THE NEW ZEALAND MATHEMATICAL SOCIETY (INC.)

NEWSLETTER

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PUBLISHER'S NOTICE

The Newsletter is the official organ of the New Zealand Mathematical Society Inc. This issue was assembled at the University of Auckland and offset printed in Dunedin. The official address of the Society is:

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

However, correspondence should normally be sent directly to the Secretary:

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LOCAL NEWS

DEPARTMENT OF STATISTICS
Wellington

Barry Wells, Mark Jones, and Jennifer Mason have joined Math Stats in Wellington. Vince Galvin visited the Australian Bureau of Statistics in August, to learn about the redesign of their Current Population Survey.

We now have our Sun workstation. The first major project done on it has been a study of graphical editing of survey data.

Jelke Bethlehem, of the Dutch central statistical office, postponed his previously planned visit because of the Gulf war. He is now visiting the Auckland, Wellington and Christchurch offices of the Department in early November. He will be holding discussions covering the whole range of his statistical interests, from computer assisted data collection to techniques for ensuring confidentiality of data.

The present Government Statistician, Steve Kuzmicich, retires in December. The Statistical Association is farewelling Steve by holding a halfday meeting in Wellington on 14th November, where invited speakers will talk on areas of Official Statistics which have been of special interest to Steve during his career.

Mike Doherty

DSIR PHYSICAL SCIENCES,
Applied Mathematics Group, Wellington

We have had a quiet time at Applied Maths, Wellington recently. Since the last Newsletter we have learned our likely place in the C.R.I. structure. Most of Applied Maths will join the National Institute of Industry Development, except for staff at our Palmerston North and Lincoln substations who will join a local C.R.I. Now, however, we face a period of uncertainty over which staff will be employed by the new C.R.I., and under what conditions. Currently all 'funded' scientists will be automatically transferred, but others may have to apply for a smaller number of positions.

Much of our time lately has been spent preparing bids for next year's funding, July 1992 to June 1993. This is a somewhat difficult task, since much of this year's work has only just got underway, and it is not clear where it is heading.

Ray Brownrigg from our Computing section has continued the exodus to Victoria University, joining ISOR last month. Mathew Hobbs has joined the OR section for a few months to help with one or two projects.

Graham Weir travelled to China in August to speak at the International Symposium on Computer Applications in Geoscience. Stephen White had a trip to Japan to install some software we developed for a geothermal company. Deborah Donnell spent a couple of months at Bell Corp in New Jersey, and at Seattle. David Rhoades presented a paper at a conference for the International Union of Geology and Geophysics in Vienna. Bruce Benseman has been travelling to Melbourne to set up a production planning system for a large food company. John Burnell presented a case study at the Industrial Mathematics Workshop at Waikato. Warwick Kissling has taken few months leave to travel around Europe.

Recent seminars were given by Ross Woods (DSIR, Hydrology Centre), Bill Stephenson (DSIR, Land Resources) and Tom Mosgaller (Madison City Council). A seminar on the New Zealand Software Industry was given by two Harvard graduates who worked on the Porter Project.

John Burnell

UNIVERSITY OF AUCKLAND
Engineering Science

In August we farewelled Robert McKibbin, who has moved to a Senior Lectureship at Massey. Also in August, Mike O'Sullivan and David Bullivant visited the USA. They both attended a Conference on the Applications of Mathematics at Washington, D.C. At the same time Andy Philpott and David Ryan attended the 14th International Symposium on Mathematical Programming at Amsterdam, and Andrew Pullan visited the CSIRO Environmental Mechanics Division at Canberra. The book *Convection in Porous Media* by Don Nield and Adrian Bejan has been published by Springer. Although he is officially retired, Mervyn Rosser has been back with us. He and Don Nield have now completed 30 years each on the staff of the University of Auckland.

Seminars

Prof. Roger J.B. Wets (U.C. Davis) An introduction to stochastic programming.

Prof. W.W. Cooper (U.Texas at Austin) An introduction to data envelopment analysis.

Prof. R.J. Gribben (U. Brunei) Models of thin liquid film flows.

Dr David Robb (U. Calgary) Scheduling in a management context: difficulties and ideas.

Prof Sean McKee (U. Strathclyde) Mathematical problems that arise from a multinational company.

Mark Craddock (DES) Adaptive discretization for the solution of continuous-time linear programs.

Yang Zhongke (DES) Hydrothermal eruptions in the Craters of the Moon, Wairakei: Their causes and simulation.

Gary Pemberton (DES) A solution for dispersion in non-linear turbulent channel flows, with sedimentation and erosion.

Ivan Brunton (DES) Solution of variable coefficient PDEs using the boundary element method.

Martin Nash (DES) Mathematical modelling of active cardiac mechanics.

Greg Sands (DES) Electrical activation of cardiac muscle.

Paul Day (DES) Domestic air crew rostering for Air New Zealand.

Colin Ives (DES) A multi-commodity flow model for New Zealand oil distribution.

Dr Mark McGuinness (VUW) Chaos: a walk through the garden.

<div align="right">D.A. Nield</div>

Mathematics and Statistics

Peter Lorimer has been promoted to a Personal Chair; and he has been awarded a Claude McCarthy Fellowship to visit Sydney, Perth and London in June and July 1992.

Gaven Martin has set a noteworthy precedent by getting promotion to Associate-Professor within a year after promotion from Lecturer to Senior Lecturer. Keep up the good work, Gaven!

After recently losing several members from our Department, we are now gaining an influx of new people: Dr Robert Chan, who had gone to Toronto on a Post-Doctoral Fellowship, has been appointed as Lecturer for the Tamaki Campus, where he has been lecturing for the 3rd term. He also has an office in the Department on the City Campus. Dr A. Guyan Robertson (at Edinburgh), Dr David McIntyre (at Reading) and Dr An Jiang-Bei (at Chicago) have been appointed as Lecturers, Dr Ilze Ziedins (at Heriot-Watt University, Edinburgh) has been appointed as a Lecturer in the Statistics Unit, and Dr Vivien Kirk (at Berkeley) has been appointed as a Lecturer in the Applied and Computational Mathematics Unit. Jill Ellis was appointed to a 1-year Lectureship for 1991, and she has now been appointed to a 2-year Lectureship. Lynne Gilmore has been promoted from Tutor to Senior Tutor, for the Tamaki Campus. Dr Horst Gerlach has been appointed (for 3 years) as Tutor in the Applied and Computational Mathematics Unit. Brent Everitt is an Assistant Lecturer for the 3rd term. Mrs Janet Triggs of St Dominic's College has been appointed as Teaching Fellow for 1992.

Dr Cathy Macken, who had been on leave at Stanford, has resigned to accept an appointment at Los Alamos.

Dr Norman Levenberg, from Wellesley College (Massachusetts), is visiting for the 3rd term, and is teaching a postgraduate course on complex analysis. Dr. Nick Dudley-Ward is here for a year, on a Post-Doctoral Fellowship from the University of York. He is teaching courses on Metric Spaces and on Real Analysis.

Andrew Balemi has returned to graduate study at Seattle, after 2 terms back here as a Tutor at Tamaki.

M. K. Vamanamurthy has gone on leave to the University of Michigan, East Lansing.

In the Department of Computer Science Associate-Professor Bob Doran has been promoted to Professor, and Dr Jeremy Gibbons, Dr En Cao and Dr Xin-Feng Ye have been appointed as Lecturers.

Ivan Reilly led the NZ Mathematical Olympiad team at Sigtuna in Sweden, and Gordon Hookings (as deputy-Leader) escorted the contestants to Sigtuna. They arrived 4 days before the contest, which gave them time to overcome jet-lag and to enjoy some sight-seeing excursions arranged by their hosts. The 1991 team maintained the steady progress of the previous teams, by coming 29th equal out of 55 teams.

After IMO, Ivan delivered a paper at the 7th Topological Symposium in Prague, and then went to Moscow as guest of the All-Union Committee for Mathematical Olympiads. He addressed the Institute of System Studies at the USSR Academy of Sciences about the problems facing a small country which is competing at the IMO with teams representing much larger countries, and he gave two seminars at the Department of General Topology at Moscow State University. He then visited Helsinki and Thessalonika, delivered a seminar on topology at Graz and attended the Conference on Uniform Mathematics at Berne. Ivan Reilly and David Gauld attended the Summer Conference on General Topology and Applications, in honour of Mary Ellen Rudin and her work, which was held at the University of Wisconsin-Madison on June 26th to 29th.

Gaven Martin visited the Mathematics Institute at ANU, and also called *en route* at the University of Sydney.

Dr Stuart D. Scott gave an invited 1-hour lecture to the International Conference on Near-Rings and Near-Fields, held at Linz in Austria on July 14-20.

At the 1991 Conference of the NZ Statistical Association, held at Wellington in August, Ross Ihaka gave an invited address on "Estimating earthquake source parameters", and Steven Thompson gave an invited address on "Adaptive cluster sampling". Papers were contributed by Peter Danaher on "Statistics in business: a little goes a long way", by Alan Lee on "The behaviour of Liang-Zeger estimates in bivariate logistic regression", and by Chris Triggs on "What do you do with the results of 27 different ANOVAs?" The NZ Statistical Association sponsored our graduate student Gita Mishra, who contributed a paper "On confidence regions for canonical variates—comparison of methods of construction".

Margaret Morton attended the 1991 Conference of the NZ Association of Mathematics Teachers, at Wellington in September. The J. T. Campbell Prize for Excellence in Teaching was awarded there to Christine Anderson, who is a Tutor in our Department for 1991.

The NZMS Visiting Lecturer, Professor Douglas Bridges (Waikato) delivered a Public Lecture on "Noncomputable numbers" (October 10), and a seminar on "Compactly generated Banach spaces" (October 11).

Our Temporary Tutors have departed to the Northern Hemisphere for post-graduate study: Melissa White to Waterloo, Cecil Smith to Minnesota, Geoffrey Pritchard to Madison, Paul Taylor and James Reilly to Ann Arbor.

Left to right: Melissa White   Cecil Smith   Geoffrey Pritchard   Paul Taylor   James Reilly

Photo: Alison Ashton

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Seminars:

Dr Chris Godsil (Waterloo), "Hermite polynomials and complete graphs".
Prof. Derek Holton (Otago), "Cyclic graphs—is it mathematics?".
Dr Vivien Kirk (Berkeley), "Resonance behaviour in ordinary differential equations".
Warren Moors (University of Newcastle), "Continuity properties related to measures of non-compactness".
Prof. Keith Worsley (McGill), "Maxima of random fields, with an application to positron emission
tomographic images".
Dr Andrew McDougall (Rutgers), "Robust methods for recursive ARMA estimation".
Dr Di Cook (Rutgers), "Direction of motion control in the Grand Tour".
Paul Bonningon (Waikato), "Homology of edge-coloured graphs".
Dr. John Wilson (Cambridge), "Infinite soluble groups: group theory or number theory?".
Mary Barnes (Sydney), "Introductory Calculus Project".

The series of mini-seminars within the Department has continued on Wednesdays.

G. J. Tee

UNIVERSITY OF CANTERBURY
Mathematics

Peter Renaud has taken over the reins of office -- or is it the overdraft?

We have been engaged in a series of brainstorming meetings in an attempt to determine future directions for the department.

Several people have returned from conference and Erskine leaves: Mark Hickman has returned from a General Relativity conference in Kyoto. Rick Beatson has returned from a workshop on radial basis approximation in Cambridge. David Wall has returned from Erskine leave. As well as the ICIAM conference in Washington DC, and the IMACS conference in Dublin he attended a memorial session to Professor R.H.T. Bates at the North American Radio Science meeting in London, Ontario. Professor Bates was, of course, based in the Electrical Engineering department at Canterbury and a correspondent for this Newsletter. Frank Lad, Murray Smith and John Deely all attended the conference on Bayesian Statistics in Science and Technology at Carnegie-Mellon University, Pittsburgh. Frank did so in the middle of a three-month Erskine leave taking him to North America, Britain and France.

Professor Will Light from the University of Leicester visited for two months from mid-August. Will gave us a seminar series on the multigrid method, and a seminar on the Strang-Fix conditions for analyzing the convergence properties of various approximation processes.

We also had Professor Jim Dickey from the University of Minnesota, as an Erskine visitor in July and August.

Professor Dickey gave a series of talks on statistical uses of multiple hypergeometric functions.

Other Seminars

Professor Gina Mladineo (Ryder College, New Jersey), "A stochastic approach to global optimization of Lipschitz continuous functions."
Peter Renaud, "Probability Theory and Legal Reasoning."
Professor Douglas Bridges (Waikato University), "Varieties of Constructive Mathematics" and "Noncomputable Numbers."
Professor Aleksander Pelczynski (Polish Academy of Sciences), "An analogue of the M. and F. Riesz Theorem for spaces of smooth functions."
Frank Lad, "Synchronicity of pilot whale strandings with phases of the moon."
Neil Watson, "How I found a simple proof without looking for it."
Mark Hickman, "Algebraic computing friend or foe?"
and finally the talk whose speaker narrowly escaped a well-earned tar and feathering:
Bill Baritompa, "Pictures are the only important part of mathematics."

Rick Beatson

MASSEY UNIVERSITY
Mathematics

The brain drain from Auckland to Massey continues with the recent arrival of Robert McKibbin (from Auckland's Department of Engineering Science) to take up a Senior Lectureship; while Helen Renwick, Robert's wife, has been appointed as Massey's University Librarian. However, it seems that a counter-current exists— Paul Bonnington, having recently moved from Massey to Waikato, will be moving further north next year to take up a position at Auckland. Congratulations to Paul on his recent successful defence of his Ph.D. thesis.

Graham Weir, head of the Mathematical Physics Section of Applied Mathematics Group, DSIR Physical Sciences, has taken up a part-time position as a Senior Research Fellow at Massey. This position, which will be held in parallel with his DSIR appointment, requires Graham to travel to Massey for several days each month. The aim is to establish joint projects and programmes in Applied Mathematics within the new School of Mathematical and Information Sciences, and to encourage interaction between applied mathematicians at Massey and in Wellington. Graham will also contribute to post-graduate research and give some graduate lectures.

Chris Price has been appointed as a temporary lecturer in Operations Research—his particular interest is nonlinear optimization.

Seminars

Bruce van Brunt (Massey), "A special class of functional differential equations"

Professor Nai Xing Chen (Chinese Academy of Sciences), "2-D and 3-D numerical modelling of internal fluid flows"

Michael Carter (Massey), "Partitions and the Faa di Bruno formula"

Professor Sean McKee (Strathclyde), "Industrial mathematics: case studies"

Dr Russell James (geothermal consultant), "Steam-water discharge at Mach 1: a geothermal experience"

Mike Hendy (Massey), "The use of computers in mathematical proof"

Nicola Jayne (Massey), "Legendre Foliations"

Glenda Anthony (Massey), "Learning approaches and study patterns of distance education students in mathematics"

Gordon Knight (Massey), "'A formula is a leather armchair': metaphor and mathematics education"

Daniel Kelly (Massey), "Intuitive transformation geometry and frieze patterns"

Robert McKibbin (Massey), "Some simple mathematical models of complex phenomena in geothermal systems".

M. R. Carter

Statistics

One of the lesser consequences of last month's launch of the School of Mathematical and Information Sciences is that Massey news now comes in two parts. The statisticians will spend the vacation period rising one level, so that by the 1992 term Statistics will be both physically and administratively separate from Mathematics.

Academic pursuits are not being ignored. Professor François Peronnet from Montréal University is here for a few weeks working with Hugh Morton modelling energy metabolism. They are refining their already plausible-looking predictions of ultimate levels of athletic performance.

Greg Arnold.

OTAGO UNIVERSITY
Mathematics and Statistics

News from the statistics group of the Department of Mathematics and Statistics:

John Harraway and Bryan Manly ran a highly successful Multivariate workshop during the August vacation. There were 25 satisfied participants, including some from overseas.

Next January Bryan Manly, in conjunction with Lyman McDonald, will run a workshop on the Statistics of Resource Selection in Denver, Colorado.

Since David Fletcher has joined the Otago staff, Malcolm Faddy has resigned to take up a position in Brisbane, and it is rumored another senior statistician is about to leave in panic for Australia. Well done David! An offer has been made to a Faddy clone, and we hope to announce the new appointee in the next Newsletter.

John Rayner has recently returned from leave. Two months were spent with long-time friend and colleague John Best of the CSIRO IAPP Biometrics Unit in Sydney. After a brief sojourn back in Dunedin, it was off to Corvallis in Oregon to visit Don Pierce, whose work on smooth tests of goodness of fit helped spark my own work in that area. Two months in Winnipeg, Canada followed, visiting Kathleen and Subrahmaniam Kocherlakota.

News from the quantitative group in the Department of Quantitative and Computer Studies:

The quantitative group in the Department of Quantitative and Computer Studies will join with the Finance Department to form a new department of Finance and Quantitative Analysis. We hope to evolve joint papers with the statisticians in the Department of Mathematics and Statistics.

Liliana Gonzalez will attend the Decision Sciences Institute 22nd Annual Meeting at Bal Habour Miami Beach from November 24 to November 27.

News from Invermay:

Roger Littlejohn has returned from a successful four months in Scotland, England, and the USA working on the modelling of hormone profiles. He also attended the GENSTAT conference in Holland.

Ken Dodds helped organise a biometrical genetics workshop at Invermay, and also attended the gene mapping and molecular genetics symposium at Otago University.

News from the mathematics group of the Department of Mathematics and Statistics:

David Gilbert is our new computer programmer. David has a B. Com. (Hons) degree and is completing Computer Science 3 this year. He and Mark Borrie will assist staff with their computing problems (both research and teaching) and help maintain the department's microcomputer fleet.

Derek Holton reports: I visited Shanghai in September and took part in a UNESCO workshop on the Nurturing and Identification of Talented Students in Science, Technology and Mathematics. It was hard work but an exciting experience. However, I have returned concerned with the little we are doing in this country for these students, compared with many developing countries in our region. The draft report of the workshop and my own report are available on request.

John Clark was in Siberia during the recent failed coup. He emphatically denies any responsibility! During January he will be visited by Professor Dinh Van Huynh from Hanoi, Vietnam. They will do joint research in ring theory.

Ross Vennell, who is one-quarter time a lecturer in the Mathematics and Statistics department and three-quarter time a lecturer in the Marine Science department, is working on several projects in Physical Oceanography, analyzing data from current meters and satellite images. One project involves studying the formation and decay of a 90 km diameter warm eddy which is observed off the east coast of the North Island. This work is being done using hydrographic measurements and satellite images of sea surface temperature. In another project, a graduate student is mapping the position and variability of the Southland front using satellite images. A second major interest is in mapping the variation of semi-diurnal tidal currents in Cook Strait using Acoustic Doppler Current Profiler measurements.

A seminar series on "Linear Logic" was given in the department by Dr. Martin Henson of the University of Essex, who was visiting the Department of Computer Science here.

We are privileged to have three visitors with us at present.

Bob Hemminger from Vanderbilt University is interested in graph theory. He is working with Robert Aldred and Derek Holton on some problems relating to removable and contractible edges in graphs. John Moon of the University of Alberta is visiting our department until June of next year. Yet another graph theorist, his research interests are with trees and tournaments.

John A. Wenzel [BA, Carleton College, MA, Ph D, University of Kansas] is at the University of Otago for

the period 23 August 1991 to 10 August 1992. He is on an exchange from Albion College, Albion, Michigan, USA. Albion College is a private undergraduate liberal arts institution with 1500 students. Wenzel's first love was abstract algebra (infinite group theory), but he has become a generalist and has had to learn something in the fields of applied mathematics (solutions of systems of ODE's and mathematical modelling) and computer science (programming languages, theory of computing, artificial intelligence) in order to meet the needs of his students and the college. While at Otago he plans to learn more about statistics. Because he is involved in the training of elementary teachers, he anticipates learning something about New Zealand's programme in this area. He is accompanied by two teen-age sons and will be joined by his wife in the Fall.

<div align="right">John Rayner and Robert Aldred</div>

VICTORIA UNIVERSITY
Mathematics

Lindsay Johnston is to be Chairperson from 1 Jan 1992 when Rob Goldblatt's term of office expires.

John Harper (chairman), Mark McGuinness (secretary), Philip Rhodes-Robinson (treasurer) et al. are beginning to prepare for the 1992 Colloquium at VUW. See notice on page ? of this issue

The Department (and the Institute of Statistics and Operations Research, and the Computing Services Centre) is now in its new quarters at the south end of the Cotton Building, though the builders are still in residence in parts of the area. E-mail is usually getting through, though at the time of writing some of us are still waiting for the promised terminals in our rooms. Phone numbers are unchanged except for the extra digit 4 that now precedes any Wellington number that used to begin with 7, and except also for Thora Blithe's extension which is now 8310, not 8319. Some of us are enjoying the chance to have tea with our ISOR colleagues (though they do ask your correspondent questions about various horrible integrals and special functions).

<div align="right">J F Harper</div>

Institute of Statistics and Operations Research

In the beginning was 42/44 Kelburn Parade and there dwelt ISOR. But on the first day VUW said, "Thou shalt move to the building called Cotton". On the second day there was great wailing and gnashing of teeth as the statisticians had to pack up their own rooms. On the third day a plane flew up into the firmament and David Vere-Jones was not seen again until the eighth day. On the fourth day a great crowd did congregate to say goodbye to Kelburn parade and amongst the crowd there were wise men bearing cans of DB, Cabernet Sauvignon and peanuts. On the fifth day there was much consternation as an army of Philistines appeared and VUW said, "Let these men be called University Porters for they shall carry your belongings to the promised Cotton Building". On the sixth day there was chaos and a great cry went up from ISOR's new home, "Why doesn't my phone work, why are there no shelves, why are there 14 filing cabinets in my room?". And so it was that shelves sprang from the walls and phones appeared from their sockets.

But ISOR was without form and darkness was upon the face of the ethernet connection. And VUW said, "It is not good that the statisticians should be alone; I will give them e-mail and appletalk and ...". Thus the Cotton Building and ISOR were finished. And on the seventh day ISOR sat on their roof garden and looked over the harbour and rested ... for about 3 seconds!

But seriously folks there is news and here it is in brief.

The NZSA Conference was held at VUW in August and with a bit of luck was enjoyed by all.

David Vere-Jones (Russia, Morocco, Egypt, etc), Andrew Bruce (Seattle) and Tony Vignaux (Poland, Seattle) all went overseas. Megan Clark did a fine job of running the Department in David's absence.

ISOR are very pleased to welcome two newcomers who have already become indispensable - Ray Brownrigg (Systems Manager) and Gurusingham Sathiyandra (Statistical Programmer).

Andrew Bruce and Deborah Donnell are moving to Seattle next year to work on research projects for Stat. Sci. Inc. Doug Harvie is also retiring at the end of the year so our best wishes go to Andrew, Deborah and Doug.

Stephen Haslett has taken over the role of Director of Internal Consulting from Ross Renner.

Lastly we are very pleased that Ken Pledger from Mathematics is still a regular at ISOR tea breaks, despite the change of building!

<div align="right">Peter Smith</div>

UNIVERSITY OF WAIKATO
Mathematics and Statistics, Waikato Centre for Applied Statistics

Graham French has has continued his period of leave, spending the major portion of his time in the Science and Mathematics Education Research (SMER) Centre here at Waikato.

Professor Bridges has now finished his series of lectures as the NZMS Visiting Lecturer for 1991.

We were visited by Professor Sean McKee of Strathclyde University in August-September. Sean presented a seminar series on Heat and Mass Transfer and conducted a one-day workshop with Waikato industrial groups.

Jeffrey Knowlton took up his position as lecturer in the department at the beginning of the third term. His field is industrial statistics.

Kevin Broughan presented a paper at the Karlsruhe IFIP conference on High Level Problem Solving Environments at the end of September and a workshop on SENAC in London at the end of October.

I hope to be able to report on the outcome of our advertising for an appointee in Numerical Analysis/Numeric Computation, which is currently vacant in the Department of Mathematics and Statistics.

Kevin Broughan

NOTICES

THE 32nd INTERNATIONAL MATHEMATICAL OLYMPIAD

The New Zealand team for the 32nd IMO comprised: Michael Burns (Shirley Boys High School), Diane Maclagan (Burnside High School), Kahn Masan (Shirley Boys High School), Timothy Sturge (St Andrew's College), Chris Tuffley (Correspondence School), Keith Wansbrough (Selwyn College).

Michael and Diane received bronze medals and Timothy an Honourable Mention. The team total was 91 compared with 83 last year and the ranking 29= compared with 31st in 1990.

The questions that were set appear in the Problems and Queries section on page ?.

The New Zealand Mathematical Olympiad Committee is most grateful to the New Zealand Mathematical Society for its continued support for this programme of challenge and enhancement, which benefits not only the six members of the team but hundreds of students who make the effort to extend their mathematical prowess.

G. A. Hookings
Hon. Secretary

1992 NEW ZEALAND MATHEMATICS COLLOQUIUM
Victoria University of Wellington, 11-13 May 1992

Accommodation at Weir House is available. Ansett NZ have offered 30% discount on standard class airfares. The following is a provisional list of invited speakers:

Peter Bryant, Canterbury (Chaotic Dynamical Systems)
Derek Holton, Otago (Graph Theory)
Megan Clark, Victoria (Mathematics Education)
Sanford Thayer, Colorado State (Industrial Applications)

The Colloquium will be followed by a Mathematics Education Day.

A First Circular will have gone out in November. Expressions of interest to: Mark McGuinness, Secretary, 1992 NZ Mathematics Colloquium Committee, Mathematics Department, Victoria University of Wellington, P.O. Box 600, Wellington, NZ, phone (04)472-1000, x8307 or Secretary: (04)471-5341. email: markm@kauri.vuw.ac.nz

NEW ZEALAND JOURNAL OF MATHEMATICS

As members will be aware from the minutes of the Council meeting 19/5/91 and the Annual General Meeting 21/5/91, a Joint Committee involving representatives of the Society and the Department of Mathematics and Statistics, University of Auckland, has been established to run the newly-named and more widely-based *New Zealand Journal of Mathematics* which supersedes the *Mathematical Chronicle*. The present membership of the Committee is David Alcorn (chair), David Gauld (as Editor), Rob Goldblatt, Paul Hafner and Derek Holton.

A meeting of the Joint Committee was held at Auckland on 19/7/91. At this meeting it was agreed that David Gauld should be appointed as Editor. The *Journal* will be published twice each year and will contain research papers and expository or survey articles in any branch of Pure or Applied Mathematics but not normally in Statistics. It was also agreed that an Editorial Board would be established with a broad spread both geographically and with respect to subject area.

It has been agreed that the first volume should be a double issue coming out early in 1992 and containing the invited addresses from the Dunedin Colloquium, expanded in some cases. It is expected that the individual subscription rate for the first volume will be about $25. The subscription rate for subsequent volumes will be discussed at the next Society AGM.

The Editorial Board has now been established with the following initial membership:

- Douglas Bridges, Waikato University
- John Butcher, Auckland University
- Marston Conder, Auckland University
- David Gauld, Auckland University
- Rob Goldblatt, Victoria University of Wellington
- Derek Holton, Otago University
- Vaughan Jones, University of California at Berkeley
- Gaven Martin, Auckland University
- Graeme Wake, Massey University
- Brian Woods, Canterbury University

Joel Schiff of Auckland University has been appointed as an Assistant Editor, and Betty Fong continues to prepare manuscripts in T$_E$X.

All members of the NZMS are invited to consider offering papers for publication in the *Journal*. You may submit a paper to the Editor or the member of the Editorial Board whose interests are closest to the subject of the paper.

In order to give some idea of the likely demand, members intending to subscribe are encouraged to complete and return the subscription form enclosed with this Newsletter.

David Gauld

LECTURESHIP IN MATHEMATICS AND STATISTICS
University of Auckland

The University Council invites applications for a Lectureship in the Department of Mathematics and Statistics at the University of Auckland. Applicants should have a proven record in teaching and research in some branch of Mathematics, Statistics or Operations Research. Applications from candidates with interests related to Information Technology, Environmental Resource Management, Information Processing, or any area of Commerce and Business Studies are particularly welcome.

The person appointed will be based primarily at the Tamaki campus of the University and will be responsible to the University Council through the Head of the Department of Mathematics and Statistics for such duties, including teaching, examining and research as may be required by the Head of the Department.

Commencing salary will be determined in accordance with qualifications and experience within the scales for Lecturers. The present salary scale for a Lecturer is $37,440 per annum rising to $45,448 per annum by seven annual increments, then to $49,088 by a further three.

The successful applicant should be able to take up his or her duties as soon as possible after 1 February 1992. Applications should be forwarded as soon as possible, but not later than 10 January 1992.

Further information about this position may be obtained from the Acting Head of the Department, Professor I L Reilly, telephone (64)(9)737999 ext 8751, or by e-mail reilly@mat.aukuni.ac.nz, or by FAX at (64)(9)737934.

GRANTEE REPORT

Early in July I travelled to Melbourne to attend and present papers at the Annual Conference of the Australian Mathematical Society and GASAT6 (Gender and Science and Technology). As it turned out the Ninth Annual Victorian Algebra Conference was on during the weekend between these two conferences and I was able to attend a few of their sessions.

My two main areas of interest at the AMS were Mathematics Education and Combinatorics. Barbara Reilly and I gave a joint paper 'Performance in a nationwide mathematics examination at tertiary entrance level'. There were more talks than I had expected in this first area, and I was able to have in-depth discussions with people from Australian Universities who were experiencing similar problems to ours in coping with an ever-widening range of mathematical knowledge in entering students. Like us, several had developed their own materials for such students and were only to happy to exchange them. My second paper 'Classification of 4- and 5-arc transitive cubic graphs of small girth' was given in a session titled 'Combinatorics and Misc', which certainly conveyed the paucity of papers in that area. A more common theme for this session might have been 'People who live, or have lived, in New Zealand': Derek Holton from Otago was the chair and Nick Wormald, recently from Auckland University, the other combinatorics speaker. I compensated by attending some group theory sessions, but these were often scheduled in sessions parallel to those in mathematics education.

The GASAT6 conference during the second week of my stay was very intensive, with sessions scheduled morning, afternoon and night. Nearly two hundred participants from over twenty countries attended. A few I had met previously at GASAT4 in Michigan in 1987 and it was stimulating to catch up on what they had been doing. There were about twenty people from New Zealand at the conference coming from Secondary Schools, Colleges of Education, Universities, DSIR, MAF, the Ministry of Education and the Ministry of Women's Affairs. An interesting innovation tried at this conference was the concept of 'home groups'. Ten people, from a variety of backgrounds and countries, were placed in each group and met for one and a half hours each day. During this time each group discussed some common topics of interest, usually decided upon by the group themselves, related to the theme of the conference. As the week wore on and people became more at ease in their 'home group' there were some really interesting and informative discussions that probably wouldn't have happened in the more formal framework of paper and workshop presentations.

Two particularly wide-ranging sessions at GASAT6 which were relevant to research that I am involved in were 'Single-sex vs coed settings for both males and females' and 'The place of role modelling in girls' participation in maths and science'. The consensus of opinion at the first discussion was that although single sex settings for girls result in increased confidence and participation, what would be really ideal is for coeducational classes to be conducted in such a fashion that both sexes felt equally at ease and able to learn to their full potential. There is a lot of work to be done in this area in ensuring that syllabi contain topics of interest to both sexes and that both males and females are taught the social and confidence skills which enable them to co-learn on an equal footing. The second session discussed a variety of ways in which role models already working in specific areas can be effectively used to make sure that all students are fully informed on subject and career choices and feel able to pursue those that interest them. However it was generally thought that the influence of role models used in this way, although valuable, was less than that of a student's parents, teachers and peers.

Highlights of my trip, outside the conferences, were seeing 'Phantom of the Opera', watching the nightly 'Penguin Parade' on the beach at Phillip Island and getting 'bumped up' to first class on the flight home. I would like to take this opportunity to thank the NZMS for their grant of $500 towards my expenses for this trip to Australia.

Margaret Morton
Mathematics and Statistics
University of Auckland

BOOK REVIEWS

The History of Statistics—The Measurement of Uncertainty before 1900, by Stephen M. Stigler, The Belknap Press of Harvard University Press, Cambridge Mass. and London , 1986, xvi + 410 pp. Clothbound ISBN 0-674-40340-1, US$29.95, Paperbound ISBN 0-674-40341-x, US$14.95.

The major mathematical problem dealt with in this book may be expressed in modern notation as follows. Consider the over-determined system of linear equations $Ax \approx b$, where A is a known matrix ($m \times n$) with $m > n$, and b is a known m-vector. In order to find an n-vector x which satisfies approximately those over-determined equations, choose a convenient matrix C ($n \times m$) and convert the over-determined system to a determinate system $CAx \approx Cb$, or $Gx \approx d$, where $d = Cb$ and $G = CA$ is a square matrix ($n \times n$). The equation $Gz = d$ can then be solved for z (unless G is singular), and that m-vector z may be taken as an estimate for the solution x of the over-determined system. Indeed, the solution z is optimal, in the sense that with $z = x$ some norm of the residual vector $r = b - Ax$ is minimized (for a suitable norm function). The residual r would have zero norm if the equations were satisfied exactly.

Part 1 of this book is devoted to *The Development of Mathematical Statistics in Astronomy and Geodesy before 1827*.

Over-determined systems were initially considered in astronomy and geodesy, and before 1750 mathematicians could do nothing better than make an arbitrary selection of n equations from the m equations (with $m > n$) and then solve the chosen determinate system for the n unknown values. Even Euler (in 1749) was worried that over-determined systems necessarily increased the error of the solution. But Mayer considered that additional measurements, beyond the minimum number n, could be combined so as to reduce the error of the solution. The first successful methods for solving over-determined equations, which were invented by Mayer (in 1750), by Boscovich (in 1757), and by Laplace (in 1787), can each be represented in the above form, with the matrix C having elements which had to be judiciously chosen as 1 or 0.

In the Method of Least Squares, published by Legendre (in 1805) and by Gauß (in 1809), the multiplier matrix $C = A^T$, so that the <u>normal equations</u> are $(A^TA)x = A^Tb$. The normal matrix A^TA is symmetric positive-definite, and hence the normal equations are non-singular (unless the columns of A are linearly dependent). The algebraic treatment of the Least Squares Method is much simpler than for other multiplier matrices C — in particular, the Least Squares Method minimizes the Euclidean norm of the residual r. Gauß analysed the statistics of the errors of the Least Squares solution in terms of the errors of the original equations, and that analysis was extended by Laplace. By 1827 the Method of Least Squares, with estimates of probable error, had become a standard technique in astronomy and geodesy.

Part 2 of the book is devoted to *The Struggle to Extend the Calculus of Probability to the Social Sciences*.

Quetelet began his career as an astronomer, and in 1824 he learned statistics from Fourier and Laplace. Thereafter, Quetelet devoted much of his work to statistical analysis of social, medical, political, commercial and moral data, attempting to create a Social Physics on a basis of social statistics. He found normal distributions in data from many diverse sources, and he invented the concept of "the average man". Some followers of Quetelet succumbed to the malady of "Quetelismus", seeing normal distributions in everything which they examined. For example, Lexis (in 1879) plotted a graph of mortality versus age, which displayed high mortality for infants decreasing to a minimum mortality at age 10, rising to a maximum at age 72 and dropping nearly to 0 by age 95. Lexis fitted a normal curve to the peak centred at age 72, and subtracted that distribution from the data. He <u>defined</u> the deaths represented by the fitted normal curve to be "normal deaths", and the residual deaths of infants and young people were then called "premature deaths"! Ebbinghaus (in 1885) adjusted the presentation of data from his experiments on memory so as to produce results which *were* normally distributed. The author pointedly observes (p.261) that "the self-fulfilling validation of analyses by producing normally distributed units of analysis continues to the present day, with the use of normal scaling for test scores".

Part 3 of the book is devoted to *A Breakthrough in Studies of Heredity*.

Galton was strongly influenced by Quetelet's examples of normal distribution of diverse types of data. In his studies on hereditary genius, he invented (in 1874) a method for quantifying ordered data (such as "genius"), fitting the cumulative count of an ordered sequence of data to the inverse normal cumulative distribution function, so that the quantified data does (by definition) have normal distribution. Galton called his technique "statistics by intercomparison" – now it is called the latent scale model. The method is so arbitrary that it is

difficult to understand why it was ever taken seriously. Any ordered data (such as "talent") could be quantified so as to have *any* specified distribution function ϕ, by fitting the cumulative count of an ordered sequence of data to the inverse indefinite integral of ϕ. The author comments (p.271) that "this method of analysis ... was to become the most used (and abused) method of scaling psychological tests... The argument for the scale was, and remains, weak: it rested solely on analogy. The statistical scale is assumed to be appropriate for talent because it is appropriate for stature."

Edgeworth developed considerably the theory of regression and of correlation, which had been invented by Galton. Edgeworth studied the multivariate normal distribution $\Pi = \mathbf{J}e^{-R}\, dx_1\, dx_2\, dx_3...$ where, in matrix notation, $\mathbf{R} = (x-x)^T \Delta (x-x)$, and (p.323) he "introduced the symbols $\rho_{12}, \rho_{13}, ...$ for the correlation coefficients of x_1 and x_2, x_1 and x_3, and so on". He struggled for some time to relate the elements of the matrix Δ to the correlation coefficients, until he found (in 1893) that the correlation matrix (whose elements are the ρ_{ij}) is $\Sigma = \Delta^{-1}$. Pearson developed the theory of non-normal distributions with skew curves, and in 1896 he published an improved method for estimating correlation coefficients and assessing their accuracy. Yule (in 1897) created analysis of variance, explaining clearly that linear characteristic functions and least squares criteria were chosen for simplicity and convenience. The author comments (p.357) that "with more than eighty years' accumulated wisdom we might think Yule naively optimistic in his belief in the power of his methods. Yet in many ways the paper stands the test of time quite well. Indeed, an embarrassingly high percentage of modern work is not up to Yule's standard"!

In Part 1 of this book the time sequence is rather confusing, starting with Legendre in 1805 and thereafter jumping back and forth in time to consider the contributions of Cotes, Euler, Mayer, Boscovich, Laplace, Legendre, Jacob Bernoulli, De Moivre, Simpson, Bayes, Laplace, Bayes, Laplace, Gauß and again Laplace. Otherwise the book is clearly and interestingly written, with some appropriately pungent comments. The portraits, the diagrams and the pages from books are all clearly reproduced, and I noticed only one minor misprint.

However, some details of the book could usefully be emended in later editions:

Page 18. "By 1700 it had become possible to determine a ship's latitude at sea with relative precision by the fixed stars". But Arab navigators had been doing that for a thousand years before 1700, and European navigators had learned the technique from them in the 15th century.

p.25. "In 1737 W. Whiston suggested that if reflecting telescopes were made part of of a ship's navigational equipment then longitude could be determined by observing the eclipses of the moons of Jupiter". But Galileo, soon after he discovered those moons of Jupiter in 1610, realised that they could be used as clocks for determining longitude. He devoted much effort to constructing tables of their orbits, and even after he was imprisoned by the Inquisition he continued to negotiate with the King of Spain for his tables to be used by navigators. In 1699 Halley, on his great geomagnetic survey of the Atlantic Ocean, observed the moons of Jupiter to determine longitudes of several islands which he visited – but he found that the moons could not usefully be observed from a moving ship.

p.40. What is meant by "The first post-Columbian hint that the Earth was not a perfect sphere"? The Greek discovery of the spherical shape of the Earth was never lost amongst educated people: even in the European Dark Ages only a few eccentric writers described the Earth as having any shape other than approximately spherical.

p.50 & p.60. No details are given of Laplace's method of solving over-determined linear systems by minimizing the maximum modulus norm of the residual.

p.64. The "Bernoulli numbers" had been published by Johann Faulhaber in 1631, to a more advanced level than that given by Jacob Bernoulli (1654-1705) in **Ars Conjectandi** (published 1713).

p.66. Jacob Bernoulli's proof of the weak law of large numbers is criticised for dealing only with proportions p which are rational, "not with the modern situation in which $p = r/(r+s)$ is allowed to range over all real numbers in the interval [0,1]". But, who *could* then deal rigorously with general real numbers? Wallis (in 1655) had identified $x^{p/q}$ with $\left(\sqrt[q]{x}\right)^p$, and he asserted that the result could be generalized for irrational exponents such as $\sqrt{3}$. But, the more cautious mathematicians continued to concentrate primarily on rational numbers, until the modern theory of real numbers was developed by Bolzano, Dedekind, Weierstraß, Cantor *et alia*.

p.67. The assertion that "unless N is a multiple of $r+s$, it is not even possible to obtain $X/N = r/(r+s)$ exactly" is incorrect. For example, if $X = 1$ and $N = 2$ then that equation is satisfied exactly for all $r = s \neq 0$.

p.69 & p.70. The name of Chebyshev has been transliterated from Cyrillic in many diverse spellings – but

"Chebychev" is certainly not correct.

p.81. De Moivre's ingenious method (of 1733) for numerical integration of the error function is Newton's $\frac{3}{8}$ Rule.

p.140. The author curiously speculates why Gauß (in 1809) did not use double subscripts for representing linear equations. But subscripts only began to be used for linear equations during the following decades, and the use of double subscripts for coefficients of linear equations did not become common until the 1930s.

p.145. The author mentions very briefly that Gauß did consider nonlinear equations in 1809. In fact, Gauß gave a very valuable explanation of how nonlinear equations could be locally linearised, so that a system of (smooth) nonlinear equations could be approximated, 'near' an estimated solution, by a much simpler linear system. Also, he carefully explained that equations within the system may need to be scaled to become dimensionally compatible, so that it becomes meaningful to add residuals (squared) for the various equations; and that equations with various accuracies should be scaled so that equal elements in the residual vector become equally significant.

p.173. Quetelet (in 1835 and 1842) fitted "the simple growth curve

$$y + \frac{y}{1000(T-y)} = ax + \frac{t+x}{1+\frac{4}{3}x}$$

separately for men and women, to the heights y of groups of individuals of weight x, where t and T are heights at birth and maturity, and a would vary by locality". But Quetelet's formula is dimensionally nonsensical: the left-hand expression adds height to a dimensionless ratio, the right-hand numerator adds height to weight, and the right-hand denominator adds 1 to weight $(\times \frac{4}{3})$!

p.202. Bessel's formula (in 1818) for numerical integration of the error function over a small interval is the simple trapezoid formula.

p.243. Fechner's law (of 1860) in psychophysics, relating sensation S to stimulus R, is misleading presented in the simplified form $S = C \log R$, which is meaningless unless R is a dimensionless number. But Fechner transformed Weber's law to the valid form $S_1 - S_2 = C \log(R_1/R_2)$, and he then carefully defined units for S and R, such that the simplified formula could be used.

p.260. Ebbinghaus (in 1885) fitted his data on memory to a curve "$b = 100K/[(\log t)^c + K]$, where $t =$ time, $b =$ a measure of the amount remembered, and c and K are constants". But Ebbinghaus's formula is dimensionally nonsensical — for example, replacing 2 hours by 120 minutes would replace $(\log 2)^c$ in the formula by $(\log 2 + \log 60)^c$.

p.301. George Darwin is described as Francis Galton's cousin - but George Darwin's father Charles Darwin was Francis Galton's first cousin (cf. p. 267).

p.341. In 1896 Pearson praised Yule's work on factor models, telling him that "you have put the whole thing in a way which might be understanded of the statistician". Pearson's quotation from **The Book of Common Prayer** (of King Edward 6th) has not been understanded of the author, who has inserted the comment [sic] after "understanded".

G. J. Tee
University of Auckland

Mathematical Problems of Combustion Theory, by J. Berbernes and D. Eberley. Applied Mathematical Sciences Volume 83, Springer-Verlag, Berlin-Heidelberg-New York, 1989, x + 178pp, DM 68. ISBN 3-540-97104-1.

This research monograph is a "state of the art" effort on this fast-growing and important area. The successful modelling of combustion phenomena has been made possible by the rapid growth of nonlinear mathematics in the non-discrete area and there is a reservoir of key methodology to address the practical engineering questions of spontaneous ignition, flame propagation, fuel enhancement etc.
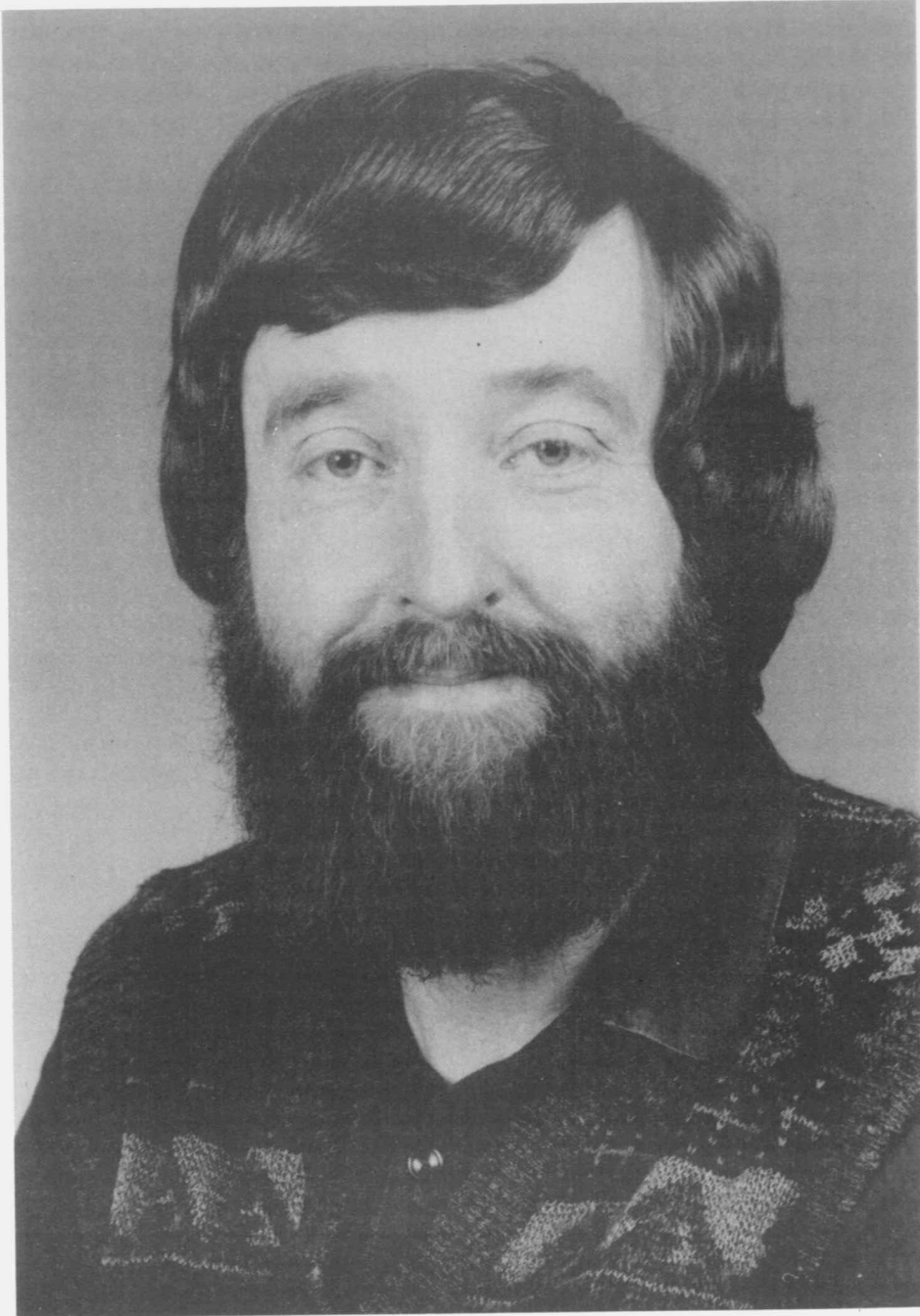
Professor Rob Goldblatt

ROBERT IAN GOLDBLATT

By Wilf Malcolm

At a relatively young age Rob Goldblatt has achieved a well deserved reputation as one of New Zealand's leading mathematicians. His recent selection for the foundation New Zealand Mathematical Society's Research Award (separately with Professor John Butcher of Auckland University) recognised the outstanding qualities of his mathematical research over the last ten years, building on research activity that began in the early seventies with his Ph.D. studies at Victoria University of Wellington under the general supervision of Professor Max Cresswell. This Research Award is only the latest in a series of honours acknowledging Goldblatt's mathematical achievements: A Nuffield Foundation Fellowship held at Oxford University in 1977-8, a Fulbright Senior Scholarship held at Stanford University in 1986, the award of the Research Medal of the New Zealand Association of Scientists in 1985 and election as a Fellow of the Royal Society of New Zealand last year form an impressive list.

Goldblatt's mathematical career to date has been based at Victoria University of Wellington, both as a student and a staff member. He was appointed to a personal chair in Mathematics early in his career in 1981 and for the last several years has ably combined responsibilities as chairperson of the Department of Mathematics at Victoria with a strong teaching role and a continuing productive research output. It is encouraging evidence of the maturity of the New Zealand mathematical community that people such as Goldblatt can be nurtured within it and rise to senior positions in universities here, while achieving international recognition as being amongst the top researchers and scholars in their fields.

Goldblatt's major field of research activity is mathematical logic, supported by strong interests in general algebra. One would probably not describe Goldblatt's work as innovative or creative in a fundamental sense. Its characteristic strength lies in his ability to bring together wide ranging mathematical ideas and techniques in the investigation and analysis of a particular field of research enquiry, weave these ideas and techniques into a coherent and perceptive exposition that gives a comprehensive understanding of that field and, with all, solve specific and hard problems associated with it, some that may have defied successful resolution by other researchers over a considerable period of time.

Probably the best expression of the maturity and strength of Goldblatt's early research is contained in the two *Reports on Mathematical Logic*, 6 and 7, published in 1976 by Polish Scientific Publishers, Warsaw-Cracow, entitled "Metamathematics of Modal Logic, Parts I and II". This concern with generalisations and applications of systems of modal logic is carried further in an outstanding paper entitled Varieties of Complex Algebras, published in 1989 in the *Annals of Pure and Applied Logic*. In this work of considerable mathematical depth Goldblatt develops an abstract theory built with concepts from universal algebra and topology and which includes modal logics as one of many special cases. In other directions Goldblatt has applied his profound understanding of the metamathematics of modal systems to areas as diverse as Computer Programming and Spacetime Geometry. His "Logics of Time and Computation", published as *Lecture Notes Number 7*, by the Center for the Study of Language and Information, Stanford University, has attracted wide interest. The first edition published in 1987 was quickly followed by a second printing in 1988. An expanded second edition is due to appear this year and a Russian translation is in preparation in Moscow.

Goldblatt's ability to solve hard and specific problems is demonstrated throughout all his work. An early example is his solution to a Completeness Problem of Lemmon and Scott, published in 1975 in the *Notre Dame Journal of Formal Logic*. Another later example is his demonstration that Orthomodularity is Not Elementary, published in 1984 in the *Journal of Symbolic Logic*. A recent example is his paper appearing this year in the *Journal of Symbolic Logic* establishing that the McKinsey Axiom is Not Canonical.

One cannot complete this brief over-view of Goldblatt's published work, contained in 4 books and 25 refereed papers and reports, without reference to his extraordinarily good and major work of exposition entitled *Topoi: The Categorial Analysis of Logic*, published by North Holland Publishing Co., Amsterdam. The first edition comprising some 500 pages was published in 1979. This first edition appeared in Russian translation in 1983. A revised and expanded edition appeared in 1984 followed by a second printing of this Revised Edition in 1986.

This major work shows in all its cycles the strengths of Goldblatt's expositional and didactic qualities at their best. These include his remarkable and uncommon mastery of quite diverse aspects of mathematics, his ability to write clearly and interestingly about complex and technically demanding ideas and techniques and to place them within a coherent whole. A rich combination of scholarly, research and expositional skills.

Those of us who are privileged to know Rob Goldblatt as a colleague and friend rejoice in his success to the present. His personal qualities and human sensitivities match his mathematical achievements. We are all enriched through the continuing and growing strength of his contribution to mathematical scholarship and to New Zealand's scholarly and intellectual reputation.

The generic problem is that first analysed by Hiroshi Fujita in the late 1960s:

$$\left.\begin{array}{l} \Delta v + e^v = v_t, \ \ x \in \Omega, \ t > 0 \\ v(\partial\Omega,t) = 0 \\ v(x,0) = v_0(x) \end{array}\right\} \ (P_t).$$

Since then many authors (yours truly included) have contributed to the nature of the steady states of this problem, their stability and conditions under where there is "finite time blow-up", that is, the solution of (P_t) satisfies

$$v(x,t) \rightarrow \infty \text{ as } t \rightarrow t_\infty,$$

and where in Ω this point occurs.

In this book the authors take the reader "back to basics" with a thorough description of the full modelbased on proper thermodynamics and engineering principles. The full equations of mass and energy conservation are established, giving rise to a coupled system of parabolic partial differential equations far more complicated than (P_t), but nevertheless it should be remembered that the latter is a prototype. Various submodels are then considered of various degrees of complexity (including (P_t)).

The mathematical models described are often deceptively simple in appearance (e.g. (P_t)), but they exhibit a mathematical richness and beauty that belies that simplicity and affirms their physical significance. The mathematical tools required to resolve the various problems raised are diverse, and no systematic attempt is made to give the reader the mathematical background which is presumed. The unifying theme of the monograph is the set of models themselves.

The analysis is technically demanding but very thorough with important results established. The key question asked by David Kassay (from Colorado, as is Professor Bebernes), "What does criticality mean when reactants are being consumed?", is fully analysed using asymptotic methods.

This book is a key work for those wishing to get "up to speed" quickly in this area. It is accessible to first year graduate students in mathematics and engineering. It would be an admirable text for a first-year graduate course. The writing is good and error-free (as far as I could tell). This, coupled with the high standing of these authors, means it is a really good investment.

GC Wake
Mathematics Department
Massey University

SPRINGER AND BIRKHÄUSER PUBLICATIONS

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

David Alcorn
Department of Mathematics and Statistics
University of Auckland
(email: alcorn@mat.aukuni.ac.nz)

(**NOTE** During December and January please contact the Editor directly viz. David Smith, Department of Mathematics and Statistics, University of Auckland — email: smith@mat.aukuni.ac.nz)

Encyclopaedia of Mathematical Sciences

15.	Khavin VP	Commutative harmonic analysis I - General survey. Classical aspects. 268pp.
18.	Kostrikin AI (ed)	Algebra II – Noncommutative rings. Identities. 234pp.
60.	Lang S	Number theory III – Diophantine geometry. 296pp.

Ergebnisse der Mathematik und ihre Grenzgebiete, 3.Folge
23. Ledoux M   Probability in Banach spaces - Isoperimetry and processes. 480pp.

Graduate Texts in Mathematics
125. Berenstein CA   Complex variables - An introduction. 664pp.
126. Borel A   Linear algebraic groups (2nd enlarged ed). 288pp.

The IMA Volumes in Mathematics and its Applications
30. Beals M (ed)   Microlocal analysis and nonlinear waves. 199pp.

ISNM (Birkhäuser)
98. Hackbush W (ed)   Multigrid methods III. 390pp.
99. Neittaanmäki P (ed)   Numerical methods for free boundary problems. 430pp.

Lectures in Mathematics (Birkhäuser)
     Bättig D   Singularitäten. 200pp.

MSRI Publications
19. Alperin RC (ed)   Arboreal group theory. 368pp.
20. Dazord P (ed)   Symplectic geometry, groupoids and integrable systems. 311pp.

Problem Books in Mathematics (Unsolved Problems in Intuitive Mathematics)
     Croft HT   Unsolved problems in geometry. 199pp.

Progress in Mathematics (Birkhäuser)
95. Michler GO   Representation theory of finite groups and finite-dimensional algebras.
                            520pp.
97. Mumford D   Tata lectures on Theta III. 240pp.
98. Godbillon C   Feuilletages - Etudes géometriques. 488pp.

Progress in Systems and Control Theory (Birkhäuser)
7.   Conte M (ed)   New trends in systems theory. 735pp.
10. DiMasi G (ed)   Modeling, estimation and control of systems with uncertainty. 486pp.

Springer Series in Computational Mathematics
14. Hairer E   Solving ordinary differential equations II. - Stiff and differential-algebraic
                            problems. 601pp.
15. Fortin M   Mixed and hybrid finite element methods. 350pp.

Undergraduate Texts in Mathematics
     Protter MH   A first course in real analysis (2nd ed). 534pp.
     Bressoud DM   Second year calculus - From celestial mechanics to special relativity. 386pp.

Universitext
     Hlwaka E   Geometry and analytic number theory. 238pp.

Miscellaneous
     Clemens CH   Geometry for the classroom. 335pp.
     Clemens CH   Geometry for the classroom: Exercises and solutions. 167pp.
     Drucker T   Perspectives on the history of mathematical logic. 284pp.
     Gong S (ed)   International symposium in memory of Hua Loo Keng. Vol. I: Number
                            theory. 353pp. Vol. II: Analysis. 343pp.
     Hilton P (ed)   Miscellanea mathematica. 326pp.
     Ribenboim P   The little book of big primes. 237pp.

MATHEMATICAL VISITORS TO NEW ZEALAND

List 30 : 1 November 1991

One of the main purposes of this list is to enable other institutions to invite visitors to spend time with them. Anyone wishing to issue such an invitation should do so through the principal contact person.

The information for each item is arranged as follows:

> Name of visitor; home institution; whether accompanied; principal field of interest; dates of visit; principal host institution; principal contact person; comments.

Dr Peter Cholak; University of Michigan; wife; recursion theory, theoretical computer Science; 22 June 1991 to June 1992; Victoria University, Wellington; Dr Rod Downey; postdoctoral fellowship.

Professor Dinh Van Huynh; Institute of Mathematics, Hanoi, Vietnam; ring theory; January - April 1992; University of Otago; John Clark; possible.

Dr William Gasarch; University of Maryland; wife; theoretical computer science; February and March 1992; Victoria University, Wellington; Dr Rod Downey; very likely.

Professor R L Hemminger; Vanderbilt University; graph theory; August 1991 to December 1991; University of Otago; Prof. Derek Holton.

Professor Reiner Horst; Universität Trier, Germany; global optimisation; February 1992; University of Canterbury; Dr Graham Wood.

Dr Hajime Ishihara; Hiroshima University; wife, 2 children; constructive functional analysis; October 6 to December 28, 1991; University of Waikato; Prof D.S. Bridges.

Professor J W Moon; University of Alberta; graph theory; August 1991 to August 1992; University of Otago; Prof. Derek Holton.

Professor Stephen M Samuels; Purdue University; wife (Dr Myra Samuels, biostatistician); probability theory and applications, dynamic optimization; 7 Jan 1992 - 8 May 1992; University of Canterbury; Dr Murray Smith; Visiting Erskine Fellow.

Dr Steven Simpson; Penn State University; foundations, proof theory; Reverse Mathematics; November 1991; Victoria University, Wellington; Dr Rod Downey; possible.

Dr Günter Steinke; Christian-Albrechts Universität zu Kiel, Germany; wife and son; topological projective planes; from present ; University of Canterbury; Dr David Glynn (becomes staff member, University of Canterbury May 1992).

Professor Anne Penfold Street; University of Queensland; combinatorics; 26 October -30 November 1991; University of Canterbury; Dr Derrick Breach; ARC Research Professor.

Professor Sanforth Thayer; Dept. of Mechanical Engineering, U of Colorado, Fort Collins; Wife (Nona); Industrial Engineering, Operations Research, Quality Assurance; 1 March to 31 May 1992; Massey University; Prof. G. C. Wake; As a Fulbright Visitor he is encouraged to visit other universities in NZ.

Please note: Production of these lists is dependent on my receiving information. When you know about a visit (whether it be definite, very likely, or possible), would you please forward the details to me at the earliest convenient time. Thank you.

David Robinson
N.Z. Mathematical Society Visitors' Co-ordinator
Department of Mathematics
University of Canterbury

CONFERENCES

** 1992 **

January 1-11 (Oberwolfach, Germany) **Mathematische Optimierung**
Contact MFOG: see (1) below

January 5-8 (St. Augustine, Trinidad) **2nd Caribbean Conference on Fluid Dynamics**
Contact Dr. Harold Rankissoon, Department of Mathematics, University of the West Indies, St. Augustine, Trinidad.

January 6-10 (Kyoto, Japan) **Automorphic Forms and Associated Zeta Functions**
Contact Koichi Takase, Dept. of Mathematics, Miyagi University of Education, Aranaki, Sendai 980, Japan.

January 6-17 (Rio de Janeiro) **Topology Workshop**
Contact P.A. Schweitzer, S.J., Dipartamento de Matematica, Pontifical Catholic University, 22453 Rio de Janeiro, Brazil.

January 6-17 (Merida, Venezuela) **International Research Workshop on Banach Space Theory**
Contact B.-L. Lin, Department of Mathematics, University of Iowa, Iowa City, Iowa 52242, U.S.A.

January 12-18 (Oberwolfach, Germany) **Applied Dyamics and Bifurcation**
Contact MFOG: see (1) below.

January 13-17 (Minneapolis, Minnesota) **IMA Workshop on Linear Algebra, Markov Chains and Queueing Models**
Contact IMA: see (3) below

January 15-17 (Zürich) **Workshop on Stochastics and Analysis**
Contact Workshop Secretary, Institut für Angewandte Mathematik, Universität Zürich, Rämistrasse 74, CH-8001, Zürich, Switzerland.

January 19-25 (Oberwolfach, Germany) **Modelltheorie**
Contact MFOG: see (1) below.

January 16-18 (Kyoto, Japan) **Numerical Analysis for Partial Differential Equations in Engineering and its Related Topics**
Contact Yuusuke Iso, RIMS: see (4) below.

January 21-23 (Kyoto, Japan) **Generation and Statistics of Turbulence**
Contact Shigeo Kida, RIMS: see (4) below

January 26-Feb.1 (Oberwolfach, Germany) **Applied and Computational Convexity**
Contact MFOG: see (1) below

January 27-29 (Orlando, Florida) **Third ACM-SIAM Symposium on Discrete Algorithms**
Contact SIAM: see (6) below.

January 30-February 1 (Wollongong) **Nonlinear Boundary Value Problems in Science and Engineering: Analytic Methods**
Contact Professor P. Broadbridge, Department of Mathematics, University of Wollongong, P.O. Box 1144, Wollongong, New South Wales 2500, Australia.

February 2-6 (Bateman's Bay, Australia) **28th Australian Applied Mathematics Conference**
Contact Professor Colin Pask, Department of Mathematics, University College, University of New South Wales, Australian Defence Force Academy, Canberra, ACT 2601.

February 2-8 (Oberwolfach, Germany) **Thermodynamische Materialtheorien**
Contact MFOG: see (1) below.

February 9-15 (Oberwolfach, Germany) **Numerical Methods for Parallel Computing**
Contact MFOG: see (1) below.

February 10-11 (Berkeley, California) **Workshop on Amenable Ergodic Theory**
Contact MSRI: see (2) below.

February 10-14 (Macquarie University, New South Wales) **1992 Mathematics-in-Industry Study Group**
Contact Dr N.G. Barton, CSIRO Division of Mathematics and Statistics, P.O. Box 218, Lindfield, New South Wales 2070, Australia.

February 16-22 (Oberwolfach, Germany) **Funktiontheorie**
Contact MFOG: see (1) below.

February 23-29 (Oberwolfach, Germany) **p-Adische Analysis und Anwendungen**
Contact MFOG: see (1) below

February 24 – March 1 (Minneapolis, Minnesota) **IMA Workshop on Iterative Methods for Sparse and Structured Problems**
Contact IMA: see (3) below

March 1-7 (Oberwolfach, Germany **Klassifizierende Räume und Anwendungen der Steenrod-Algebra**
Contact MFOG: see (1) below.

March 8-14 (Oberwolfach, Germany) **Mathematische Stochastik**
Contact MFOG: see (1) below.

March 15-21 (Oberwolfach, Germany) **Regelungstheorie**
Contact MFOG: see (1) below.

March 20-27 (Princeton, New Jersey) **Workshop on Fluid Dynamics and Statistical Physics**
Contact T. Spencer, Institute for Advanced Study, School of Mathematics, Olden Lane, Princeton, New Jersey 08540, U.S.A.

March 22-28 (Atlanta, Georgia) **Georgia Tech-UAB International Conference on Differential Equations and Mathematical Physics**
Contact E. Harrell, School of Mathematics, Georgia Institute of Technology, Atlanta, Georgia 30332-0160, U.S.A.

March 22-28 (Oberwolfach, Germany) **Teichmüller-Theorie und Modulraume Riemannscher Flachen**
Contact MFOG: see (1) below.

March 26-28 (Kyoto, Japan) **Number Theory and Related Areas**
Contact Yasutaka Ihara, RIMS: see (4) below

March 29 - April 4 (Oberwolfach, Germany) **Topologische Methoden in der Gruppentheorie**
Contact MFOG: see (1) below.

March 29 - April 5 (Haifa, Israel) **Sixth International Conference on Geometry**
Contact R. Artzy, Department of Mathematics, University of Haifa, 31999 Haifa, Israel.

March 30-31 (Edinburgh) **IMA International Conference on Mathematics in Industrial Maintenance**
Contact Professor L. C. Thomas, Department of Business Studies, University of Edinburgh, William Robertson Building, 50 George Square, Edinburgh EH8 9JY, Scotland.

March 30 - April 3 (Berkeley, California) **Workshop on Statistical Methods in Molecular Biology**
Contact MSRI: see (2) below.

April (USA) **Eighth International Conference on Mathematical and Computer Modelling**
Contact X.J.R. Avula, President IAMCM, University of Missouri, Rolla, Dept. of Engineering Mechanics, P.O. Box 1488, Rolla, Missouri 65401-0249, U.S.A

April 5-11 (Oberwolfach, Germany) **Algebraische K-Theorie**
Contact MFOG: see (1) below.

April 5-11 (Oberwofach, Germany) **Informationstheorie**
Contact MFOG: see (1) below.

April 6-8 (Prague) **19th Conference of the Standing Committee on Regional and Urban Statistics**
Contact ISI Permanent Office, 428 Prinses Beatrixlaan, P.O. Box 950, 2270 AZ Voorburg, Netherlands.

April 6–10 (Minneapolis, Minnesota) **IMA Workshop on Linear Algebra for Signal Processing**
Contact IMA: see (3) below.

April 7-10 (Lisbon) **Statistics in Public Resources and Utilities and in Care of the Environment (SPRUCE)**
Contact V. Barnett, Dept. of Probability and Statistics, The University, Sheffield S3 7RH, UK.

April 12-18 (Oberwolfach, Germany) **Mathematische Logik**
Contact MFOG: see (1) below.

April 13-17 (Berkeley, California) **Workshop on Lie Groups, Ergodic Theory and Geometry**
Contact MSRI: see (2) below.

April 26-28 (Manhattan, Kansas) **Kansas State University Conference on Applied Statistics in Agriculture**
Contact George A. Milliken, Kansas State University, Department of Statistics and Statistics Laboratory, Dickens Hall, Manhattan, Kansas 66506, U.S.A.

April 26-May 2 (Oberwolfach, Germany) **Gruppentheorie**
Contact MFOG: see (1) below.

April 30 - May 1 (Pittsburgh, Pennsylvania) **23rd Annual Pittsburgh Conference on Modeling and Simulation**
Contact W.G. Vogt, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, Pennsylvania 15261, U.S.A.

May (L'Aquila, Italy) **Conference on Classification of Algebraic Varieties**
Contact E.L. Livorni, Dipartimento di Matematica, Universita, Via Vetoio, loc. Coppito, 67100 L'Aquila, Italy.

May 6-9 (University Park, Pennsylvania) **Seventh International Conference on Multivariate Analysis in memory of Parachuri R. Krishnaiah**
Contact C.R. Rao, 123 Pond Laboratory, Pennsylvania State University, University Park, Pennsylvania 16802, U.S.A.

May 10-16 (Oberwolfach, Germany) **Geschichte der Mathematik**
Contact MFOG: see (1) below.

May 11-13 (Chicago, Illinois) **Fourth SIAM Conference on Optimization**
Contact SIAM: see (6) below.

May 17-23 (Oberwolfach, Germany) **Quadratische Formen**
Contact MFOG: see (1) below.

May 24-30 (Oberwolfach, Germany) **Kommutative Algebra und Algebraische Geometrie**
Contact MFOG: see (1) below.

May 31 - June 6 (Oberwolfach, Germany) **Singularitaten**
Contact MFOG: see (1) below.

May 31 - June 6 (Oberwolfach, Germany) **Free Resolutions in Algebraic Geometry and Representation Theory**
Contact MFOG: see (1) below.

June 1–5 (Minneapolis, Minnesota) **IMA Workshop on Linear Algebra for Control Theory**
Contact IMA: see (3) below

June 1-5 (Kalamazoo, Michigan) **7th International Conference on Graph Theory, Combinatorics, Algorithms and Applications**
Contact Y. Alari, Department of Mathematics and Statistics, Western Michigan University, Kalamazoo, Michigan 49008-5152, U.S.A.

June 7-13 (Oberwolfach, Germany) **Computational Group Theory**
Contact MFOG: see (1) below.

June 8-11 (Vancouver, Canada) **Sixth SIAM Conference on Discrete Mathematics**
Contact SIAM: see (6) below.

June 14-20 (Oberwolfach, Germany) **Freiformkurven and Freiformflachen**
Contact MFOC: see (1) below.

June 14–20 (West Lafayette, Indiana) **5th International Symposium on Statistical Decision Theory and Related Topics**
Contact Shanti S. Gupta, Department of Statistics, Purdue University, West Lafayette, IN 47905, U.S.A.

June 15-18 (Edmonton, Canada) **Wave Phenomena II: Modern Theory and Applications**
Contact Canadian Applied Mathematics Society Conference, Applied Mathematics Institute, University of Alberta, Edmonton, Alberta, Canada T6G 2G1.

June 15–19 (Toronto, Canada) **Twenty First International Conference on Stochastic Processes and their Applications**
Contact G.L. O'Brien, Department of Mathematics, York University, 4700 Keele Street, North York, Ontario M3J 1P3, Canada.

June 17-20 (Nova Scotia, Canada) **4th International Conference on Computers and Learning**
Contact I. Tomek, Jodrey School of Computer Science, Acadia University, Wolfville, Nova Scotia BOP 2X0, Canada.

June 21-27 (Oberwolfach, Germany) **Porous Media**
Contact MFOG: see (1) below.

June 22-26 (Toronto, Canada) **5th International Meeting on Statistical Climatology (5IMSC)**
Contact Francis W. Zwiers, Numerical Modeling Division, Canadian Climate Centre, 4905 Dufferin Street, Downsview, Ontario, Canada M3H 5T4.

June 22-26 (Toronto, Canada) **12th Conference on Probability and Statistics in the Atmospheric Sciences**
Contact Paul Mielke Jr., Department of Statistics, Colorado State University, Fort Collins, Colorado 80523, U.S.A.

June 23-26 (Sorrento, Italy) **Homotopy Theory**
Contact R.A. Piccinini, Univ. di Milano, Dipt. di Matematica, Via C. Saldini 50, I-20133 Milano, Italy.

June 28 - July 4 (Oberwolfach, Germany) **Hypebolic Systems of Conservation Laws**
Contact MFOG: see (1) below.

June 29 - July 1 (Port Moresby, Papua New Guinea) **South Pacific Conference on Mathematics and Mathematics Education**
Contact Associate Professor O.P. Ahuja, Department of Mathematics, University of Papua New Guinea, Box 320, University P.O., Papua New Guinea.

June 29 - July 5 (Salamance, Spain) **19th International Colloquium on "Group Theoretical Methods in Physics"**
Contact L.J. Boya, Chairman, Depto. Fisica Teorica, University of Zaragoza, 50.009 Zaragoza, Spain.

July 1-10 (Point-à-Pitre, France) **Stochastic Analysis Workshop of Guadaloupe-Silivri**
Contact C. Martias, Univ. des Antilles et de la Guyanne, Faculté des Sciences, B.P. 592, 97167 Point-à-Pitre Cedex, France.

July 2-8 (Oberwolfach, Germany) **Algebraische Zahlentheorie**
Contact MFOG: see (1) below.

July 5-11 (Oberwolfach, Germany) **Mathematische Modellierung und Simulation Elektrischer Schaltungen**
Contact MFOG: see (1) below.

July 6-10 (Paris) **European Congress of Mathematics**
Contact ECM, College de France, 3 rue d'Ulm, F-75005, Paris, France.

July 6-10 (Perth) **11th Conference of the Australian Statistical Society**
Contact Dr Russel John, School of Agriculture, University of Western Australia, Nedlands, WA 6009, Australia.

July 6-10 (Perth) **18th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing**
Contact Dr K. Vijayan, Department of Mathematics, University of Western Australia, Nedlands, WA 6009, Australia.

July 6-10 (Perth) **36th Annual Meeting of the Australian Mathematical Society**
Contact Dr P.F. Siew, School of Mathematics and Statistics, Curtin University of Technology, Bentley, WA 6102, Australia.

July 6-31 (Minneapolis, Minnesota) **Environmental Studies: Mathematical, Computational and Statistical Analysis**
Contact IMA: see (3) below.

July 11-18 (St Andrews, Scotland) **St Andrews Colloquium**
  Contact J.M. Howie, St Andrews Colloquium 1992, Mathematical Institute, North Haugh, St Andrews, KY16 9SS, Scotland.

July 12-17 (Vienna) **International Colloquium on Automata, Languages and Programming**
  Contact W. Kuich, Technische Univ. Wien, Wiedner Hauptstrasse 8-10, A-1040 Wien, Austria.

July 12-18 (Oberwolfach, Germany) **Arithmetic Algebraic Geometry**
  Contact MFOG: see (1) below.

July 19-24 (Los Angeles) **SIAM Annual Meeting (SIAM's 40th Anniversary)**
  Contact SIAM: see (6) below.

July 19-25 (Oberwolfach, Germany) **Lower-Dimensional Theories and Domain Decomposition Methods in Mechanics**
  Contact MFOG: see (1) below.

July 19-25 (Blaubeuren, Germany) **Applications of Nonstandard Analysis to Analysis, Functional Analysis and Probability Theory**
  Contact M. Wolff, Mathematisches Institüt der Universität Tübingen, Auf der Morgenstelle 10, D-74 Tübingen, Germany.

July 20-24 (St Andrews, Scotland) **The Fifth International Conference on Fibonacci Numbers and their Application**
  Contact Professor A.F. Horadam, Department of Mathematics, Statistics and Computer Science, University of New England, Armidale, New South Wales 2351, Australia.

July 20-26 (Paris) **International Conference on Algebraic Geometry**
  Contact Y. Laszlo, Univ. Paris-Sud, Mathématiques Bat. 425, 91405 Orsay Cedex, France.

July 26-31 (Vancouver) **18th International Symposium on Rarefied Gas Dynamics (RGD 18)**
  Contact B. Shizgal, RGD 18, Dept. of Chemistry, University of British Columbia, Vancouver, British Columbia, Canada V6T 1Y6.

July 26 - August 1 (Oberwolfach, Germany) **Variationsrechnung**
  Contact MFOG: see (1) below.

August (Kazan, U.S.S.R.) **The International Conference Lobachevsky and Modern Geometry devoted to the 200th Anniversary of Lobachevsky's birthday**
  Contact V.V. Vishnevsky, Department of Geometry, Kazan University, 18 Lenin Street, Kazan, 420008 - U.S.S.R.

August 3–7 (San Sebastian, Spain) **IMSIBAC 5(5th International Meeting of Statistics in the Basque Country**
  Contact Professor J.P. Vilaplana, Faculty of Mathematical Sciences, University of Bilbao, E–48070 Bilbao, Spain.

August 3-7 (Clearwater, Florida) **6th Workshop on Lie-Admissible Formulations**
  Contact G.F. Weiss, Chairman of the Organizing Committee, 6th Workshop on Lie-Admissible Formulations, The Institute for Basic Research, 495 A-19, no. 1577, Palm Harbour, Florida 34682-1577, U.S.A.

August 9-15 (Oberwolfach, Germany) **Jordan-Algebren**
  Contact MFOG: see (1) below.

August 16-22 (Oberwolfach, Germany) **Reelle Analysis**
  Contact MFOG: see (1) below.

August 16–23 (Québec City, Canada) **ICME7 : Seventh International Congress on Mathematics Education**
Contact D. Wheeler, Department of Mathematics, Concordia University, 7141 ouest, rue Sherbrooke, Montréal, Québec H4B 1R6, Canada.

August 19–26 (Melbourne, Florida) **World Congress of Nonlinear Analysts**
Contact Professor V. Lakshmikantham, Department of Applied Mathematics, Florida Institute of Technology, 150 West University Boulevard, Melbourne, FL 32901-6988, U.S.A.

August 22–28 (Haifa, Israel) **18th International Congress of Theoretical and Applied Mechanics**
Contact A. Solan, Secretary, IC-TAM 1992, Faculty of Mechanical Engineering, Technion-Israel Institute of Technology, Haifa 32000, Israel.

August 23-29 (Oberwolfach, Germany) **Mathematical Finance**
Contact MFOG: see (1) below.

August 25-29 (Rabat, Morocco) **3rd Islamic Countries Conference on Statistical Sciences**
Contact Secretary, Executive Board, Islamic Society of Statistical Sciences, 122-F Liberty Plaza, Gulberg-III, Lahore, Pakistan.

August 30 - Sept. 5 (Oberwolfach, Germany) **Komplexe Analysis**
Contact MFOG: see (1) below.

August 31 - Sept.2 (Pécs, Hungary) **4th International Workshop on Generalized Convexity**
Contact Professor S. Komlosi, Faculty of Economics, Janus Pannonius University, Rakoczi ut 80, H-7621 Pécs, Hungary

September (Beijing) **IMACS 2nd International Conference on System Simulation and Scientific Computing - BICSC '92**
Contact W. Chuan-Yuan, Chinese Association for System Simulation, 37 Xue Yuan Rd., Beijing 100083, China.

September 6-12 (Oberwolfach, Germany) **Topologie**
Contact MFOG: see (1) below.

September 9-11 (Sheffield, U.K.) **Royal Statistical Society Full Conference**
Contact Professor P.J. Diggle, Mathematics Department, Lancaster University, Lancaster LA1 4YF, U.K.

September 13-19 (Oberwolfach, Germany) **4-Dimensional Manifolds**
Contact MFOG: see (1) below.

September 14-18 (Bath, U.K.) **20th European Meeting of Statisticians**
Contact Professor R. Gibson, School of Mathematics, University of Bath, Claverton Down, Bath BA2 7AY, U.K.

September 16-18 (Minneapolis, Minnesota) **2nd SIAM Conference on Control in the 90s**
Contact SIAM: see (6) below.

September 17-19 (Timisoara, Romania) **International Conference on Group Theory**
Contact "The Group Theory Conference", Division of Algebra, Dept. of Mathematics, Univ. of Timisoara, Bd. V. Parvan 4, 1900 Timisoara, Romania.

September 20-26 (Oberwolfach, Germany) **Funktionalgleichungen**
Contact MFOG: see (1) below.

September 21-23 (Barcelona) **7th International Conference on Multivariate Analysis in memory of Ronald A. Fisher**
Contact C.M. Cuadras, Universitat de Barcelona, Barcelona, Spain.

September 27 - October 3 (Oberwolfach, Germany) **Darstellungstheorie Endlicher Gruppen**
Contact MFOG: see (1) below.

October 4-10 (Oberwolfach, Germany) **Funktionalanalysis**
Contact MFOG: see (1) below.

October 16-19 (Salt Lake City, Utah) **Second SIAM Conference on Dynamical Systems**
Contact SIAM: see (6) below.

October 18-24 (Oberwolfach, Germany) **Geometrie**
Contact MFOG: see (1) below.

October 25-31 (Oberwolfach, Germany) **Stochastische Analysis**
Contact MFOG: see (1) below.

November (Gold Coast, Queensland) **AUSCRYPT '92**
Contact Professor W. Caelli, Faculty of Information Technology, Queensland University of Technology, P.O. Box 243, Brisbane, Queensland 4001, Australia.

November 1-7 (Oberwolfach, Germany) **Kombinatorik**
Contact MFOG: see (1) below.

November 8-14 (Oberwolfach, Germany) **Numerische Integration**
Contact MFOG: see (1) below.

November 14-16 (Allahabad, India) **The Third Biennial Conference of the Allahabad Mathematical Society**
Contact K.K. Azad, Secretary, Allahabad Mathematical Society, 10, C.S.P. Singh Marg, Allahabad - 211001, India.

November 15-21 (Oberwolfach, Germany) **Komplexitätstheorie**
Contact MFOG: see (1) below.

November 16-20 (Concepcion, Chile) **International Congress on Numerical Methods in Engineering and Applied Sciences**
Contact Sergio Lavanchy, Facultad de Ingenieria, Casilla 53-C, Concepcion, Chile.

November 29 - December 5 (Oberwolfach, Germany) **Theory of Large Deviations**
Contact MFOG: see (1) below.

December 6-12 (Oberwolfach, Germany) **Theory and Numerical Methods for Initial-Boundary Value Problems**
Contact MFOG: see (1) below.

December 7-11 (Bangalore, India) **IMACS Symposium on Scientific Computing and Mathematical Modelling**
Contact K.S. Yajnik, C-MMACS, National Aeronautical Lab, Belur Campus, Bangalore 560037, India.

December 13-19 (Oberwolfach, Germany) **Asymptotische Statistik**
Contact MFOG: see (1) below.

December 16-22 (New Delhi) **7th International Conference on Multivariate Analysis in memory of Prasanta Chandra Mahalanobis**
Contact S.K. Mitra, Delhi University, New Delhi, India.

** 1993 **

January 3-7 (Auckland) **International Conference on Scientific Computation and Differential Equations (in honour of Professor John Butcher's 60th birthday)**
Contact Professor Kevin Burrage, Department of Mathematics, University of St Lucia, Brisbane, Australia.

May 20-23 (Santa Barbara, California) **International Conference on Approximation Probability and Related Fields**
Contact S.T. Rachev, Dept. of Statistics and Applied Probability, University of California, Santa Barbara, California 93106, U.S.A.

August 1-14 (Galway, Ireland) **Groups 93 Galway/St Andrews**
Contact: email groups 93 @ st. andrews.ac,uk (telefax +353 91 25700).

August 25 - September 3 (Firenze, Italy) **49th Biennial Session of the International Statistical Institute**
Contact ISI Permanent Office, 428 Prinses Beatrixloan, P.O. Box 950, 2270 AZ Voorburg, Netherlands.

** 1994 **

August (Zürich, Switzerland) **The International Congress of Mathematicians 1994**
Contact R. Jeltsh, Seminar für Angewandte Mathematik, ETH Zürich, Switzerland.

Special Contact Addresses:

(1) **MFOG:** Mathematisches Forschungsinstitut Oberwolfach Geschäftstelle, Alberstrasse 24, D-7800 Freiburg in Breisgau, Germany.

(2) **MSRI:** I. Kaplansky, Director, MSRI, 1000 Centennial Drive, Berkeley, California 94720, U.S.A.

(3) **IMA:** Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street S.E., Minneapolis, Minnesota 55455, U.S.A.

(4) **RIMS:** Research Institute for Mathematical Sciences, Kyoto University, Kitashirakawa, Sakyo-ku, Kyoto 606, Japan.

(5) **ICTP:** International Centre for Theoretical Physics, P.O. Box 586, 34100 Trieste, Italy.

(6) **SIAM:** SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, Pennsylvania 19104-2688, U.S.A.

(7) **IMA:**   Miss Pamela Irving, Conference Officer, The Institute of Mathematics and its Applications, 16 Nelson Street, Southend-on-Sea, Essex SS1 1EF, England.

(8) **CIRM:** A. Zeller-Meier, CIRM, Luminy, Case 916, F-13288 Marseille, Cedex 9, France.

M.R. Carter

PROBLEMS AND QUERIES

There is no fresh correspondence, so we publish as our "swan-song" the problems from the 32nd International Mathematical Olympiad in Sweden in July 1991. Our team did well coming 29th equal this time. How would you go on these problems?

32nd International Mathematical Olympiad Questions

Total time allowed: 9 hours.

1. Given a triangle ABC, let I be the centre of its inscribed circle. The internal bisectors of the angles A, B, C meet the opposite sides in A', B', C' respectively. Prove that

$$\frac{1}{4} < \frac{AI \cdot BI \cdot CI}{AA' \cdot BB' \cdot CC'} \leq \frac{8}{27}.$$

2. Let $n > 6$ be an integer and $a_1, a_2, \ldots, a_k$ be all the natural numbers less than n and relatively prime to n. If

$$a_2 - a_1 = a_3 - a_2 = \ldots = a_k - a_{k-1} > 0,$$

prove that n must be either a prime number or a power of 2.

3. Let $S = \{1, 2, 3, \ldots, 280\}$. Find the smallest integer n such that each n-element subset of S contains five numbers which are pairwise relatively prime.

4. Suppose G is a connected graph with k edges. Prove that it is possible to label the edges $1, 2, 3, \ldots, k$ in such a way that at each vertex which belongs to two or more edges the greatest common divisor of the integers labelling those edges is equal to 1.

[A *graph G* consists of a set of points, called *vertices*, together with a set of *edges* joining certain pairs of distinct vertices. Each pair of vertices u, v belongs to at most one edge. The graph G is *connected* if for each pair of distinct vertices x, y there is some sequence of vertices $x = v_0, v_1, v_2, \ldots v_m = y$ such that each pair v_i, v_{i+1} $(0 \leq i < m)$ is joined by an edge of G.]

5. Let ABC be a triangle and P an interior point in ABC. Show that at least one of the angles $\angle PAB$, $\angle PBC$, $\angle PCA$ is less than or equal to 30°.

6. An infinite sequence $x_0, x_1, x_2, \ldots$ of real numbers is said to be *bounded* if there is a constant C such that $|x_i| \leq C$ for every $i \geq 0$. Given any real number $a > 1$, construct a bounded infinite sequence $x_0, x_1, x_2, \ldots$ such that

$$|x_i - x_j| \, |i - j|^a \geq 1$$

for every pair of distinct non-negative integers i, j.

<div align="right">
Mike Hendy
Graeme Wake
</div>

Solution to Crossword No 34

CROSSWORD

No 35

by K N Tode
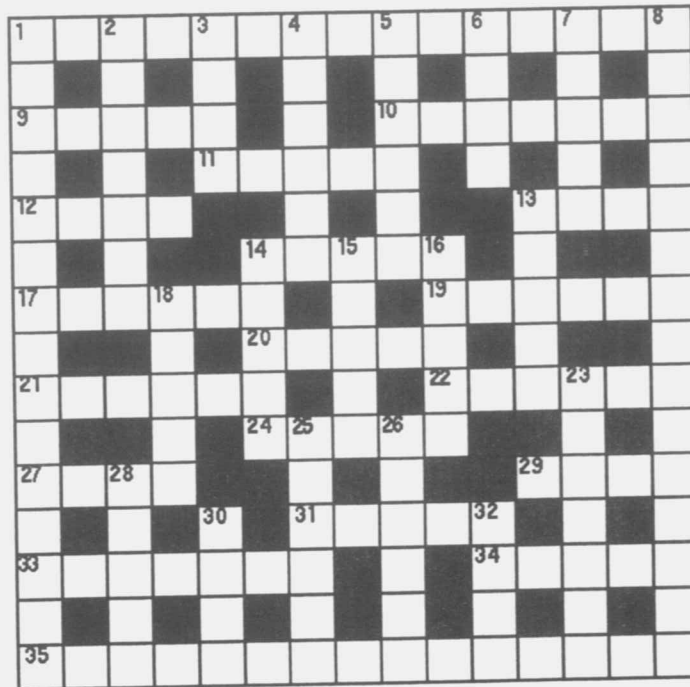
Across

1. Involved, unstable and not real (7,8)
9. Girth as is correct (5)
10. Annoy about a hundred ways (7)
11. Dates made replete (5)
12. Praise about the system of land tenure (4)
13. Five in trouble made material (4)
14. Reliance sounds bound (5)
17. Provoke a pointer (6)
19. Dress of habitual jogger? (6)
20. Player in Croat's clothing (5)
21. Church official right on edge (6)
22. To mark the leather at the back of the neck (6)
24. State bird for shingle slide (5)
27. Dress for classic direction before another (4)
29. Self conveyance (4)
31. English car's end is floral powder (5)
33. Gear meshed in TT's bowman's boards (7)
34. Both hands and youse at the central rock? (5)
35. Three common to English and French standards (3,5,3,4)

Down

1. "I'm craving a court," (mistranslated, by Columbus(?), who wanted to be one but wasn't) (15)
2. Get a man into powerful one (7)
3. Plenty often drawn (4)
4. Unknowns set about right bone scraper (6)
5. Confidential lines like the Roman days (6)
6. Small island measurement (4)
7. No big game. Got it? (5)
8. Is it a page or just a part of space? (7,2,6)
13. Fluid Waiter! I am left out (5)
14. Waterworks rents (5)
15. The endmost say (5)
16. Twisted gold set in store (5)
18. Keep gardening for the two-sided figure (5)
23. Normal world organisation? Quite the opposite (7)
25. Misplace in court wardrobe (6)
26. Her? O, a pure mix-up! (6)
28. Toured by 1 (5)
30. Second Hebrew girl (4)
32. Often irrational but not fully ridiculous (4)

Dr Tode has enjoyed this year as a guest setter, and on his departure for 34 across returns the task of setting the crossword to Matt Varnish.