position in September 1999, when he completes a post-doctoral fellowship at North Carolina State University. From 1 February, we will also welcome Dr I-Ming Liu, who has a one year lectureship with the department. I-Ming completed her PhD at the University of Florida, and comes to us from the National Chung Hsing University, Taiwan. Sharon Gunn has completed her term appointment as a tutor with the statistics department. While here she has been working on research for her PhD, looking at the learning environment of statistics students. We are currently negotiating a further contract for 1999.

Nye John recently hosted Emlyn Williams (CSIRO, Australia) for another short visit. Lyn Hunt is currently in Brisbane, working with Kaye Basford from the University of Queensland and Murray Jorgensen recently visited Victoria University, Wellington, to discuss Computer Network Modelling with David Harte and Peter Smith. In December, Nye John and Judi McWhirter will attend and present papers to IBC98 in Capetown. Our honorary lecturer, Harold Henderson, from Ruakura, is also planning to attend.

Ray Littler, who has been visiting with Larry Weldon at the Department of Mathematics and Statistics at Simon Fraser University, Burnaby, BC, Canada, is due back early January 1999. Murray Jorgensen will commence his sabbatical by attending Uncertainty 99 at Fort Lauderdale, Florida, January 1999. He will then be at Monash University working on Minimum Message Length Inference with Chris Wallace and David Dowe of the Computer Science Department. Towards the end of his sabbatical, he is planning to visit Geoff McLachlan at the University of Queensland.

Success for our DPhil students, includes the appointment of Kathy Ruggiero to a lectureship at Massey University, Albany Campus, commencing 1 February, 1999. She will continue her DPhil studies part-time and plans to submit mid-year, 1999. The department extends its best wishes to Kathy. Samuel Manda is about to submit his DPhil thesis entitled ``A Nested Random Effects Model Analysis of Child Survival in Malawi". He returns to his lectureship at the University of Malawi, Zomba Campus, Malawi, in early December 1998.

Seminars

Kathy Ruggiero,
``Multi-factor alpha-designs".
Bill Bolstad,
``Why Isn't Everyone a Bayesian? The Millennium Perspective".
Professor J D Kalbfleisch
(University of Waterloo, Ontario, Canada), ``The Estimating Function Bootstrap".
Katrina Sharples

(Department of Preventive and Social Medicine Otago Medical School), ``Evaluation of surgical interventions: decompression of the cervical spine".

Sharon Gunn

``Curriculum response to the changing nature of Statistics".

Dr Alain C. Vandal

(Department of Statistics, University of Auckland) ``Interval orders and interval censored data".

Judi McWhirter

A MATHEMATICS REPORT FROM BRUNEI

An Unexpected Encounter

It was a jungle trek run by the Brunei Nature Society soon after my arrival in the country at the beginning of January, 1997. I sat apart from the main group, hot and exhausted and wondering if I could last the distance. A fellow tramper approached me, looking disgustingly fit. ``You are not by chance Wilf Malcolm?", was his unexpected question. I confessed that at the beginning of the trek I had indeed believed I was the person so named: but who I was now, several demanding hours later, I hesitated to say. ``You taught me mathematics at University in Wellington", was his surprising response. For a brief few moments the pressing realities of the Borneo jungle faded as we recalled together the mathematical experiences of those far off years in Wellington in the early 1970s!

And so my overwhelming response to being here in the University of Brunei Darussalam, after many years away from direct involvement in mathematics, is one of joy and appreciation in the privilege of being involved again in the teaching of Mathematics. As with all who are glad to be teachers that joy is associated both with the relationships that teaching brings with students in one's care and with the intellectual satisfaction of always growing in understanding of the subject knowledge being shared and communicated.

Universiti Brunei Darussalam

The University here in Brunei was established some twelve years ago, developing from a College of Education which as the Institute of Education continues as the largest faculty in the University. There are four other faculties, Arts and Social Sciences, Management, Science and Islamic Studies. Full time students number over one thousand three hundred, with a majority training to be teachers at primary and secondary level. The liberal character of the Brunei Islamic State is shown in the strong encouragement given to women to study at the University, who comprise close to a majority of the students enrolled. It is still the case that a considerable number of Bruneian students take first degrees at overseas universities, supported by private means, or by Government scholarships, especially in professional areas not taught as yet at UBD.

The Mathematics Department

The Mathematics Department is one of five departments in the Science Faculty. The Department of Petroleum GeoScience, the most recently established, is the only Department to teach at graduate level - a two year Masters programme, with plans to begin a Ph.D. programme in the near future. The Biology Department, with a magnificent natural laboratory in one of the world's best preserved areas of rain forest, provides joint supervision for graduate students from other universities, but otherwise like Chemistry and Physics provides a first degree programme for students training to be secondary teachers. Plans are being developed for the introduction of a full science degree across these three disciplines.

The Mathematics Department , too, teaches only to first degree level, with the majority of its students likewise intending to be teachers of mathematics at the secondary level. But for some years it has also provided a four year B.Sc. in mathematics, some eight students or so now graduating each year. A special feature of this programme is that in the second half of their third year of study the students are required to spend a full semester in a selected work situation designed to equip them with mathematical experience in a work environment.

The Mathematics Department also incorporates the teaching of Computer Science, particularly providing the first two years of a programme which leads to a final two years in the University of Strathclyde, Scotland, and a degree in Computer Science conferred by that University. As well, the Department provides the mathematical components of the first two years of a degree in Electrical Engineering offered through the University of Glasgow, and which the Bruneian students complete by taking the third and fourth years at Glasgow.

With some twenty five staff, including permanent tutors, the Mathematics Department is one of the largest in the University. Like the academic staff community of the University as a whole, the overwhelming majority are expatriate. Some ten countries are represented in the staff of the Mathematics Department, which also includes a growing group of local graduates. Research interests amongst staff are diverse, ranging from a strong interest on the applied side in mathematical modelling, through algebra and group theory, functional analysis number theory and

discrete mathematics to numerical analysis, operations research and statistics.

New Zealand Connections

The history of Brunei has meant that the strongest outside educational associations have been with the United Kingdom and these continue strongly into the present. However, over recent years the University has sought, as well, to foster relationships with Australia and New Zealand. For instance, last year it hosted visits from Auckland and Otago Universities. In terms of links with the Mathematics Department Professor Graeme Wake, now of Canterbury University, has played a leading role. He served as external examiner for the Department in the early nineties, played a leading role in a regional conference hosted by the Department on mathematical modelling, supervised two local graduates for their Masters degrees at Massey University and is currently supervising the Ph.D. programme at Canterbury University of a local staff member. My own appointment as a visiting professor in the Department came about through his initial recommendation. At the beginning of next year Professor Roger Hosking, formerly of Waikato University and more recently of James Cook University will be taking up a contract appointment as a professor in the Department.

In the short term mathematics staff in New Zealand universities have much to contribute to developments in mathematics in this region. In the longer term mathematics in New Zealand will stand to gain much in return as the mathematical activities here grow in strength and importance.

Back to the Jungle

No, I could not have predicted those many years ago that I would find myself recognised as a teacher of mathematics in the midst of a Borneo jungle. But I could not wish for a more satisfying end-run in my professional career than the opportunity to return to the teaching of mathematics, to experience again the intellectual challenge of mathematical ideas and the satisfaction of sharing the understanding of them with those keen to learn. *Wilf Malcolm, Visiting Professor*

Book Reviews

Ideals, Varieties, and Algorithms
David Cox, John Little, and Donal O'Shea
2nd ed., Springer-Verlag, Berlin e.a., 1997, 536pp, DM 68.00. ISBN 0-387-94680-2.

Algebraic geometry is thriving these days.

To substantiate this claim, it suffices just to visit briefly the ``Front for the xxx Mathematics Archive'' maintained at UC Davis `http://front.math.ucdavis.edu`, this very recent and already hugely successful development on the road to the global information space finally overcoming the `tyranny of distance.' The Archive brings together a number of previously disparate and independent electronic preprint archives (31 of them already), standardises them, and mirrors the entire repository at eight different locations all over the world, so as to protect this priceless collection in case of any local disaster, be it an eight-point earthquake or something even more destructive, like the `rm *` command executed by a UNIX system manager. Out of 31 categories the Front is subdivided into, the category AG -- Algebraic Geometry has the largest number of submissions stored: a formidable 1561 of them as of November 11. Only the Quantum Algebra (QA) category, with its 1516 e-prints, rivals Algebraic Geometry, while the rest of categories are lagging far behind -- the third largest one, Functional Analysis (FA), can only boast of 438 submissions, and a typical specimen would rather be something like Rings and Algebras (RA), with the modest total of 33 submissions. Assuming the degree of conservatism of mathematicians and thus the percentage of all new preprints submitted in the electronic form is uniform across the spectrum of mathematical disciplines, those figures give a reasonably accurate picture of the level of current research activity in all the branches of mathematics. (Though one should bear in mind that not all existing e-print archives have merged into the Front yet, one sizeable exception being the Topology Atlas repository.)

It is however no wonder that algebraic geometry is so important, if one recalls for the moment that the objects studied in this simultaneously very classical and very modern area of mathematics are of the most basic nature: algebraic geometry is dealing, in essence, with sets of solutions to systems of polynomial equations. Other objects of mathematics may come and go, drifting along with fashion, but solutions to polynomial equations are always here: basically all of the classical figures and shapes in low dimensions, from triangle and hyperbola to sphere and cone, are either loci of solutions to polynomial equations, or else intersections of finitely many loci of this kind. Surely one can somehow survive without the Cantor perfect set, but what about trying to get along without a circle? This is also why algebraic geometry provides the focal point where geometry and algebra meet each other and interact in a remarkably fruitful fashion.

Among all branches of pure mathematics, algebraic geometry is nearly unique in that it maintains a fine and healthy

balance between the abstract and the concrete. On the one hand, it might be that no other area of modern mathematics requires such a consistent and determined effort over a long period of time to master as algebraic geometry apparently does. Before one starts producing new results in modern algebraic geometry, one needs to achieve, among all other things, a good working knowledge of sheaf theory, which in itself is a formidably abstract area. A typical object one has to work with in sheaf theory would be a functor from some small category to a category of algebraic objects, such as groups or vector spaces or algebras. This is something that really takes one's time to develop a good intuitive feeling for. At the same time, the sheaf-theoretic foundation of algebraic geometry, laid down to a large extent by Grothendieck, has not obscured the hard core of the discipline, and computations remain as difficult as they ever were during the classical Italian period one hundred years ago. There is no outward sign of degeneration in sight, unlike some other mathematical disciplines better left unnamed where an excessive level of abstraction has taken its toll, turning once healthy and still vitally important areas into a veritable `gallery of monsters.'

Among other areas of knowledge that have benefitted from contacts with algebraic geometry in a most spectacular fashion are number theory (Fermat's Last Theorem), physics (mirror symmetry), and cryptography (elliptic curve cryptosystems). The book under review is devoted to computational algebraic geometry, that is, the design of algorithms for solving systems of polynomial equations. The authors suggest that the text can be used as a basis for a number of University courses taught at various levels, from undergraduate courses in algebra through first graduate course in algebraic geometry. My own clear impression would be that in New Zealand Universities, the book could very well serve as a textbook for a nice 300-level course in algebra plus an Honours course in algebraic geometry.

To begin with, the book handles the subject matter very gently, that is without referring to `abstract nonsense' such as sheaf theory at all. For example, an *affine variety* is defined, very simply, as the common locus of zeros of a finite system of polynomial equations. From the fundamentalist Bourbakist viewpoint, this locus just forms the underlying set, or *set of points,* of an affine variety, which is a much more complex and intricate object than a set; what one has to do, is to put the so-called Zariski topology on the set of points (which topology is different from the one induced by the standard product topology on the finite-dimensional vector space, and more difficult to work with), and then to equip the resulting topological space with a sheaf of rings of polynomial functions. The approach adopted in the book is, in a sense, `naïve.'

However, it makes the book immensely readable, and concrete examples, which abound throughout the text and are often supplemented with good pictures, help the reader to develop a good intuitive understanding of the objects involved. And since the book is addressed in a large degree to undergraduates, this approach is the only one feasible. Actually, after having taught at Victoria for seven years, I cannot possibly imagine a course in modern algebraic geometry, Grothendieck-style, being offered to our Honours students, who usually lack any background in topology by the time they start graduate studies, and only have a very limited knowledge of algebra. However, the book under review would serve the purpose perfectly.

What is perhaps equally (or even more) important, is the remarkably close rapport with computational aspects of the theory maintained throughout the treatise. Many concrete algorithms are written out in pseudocode, and useful suggestions are given on how to implement them in all the major mathematical software packages, namely Maple, Mathematica, AXIOM, REDUCE, and even a number of others. This makes the text both very attractive for the modern-day students (just imagine a variety of assignments that can be set using software, and the amount of creativity and inventedness required on the part of the students to do them), and very useful -- after all, we have to think of making our mathematics students employable, and computing jobs is what more and more of them have to take after graduation. (Indeed teaching such a course will add employability to any one of us, the Lecturers as well --- which is not something to be dismissed lightly either.)

Concepts of algebraic geometry are illustrated with the help of examples from robotics, computer aided geometric design, automatic geometric theorem proving, and other exciting disciplines where methods of algebraic geometry are presently being applied.

However, and this is important, the book would also make perfect reading for someone uninterested in computing and any other `practical applications' of algebraic geometry. The contents of the book cover in great detail seemingly all of the by now classical topics in commutative algebra and algebraic geometry, such as basic polynomial algorithms, affine and projective varieties, ideals, Nullstellensatz, Groebner bases, invariant theory, elimination and extension, irreducibility and factorization of polynomials, the ideal-variety correspondence, quadric hypersurfaces, Bezout theorem. The dimension of an affine variety is treated in great detail (because of its obvious relevance to the computational aspects), and singular points of a variety appear near the end of the book together with the tangent cone. Even the Zariski topology is introduced at some stage through the closure operator, which is no doubt makes the concept much more accessible than a purely abstract head-on approach. This leads to irreducible varieties vs prime ideals and minimal decomposition. What is more, functions (polynomial and rational) on varieties are introduced and studied as well, and it turns out that one does not need to frighten the reader with sheaves to communicate essentially every basic fact there is to know about those functions. In such a way, the coordinate ring of an affine variety is introduced, and the notion of birationally equivalent varieties appears. The presentation always makes a point of consistently stressing interactions between algebra and geometry, and the basics of commutative algebra are taught alongside very geometric concepts.

Every subsection is generously supplied with exercises. The book concludes with four Appendices listing the basic concept from algebra (rings and fields for a layman), computing (pseudocode for the computationally challenged among us), comments on usage of the most common software packages for the needs of this study, and a list of possible independent projects for the students.

One side of this all is that a course taught along the lines of the reviewed book, if advertised properly, might attract computer science graduate students as well as mathematicians. However, mathematics students should be particularly encouraged to study algebraic geometry, through stressing both its importance in pure mathematics where it forms the area of bubbling research activity, and its unusually high relevance for applications of mathematics, in particular those in computing.

If the present reviewer ever decides to resume his study of algebraic geometry, he will do so through offering an Honours course, and the present book, with its hands-on approach, would make for about the most attractive recommended textbook --- almost certainly more attractive than many a classical text based on sheaf theory, because of capturing the *Zeitgeist* so well.

Vladimir Pestov Victoria University of Wellington

Topology, Geometry and Gauge Fields
Gregory L Naber
Texts in Applied Mathematics, 25 Springer-Verlag New Yourk, 1997, 396pp, DM 78.00. ISBN 0-387-94946-1.g

Mathematics and Physics have enjoyed a close relationship over the centuries. The study of physical and geometrical problems has often been a strong motivating factor in the development of new mathematics which in turn has contributed to the understanding of physical phenomena. In the last century the two disciplines have proceeded more independently with mathematics pursuing its fascination with abstraction. Nevertheless from time to time mathematicians and physicists discover that they are following similar lines of thought and the resulting interaction enriches both disciplines. A well-known example is the development of differential geometry and general relativity. More recently the work of physicists on the problem of quantizing classical field theory using gauge fields has provided an application of the theory of fibre bundles. The two groups, working independently, used different nomenclature, but once the links were realised the resulting activity and interactions produced mathematics of great depth and beauty along with profound insights into the structure of fundamental physical theories.

This book provides the mathematics needed to begin to appreciate this amazing parallel development of ideas. Its goal is to weave together notions from the classical gauge theory of physics with the topological and geometric concepts which become the mathematical models of these notions. Essentially it presents certain aspects of topology, algebra and differential geometry which form the foundation and vocabulary for describing gauge theories.

The author begins with a Chapter 0, designed to provide the physical and geometric motivation for the abstract mathematics which follows - ``an initial aerial view of the terrain'' as he says. He traces the notion of a gauge field using, as an example, Dirac's magnetic monopole and the classical quantum mechanical description of the motion of a charged particle in its field. This points to the need for a fibre bundle and a path lifting procedure to keep track of the particle's phase. We then get informal descriptions of the Hopf bundle, connections on principal bundles and non-Abelian gauge fields and the moduli space of the bundle. All of this is punctuated with references forward to the main text.

The following chapters deal with the mathematics - topological spaces, homotopy groups, principal bundles, differentiable manifolds and matrix Lie groups. Here Naber assumes only a solid background in analysis, linear algebra and some of the terminology of modern algebra. Exercises are liberally scattered through the text, gently leading the reader to assist in proofs or to explore particular examples pertinent to the understanding of the concept. When the going gets tough there are references back to the motivational chapter, or forward to assure the reader that this further leap into abstraction is exactly what will be needed at a later stage.

In some sections of the final chapter on gauge fields and instantons Naber again reverts to a less formal survey, providing more ``excursions into the murky waters of physical motivation'', and outlining results which require deeper mathematics.

Inevitably the book selects from topology and geometry only those topics (and they are substantial) which are needed for its purposes though there are often signposts and references to the broader fields. It is unusual to find a book so carefully tailored to the needs of this interdisciplinary area of mathematical physics. It is very self contained, all the definitions are here along with references for any results which are not proved. It is also very readable. Naber combines a deep knowledge of his subject with an excellent informal writing style. I recommend this book for graduate students and others with interests in mathematical physics, topology or differential geometry.

Gillian Thornley Massey University

Optimization: Algorithms and Consistent Approximation
Elijah Polak *Applied Mathematical Sciences, 124*, Springer-Verlag, Berlie-New York-London, 1997, 785pp, DM

118.00. ISBN 0-387-94971-2.

Contents: (Chapters and major sections)

1. **Unconstrained optimization:** Optimality Conditions.- Algorithm Models and Convergence Conditions I.- Gradient Methods.- Newton's Method.- Methods of Conjugate Directions.- Quasi-Newton Methods.- One Dimensional Optimization.- Newton's Method for Equations and Inequalities.
2. **Finite Minimax and Constrained Optimization:** Optimality Conditions for Minimax.- Optimality Conditions for Constrained Optimization.- Algorithm Models and Convergence Conditions II.- First-Order Minimax Algorithms.- Newton's Method for Minimax Problems.- Phase I.- Phase II Methods of Centers - Decomposition of Problems Using Penalty Functions.- An Augmented Lagrangian Method.- Sequential Quadratic Programming.
3. **Semi-Infinite Optimization:** Optimality Conditions for Semi-Infinite Minimax.- Optimality Conditions for Constrained Semi-Infinite Optimization. - Theory of Consistent Approximations.- Semi-Infinite Minimax Algorithms.- Algorithms for Inequality Constrained Semi-Infinite Optimization.- Algorithms for Semi-Infinite Optimization with Mixed Constraints.
4. **Optimal Control:** Canonical Forms of Optimal Control Problems.- Optimality Conditions for Optimal Control.- Algorithms for Unconstrained Optimal Control.- Minimax Algorithms for Optimal Control.- Algorithms for Problems with State Constraints: Inequality Constraints.- Algorithms for Problems with State Constraints: Equality Constraints.- Algorithms for Problems with State Constraints: Equality and Inequality Constraints.
5. **Mathematical Background:** Results from Functional Analysis.- Convex Sets and Convex Functions.- Properties of Set-Valued Functions.- Properties of Max Functions.- Minimax Theorems.- Differential Equations.

Most people familiar with (non-linear) optimization will know the name Polak in the context of the Polak-Ribière variety of the Conjugate Gradient Algorithm dating from 1969. Examining the references in the back of the book one can see that Polak's output during the 80's was largely regarding optimization of non-differentiable functions while over the past decade has been solely in semi-infinite optimization for optimal control. As stated in the first sentence of the preface, this last area is the focus of this book. Given that the author is in Electrical Engineering and Computer Science at the University of California at Berkeley and gives thanks to the Airforce Office of Scientific Research, it seems likely that Polak's recent work has been guiding the U.S. Airforce and their missiles.

The author reports that the book grew out of two sets of his graduate class notes, the first being an analysis of optimization algorithms in current use forming chapters 1 and 2. The second is a more advanced course on semi-infinite optimization and optimal control that has been transformed into chapters 3 and 4. The unifying thread is the use of optimality conditions and the description of algorithms in terms of conceptual algorithm models and then specific implementable algorithms. Chapter 5 provides mathematical background. From the outset it was clear that this book is best viewed as two books in one cover; Chapters 1 and 2 on standard optimization, chapters 3 and 4 on optimal control, with chapter 5 as a common appendix.

The goal in chapters 1 and 2 of providing a ``unifying framework'' for ``most existing optimization algorithms'' is ambitious. After all, *optimization* is an umbrella term for a broad range of problems with distinct characters. For example, model fitting often results in few-variable problems with severely non-linear objective and constraints, travelling salesperson problems typically have hundreds of variables with no constraints but a disconnected state space, image deconvolution requires million-variable optimization of weakly non-linear functions with relatively few constraints, while trajectory optimization with physical constraints requires semi-infinite optimization. Each of these problems is tackled using methods that are natural to that class but not really any other. An attempt to provide a unifying theory is not much use if it adds more baggage to the analysis than value. Not surprisingly, the framework developed is not at all a balanced analysis of current optimization but rather a catalogue-like recasting of local optimization methods (that are global for convex functions) in a light that proves to be useful for analysing optimal control and semi-infinite programming. I note that linear programming is not even mentioned while sequential quadratic programming is developed in detail.

I found the development of the various optimization methods in chapters 1 and 2 quite hard going and could not help thinking that there has to be an easier way of introducing the algorithms. The use of abstract optimality conditions for unconstrained optimization, in chapter 1, is an unnecessary obfuscation of the simple idea of local increase away from a minimum and also hinders the development of finitely constrained optimization in chapter 2. Many of the ideas are simply catalogued rather than developed. For example, on page 35 the section on the Trust Region Model begins with ``There are a number of trust region algorithm models in the literature...'' followed by a small list of references to seminal papers and formal statements of algorithm models. Those references, and the whole section, were of considerable interest to me because I know what a trust region is and why one is likely to use one. But the whole section would be virtually useless for the uninitiated or as a text.

Chapters 3 and 4 contain the brunt of the valuable material in the book. These chapters deal with recent developments in semi-infinite programming for control via the ideas of consistent approximation and epi-convergence. I am certainly not an expert in these areas, but the expository style made the material easy to read and digest.

Chapter 5 is a collection of ``essential'' mathematical facts that are included since ``no (other) book available contains all of these results''. But do we really need to reprove the assertion that a continuous function attains its infimum on a compact set? I think not. The nearly 100 pages taken up by this chapter could have been greatly reduced by referencing other texts throughout the other chapters with enhanced derivations where absolutely needed.

There were many often-unconsidered trifles throughout chapters 1 to 4 that I enjoyed snapping up. The 11 pages on conjugate gradient methods contained insights into the relative merits of the varieties of conjugate-gradient algorithms --- which algorithms also worked for non-quadratic or non-convex functions, or even for finding stationary points, and so on. Sections 2.7 and 2.8 on penalty functions and augmented Lagrangians for dealing with equality-constrained optimization gave an enjoyable consistent description of some of the theoretical results that are not often dealt with.

One generally good feature is the ``Notes'' appearing at the end of each major section, containing a reasonably informal discussion of the historical progression of ideas and issues surrounding the algorithms. I particularly valued those that dealt with some part of the development in which Polak had played a part. These provide a kind of a scientific gossip as commentary on the mathematics. But one needs to be careful with the validity of the information in the purely historical notes; For example the note on page 87 regarding local Newton methods state that Ralphson [*sic passim*] had his name associated with the methods because of his *translation* of Newton's algorithm published in 1720. Apart from the misspelling of Raphson, the note is misleading in terms of Raphson's contribution to the Newton-Raphson-Kantorovich method. In fact Raphson was a mathematician in his own right and a friend of Newton. Raphson certainly knew of Newton's laborious method of 1669 for finding the zeros of a cubic by repeated linearization with residuals combined as the last step, and its application to functions other than polynomials. But it was Raphson who extended and polished the method to use the derivative of the function with each residual added at the end of the iteration. The resulting work was published in 1690. (Further details may be found in the reference given below.) Presumably the proof-reading left something to be desired as other misspellings occur throughout the book; Fréchet is consistently misspelled as Frechet, etc. I am tempted to mention that the author is Australian, except that that might be an unnecessary slur.

In summary, one really needs to consider the two books (chapters 1, 2 on local optimization, chapters 3, 4 on optimization for optimal control) separately. The combined appendix, chapter 5, is of little value. The first of these books catalogues standard methods with background notes but is too turgid to replace the many excellent books on algorithms for optimization. Consequently, this book would not be useful as a text, besides that fact that no graduate course in New Zealand is likely to require students to buy a 500 page book costing NZ $140. The second of the books, chapters 3 and 4, is an altogether different case and could be of great interest to researchers in optimal control. In my opinion these 278 useful pages should have been published as the whole book, that would then have been a digestible and informative work on a topic of contemporary interest. If you happen to be looking for a valuable up-to-date development of the theories of consistent-approximation and epi-convergence for optimal control, I suggest you augment the price by a few dollars for a razor blade to remove the rest. You may also be interested in the 10 page errata from `http://diva.EECS.Berkeley.EDU/~polak/errata.ps` that I intend to contribute further to.

I'd like to thank Andy Phillpott (who is also acknowledged by the author for comments he made on an early draft of the book) for useful comments and also Garry Tee who provided the definitive information regarding Raphson.

Reference: N. Bicanic and K.H. Johnson Who was `-Raphson'? Int. J. Num. Meth. Engng. 1978.

Colin Fox University of Auckland

Pi

A film by Darren Aronofsky, starring Sean Gullette.

Winner, Directing Award, Sundance Film Festival. `http://www.pithemovie.com/`

Maximilian Cohen is riding hunched up on the New York subway, cradling a black go stone in his hand. It's a circle. Pi r^2. The empty go board, its rules unseen, represents the blank universe; a played game, its state. The empty board becomes strangely appealing: clean and symmetric, large enough to suggest an infinite lattice, yet finite, truncating its symmetry to a groupoid. Its cells are not quite square, the game tree is complete. Why break that symmetry? A go master once spent five of his ten hours contemplating the empty board.

Once in play, the rules don't determine the structure. But like the islands of order in our sea of increasing entropy, there are patterns. Maximilian is looking for that emergent structure. He's a mathematician.

In the small field of films featuring mathematicians---only Hollywood's *Good Will Hunting* and *Jurassic Park* and the touching Italian *Death of a Neapolitan Mathematician* come to mind---Pi is a winner. It's a movie of ideas, with intersecting streams from Rudy Rucker on cyberpunk, Jorge Luis Borges and Umberto Eco on conspiracies and hidden meaning, George Steiner on prodigies and obsession (maths, music, and chess) and Nabokov on chess and madness, all up there in high-contrast grainy black and white with a cool electronic soundtrack. Hey, *I* spent three

years obsessed with go, *I'm* a mathematician, *my* teacher had a stroke just like Max's. This is my movie! Plus, I'm seeing it in Berkeley, where the streets are filled with real crazy people, partly crazy people who've read too many popular science books, and Fields medallists, in equal proportions. That fat guy next to me with sweaty feet is probably Ted Kaczynski's brother.

That stroke---there's a suggestion that Max's teacher stumbled on something hidden in mathematics that humans just weren't meant to know. Some kind of Gödel sentence that fused his mind. Now Max, who wants to model the stock market on a home-built supercomputer that fills his apartment (shades of the Chudnovsky brothers), is getting close also. His full-complex migraines and extensive self-medication don't help much either, although perhaps the pre-fit euphorias spark creativity. He's getting close, and Wall Street devils and Hasidic angels want a piece. The Hasids bail him out, but they want the number in his head---the Name of God. Max realizes that it's not the number itself that's important, it's its meaning, and the number was given to *him*.

This Name-of-God stuff could be seen as traditional science fiction, or one can read the whole Kaballah sequence as a figment of Max's imagination: religious and persecution mania triggered by overwork. These things happen. This is a film about doing science, meaning, and mania. After all, where does meaning reside? It's partly intrinsic, and partly (lest mathematics degenerate to a list of consequences of axioms) imposed by us. To do science, you have to believe in it and give it meaning; worse, it's usually difficult and likely to fail. Occasionally you have to suspend your critical faculties and just push ahead with some weird idea. You have to hang on to it and not let go. The Pythagoreans believed all was number, and lo, all *was* number. The potential rewards are great, but there's a risk of becoming a crackpot, or of starting to see too much meaning and too many connections---mania.

The maths in this film is pretty simple: the stock market time series, the digits of pi, Archimedes' spiral and the golden ratio. I think that's much better than hiring experts to fill blackboards with the latest jargon. Coincidences and connections and hidden patterns *are* the stuff of mathematics. And, although it may give the field a bad name, some mathematicians really do study the digits of pi. The Name of God lends a suggestion of weird science. But think of Gödel undecideability, nonstandard real numbers, even standard reals supporting things like the Mandelbrot set, multidimensional string theory, infinite state quantum computing,...A suggestion of weird science is allowed.

Pi is Aronovsky's first film, the traditional low-budget debut. I hope he hasn't used up all his ideas. I can't wait for his next one.

Robert McLachlan Massey University

Dissections: plane & fancy Greg N. Frederickson, Cambridge University Press, 1997, 324pp, $31.95,

`http://www.cs.purdue.edu/homes/gnf/book.html`

How can a geometrical object like a square be dissected so that the reassembly of the obtained pieces have a certain desired property such as being three squares? Questions like this have been of interest to mankind for a long time. For example, in the translation of Book I of Euclid's *Elements of Geometry* by the Arabian astronomer and mathematician al-Sabi al Harrani Thabit ibn Qurra (836 - 901 AD) a proof of the Pythagorean Theorem in terms of dissecting two squares to one can be found (p.29).

Dissections (e.g.in the disguise of tesselations) are a well studied area of modern mathematics. However, dissection problems need not only interest the expert working in the field, but can also be fascinating to the interested amateur. *Dissections: plane & fancy* is a book which admirably addresses these problems. Its declared aim to contribute to the area of recreational mathematics has been more then reached. The way in which fairly complicated techniques and dissections (e.g. Theobald's dissection of a hexagon to a square p.129) are developed and presented turn it into an easy to digest and enjoyable book to read. Also, applications of dissection techniques such as the butterfly expanding keyboard of the IBM ThinkPad 701C minilaptop computer (p.68) are given.
The material presented is very clearly structured: objects, finally universe" dissections of squares are discussed. Their natural generalizations to polygons and polygrams are studied next. A short chapter is devoted to dissecting curve figures before the author moves on to dissections of solids (with not necessarily orientable surface) in the final chapters.

A major part of the book is devoted to impressive examples such as Varsady's dissection of six pentagons to one (p.59), and older problems such as the dissection of the crescent to the cross (p.167f) and the *Smart Alec Puzzle* (p.270) are not missing. The reader is also actively involved in the development of the material through a great variety of exercises, whose solutions are given in the final chapter of the book. Moreover, an index of all the dissections discussed as well as a very comprehensive literature list are given at the end. A great number of biographical notes and anecdotes of the people involved in the development of the theory such as H.Lindgren and S.Lyod are spread through the whole text which adds an interesting touch.

The manuscript and the figures are done with great care. However, the missing of one of the dissection figures in Reid's hexagram (Figure 9.22) and a couple of minor typos (e.g.on page 73, the roles for x and y have to be swapped when passing from Fibonacci's formula to Diophantus' formula) are genuine misprints. Dissection problems that can be reformulated as the problem of solving an algebraic equation are mostly discussed in chapters eight and nine. In

this context it would have been of help to label the dissection figures involved by the variables in the describing relation. In the same chapters, the various different dissection methods given in the context of Fibonacci's formula undoubtedly have an important part to play in the theory. However, a shortening of this chapter or a summary of these methods in form of a table at the end, probably would not have been of harm to the reader.

Summing up, the material is very well presented. This together with the agreeable writing style made the book a pleasure to read.

Katharina Huber Massey University

The Book of Numbers,

by John H. Conway and Richard K. Guy. Springer-Verlag, New York, 1996, 310pp, DM 58.00. ISBN 0-387-97993-X.

This is a book unlike any others says the dust jacket, and with justification. Its coverage is immense, from common words involving numbers, through number patterns and recurrence equations, prime numbers, fractions, algebraic and complex numbers and transcendental numbers to ordinal and cardinal infinities and surreal numbers, which can be interpreted as fractional ordinals. Along the way there are such topics as a naming system for zillions, number walls, phyllotaxis, Farey fractions and Ford circles, repeated card shuffling, continued fractions, ruler and compass constructions, constructions for regular polygons, some depending on angle trisections, calculations for pi, harmonic numbers and the games of Hackenbush and Nim. There are also many historical references. This broad sweep means that each topic is much abbreviated, and anyone familiar with any of the topics covered will find that some favourie result has been omitted.

But it is the approach which makes this book different. Informality predominates, though the statements of definitions are accurate and the statements of results precise. There is scarely a traditional proof in the whole book. Instead, maximum use is made of suggestive diagrams and tables. By looking at these and constructing the next few cases, readers can convince themselves that the results claimed are true. Not all of the illustrations are easy. The concentration on this approach will have determined the approach of the authors and limited the topics they can cover to some extent, for not everything even in this area lends itself to such an approach.

The main question a reviewer needs to answer is *Who would this book be useful for?* Certainly it would find a useful place in the library of anyone lecturing in discrete mathematics, particularly in the area of recurrence relations, where the diagrammatic approach works best. These pictures are well adapted to the needs of a lecture, and the material should extend, but not often defeat, an ordinary second-year university student. A few results would probably be beyond all but the best students. It could be a useful exercise to get students to turn these figures into traditional proofs. Besides these, there are many statements given without proof, ranging from the easy to very difficult which suggest problems that could be set. There are no collections of exercises.

The book could be used by a person working alone, but it is not ideal for that purpose. A mathematical background of roughly what a second-year university stuent is generally assumed to have is required. The use of diagrams also allows the solo reader to see the overall shape of the argument rather better than a sequence of definitions and proofs.

In any book with so many statements, it is easy to find a few quibbles. For example, early in the book is a section on words connected with number, where it is suggested that ``astronomy'' derives from counting the stars, whereas in fact it means ``the law of the stars''. A decent compromise would be ``the arrangement of the stars''. The origin of complex numbers is related by the authors to the solution of quadratics whereas, according to Boyer, the beginning was Bombelli's insight into the curious fact that when all the roots of a cubic are real, Tartaglia's solution gives real numbers in terms of expressions involving the square roots of negative numbers. But these are trivial objections. Of more significance is the treatment of the laws of algebraic operation in special arithmetics, such as that of ordinal numbers. It is demonstrated that addition and multiplication are not commutative and powers are defined, but the question of the associativity of addition and multiplication and the distributive laws are not mentioned.

In sum, this book lives up to its advertisement; a valuable resource for any lecturer in number systems or discrete mathematics, especially in the area of recurrence relations, illustrating the essentials of the subject and full of fascinating byways.

David Robinson University of Canterbury

SPRINGER-VERLAG PUBLICATIONS

Information has been received about the following publications. Anyone interested in reviewing any of these books should contact g g&# David Alcorn& Department of Mathematics& University of Auckland& (email: alcorn@math.auckland.ac.nz)g

Abhyankar SS, Resolutions of singularities of embedded algebraic surfaces. (2nd ed) (Springer Monographs in

Mathematics) 312pp. **Arnold VI**, Topological methods in hydrodynamics. (Applied Mathematical Sciences, 125) 390pp. **Aubin T**, Some nonlinear problems in Riemannian geometry. (Springer Monographs in Mathematics) 396pp. **Back RJ**, Refinement calculus. (Graduate Texts in Computer Science) 520pp. **Betounes D**, Partial differential equations for computational science analysis. 530pp. **Bochnak J**, Real algebraic geometry. (Ergibnisse der mathematik und ihrer Grenzgebiete. 3. Folge, 36) 430pp. **Borwein J**, Interactive math dictionary; The Math Resource on CD-ROM. **Cloud MJ**, Inequalities. 170pp. **Combes KR**, Multivariate calculus and Mathematica. 305pp. **Cox DA**, Using algebraic geometry. (Graduate Texts in Mathematics, 185) 495pp. **Deeba E**, Interactive linear algebra with Maple V. (Textbooks in the Mathematical Sciences) 300pp. **Douglas RG**, Banach algebra techniques in operator theory. (Graduate Texts in Mathematics, 179) 240pp. **Friedman RD**, Algebraic surfaces and holomorphic vector bundles. (Universitext) 353pp. **Fritsch R**, The four-colour problem. 225pp. **Gale D**, The automatic ant and other mathematical explorations. 255pp. **Gray A**, Modern differential geometry of curves and surfaces with Mathematica. (2nd ed) (Studies in Advanced Mathematics) 1053pp. **Harris J**, Moduli of curves: a user's guide. (Graduate Texts in Mathematics, 187) 378pp. **Hastings NB**, Workshop calculus. (Textbooks in the Mathematical Sciences) 470pp. **Havin VP**, Commutative harmonic analysis II. Group methods in commutative harmonc analysis. (Encyclopaedia of mathematical Sciences, 25) 325pp. **Ivrii V**, Microlocal analysis and precise spectral asymptotics. (Springer Monographs in Mathematics) 731pp. **Jost J**, Riemannian geometry, geometric analysis. (Universitext) 455spp. **Kobayashi S**, Hyperbolic complex space. (Grundlehren der mathematischen Wissenschaften, 318) 471pp. **Kres R**, Numerical analysis. (Graduate Texts in Mathematics, 181) 335pp. **Logan D**, Applied partial differential equations. (Undergraduate Texts in Mathematics) 210pp. **Marshall GS**, Introductory mathematics. (Springer Undergraduate Mathematics Series) 226pp. **Mero L**, Moral calculations; game theory, logic, and human frailty. 300pp. **Oksendal B**, Stochastic differential equations. (5th ed) (Universitext) 324pp. **Polster B**, A geometrical picture book. (Universitext) 300pp. **Polyanin AD**, Handbook of integral equations. (CRC Press) 787pp. **Priestley WM**, Calculus: a liberal art. (2nd ed) (Undergraduate Texts in Mathematics) 416pp. **Rudyak YB**, On Thom spectra, orientability and cobordism. (Springer Monographs in Mathematics) 587pp. **Smith L**, Linear algebra. (3rd ed) (Undergraduate Texts in Mathematics) 465pp. **Sontag ED**, Mathematical control theory. (2nd ed) (Texts in Applied Mathematics, 6) 530pp. **Srivastava SM**, A course on Borel sets. (Graduate Texts in Mathematics, 180) 250pp. **Steeb W-H**, Symbolic C++: an introduction to computer algebra using object-oriented programming. 600pp **Toth G**, Glimpses of algebra and geometry. (Undergraduate Texts in Mathematics) 335pp. **Walter W**, Ordinary differential equations. (Graduate Texts in Mathematics, 182) 375pp. *David Alcorn*

Conferences 1999

December 14 - 16 (Auckland) **Symposium to mark the retirement of John Butcher***
January 2 - 10 (Raglan) **NZMRI***
January 18-21 (Auckland) **DMTCS `99 Discrete Mathematics and Theoretical Computer Science and CATS `99 (Computing: The Australian Theory Symposium)**
Contact Bakh Khoussainov, Department of Computer Science, University of Auckland, Private Bag 92019, Auckland, New Zealand.
home-page: `http://www.tcs.auckland.ac.nz/~acsw99/`
February 7 - 11 (Mollymook, New South Wales) **ANZIAM `99 (The 35th Australian Applied Mathematics Conference)** Contact Rod Weber
home-page: http://www.uow.edu.au/conferences/anziam99/
February 11 - 12 (Mollymook, New South Wales) **Combustion Meeting in Honour of Professor Brian F Gray.**
contact Geoff Mercer
homepage: `http://www.mz.adfa.oz.au/Events/Conferences/BFG meeting.html`
February 15 - 18 (Christchurch) **Surface Approximation and Visualisation***
June 29 - July 2 (Dunedin) **NZAMT 6 2000 Minus One, Dunedin 1999**
`http://www.dce.ac.nz/nzamt6`
July 5 - 7 (Victoria University of Wellington) **New Zealand Statistical Association 50th Anniversary Conference**
`http://www.mcs.vuw.ac.nz/`
July 5-9 (Darwin) **24th Annual Conference on Combinatorial Mathematics and Combinatorial Computing (24ACCMC).**
The conference precedes a Joint Australian and American Mathematical Society Conference to be held in Melbourne Australia beginning July 12th 1999.
For inclusion on further mailing lists send your address to: website: http://www.cs.ntu.edu.au/homepages /rsvp/ACCMCC99.html
July 7 - 9 (Christchurch) **1999 New Zealand Mathematics Colloquium***.
July 12 - 16 (Melbourne) **Australian Mathematical Society 43rd Annual Conference**
`http://www.maths.monash.edu.au/~ams99`
November 24 - December 3 (Sydney) **Group Theory and Computation**
Contact Laci Kovacs

Preliminary Notice 1999 NEW ZEALAND MATHEMATICS COLLOQUIUM Wednesday 7th from 9 a.m. -

Friday 9th July at 5 p.m. 1999 (arrival possible p.m. 6th July 1999) University of Canterbury, CHRISTCHURCH. Hosted by the Department of Mathematics and Statistics Special Theme days:

- MATHEMATICS IN FINANCE
- SECONDARY/TERTIARY MATH EDUCATION

First Circular will be circulated in November 1998. *Graeme Wake*

NOTICE TO STUDENTS PLANNING TO ATTEND THE 1999 NZ MATHEMATICS COLLOQUIUM

1. The 1999 NZ Mathematics Colloquium will be held at the University of Canterbury from Wednesday 7 July until Saturday 10 July. Students who wish to apply for financial assistance to attend this Colloquium should do so when they send in their registration form. The Colloquium organisers are empowered to distribute funds on behalf of the NZMS.
2. The New Zealand Mathematical Society offers a prize, known as the Aitken prize, for the best contributed talk by a student at the annual NZ Mathematics Colloquium. It consists of a cheque for NZ$250, accompanied by a certificate. Entrants for the prize should clearly indicate their willingness to be considered for the award when they register their intention to contribute a talk at the Colloquium. Further information about the Aitken prize will published in the April 1999 issue of the NZMS Newsletter.

Stephen Joe **20-24 September 1999** Australian National University Canberra, ACT, Australia A conference and workshops on aspects of computational mathematics; scientific, technical, and industrial applications; and high performance computing. **Invited Speakers**

- Markus Hegland, Australian National University
- Steve Hirschman, Oak Ridge National Laboratory
- John Lewis, Boeing Corporation
- Terry Speed, University of California at Berkeley
- Grant Steven, University of Sydney
- Alistair Watson, University of Dundee

Public Lecture Jack Dongarra, University of Tennessee and Oak Ridge National Laboratory **Workshops**

- Data mining
- High performance computing
- Scientific visualisation and virtual environments

Organising Committee Mike Osborne, Bob Gingold, Steve Roberts, David Harrar II, Thanh Tran, Bob Anderssen, Henry Gardner, Lutz Grosz, and Markus Hegland. Further information, including deadlines, registration information, contact information for workshop organisers, etc., is available from the conference website: `www.http://wwwmaths.anu.edu.au/conferences/CTAC99/` This will be updated as further information becomes available. Further announcements will follow. David Harrar II CTAC99 Secretary Canberra, Australia David.Harrar@anu.edu.au **Symposium to mark the retirement of John Butcher**

At the end of 1998, John retires from his position at the University of Auckland which he has held for 33 years. To mark the occasion, the Department of Mathematics is organising a symposium. Details are: 14 - 16 December 1998 University of Auckland Auckland, New Zealand The following have been invited so speak at this symposium: Alan Feldstein (Tempe), Joe Flaherty (Troy), Arieh Iserles (Cambridge) Zdzislaw Jackiewicz (Tempe), Gaven Martin (Auckland), Ander Murua, Donostia (San Sebastian), Reinout Quispel (Melbourne), Manfred Trummer (Vancouver), Gerhard Wanner, (Geneva).
There will be a limited scope for additional lectures and anyone interested in presenting a lecture is urged to contact a member of the organising committee as soon as possible. The members of the organising committee are:

- Robert Chan (Chair) chan@math.auckland.ac.nz
- Marston Conder conder@math.auckland.ac.nz
- Nicolette Goodwin goodwin@math.auckland.ac.nz
- Bev Grove grove@math.auckland.ac.nz
- Allison Heard heard@math.auckland.ac.nz

Further information is available on the symposium web page, which is still being developed.
`http://www.matg.auckland.ac.nz/anode/retire.html` This has a link to an on-line registration form.

The New Zealand Approximation Theory Group presents ... Surface Approximation and Visualisation 15-18 February 1999 at Christchurch, New Zealand

The topic Surface Approximation and Visualisation will be interpreted broadly and we expect participants with interests covering the spectrum from Approximation Theory, through Numerical Analysis and Computer Aided Geometric Design, to those whose main interest is applications (e.g., data mining and geophysics). We plan to

allocate lots of time without lectures for informal interactions, including a conference trip to Hanmer Springs thermal area. Currently confirmed speakers include: B. Barsky (Berkeley), M. D. Buhmann (Dortmund), N. Dyn (Tel Aviv), R. Goldman (Rice), M. Hegland (Canberra), S. L. Lee (Singapore), T. Lyche (Oslo), D. Leviatan (Tel Aviv), C. A. Micchelli (IBM), G. M. Nielson (Arizona), A. Pinkus (Technion), R. Schaback (GÅ¡ttingen), L. L. Schumaker (Vanderbilt), Zuowei Shen (Singapore).

Please register as soon as possible to help us with our planning.
Organising committee

- Rick Beatson (University of Canterbury)
- Keith Unsworth (Lincoln University)
- Shayne Waldron (University of Auckland)

The organising committee can be contacted by e-mailing: approx@math.auckland.ac.nz. We gratefully acknowledge the support of N.Z. Math. Society : Auckland University : Canterbury University : Lincoln University

Mathematics Summer Workshop 1999 Harmonic Analysis, Riemann Surfaces, Operator Theory 2 January 1999 - 10 January 1999, Raglan, New Zealand About New Zealand Mathematics Summer Workshops These now traditional Mathematics Summer Workshops usually take place in the beginning of January and are supported by grants from the New Zealand Marsden Fund.

- December 1994 Huia, Knot Theory
- January 1996 Tolaga Bay, Integrable Models and Statistical Physics
- January 1997 Tolaga Bay, Discrete Groups and Geometry
- January 1998 Napier, Complex Analysis, Conformal Geometry

1999 Summer Workshop in Harmonic Analysis This will take place in Raglan, New Zealand, during the period 2 January 1999 to 10 January 1999. The aim of our workshop is to introduce participants to current research and methods of the Spectral Theory of Nonselfadjoint Operators and Resonance Scattering Theory for Periodic Differential Operators, which incorporate both Harmonic Analysis and Topology on Riemann surfaces with the Geometry of the corresponding Hilbert Spaces. We also plan to cover some interesting applications of Spectral and Scattering Theory. The workshop will feature several main series of lectures by prominent analysts. There will also be scheduled lectures by other participants, organized to some extent into minisymposia. It is hoped to make provision for impromptu presentations on work, as it develops, arising from discussions amongst people taking part in the workshop. **Venue** This time the school will be in Raglan, a small resort on the west coast of the North Island, about 160km from Auckland. The venue will be the campus of the local school in Raglan, which will provide two lecture rooms (and sporting facilities). The weather in New Zealand during early January is usually stable and mild. **Workshop format** There will be two lecture sessions per day 9.30-12.30 and 5-9 (with a dinner break). It is planned to take Wednesday off (details of available activities are not yet available). It is anticipated that participants will want to spend part of this week working amongst themselves and the organizers will do all they can to facilitate this. It is expected that there might be a need to arrange times for informal and impromptu presentations; times for this will be scheduled into the program as the details become known. **Invited speakers** The following internationally known speakers have agreed to present series of lectures at the workshop: Professor L.Carleson (Stockholm), Professor M.Cowling (Sydney), Professor L.Faddeev (St. Petersburg), Professor D.Sarason (Berkeley), Professor H.Widom (Santa Cruz), Professor C.Sadosky (Washington),Professor S.Treil (Michigan), Professor V.Vinnikov (Rehovot) **Draft Program** A draft program, for the workshop (and the relevant link) will be available upon construction. Please let the organizers know as soon as possible of any late offers to speak at the workshop and we will do our best to accommodate you. Existing speakers are also invited to let the organizers know of any change they feel is necessary. **List of Participants** The link to a list of people who have already registered will be available upon construction. **Accommodation** For registered participants the Organizing Committee reserves lodging in Raglan and two meals a day (lunch, dinner). **Important Dates** 15 September - Deadline for booking lodging. Please confirm your participation for us before this date or as soon as possible after that. **Organizing committee**

- David Gauld gauld@math.auckland.ac.nz
- Vaughan Jones vfr@math.berkeley.edu
- Boris Pavlov pavlov@math.auckland.ac.nz

Details Contact Sergei Federov at email `sergei@math.auckland.ac.nz`
SECOND SUMMER TOPOLOGY MINICONFERENCE IN DEVONPORT In February this year we escaped Auckland's CBD power crisis to talk in Devonport about our current research. We shall be meeting again on 19 February 1999 and invite anyone who is interested to join with us. The day involves 20 minute talks with breaks for coffee, lunch, and this year (we hope) a conference dinner which will cost each of us about $15 plus drinks (byo?). There will be no registration fee. Any visitors who happen to be in Auckland when the miniconference is held would be especially welcome. Please contact Sina Greenwood for further information.

Centrefold

Dean Halford

In June this year, the mathematics staff at Massey University marked the retirement of their longest serving member, an academic whose career here outspans that of Massey University itself. In 1962 Dean Halford was appointed as a Junior Lecturer in mathematics, at the Palmerston North University College, a feeder college for Victoria University, teaching first year undergraduate courses at Palmerston North and taking the responsibility for teaching university courses extramurally throughout New Zealand. Dean had just completed his MSc at Canterbury, studying under Professor Derek Lawden, presenting a thesis ``On the Cosmological Problem''. His appointment at PNUC was a return to the Manawatu district of his childhood.

In 1964 PNUC merged with Massey Agricultural College to become New Zealand's fifth university. The university was initially named Massey University of Manawatu, the geographical component was soon dropped to give it its current title. During his 37 years service to Massey University and its precursor, Dean has played a major role in developing the discipline of mathematics, from a single first year paper, to a fully fledged programme from undergraduate to PhD studies, both internally and extramurally. A particular programme Dean keenly pioneered in conjunction with the Physics department, was the BSc and BSc(Hons) degrees in Mathematical Physics, a particularly popular and successful programme, attracting top students from both disciplines. He quickly rose through the academic ranks, promoted to a readership (Associate Professor) in 1981, and was Head of Department from 1995 to 1997 (In 1998 the department was absorbed into the Institute of Fundamental Sciences.) Dean played a prominent role in the wider administration at Massey, serving on numerous faculty and university committees, including 5 years as staff representative on Academic Board, secretary of the local branch of the Association of University Teachers, and University Proctor from 1993 until his retirement.

When the opportunity arose, Dean completed his PhD, studying under Professor Roy Kerr (then at Canterbury) with his thesis entitled ``The Conformal Group and Einstein Spaces''. Although he had previously published research papers, this marked the establishment of an enhanced research activity, leading to 26 papers to date, mostly in the area of mathematical physics. During this period he also supervised 3 PhD students. He is currently engaged in writing a textbook on Differential Equations and Symmetries.

However Dean's contribution has not been confined to activities at Massey. He has also made a substantial national contribution to the mathematics community, and in the broader educational arena. He was a foundation member of this Society, serving as President (80-81), on the Council (78-82), was editor of this newsletter (78-80), as well as serving in a number of other roles. He was senior author of the Society's successful 7th textbook *Mathematics with Calculus*.

In 1981 Dean was elected to the Board of Governors of newly established Awatapu College in Palmerston North, becoming chairman in 1984, continuing in this role with the chairmanship of its succeeding body, the College Board of Trustees, until 1994. During this period he became a member of the New Zealand Secondary School Boards' Association (from 1983), taking the presidency 87-89, and was a substantial contributor in 89-90 to the formation of the New Zealand School Trustees Association. He had significant interaction with the Minister of Education and the ministry on the introduction of ``Tomorrow's Schools'', in the development of the core curriculum review, and on other ministerial committees. For these and other services to education Dean was honoured by the award of a New Zealand 1990 Commemoration Medal by Queen Elizabeth.

However Dean's retirement is only partial. After a relaxed holiday in Europe with his wife Anne, Dean is returning to Massey on a part time basis. As well as continuing his research and some teaching activities, he will retain his role as the Deputy Head of the Institute of Fundamental Sciences, a grouping that incorporates mathematics, physics and chemistry. And of course, there's that textbook to be completed.

I will remember Dean especially for the mentoring role he provided me during my initial two years at Massey University as a Junior Lecturer and also for the significant guidance and support throughout our shared time later here. His ability not to be swayed under pressure when he stood ground on sound principles, his knowledge of correct and effective procedures, his unswerving enthusiasm for the benefit of students, together with his personal interest in the welfare of all around him, will always be with me. I value Dean's friendship and collegiality and look forward to many more years of working closely with him.

Mike Hendy

First South East Asian Mathematical Olympiad

In early September this year I was invited to Penang to Chair the Jury for the First South East Asian Mathematical Olympiad. This meant that over the period of a week, I saw a great deal of the inside of small rooms and very little

of Malaysia.

This Olympiad was based on the International Mathematical Olympiad (IMO) but differed from it in a few important respects. The most obvious was size: nine countries were represented by four students each. This made the Jury a much more intimate group. As a consequence all Team Leaders put in an extraordinary effort as we worked flat out for several days; first setting the problems, then marking the students' work.

Another interesting difference was the examination itself. There were three parts to the assessment. The first one was a 'short answer' test, which consisted of 20 questions that lasted for 120 minutes. Each question was worth just one mark so this test was easily marked. The second one contained longer problems, nearer in style to IMO problems. Here the students had 180 minutes to answer 5 questions. These questions were given 7 marks each and naturally proved more difficult to mark. Finally there was a team test. Here all the students from a country worked together on a set of 10 problems worth 20 marks, each over 60 minutes.

As a result of all these problems, there were individual winners (using a gold, silver and bronze medal system like the IMO) and team winners. The gold team prize went to Vietnam, the silver to Singapore and the bronze to Thailand.

I have written a longer report that will appear in the November Newsletter of NZAMT. Anyone who doesn't regularly see that Newsletter can get a copy of that report by writing to me C/- Department of Mathematics and Statistics, University of Otago, PO Box 56, Dunedin. (Please don't send email!) *Derek Holton*

Notices

REPORT ON THE 13th GENERAL ASSEMBLY OF THE INTERNATIONAL MATHEMATICAL UNION (IMU)
by Rob Goldblatt

I attended this four-yearly meeting during August 1998 in Dresden, Germany, as the New Zealand delegate. In this report I will give some background on the nature and functions of the IMU, and record the main outcomes of the 13th General Assembly.
Mission The statutory objectives of the IMU are

- to promote international cooperation in mathematics;
- to support and assist the four-yearly International Congress of Mathematician (ICM) and other international scientific meetings or conferences;
- to encourage and support other international mathematical activities considered likely to contribute to the development of mathematical science in any of its aspects, pure, applied, or educational.

Organisation The IMU is affiliated to the International Council of Scientific Unions (ICSU). There is an Executive Committee overseeing IMU activities, many of which are associated with various Commissions, including:

- ICMI: the International Commission on Mathematical Instruction, which organises the International Congress on Mathematical Education (ICME).
- CDE: the Commission on Development and Exchange, whose mission is to encourage the growth of mathematics in developing countries and support exchange of visits with member countries where there are obstacles (such as non-convertible currencies).
- ICHM: the International Commission on the History of Mathematics. This is a joint commission between the IMU and the International Union of the History and Philosophy of Science (IUHPS).

The General Assembly elected a new Executive Committee, as well as new memberships for ICMI and CDE, and representatives on ICHM. The IMU President for 1999-2002 will be Jacob Palis (Brazil), and the Secretary will be Phillip Griffiths (USA). The ICMI President will be Hyman Bass (USA). There is no International Congress for computer science. Different areas have their own conferences, such as Foundations of Computer Science (FOCS) and Symposium on the Theory of Computing (STOC), but there is no meeting at which theoreticians interact with practitioners in software engineering, architecture etc. The current IMU President, David Mumford, reported that in 1995 the IMU sponsored a meeting in Paris with leaders in computer science to discuss the formation of an International Union of Computing Science and Informatics. This initiative foundered on the lack of support from US computer scientists, who consider that their national organisations (IEEE, ACM) are already sufficiently international, and that there was little to be gained from such a broad meeting. Professor Mumford also expressed the view that ICMI is at a cross-roads, and faces the issue of whether it should evolve into the professional organisation for research into mathematics education, or whether it should be the arena for mathematicians to discuss educational issues with education researchers.
Membership IMU has about 60 member countries, in five Groups. Members of Group N are entitled to send N voting delegates to the General Assembly. (There were around 140 delegates at Dresden.) New Zealand joined in

1970, and is in Group I along with about 25 other countries. Group V contains China, France, Germany, Japan, Russia, United Kingdon, United States of America, and the new members Canada, Israel, and Italy, who moved up from Group IV this year. New Zealand has maintained the practice of appointing the President of the New Zealand Mathematical Society as its delegate to the IMU. I observed that this is typical of the policy of many countries. Each member country is linked to the IMU by an Adhering Organisation. In our case this is the Royal Society of New Zealand, which pays the annual IMU subscription and contributes to the expenses of the delegate to the General Assembly. The subscription is a non-linear function of Group number, with Group V countries paying ten times as much as those in Group I. A notable Statute change approved by this Assembly was to allow for affiliate membership of the IMU by professional societies (eg SIAM) and multi-national mathematical societies (eg European Mathematical Society, African Mathematical Society).

International Congress of Mathematicians The IMU Executive Committee appoints the programme committee that determines the scientific content of the ICM, and the committee that selects the recipients of the Fields Medals that are awarded at each ICM. President Mumford observed that there is a need for the ICM to continually rejuvenate as mathematics develops and changes. The tendency towards specialisation can lead to fragmentation into sub-disciplines, producing a decrease in communication and disagreements over which fields should be represented at the ICM, and how many speakers there should be in each. For ICMÃ•98, held in Berlin, invited speakers were asked to make a special effort to communicate to a wide audience, and attempts were made to respond to a call for more applied topics by inclusion of sessions on statistics, operations research and the mathematics of computer science. Also, the identity of the Chair of the Programme Committee was made public, to allow dialogue with the community about appropriate speakers and subject area, while the rest of the committee remained anonymous. The Chair (Phillip Griffiths, USA) reported that this practice had worked well.

ICM 2002 It was decided by written ballot that the next ICM will be held in Beijing, China. (The other candidate was Norway, which will be hosting a conference in 2002 to mark the bicentennial of Abel.) The Executive Committee recommended the Chinese application to the General Assembly under the fundamental assumption that all mathematicians of the world will be allowed to participate in the meeting, in accordance with ICSUÃ•s principle of free circulation of scientists.

Commission on Electronic Information and Communication It was resolved to establish this new Commission (CEIC) to address issues arising from the emergence of the internet and electronic publishing, and the need for international standards on electronic communication between mathematicians. The debate on this matter was lively, traversing many issues. Can the IMU play a coordinating role in a decentralised system of communication? Will member societies that depend on traditional paper publication for revenue be disadvantaged by the growth of electronic journals? Will poorer countries become isolated by their lack of electronic infrastructure or funds to pay for access to foreign archives? What is the definition of the final form of an electronic publication (and what happens if its URL disappears)? What should be the relationship between the IMU and large commercial publishers (including for example the American Mathematical Society) in relation to these matters? An Ad Hoc Committee was appointed, to be chaired by Peter Michard (Germany), which will decide terms of reference and initial additional membership of CEIC. Recommendations will be sent to adhering organisations for approval by mail ballot.

Equity Resolution The following was resolved: ``Building on the resolutions adopted at the 1986 and 1990 General Assemblies, the IMU shall continue to endeavour to attract the participation of all mathematicians. Subfields of mathematics, women and mathematicians in smaller countries and areas should not be overlooked in IMU activities".

World Mathematical Year 2000 IMU declared in 1992 that 2000 will be World Mathematical Year. The declaration set three goals:

- the determination of great mathematical challenges of the 21st century;
- the promulgation of mathematics, both pure and applied, as one of the main keys for development; and
- the recognition of the systematic presence of mathematics in the information society (the image of mathematics).

A server has been established in Paris which provides information about the progress in organizing WMY 2000 (see below for the URL). A series of Newsletters (six so far) are available from this server, which can also be reached through the IMU website (URL also below). In pursuit of the first goal, a book entitled ``Mathematics Tomorrow" is being edited by a team chaired by Vladimir Arnold. It is expected to contain articles by more than thirty leading mathematicians, including many Fields Medallists, about how they see the present state of mathematics, its main problems and prospects for the coming century. The book is due for publication by the IMU in mid-1999.

Finances It was reported that the IMU is in good financial health, with reserves being more than twice the annual budget. Consequently it was decided that there will be no increase for the next four years in the annual subscription, which remains at 1200 Swiss Francs for Group I countries. About one-third of the planned expenditure for 1999-2002 is for administration costs, including costs of the secretariat and Executive Committee, contributions to ICSU, production of the IMU Bulletin and the World Directory of Mathematicians etc. The other two-thirds is to support the scientific activities of ICMI, CDE, ICM and various symposia and IMU lectures. Further Information and References

1. **IMU Website** `http://elib.zib.de/IMU` This contains a wealth of information about the IMU and its various activities, lists of member countries, and links to other mathematical sites.
2. **WMY 2000 Paris Server** `http://www.math.jussieu.fr/jarraud/wmy2000/ma2000.html`
3. **Bulletin of the International Mathematical Union, No. 42, June 1998 (Special Number).** Provides much

information, news and reports, including accounts and budgets, concerning the activities over the last four years of the IMU and its Commissions and other activities. I have a spare copy that I can forward to anyone interested.

4. **Mathematics Without Borders, by Olli Lehto, Springer-Verlag 1998, ISBN 0-387-98358-9.** This book is a comprehensive history of the IMU written by a former IMU Secretary. It was launched at the Berlin ICMÃ•98.

Grantee Reports

Jiling Cao University of Auckland I am grateful to the New Zealand Mathematical Society, the mathematics department of the University of Auckland and Prof. Ivan L. Reilly for their financial support which enabled me to attend the International Colloquium on Topology at Gyula, Hungary, in August 1998. This Colloquium on Topology, which is organized by the Janos Bolyai Mathematical Society of Hungary every five years, attracts famous topologists from all over the world. There were 70 participants this year. I enjoyed this conference and the talks presented there very much. It allowed me to meet people, make more friends, and discuss my research problems with other mathematicians. I really benefited from participating in this conference Again, I would like to thank the New Zealand Mathematical Society for its generosity and financial assistance.

Kerry Richardson University of Auckland I wish to thank the NZMS for financial assistance in attending General Topology and its Applications conferences in Mexico City, June 24-27 and in Gyula, Hungary, August 11-15.

I spoke on a consistency result in set theory using iterated Sacks forcing which partially proves: Is the normal Moore space conjecture consistent with the cardinality of the reals being , assuming large cardinals?

There were 121 participants at the conference in Mexico City and 55 in Gyula.

Mexico City has a population of 25 million according to a local Taxi driver. In spite of that the population density is lower than many other cities. A cultural highlight was climbing a Mayan sun pyramid. This was one of two pyramids, the other called a moon pyramid, that are part of an ancient Temple city which at one time had a population of 200,000 people.

Gyula is a Hungarian town at the border of Transylvania, about 16 kilometres from the Hugarian/Romanian border. There was an Indonesian restaurant in Gyula and featured on it's menu were ``shellfish dishes from New Zealand''. I stayed with a geologist in Budapest. The streets are lined with buildings riddled with bullet holes from WWII. Just around the corner however were two of Hungary's best secrets. The opera house which is claimed to be acoustically third best in the world after La Scala in Milan and the opera house in Paris. The other little secret I found in a butchers, Tokaji wine. The 1983 Tokaji Oremus dessert wine is unique.

Coralie Daniel University of Otago

I wish to thank the Mathematical Society for their support of my attendance at the invitational meeting of the International Commission on Mathematics Instruction in France in April, and for their financial contribution towards my expenses. The week-long conference was held at CIRM (Center International de Rencontres Mathematiques), at the Luminy Campus of Marseilles University. CIRM is home to the SMF (Societe Mathematiques de France) and has a worldwide reputation for organizing meetings on various mathematical subjects (and is described at http://www.cirm.uni-mrs.fr).

The conference brought together sixty-five participants from twenty-seven countries. Less than a quarter of our number came from countries outside of Europe or North America, and I was the only participant from New Zealand. The purpose of the conference was to begin the writing of a book on the use of history in the teaching of mathematics. The publication date of the book is planned to coincide with the 9th International Congress on Mathematics Education in Tokyo, in 2000. John Fauvel, this year's NZMS Visiting Lecturer, and Jan van Maanen, from the Netherlands, are the co-authors of the book. Conference participants were invited for their ability to work on a specified chapter, but were also asked to select one other chapter to which they were willing and able to make a contribution.

I was invited in order to contribute on the use of the history of mathematics in support of the educational needs of mathematically gifted and talented students, and the relationships of thinking and learning aptitudes. In this group each person was asked to contribute from their own specific research area on different groups of students with requirements for specific attention including gifted students, adults returning to education, primary school children, students in less well resourced countries or environments, etc, and so while the sharing of research and ideas was extremely interesting, it did not lead to controversy among the group.

I elected to join the group writing a chapter on the philosophical, interdisciplinary and multi-cultural aspects of using history in the teaching of mathematics. This group turned out to be particular explosive in discussion, principally because its members had strong, and sometimes different, views on the extent to which mathematics is embedded in

culture, and the ways in which the mathematics of non-european cultures have contributed to the body of mathematical understanding. Only three of the nineteen of us in this group came from the Southern Hemisphere, and we found that we had a very special contribution to make in regard to expressing the idea that the diversity, rather than the universality, of mathematical developments allows the world and its history to enter the classroom in a way that does not have nationalist or racist or colonial connotations. I found that many of the attitudes New Zealanders have learned through coming to terms with biculturalism and Treaty of Waitangi obligations provided words and ideas which it was important to have expressed in that context. Consequently, I was asked by the group to be the first writer of the draft for the section on multiculturalism. I felt that this in itself warranted the efforts to help me attend, made by the University of Otago and the NZMS.

I thank the Society for their financial support; and I am delighted to be able to report that since the conference individual members of the Society have been interested to discuss the chapters to which I am a contributor and thus have helped stimulate and focus my thoughts for the writing side of the conference tasks.

APPLICATION FOR FINANCIAL ASSISTANCE
Please fill in where appropriate

Name of Applicant:

Address:

e-mail:

Academic Affiliation / Official Status / Present Position:

NZMS Status:Ordinary member / Student member /
Other (give details)

Signature: Date:

Type of assistance sought:

(a)Student Travel Grant

(b) Research Grant: conference/travel/other

(c) Grant from South Pacific Fund

(d) Conference/Workshop Organisation

(e) Other (please specify below)

Estimated total expenditure:

Other sources of assistance sought/approved (please specify below):

Please send this application (and any supporting documents or other evidence) to: Dr Stephen Joe, Secretary, NZ Mathematical Society,
Department of Mathematics, The University of Waikato,
Private Bag 3015, Hamilton The NZMS Council normally considers these applications at its meetings in July and November each year, but applications may be considered at other times in exceptional circumstances.
