THE NEW ZEALAND
MATHEMATICAL SOCIETY (INC.)

NEWSLETTER

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PUBLISHER'S NOTICE

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	Prof John Butcher (University of Auckland), to 1991
	Prof Rob Goldblatt (Victoria University of Wellington), to 1992
	Dr David Robinson (University of Canterbury), to 1992
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Problems and Queries	Prof Graeme Wake and Dr Mike Hendy (Massey University)
Visitors to New Zealand	Dr David Robinson (Canterbury University)

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Dr J F Harper	Mathematics (Victoria University)
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Mr J H Maindonald	(DSIR, AMG, Mt Albert)
Dr M McGuinness	(DSIR, AMG, Wellington)
Prof D A Nield	Engineering Science (University of Auckland)
Dr J Rayner	Mathematics and Statistics (University of Otago)
Mr G J Tee	Mathematics and Statistics (University of Auckland)

NOTICE OF ANNUAL GENERAL MEETING

The Annual General Meeting of the New Zealand Mathematical Society will be held on Tuesday May 21, 1991 (at either 4.30 pm or 5.00 pm, subject to confirmation) during the New Zealand Mathematics Colloquium at the University of Otago. Items for the Agenda and nominations for the two positions on the NZMS Council should be forwarded to the Secretary.

LOCAL NEWS

DSIR PHYSICAL SCIENCES,
Applied Mathematics Group, Mount Albert

There are now five of us: Rod Ball, Tony Cooper, Jocelyn Dale (30% of time), Stephen Barnett, and myself. We await with keen interest the outcome of discussions on how we will fit into the new Crown Research Institute structure.

The appointment of Elizabeth Robinson as a statistician to Fruit and Trees had greatly increased awareness of requirements for biometrical work in that area. We had a very favourable response to a series of six workshops, run jointly between Applied Maths and Fruit and Trees, on the design and analysis of experiments. We regret that Elizabeth is leaving to join the Department of Community Health at the Medical School.

The statistical language Splus is proving a most effective tool for out day to day work. We are currently trying the beta release of version 3. This dramatically increases the statistical functionality. Also of interest to us is the recently released XLISP-STAT. This has much the same philosophy as S, and uses extensions to LISP to achieve a functionality roughly comparable with that of S.

John Maindonald

UNIVERSITY OF AUCKLAND
Mathematics and Statistics

In 1960 the "site row", which had been debated in Auckland (often passionately) for 55 years, was resolved by the decision that the University of Auckland would not move to Tamaki but would stay on its city site. Everyone then accepted that, with a campus of 18 hectares, enrolments must be limited to 10,000 students. By the end of the 1991 enrolment period, 17,707 students had enrolled at the University of Auckland - there are now perceptible signs of overcrowding on the campus. On 1990 December 13th, the University of Auckland announced that a new campus at Tamaki would be opened for the 1991 academic year. Initially there are 200 stage 1 Commerce students with 13 academic staff, and the Tamaki campus is expected to grow to about 4500 students by the year 2000. Additionally, the University is leasing some buildings near the city campus.

At the end of enrolment, our Department had 708.4 EFTS at Stage 1 (581 in 1989, 612.3 in 1990), 244.0 at Stage 2 (211 in 1989, 231.8 in 1990) and 95.2 for Stage 3 (73 in 1989, 74.2 in 1990). The course Introduction to Probability and Statistics (26.181 and 26.182) with 1392 students, is taught in 8 streams. The 26.182 stream, with 14 students, is taught at Auckland College of Education. Similarly, the preparatory course Introduction to Algebra and Calculus (26.101 and 26.102), has 419 students, 20 of whom are taking the 26.102 stream at ACE.

Dr Ross Ihaka has been appointed Lecturer in Statistical Computing.

Lynne Gilmore was a Tutor here in the early 1970s, with Vaughan Jones attending some of her Stage 3 lectures on analysis. Since then she has been a Statistician in the Alcohol Research Unit at the School of Medicine, and now she has been appointed as Tutor in Mathematics and Statistics, for the Tamaki campus. Andrew Balemi has been appointed as full-time Tutor for 1991. Lynne and Andrew are giving the lectures at Tamaki for papers 26.181 and 26.101, under the supervision of Chris Wild and Ivan Reilly.

Jill Ellis was Director of MECA, and last year she taught a course on Issues in Mathematical Education. She has now been appointed to a 1-year Lectureship in Mathematics Education. She has organised the new course 26.200, on Tutoring in Mathematics, which was designed for 12 students: 88 have applied.

Christine Anderson has been appointed as Tutor for the Wellesley Programme. The maximum number of 100 students have enrolled, with 46 preparing for B.Sc and 54 for B.A.

Peter Danaher is now commuting weekly to here from Hamilton.

Ivan Reilly has been awarded a D.Sc. by VUW.

John Whale joined the Department of Mathematics in 1959, and in 1980 he became a foundation member of the Department of Computer Science. The Departments of Computer Science and of Mathematics and Statistics held a farewell celebration for John, when he retired in December. He and Sheila hope to be able now to spend more time in studying ancient sites in Egypt. A farewell function was held in January for Kevin Burrage and for Nick Wormald. Kevin has become Professor of Computational Mathematics at the University of Queensland, and Nick has become a Lecturer at the University of Melbourne. Simon Fitzpatrick will leave in June, to become a Senior Lecturer at the University of Western Australia.

Our Department is currently seeking Lecturers for the following positions [see advertisement on p. 10]: Replacements for Kevin, Nick and Simon; Lecturer in Mathematics Education (in succession to Jill Ellis), Lecturer for the Tamaki campus, and Lecturer in Applied Statistics. Also, the post of Tutor (which was vacated by Margaret Morton when she was appointed recently as Lecturer) has now been up-graded, and we are advertising that as a Lectureship. The Lecturer for the Tamaki campus will also have an office within our Department.

Robert Chan has gone to the University of Toronto until June, on a post-doctoral fellowship.

Professor Fred Chipman, from Acadia University, is visiting the Applied and Computational Mathematics Unit for the first term.

Dr. Robert Gentleman, a biostatistician from the University of Waterloo, is visiting the Statistics Unit for the first half of 1991.

Dr. Jiang Shouli, a topologist from Shandong University, is visiting our Department for 5 months.

Dr. Chris Godsil, from the University of Waterloo, is visiting for the first term, and is teaching a graduate course on Algebraic Combinatorics.

Professor Peter Whittle FRS, the 1991 Forder Lecturer, visited our Department on March 4th and 5th, giving 2 seminars.

Ganesh Dixit had returned briefly to Auckland in August, when he had been scheduled to go for the remainder of his leave to the University of Kuwait! Instead, he spent the rest of his leave at Ujjain University, visiting also some other universities in India.

David Gauld returned from leave at Helsinki, where he and Louise shared a flat with M. K. Vamanamurthy (and others). David and Louise then went on to Dubrovnik, Madison and Ann Arbor. John Kalman returned from leave at Kaiserslautern and at Coïmbra University, plus a visit to Argonne National Laboratories. Gaven Martin returned from leave at the Mittag-Leffler Institute, Oberwolfach (Seminar on Complex Analysis), University of Helsinki, IHES Paris and the University of Michigan. He gave invited addresses at the Nevanlinna Symposium and at the Teichmüller Symposium, and he gave lectures at many places in Sweden and in the USA. Gaven has been promoted to Senior Lecturer.

John Butcher and Alastair Scott will go on leave, after the first term.

Marston Conder has been promoted over the Bar, in the Senior Lecturers Scale.

David P. Smith is a Demonstrator for 1991, in charge of tutoring for Stage 1 Statistics, and for the new courses in Quantitative Analysis for students of commerce (with 93 students for 26.108 and 185 students for 26.188). Geoffrey Pritchard, James Reilly, Cecil Smith, Paul Taylor and Melissa White are Temporary Tutors for 1991. Michael Smyth has gone for post-graduate study to the University of Newcastle.

The Department of Computer Science have begun vacating their offices on Floors 2 and 4 of the Physics wing of the Science Block, moving into new offices on Floor 1 and in the Library wing. Consequently, our Department is now occupying all of Floors 2 and 3, and half of Floor 4 of the Physics wing.

Marston Conder, Peter Gibbons, Peter Lorimer and Margaret Morton attended the 1990 Australasian Conference on Combinatorial Mathematics and Computing, held at Massey University in December. Marston spoke on "Random walks in large finite groups", Peter Lorimer spoke on "Embedding symmetric graphs in surfaces" and Margaret spoke on "Classification of 4- and 5-arc transitive cubic graphs of small girth". The 27th Applied Mathematics Conference of the Australian Mathematical Society, on Nonlinear Dynamics, was held at Hanmer Springs from February 3rd to 7th. Over 100 people attended, including John Butcher, Bruce Calvert and Colin Fox. John gave an invited address on "Singly-Implicit Runge-Kutta Methods", and Bruce spoke on "Some properties of flow in pipe networks".

Our Department now has 10 people enrolled for Ph.D., more than ever before. These include assistant lecturers Tim Marshall, Geta Misira and Soo Siew-Choo.

Seminars

Dr. Uri Ascher (University of British Columbia), "Projected methods for differential-algebraic problems".

Dr. Ian Doust (UNSW), "Spectral projections for Hermitian operators".

Dr. Nick Fisher (CSIRO), "Using the Bootstrap in practice".

Dr. George Havas (University of Queensland), "Aspects of algebraic computation".

Dr. Hans-Peter Künzi (University of Berne), "Digital Topology".

Professor Jerome Spanier (Claremont College, California), "Multi-stage procedure for systematic variance-reduction in Monte Carlo problems".

Professor Peter Whittle, FRS (Cambridge University), "Probability theory via expectation", and "Neural Networks" (in the Department of Engineering Science).

<div align="right">G. J. Tee</div>

UNIVERSITY OF CANTERBURY
Mathematics

Robert Bull retired at the end of January to start a new career as a speech therapist (see article on page 12 in this issue). With a brave new university world just around the corner, several others have talked about moving on, but there don't seem to be any other retirements coming up in the immediate future. While we wait for a permanent replacement, Günther Steinke has become a temporary lecturer.

Derrick Breach has gone to the University of Queensland for the first part of his sabbatical. Later he will move on to Auburn University in Alabama.

During the summer Graham Wood and Bill Baritompa were abroad studying global optimization at a workshop in Hungary. Graham also attended a Total Quality Management seminar in Mississippi, and since his return he has been spreading the TQM good news to local business leaders. (He also talks about it to the first year statistics class, where it goes down quite well.)

We have two long-term visitors at the moment. Professor Heinz Bauer (director of the Mathematics Institute at Erlangen) is here until Good Friday. He is giving a series of lectures about modern potential theory at the moment. The other visitor is Professor John Herzog from Pacific Lutheran University who is spending part of his sabbatical year here (until May). His main interest is chaos theory.

The more applied members of the department organized the 27th meeting of the (Australasian) Applied Mathematics Conference at Hanmer in early February, and a Symbolic Algebra workshop afterwards here in Christchurch.

Despite an initial scare that we might have to put on another stream of our main first-year mathematics course, class numbers actually seem to be slightly down this year. The extra students vanished during enrolment week, presumably into their first-choice limited-entry courses. Once again the Polytech is offering back-up courses for those students whose background is weak (though with a course fee of $165 it is considerably more expensive than what is probably a wiser choice: going to Hagley High School's 7th form maths for just $30 a year!). The Polytech course was at best a limited success last year. Very few students persisted with it to the end of the year (although those that did seem to have performed above expectations), and the overall pass rate showed no improvement. We are trying to improve our liaison with local secondary teachers, and hopefully this will help us to reduce the high failure rate and its associated waste.

Our first-year statistics course had over 900 applicants for the 600 available places, but in the end anyone who got over 50% in bursary statistics was able to get into the course. The third-year statistics courses now have about 25 students each, a welcome change from the years when they had only one or two students.

Seminars

Professor Bruce Weir (North Carolina), "Statistical issues in the forensic uses of DNA."

Professor Heinz Bauer (Erlangen), "Analytic and probabilistic aspects of potential theory" (8 lectures)

Professor Peter Whittle (Cambridge), "Restless bandits and optimality conjectures", and "Probability theory via expectation".

Professor Bert Keats (Arizona), "Developing and maintaining a statistical reliability program in a manufacturing environment".

<div align="right">John Hannah</div>

MASSEY UNIVERSITY
Mathematics and Statistics

After grinding for some time, the University machinery has produced the outcome we were hoping for—Mathematics, Statistics, Computer Science and Information Systems are now grouped in a School of Mathematical and Information Sciences (I think this title is correct at time of writing, but I'm not sure that it has finally settled into a stable configuration). The School is not part of any faculty, but that is the only thing about its administrative structure that is certain at the moment. It is also equally unclear whether the creation of the School will result in any changes in the teaching programmes of the various subjects involved. We await developments!

We were all shaken and saddened by the untimely death of Sirimathie Wewala (due to a sudden illness). Sirimathie had just been appointed to a lectureship in statistics in our department (a move from DSIR Palmerston North) and was due to start work early in 1991. Our sympathy goes out to her husband Rohan and young son Navin.

Graeme Wake has been appointed External Examiner for Mathematics at University Brunei Darassalam, and will visit there for a couple of weeks in May to assess scripts and attend examiners' meetings.

Richard Rayner arrived recently to take up an appointment as a computer software consultant with the Department. Richard comes to us with B.Sc. degrees in mathematics and computer science from Canterbury, and experience as a programmer with Gough Technology, Christchurch.

Seminars

Nicola Jayne (Massey), "Foliations".

Khee-Meng Koh (National University of Singapore), "Chromatically unique graphs".

Maricke Vlieg (Massey), "Comments upon exact solutions of the Korteweg-de Vries-Burgers' equation".

Paul Bonnington (Massey), "The classification of combinatorial surfaces using 3-graphs".

Bruce Weir (North Carolina State University), "Statistical issues in the forensic use of DNA".

John R. Philip (CSIRO Canberra), "Certain boundary layer equations and natural coordinates: some conjectures".

Tony Pleasants (MAF Whatawhata), "Discussion of some mathematical problems arising in agriculture".

Peter Whittle (Cambridge; 1991 Forder Lecturer), "Neural networks: a survey" and "Probability theory via expectation".

M.R. Carter

OTAGO UNIVERSITY
Mathematics and Statistics

Things are settling back after an action-packed summer. Of course, for some action of summer took place in winter, but that is just one of the quirks of living on a sphere in elliptic orbit about another sphere.

Professor Derek Holton spent six weeks in England establishing links between the WSIHE (West Sussex Institute for Higher Education), the Dunedin College of education and the University of Otago. His very full timetable of activities provided him with the opportunity to discuss and experience first-hand some of the new approaches to Mathematics Education in the U.K., as well as working with gifted students and sharing some of his own considerable skills in developing mathematical interest and ability.

Professor Bryan Manly taught two one-week workshops on Statistics of Resource Selection by Animals at the University of Wyoming in January. The workshops were mainly attended by U.S. government biologists. Professor Manly also had published a book, "Randomization and Monte Carlo Methods in Biology" (Chapman and Hall, December 1990).

Dr. Gerrard Liddell has returned from a year's leave in Indiana. The experience was refreshing and productive and Gerrard will have some more information on that, one day.

The Mathematics and Statistics Department has appointed a new member of academic staff; Dr. David Fletcher. David has come to us from the University of Sydney and is interested in Experimental Design and Applied Statistics in general. He is pursuing several interesting projects and seems to be settling in well.

Plans for the year ahead include various seminar series and visitors. Yes it's all go, go, go!

Robert Aldred.

VICTORIA UNIVERSITY
Mathematics
Institute of Statistics and Operations Research

This report includes material from the second half of 1990, which missed the previous Newsletter.

There has been an administrative re-organisation between the Mathematics Department and the Institute of Statistics and Operations Research (ISOR), in which the following teaching staff have transferred their departmental membership from Mathematics to ISOR: Brian Dawkins, Megan Clark, Peter Thomson, Peter Smith, Tapas Sarkar, Shirley Pledger, Leigh Roberts, David Vere-Jones, and Tony Vignaux. ISOR now has formal responsibility for undergraduate teaching in statistics and operations research, in addition to its existing functions of graduate study, internal and external consulting, and research in these areas. David Vere-Jones continues as chairperson of ISOR, and Rob Goldblatt does likewise for Mathematics.

The change formalises a situation that has existed in practice for some time. Academic relationships between Maths and ISOR remain close, and the two departments will be housed alongside each other (together with Computer Science and the Computer Services Centre) in new accommodation due for occupation in November.

From an external perspective, it may be useful to note that enquiries about matters to do with statistics or operations research should in future be addressed to the chairperson of ISOR.

Terence Nonweiler retired on January 31st after fifteen years with the Department, and has had the title Emeritus Professor conferred. His replacement, Mark McGuinness, moved in the next day (see page 14 in this issue).

John Harper, currently on sabbatical at Oxford, has been awarded a higher doctorate in Science, the Sc.D., by Cambridge University.

Rob Goldblatt was elected to Fellowship of the Royal Society of New Zealand in November.

Rod Downey was presented with his Royal Society Hamilton Award at the Combinatorics conference at Massey in November, which was also attended by Stephen Glasby.

Staff travelling overseas included Stephen Glasby in November to the Sydney meeting on computational algebra and group theory in honour of Tim Wall; Rob Goldblatt to the International Congress at Kyoto; and Rod Downey to the Fourth Asian Logic Conference in Tokyo in September, where he gave an invited address.

Recent visitors from overseas have included Calvin Long from Washington State (combinatorics), Charles Miller from Melbourne (group theory, mathematics education), and George Havas from Queensland (computational algebra).

Peter Cholak, a recursion-theorist currently at Wisconsin-Madison, has been appointed to a VUW Post-Doctoral Fellowship. He is due to arrive in June to work with Rod Downey.

Amongst those receiving promotion at the end of 1990 were Colin Bailey (over the Lecturer bar), Megan Clark (over the Senior Lecturer bar), and Rod Downey (to Reader).

Rob Goldblatt

UNIVERSITY OF WAIKATO
Mathematics and Statistics

A lot of change and activity around the University. In spite of attempts to achieve the chemist's ideal of a "steady state" university our total numbers are up by between 8% and 10%.

Judi McWirter commenced her Lectureship. Biographical details are included on page 15 in this Newsletter. Bill Bolstad completed the D.Phil degree. The thesis is entitled "Estimating and Forecasting Univariate and Multivariate Time Series using Dynamic Linear Models". John Turner and Ian Urch have returned from leave. Ian Craig is still in the United Kingdom, the only absentee. We have a new tutor Paul Bonnington: Paul is completing his Ph.D at Massey in topological graph theory.

Douglas Bridges gave a short communication at ICM (Kyoto) and two invited talks at Asian Logic Conference (Tokyo). He will be NZMS Visiting Lecturer in 1991.

John Turner has been invited to speak at the special session "Problems in Number Theory" the the AMS meeting 8-11 August 1991 on Orono, Maine. The first two pamphlets have been published in our 'occasional series' Topics in Braiding Theory and Practice (A. G. Schaadke and J.C.Turner). It is a also a pleasure to be able to report that the Royal Institute for the Blind is to make a 'talking book' of "First steps in Numerical Analysis" by Hosking, Joyce and Turner, (Hodder and Stoughton).

The course in the History of Mathematics developed by Mark Schroder has passed through a fairly

successful two-year pilot testing period, and has met with significant student support, well justifying the demands on preparation of course material. This year it goes into recess in favour of an equally pilot course in geometry, centred around classical Euclidean and locally Euclidean geometries. Mark asks this challenging question: "Am I the only mathematician in NZ never to have spoken on a Colloquium?".

The government funding shortfall and additional inequitable cuts to Law School and general funding for Waikato had serious consequences for our enrolment procedures this year. The University imposed a 95% of last years numbers ceiling on first-year courses, making the complex net of relationships between our own streamed courses and programs of study difficult, if not impossible, to maintain.

The Department has completed a review of the Part II course programme, and is implementing this in 1991. Included is a new course in Computational Mathematics which consists of a study of algorithms in general followed by modules on numeric and symbolic computation. Reviews of Part I and the upper division programme are underway.

Dennis Cook of the University of Minnesota is visiting the Waikato Centre for Applied Statistics for two months. His workshop on Dynamic Graphical Methods in Linear Models had 55 attendees and generated a lot of interest in XLISP-STAT, the system he has developed.

<div align="right">Kevin Broughan</div>

NOTICES

NEW ZEALAND SCIENCE MONTHLY
Science Magazine Seeks Information

The *New Zealand Science Monthly* provides an informative, readable look at New Zealand science and technology. It is read by everyone from secondary school students to academics, and aims to provide information of substance in a non-technical manner. The magazine covers a broad range of subjects in a variety of ways—including feature stories, opinion pieces, conference announcements, new technology developments and book reviews.

We would welcome submissions from researchers, engineers and interested parties about their work, their ideas and their concerns. These could range from copies of abstracts to conference proceedings, from information for feature articles to letters to the editor. This is a chance to reach the general public and assure them that science is alive and kicking in New Zealand.

Copies of writer's guidelines are available on request as are free evaluation copies of the magazine itself. Write to: Vicki Hyde, Editor, New Zealand Science Monthly, PO Box 19-760, Christchurch 8005. Tel: 03-845-137. FAX: 03-845-138.

COMPUTATIONAL GEOMETRY
A New Journal

Elsevier announces the publication of this new international journal for 1991 under the editorship of J-R Sack, Carleton University, Ottawa, and J Urrutia, University of Ottawa. The honorary editors are P Erdös and F P Preparata.

The journal will publish fundamental research in all areas of the subject as well as disseminating information on the applications, techniques, and use of computational geometry.

COMPUTATIONAL GEOMETRY will offer its readers articles on:
- Design and analysis of geometric algorithms
- All aspects of computational geometry including numerical, graph theoretical, combinatorial.
- Computational geometry solutions to fundamental problems arising in computer graphics, pattern recognition, robotics, image processing, CAD-CAM, VLSI design, geometric information systems as well as a special section containing open problems and concise reports on implementations of computational geometry tools.

The subscription price for Volume 1, 1991, 6 issues, will be 280 Dutch guilders, approximately US$166 including postage. The first issue is expected in June 1991. Full details and a free sample copy can be requested by writing to Elsevier Science Publishers, attn: M Haccou, PO Box 103, 1000 AC Amsterdam, The Netherlands.

VAUGHAN JONES IN AUCKLAND

Les Mills   Vaughan Jones   Maurice Williamson

(Photo: GJ Tee)

Vaughan Jones arrived from Berkeley on December 18th, bringing his wife and 3 children for a month's holiday. On Friday December 21st the newly-elected Mayor of Auckland, Les Mills, conducted his first official function: a Civic Welcome to Vaughan Jones.

The ceremony had been arranged by the (former) Ministry of Science, which was represented by Maurice Williamson, the Associate Minister of Research, Science and Technology. Most of the members of the Department of Mathematics & Statistics attended, with other representatives of the University and of Auckland Grammar School, members of the Auckland City Council, and Vaughan's parents and family.

In the Mayor's speech, he observed that New Zealanders had traditionally honoured people for achievements in sport, in business or in finance; and that it's about time that New Zealanders began recognising intellectual achievements. We could hardly have a more inspiring example than Dr. Jones's achievements in mathematics, which had gained him election to the Royal Society and the award of the Fields Medal. Mr. Williamson explained that it was only when he was preparing his speech that he had seen a photograph of Vaughan, and recognised him as a fellow-student at Stage 3. He had thereafter advanced in politics, whereas Vaughan had advanced in mathematics—and sometimes he wondered who had made the better choice. After all (he explained), in public esteem the politicians come just above used-car salesmen!

The NZMS was represented by Ivan Reilly, who explained that Gillian Thornley and Derek Holton were both then out of the country. He emphasized that Vaughan's achievements in knot theory had not been planned in advance. Rather, his deep understanding of von Neumann algebras had enabled him to look at knot theory from a fresh viewpoint, and thereby achieve major advances in that subject. The University of Auckland had given Vaughan a mathematical education which had provided a basis for his subsequent achievements. Ivan had taught topology to Vaughan in a post-graduate course—and had awarded him a B grade. He had awarded A+ grades to 3 other students for that course: their subsequent achievements in topology are significant, but they have been surpassed by Vaughan's!

In his response, Vaughan expressed his deep appreciation of the honour afforded him by the Auckland City Council. He gave tribute to his teachers at Auckland Grammar School and his lecturers at the University of Auckland for the education which they had provided. He expressed particular thanks to Mike Lennon for having induced him to undertake a research project as a graduate student. And he expressed his gratitude to the Government of Switzerland, for having provided the scholarship which had enabled him to advance his studies at Geneva.

The speeches were followed by informal discussions over refreshments. The ceremony was attended by journalists and television reporters, but the Auckland newspapers did not bother to mention the event. The report in the news programme that evening on TV3 is said to have been less inadequate than that on TV1.

Vaughan celebrated his 38th birthday on December 31st, whilst touring Northland with his family. On January 14th he attended the Department of Mathematics & Statistics, for the ceremony of mounting a plaque celebrating his achievements. That bronze plaque was mounted in the entrance foyer on the ground floor, and it is engraved with the following inscription:

<div align="center">

TO HONOUR
VAUGHAN F.R. JONES
BSc '72   MSc '73   Auckland   D ès Sc '79   Geneva
1990 FIELDS MEDAL WINNER
* THE HIGHEST AWARD IN MATHEMATICS *
FOR HIS WORK IN VON NEUMANN ALGEBRAS
WHICH LED TO FUNDAMENTAL DISCOVERIES
IN KNOT THEORY

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(It had been intended to mount the plaque on the day of the Civic Welcome, but when the engraver had delivered the original plaque on that morning, it was found that he had inscribed the word "MATHMATICS"!)

At the 1991 NZ Mathematics Colloquium, at the University of Otago, Vaughan will be the principal speaker.

G. J. Tee

FOSTS
Federation of Scientific and Technological Societies

In December 1990 the above grouping was formed under the auspices of the Royal Society of NZ. At present it is constituted as a sub-committee of the Member Bodies Committee of RSNZ, but this may change as part of the current RSNZ restructuring exercise.

FOSTS has a Council representative of affiliated Member Bodies and I (Professor Graeme Wake) am one of two persons on the Council representing the "Information and Mathematics Group". (The other is from the Surveying section.) I see my role as serving as a link to the Government/RS for the groupings in the Mathematical and Information Sciences and I would expect to liaise with the following societies.

> NZ Mathematical Society
> Statistical Association of NZ
> Operational Research Society of NZ
> NZ Computer Society

(The last two are not currently Member Bodies of the RSNZ).

The Council has an Executive Officer (Mr Brian Balshaw—one of my ex-students) appointed within the Royal Society to serve our needs and that of the Member Bodies. I have also been elected as Deputy-Chairman for 1991 of the Council of FOSTS (Dr Jim Salinger of the NZ Meteorological Service is its Chairman). A comprehensive newsletter is being produced for inclusion with the Society Newsletters.

The objectives of FOSTS are:

1. To provide an independent voice on relevant issues to both Government and the people of New Zealand on behalf of the scientific community
2. To engage in science policy development and lobbying
3. To give a rapid response on technical and scientific matters where advice is sought.

To strengthen my ability to represent the above disciplines I would encourage the above groups to acquaint me of current concerns. We are currently assisting the RSNZ with the submissions on the formation of Crown Research Institutes. I would welcome any thoughts you wish to make on this or any other matter.

Graeme Wake
Massey University

FOUR VACANT LECTURESHIPS
Department of Mathematics and Statistics, University Of Auckland

Applications are invited for four Lectureships, two in Pure Mathematics, one in Industrial Statistics or Operations Research and one in Applied or Computational Mathematics, in the Department of Mathematics and Statistics at the University of Auckland. Applicants should have a proven record in teaching and research.

The Department of Mathematics and Statistics teaches a full range of undergraduate and postgraduate courses. Within the department there are two units which operate with a certain degree of autonomy. These are the Statistics Unit and the Applied and Computational Mathematics Unit.

The Department has particular research strength in finite group theory, functional analysis, complex analysis, topology, numerical analysis and statistics.

Commencing salary will be established within the range $NZ37,440 – $49,088 per annum.

Conditions of Appointment and Method of Application are available from the Assistant Registrar, Academic Appointments, University of Auckland, Private Bag, Auckland. Applications should be forwarded as soon as possible but not later than the closing date 30 June 1991. The University of Auckland is an equal employment opportunity employer.

WB Nicoll
Registrar

SENAC NEWS

Recently incorporated features include the following:

• Functions for primality testing and factoring of large integers. These have been written originally by Steve Galbraith (now at Georgia Tech University) and are based on continued fraction methods. Probabilistic and deterministic algorithms are available. Tests have shown that this implementation is faster than those of other systems like Macsyma or Mathematica or Maple.

• Update to Mark 14 of the NAG Library: This enhancement includes a significant expansion of the available numeric facilities of Senac. Roots of complex polynomials, inverse Laplace transforms, elliptic PDE's, Volterra equations of the second kind, bi-cubic spline interpolation, constrained non-linear least-squares problems, real and complex QR factorisations, real and complex SVD, mixed integer linear programming, statistical distribution functions which allow for non-integer degrees of freedom and non-central distributions, linear regression modelling, generalized linear models, principal component analysis and non-parametric statistics.

• Update to Mark 3 of the NAG Graphics Library: As well as a postscript interface this includes routines for including error bars on function graphs, contouring from scattered data, plotting two and three-dimensional vector fields and plotting the solutions to systems of ODE's.

• Additional matrix and sparse matrix manipulation routines including transformations between band or triangular and regular matrices and matrix block manipulation functions.

Two sparse polynomial data type representations have been introduced and an implementation of Zippel's fast probabilistic greatest common divisor algorithm for multinomials with integer coefficients. These representations were developed by Diane Koorey Willcock and Terry Robb. Also developed by Terry and now included are facilities for the simplification of canonical rational expressions—rational functions where the "variables" could be functions with arguments which in turn could be canonical rational expressions (and therefore will be simplified).

Due for inclusion by May are functions for multinomial factorisation and Risch symbolic integration, a VAX or microVAX processor running VMS, Sun-3, Sun-4 or Sparcstation I running SunOS and a compatible version of the NAG Library. A DECstation implementation will be ready soon.

To obtain information about Test Site Licences (NZ only) send e-mail to kab@waikato.ac.nz or write to: Kevin Broughan, Mathematical Software Project Director, University of Waikato, Private Bag 3105, Hamilton

Kevin Broughan

CONFERENCE REPORT
27th Applied Mathematics Conference, Hanmer Springs, 3-7 February, 1991

The conference series is run by the Division of Applied Mathematics, Australian Mathematical Society, and this conference was organised by a committee from the Mathematics Department, University of Canterbury. It is traditional to hold the conferences outside the main cities early in February, hence the choice of Hanmer Springs. Net registrations totalled 138, of which about 95 came from Australia and 35 from New Zealand. There was a good mix from universities and other research institutions, and the country surroundings aided by fine weather ensured a successful conference.

Ten invited papers and 89 contributed papers were given. The large number of contributed papers forced the committee to restrict them to 20 minutes each, including discussion. The three New Zealand invited speakers were Professors Jim Ansell, John Butcher, and Graeme Wake. Jim Ansell spoke on "The location of earthquakes and the determination of structure", made especially relevant by a description of the Hanmer area and the reason for the hot springs there. We were fortunate that John Butcher agreed to enlarge his contributed paper to an invited paper at less than 24 hours' notice when one of the U.S. invited speakers was unable to travel. This gave him plenty of time to show how "Diagonally-implicit methods for ordinary differential equations" (DIM's) can be improved to DIMSIM's, with mathematical rather than Chinese applications. Graeme Wake described a number of nonlinear mathematical applications under the title "Bifurcation theory applied to chemical and biological systems", including an application to self-combustion of dry-cleaned linen.

One noteworthy feature of these conferences is the number of student speakers, who compete at the conference for the T.M.Cherry Student Prize. There were 19 student speakers this year, of whom 12 came from Australia and 7 from New Zealand. Despite the loading of the judging panel with New Zealand professors, a joint award was given to two Australians. This incentive for student participation is commended to organisers of other conferences such as the NZ Mathematics Colloquia, since the student speakers, the conference, and the Mathematical Society all benefit from it.

This is the second conference in the series to be held in New Zealand, and suggestions have been advanced for a third conference in the lower North Island in a few years time. There is a proposal before the Division's parent, the Australian Mathematical Society, to enlarge the eligibility for membership of the Division to include members of the New Zealand Mathematical Society. If this proposal passes the various hurdles, it will be of considerable benefit to applied mathematics here because of the easier access it will bring to this flourishing Division.

Peter Bryant

ROBERT BULL
A Mathematical Obituary
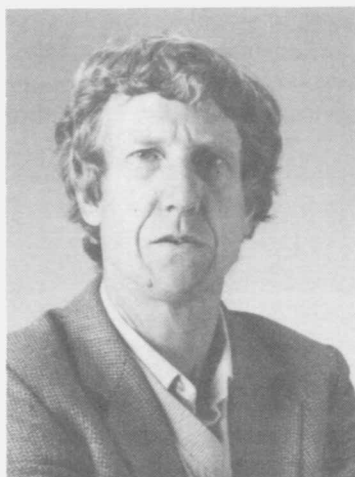
This month (January 1991) marks the end of Robert Bull's career as a mathematician. In 30 years he has accumulated a distinguished record of research into mathematical logic, and he has overcome the handicap of a cleft palate to become one of our most popular lecturers. Next month he starts a new career in speech and language therapy, so I talked to him about his first career.

It was perhaps inevitable that Robert should become a mathematician. His father, M.A. Bull, had a first class degree in mathematics, but he never got the chance to go on to research because he had to support his family after he graduated. He became the headmaster at Timaru Boys High School and gathered around him several other excellent mathematics teachers, including Una Dromgoole and Alan Ramsay. He organised special talks on mathematics for school pupils and played a leading role in forming the Canterbury Mathematical Association. It was in these surroundings that the young Robert's interest began. "I've been fascinated by mathematics since the third form, and really feel sorry for anyone who misses out on that fascination."

In 1956 Robert came to the University of Canterbury to study mathematics. In those days there was perhaps more emphasis on applied mathematics in the department (his M.Sc. course was roughly half and half pure and applied maths), and it is slightly ironic that he should have chosen such an abstract area for research as logic. In fact the inspiration for this came not from the mathematics department but from Arthur Prior's Philosophy 1 course which Robert took in his second year. Prior encouraged this interest in the best possible way: he gave him lots of work to do! "There was a guy, Meredith, in Dublin, at Trinity College. He used to write to Arthur but he'd only ever use postcards. So there'd be just enough room to say 'I have discovered the following result' followed by a statement of the theorem, but no room for the proof. Arthur gave these to me as exercises so that I could find the proofs for him."

Later Prior left Canterbury to take up the chair in philosophy at Manchester and Robert, by now a graduate, gave the logic course which Prior had left behind. In 1960 Robert followed Prior to Manchester to do his Ph.D. Officially he was doing mathematics, so his supervisors were Bernhard Neumann and, after Neumann had left for Canberra, Robin Gandy. However he still worked with Prior, doing an M.Sc. about axiomatizing group theory (a topic which Forder had suggested to Prior before he left New Zealand), and then studying the completeness of modal and tense logics. He finished his Ph.D. in 1962 but he wanted to keep doing research, so he approached Michael Dummett in Oxford. "Dummett and Lemmon had recently published a paper and there was a mistake in a key lemma. I'd gone through the paper proving all the consequences were still true despite this gap. I showed Dummett this work and he took me on." His research went well and he discovered a more systematic approach to completeness than his earlier ad-hoc methods. By 1966 he had a D.Phil. from Oxford.

With two doctorates behind him, he began looking for teaching positions. A temporary job at

Birmingham was followed by a permanent one at Leeds. Was his speech handicap a problem when he applied for these jobs? "For those first two jobs, yes. They cross-examined me very closely about the problem, but obviously decided I was worth the risk. I think the two degrees helped too, although when I did the second one at Oxford I thought I was committing career suicide." And presumably with each new batch of students he's had to overcome their prejudices too? "Yes. Not so much in the past few years, but certainly I remember feeling their initial sense of shock. But it usually disappeared after a couple of weeks when they realised what I was actually like."

Leeds was a logician's paradise with several people working in the area in both the maths and the philosophy departments. However Robert "did one of my U-turns" and left after only four terms to take up a job here at Canterbury in 1969. His research suffered but during the next ten years or so he taught final year honours courses in lots of different aspects of logic, and these courses produced a steady stream of masters and Ph.D. students. "That was the most important part of the job for me." More recently he found a more fruitful area of research in dynamic logic, but this wasn't enough to keep him in mathematics.

The department Robert came back to had changed a lot from the one he'd left behind in 1959. Under Gordon Petersen there was more emphasis on pure mathematics, and the honours degree was built round courses in analysis (some would say it still is!). In more recent times subjects like numerical analysis, statistics and applied algebra have come into their own, and Robert was one of those who pushed for the introduction of courses in discrete algebra and applied linear algebra at the second and third year levels.

Robert enjoyed his teaching career and he always rated highly with the students. "I think the best period was during the early 80's when I was taking 111 (algebra), 243 (linear algebra) and my half of 303 (advanced linear algebra), even though I had more contact hours then than I do now. The students would have me for three years. They would get to know what I was like and I'd get to know what they were like." This sort of relationship between lecturer and students is almost impossible now (particularly with the large classes), and perhaps this is one of the reasons why many students perceive us as a rather remote or unapproachable department. There is, too, "an increasing tension between the demands of mathematics and the demands of the students". This has been particularly evident with our first year classes. "Yes, it was a mistake to axe the [non-continuing] MATH 110 course. Or we should have limited entry for these courses. There's a definite mismatch between the courses we offer and the students who come to do them. Of course the government could have done a lot to avoid this problem too. As soon as they started using the 7th forms to solve their unemployment problems, they should have set up a separate 7th form qualification for these new students. That way Bursary could have been kept as a university qualification."

And the future? Robert is not optimistic about recent and pending reforms in education, and he fears that universities may end up under the thumb of a bureaucracy like the Ministry of Education. "I think that's what much of the 'learning for life' reforms is about: the hijacking of education by bureaucrats."

As for his own future: "I think a fascination with mathematics shapes your whole outlook on life, and I feel the need for a new outlook." So this year he begins studying for a degree in speech and language therapy. "I hope to work with preschool and primary school children who have speech or language problems. I think I have two advantages here. I've been through it all myself and so I can see the kid's view better. And I've succeeded in a career many would think I was disqualified for, so I can be a role model for the kids." We are very sorry to lose him, but we wish him every success in his new career.

John Hannah

LETTER TO THE EDITOR

THE RE-ORGANISATION OF GOVERNMENT SCIENCE

Government science is under review, again! The new features on this occasion are that the review will be comprehensive, and that the opinions of those affected are being sought. There seems a genuine will to look hard and deep, and to establish institutions that will encourage and facilitate innovative science.

I am concerned that mathematicians and statisticians bring their special perspectives, arising from experience in many different application areas, to the debate. Aspects of projects to which we contribute include: modelling (mathematical description), experimental design (the devising of effective and efficient methods for testing ideas), and analysis (the interpretation of results). In addition we often help generate ideas.

Effective science requires the bringing together of relevant and highly honed skills to tackle specific problems. Universities and research establishments have over the years developed effective mechanisms for honing individual skills. Perhaps most important is exposure to the standards of the best workers in the discipline. There is a much poorer understanding of means for bringing skills together and applying them to

specific problems.

One traditional mechanism has been the building of an organisation that addresses a particular applied area. New demands will inevitably lead to organisational changes. The recently created division of Fruit and Trees is the fifth home for DSIR horticultural science since 1947, while the only change for Applied Mathematics has been its recent incorporation into DSIR Physical Sciences.

My preference is to locate scientists together with their peers in their own areas, bringing them together to work on particular problems as occasion demands. How does one get this "project team" approach to work? It is not something that can be left to chance. Well-tested and scientifically based methods have been documented, notably in Scholtes' *The Team Handbook* (Joiner Associates, 1984).

This project approach, drawing skills from wherever they are available, is the only way to get the flexible mix that diverse problems require. It is the proper context into which to fit biometrical and other mathematical work, contributing skills in working with ideas as well as skills in working with data in its more conventional sense.

John Maindonald

NEW COLLEAGUES

MARK MCGUINNESS

Dr Mark McGuinness took up an appointment as Senior Lecturer in the Mathematics Department at Victoria on 1 February. This involved a short movement of his office along the corridor from the DSIR's Applied Mathematics Group, where he has worked in the Mathematical Physics Section since 1984. Being already a member of the Society, he is unable thereby to claim a year's free membership!

Born in Hamilton, Mark obtained his PhD in physics from Canterbury in 1978, and then held a post-doctoral fellowship in mathematical physics at University College Dublin, and an instructorship in applied mathematics at Caltech, before joining the DSIR.

His interests are in the application of mathematics to nonlinear modelling problems, and at the DSIR he worked mainly on geothermal modelling. His previous work had been in the area of chaos, strange attractors, and nonlinear dynamical systems, and he plans to take this up again in the future.

MARGARET MORTON

Dr Margaret Morton was recently appointed to a lectureship in the Pure Mathematics Unit within the Department of Mathematics and Statistics at Auckland University. Margaret received her BSc and MSc from that department; her PhD (and family of three children) were completed at Penn State University in the US.

Margaret lived in the US for a number of years, mainly in Pennsylvania, Florida and Texas. This time was spent parenting children and lecturing part-time at Penn State University, Southern Methodist University

and the University of Texas at Dallas. She returned to New Zealand in late 1982 and spent the next two years working as an analyst/programmer for Beca, Carter, Hollings & Ferner in Auckland. Unable to resist the temptation to return to teaching Margaret accepted a Tutorship in the Department of Mathematics and Statistics at Auckland University in 1985 and became a Senior Tutor in 1987. Her current research interests are in the areas of group/graph theory and mathematical education.

JUDI McWIRTER

Judi began university studies part time as an adult student in 1979 (with two young children, though Sharn was actually born during that year). Her goal was to attend teachers training college and eventually become a mathematics teacher. She completed her first degree in 1982 and decided to return to university to study for a masters degree in statistics with some mathematics education. In 1984, she worked part time as a computer laboratory supervisor and in 1985 was appointed as Junior Lecturer in Statistics in the Mathematics Department. She also completed her masters degree with first class honours that year. In 1987 she began to work towards a D.Phil. under Harold Henderson. Area of topic—modelling and analysing pulsatile data, such as that which arises in studying levels of hormones in animals. In 1989, she took a period of maternity leave following the birth of her third daughter. She took up the appointment as lecturer at Waikato University in February 1991. She hopes to finish her D.Phil. by the end of 1991.

Personal interests include camping, tramping and handcrafts such as knitting.

BOOK REVIEWS

Multiparameter Eigenvalue Problems and Expansion Theorems, by H. Volkmer. Lecture Notes in Mathematics, Volume 1356, Springer-Verlag, Berlin-Heidelberg-New York,1988, vi + 155pp, DM 28.50. ISBN 3-540-50479-6.

Multiparameter eigenvalue problems have their origin in the method of separation of variables typically in ellipsoidal type coordinates in Euclidean space, for which Laplace's equation gives rise to separable ordinary differential equations in the form $y'' + \left(\sum_{i=1}^{n} \lambda_i f(x) \right) y = 0$ for separation parameters λ_i. The problem is then to determine the spectrum of allowed values of the separation parameters λ_i by using a multidimensional analogue of the normal Sturm-Liouville theory, which usually involves only one such parameter. Klein [1] established oscillation theorems similar to those of Sturm for the equations of the type above.. The study of the vector space (i.e. finite-dimensional) analogue of these problems was studied earlier this century by Carmichael [2]. The impetus to develop this field further has come from about the time of the review article of F.V.Atkinson [3] and his subsequent book *Multiparameter Eigenvalue Problems, Vol.I* [4], which dealt mainly with finite-dimensional and compact versions of these problems. A second book was promised but has yet to appear. There have been more recent books by Sleeman (1978) [5] and McGhee and Picard (1988) [6].

The present book in some respects provides a sequel to Atkinson's Vol.I. It can best be thought of as an exposition of "classical multiparameter theory". Two problems are studied, viz. the existence of eigenvalues and the expansion in series of eigenvectors. Each of these problems is treated for multiparameter eigenvalue problems involving (i) Hermitian matrices (ii) compact Hermitian operators, in particular integral operators and (iii) semibounded self-adjoint operators with compact resolvent, in particular differential operators. This is done in six chapters.

To read this book a knowledge of the usual one-parameter eigenvalue problems for compact Hermitian operators and their inverses is needed, together with Brouwer's degree of maps and the basic properties of the tensor products of linear spaces. The theorems proven in multiparameter spectral theory are usually proven under so-called definiteness conditions. The book proves the expansion and existence theorems under definiteness conditions that are as weak as possible. As a consequence some new results are presented — in particular abstract oscillation theorems under the notion of local definiteness in the strong sense and expansion theorems under left-definiteness. For each type of expansion treated, concrete examples are given from problems in classical analysis.

The book is written in a straightforward style and has useful notes at the end of each chapter outlining sources in the literature for the material covered. There is also a good bibliography for readers wishing to pursue the subject further. It is the most recent book which covers this subject and as such is a useful up-to-date exposition.

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E.G.Kalnins
University of Waikato

Elliptic Functions and Applications, by Derek Lawden.   Applied Mathematical Sciences Volume 80, Springer-Verlag, New York, 1989, xiv + 334pp, DM 124. ISBN 0-387-96965-9.

There are reviews of this book in *Choice*, vol 27 (Apr 1990) p1350, and in *SciTech Book News*, vol 13 (Nov 1989) p7. I have read the former and I am in general agreement with it: I will not repeat its content here. Having referenced a real review, I now feel happier about the collection of remarks which I have to add to it. The subject is beautiful, and I think the book should be bought by every university library in Australasia. Some obvious criticisms are that the bibliography is rather inadequate (17 items, far fewer than in the semipopular articles [2],[4]), and that, in my opinion, the last 65 pages, i.e. one fifth of the book, on numeric tables and so on, is a waste of paper! Reference [1], not quoted in Lawden's book is one standard reference for numeric tables. There will be more about computing matters in a supplement at the end of this review.

Derek Lawden is known to many New Zealand mathematicians. He came from England to become a Professor of Mathematics at Canterbury in the early 1960s. He moved to a Professorship at Aston University in Birmingham around 1969. He writes competently and accurately. He has presented the subject matter in his various books (the others being on relativity and on electromagnetism) in ways accessible to advanced undergraduates. This book is at 4th year undergraduate, or beginning postgraduate level.

A major strength in the book is its chapters on applications, Chapters 4, 5 and 7. Chapter 4 is concerned with applications in classical geometry, the others to applications in classical physics. A familiar primary school exercise is constructing an ellipse with a short rod and a longer loop of string around it, the string pulled into a triangular shape tight against the rod (with a pencil in the apex). (Variations involving a couple of drawing pins instead of a rod are easier.) In section 4.1 of Lawden I learnt that if one replaces the rod with a (small) ellipse, keeping the string taut and the pencil at the apex of the straight segments as before, again the locus of the pencil will be an ellipse, larger than, but confocal with, the given ellipse. (Garry Tee called my attention to the same result in Forder [6, p.55].) The book has many memorable examples like this, aptly interspersed amongst the detailed calculations.

In the preface Lawden states: 'the theory of elliptic functions has dropped out of most university courses and very few mathematics graduates leaving universities today know more than that many problems of applied mathematics lead to elliptic functions ...'. I'm afraid that, in this respect, I'm very much one of the majority. Elliptic functions, in their many guises, have arisen in peripheral calculations in a significant number of the applied maths problems on which I have published, including: periodic water waves, vortex pairs and streets, and most recently with Alex McNabb in connection with the torsion problem in a rectangle. I will skip those

listed, but two others from my recent papers will now be mentioned.

Lawden's book begins with problems concerning the heat equation,

$$u_t - u_{xx} = 0, \text{ in } t > 0, \text{ x in interval I}.$$

The initial-value problem requires us to solve this, in $t > 0$, subject to u being zero at the ends of the space interval, and with $u(x,0)$ prescribed. One can solve this, by superposition or convolution, with any initial data when one has the Green's function. When the interval I is the whole real line this is:

$$G_\infty(x,y,t) = (4\pi t)^{-1/2} \exp(- ((x-y)^2)/(4t)) .$$

When I is a semi-infinite interval the Green's function is again elementary. However, this is not the case when I is finite, say $I=[0,\pi]$. Theta functions occur as solutions of the heat equation on the finite rod $[0,\pi]$. There are various theta functions, and for all of them,

$$\theta(x\alpha^{1/2},q^\alpha) \quad \text{where } q=\exp(-4t),$$

solves the heat equation. The Green's function for the initial-value problem for the heat equation on a finite rod $[0,\pi]$, with zero temperature at the ends, is $G(x,y,t)$ where, except for an unimportant positive multiplicative constant,

$$G(x,y,t) = (\, \theta_3((x-y)/2,q^{1/4}) - \theta_3((x+y)/2,q^{1/4})\,)/2 ,$$

where $q=\exp(-4t)$. This corresponds to a source of heat input when t=0 at location x=y. We have the following theorem (see [9] and references there):

THEOREM. *The function* G *is positive for all* x,y *in* $(0,\pi)$ *and* t>0. *At fixed values of* t *and* y, $\log(G)$ *is concave in* x.

The interesting part is the second sentence. (It is, of course, trivial from the formula above that, at fixed $t > 0$, $\log(G_\infty)$ is concave in x.) When y is the midpoint of the interval, $y = \pi/2$, the formula for G simplifies to $\theta_1(x,q)$. The particular theta function is $\theta_1(x,q)$ and is defined, motivated by this problem, in Lawden's equation (1.1.8) on page 2. A test I made of Lawden's book, and myself, was how many pages I would have to read before I saw a 'special function' proof that I hadn't thought of before. I still haven't seen an easy special function proof of the result at general y, but with $y = \pi/2$ the result follows from the infinite product formula (1.6.23) on p15. The first ingredient is that products of logconcave functions are logconcave. Formula (1.6.23) expresses $\theta_1(x,q)$ as a product of sin(x), which is concave on $(0,\pi)$ and hence logconcave there, and of terms of the form

$$(1- 2\, q^{2n} \cos(2x) + q^{4n}).$$

All these terms can be tested to be logconcave, using the criterion that a positive function f is logconcave iff $(ff'' - (f')^2)<0$ where the prime denotes differentiation with respect to x. (I still haven't constructed an equivalent infinite product form for $G(x,y,t)$ at general y.) In typical modern applied mathematician way, I had this result, for G and more (arbitrary log-concave initial data), proved by maximum principle techniques a long time before I got to a special function proof using only properties of theta functions.

REQUEST: I would be grateful for a neat special function proof, for general y, from people with more expertise than I in theta functions.

Betwen July 1988 and August 1989, I've given seminars at the four North Island universities on proving a classical engineering approximation associated with flow in a porous media. See [10]. In fact, though it doesn't get mentioned in the final paper, my work started with numerics in which elliptic integrals K(k), E(k) occurred and the NAG library was used in the computations. Asymptotics related to the problem did remain in the appendix to the paper. The relevant chapter of Lawden's book is Chapter 3 on elliptic integrals. I found there the identities I had needed: the asymptotics can be found in Chapter 8. Also in Lawden's Chapter 3, p. 81, is the arithmetic-geometric mean algorithm for the computation of K(k), which is used in the NAG routines. This algorithm is elegant, and described elsewhere: see [1, p. 571 and p. 598], [2, Theorem 1, p. 588].

Lawden believes that there is a continuing role for special function work, possibly including it in teaching. There is one trend which might facilitate this, namely the rapid popularisation of classical computer

algebra systems — Maple, Mathematica, Macsyma and REDUCE. Both Mathematica and Macsyma have capabilities for finding numeric approximations to elliptic functions. As such capabilities are also in numeric libraries, such as NAG, they are also available from the symbolic front ends to the such libraries, in the case of NAG: Numlinks from Macsyma and from SENAC (from Waikato, see [7] , [8]), IRENA (this latter being an Interface between REduce and NAg, developed at University of Bath), and others in development. There will be more on Waikato's Numlinks in the Supplement below.

A realisable, but large, task will be to provide (at least one of) these classical computer algebra systems with knowledge of properties of special functions. (The latest Symbolics Macsyma has some knowledge of the elementary identities, but the wide range of identities used throughout Lawden's book is not present in any of the packages. Scratchpad, one of the less widely available packages (only available in Australasia at the University of N.S.W.) was used by Baxter [3]. Thus one should be able to load an extra package, 'basic-elliptic-function-rules' for example, and then ask it to check identities (simplify expressions which should come out to be zero) using the simplification rules. I'm fairly confident that this will be done this century. The more modest goal of providing on-line look up of identities is likely to be done first. When there has been more progress in this direction, I might be prepared to mention elliptic functions in, say, a 4th year 'methods of mathematical physics' course. Until then, I'm afraid, I have to work too hard to manage the intricate details, and I would regard it as cruel to inflict these details on students.

Let's retreat to the much easier task of numeric approximations by computer. I consider Lawden's provision of BBC BASIC programs to be ridiculous. Standard computer libraries are available, and any applied maths student who might read his book will know a standardised language (e.g. Pascal, C or FORTRAN) appropriate to numeric computation. The routines in numerical libraries, e.g s21bcf in NAG which we will discuss in the Supplement below, are especially easy to use in code associated with applications. For example an application might be either to find the period of a (nonlinear) pendulum given length, mass and amplitude, or alternatively to design a pendulum, i.e. find an appropriate length given mass and amplitude, to have a given period. Such tasks typically use a function from a library rather than numeric tables.

Rather than continuing in a critical vein, I have chosen, in the Supplement below, to go some way towards repairing the omissions in Lawden's treatment of numeric libraries. I certainly enjoyed Lawden's book, and in spite of its deficiencies, I expect that it will be a very useful addition to my bookshelves.

Supplement on elliptic functions and standard numeric libraries

I think that, as an alternative to the numeric tables and BASIC programs, Lawden should have told his readers what was available in various libraries, referring to the literature concerning algorithms and code, and so on. He didn't, but this Supplement is a partial correction to this. My brief investigations suggest that the public domain Netlib collection (which contains the ACM and TOMS routines) is more comprehensive in special functions than is any particular commercial product. Somewhat untypically it also appears that, in this area, Numerical Recipes ([11]) has pretty well everything NAG has: Numerical Recipes has elliptic integrals (as does NAG) and also the Jacobian elliptic functions sn, cn, dn (which NAG does not have).

For people wishing to use microcomputers, or Workstations, without a standard library, Numerical Recipes [11, or its equivalent version in Pascal or FORTRAN] is adequate in this area. The rest of the supplement is oriented towards Workstation or mainframe computing where there is a good shared library.

I respect the effort that goes into documenting, testing and maintaining numerical libraries. (I acquired this respect in the old days when numeric languages were less well standardised across machines, and when I coded, tested and documented some of the Bessel function routines in the CSIRO library. The CSIRO library did not stand the test of time, as CSIRO then used Control Data machines which allowed longer identifiers than many others.) The universities at which I have chosen to work have, since the late 70s, had the NAG library. My home university has its own undergraduate text using NAG, [5]: Waikato has Numlinks providing symbolic front ends to NAG. Now, I will give an example of how Lawden's numeric tables could be developed by calling NAG's library. NAG has three routines

$$s21bbf, \quad s21bcf, \quad s21bdf$$

to compute the symmetrised elliptic integrals

$$R_F(x,y,z), \ R_D(x,y,z), \ R_J(x,y,z,\rho),$$

of the first, second and third kind respectively. (See NAG or Numlink documentation.) The NAG documentation gives very clear instructions on how to use them to evaluate elliptic integrals, for example:

$$K(m) = R_F(0,1\text{-}m,1), \quad E(m) = R_F(0,1\text{-}m,1) \text{ -m } R_D(0,1\text{-}m,1)/3 .$$

I don't like the look of FORTRAN code. Thus the code below is written in SENAC (which is available at most NAG sites in NZ). The gain in using SENAC (or the forthcoming Numlink from Macsyma) is very much greater in tasks where the NAG calls from FORTRAN would involve more user coding: there is no gain in using SENAC for NAG calls as simple as this. The item here will serve as another published example of how to use SENAC, and could be tried by users, new to SENAC, at SENAC sites—at present, Canterbury, Waikato and Auckland—should they wish to do so.

```
record("lawdeb.out");
# Lawden, Elliptic Functions, Table B
# Nome and complete integrals of the first and second kinds
# as functions of the squared modulus
#
imin: 1;  imax: 5;
# Lawden Table B has imax =50
#
for i from imin to imax do
  sprog(
  fm: eval(float(i/100.0)),
  fmp: eval(float(1.0-fmp)),
  ansk: s21bbf(0.0,fmp,1.0),
  anse: eval(float(ansk-fm*(s21bcf(0.0,fmp,1.0))/3.0)),
  print("   m=",fm," K(m)=",ansk," E(m)=",anse),
  anskp: s21bbf(0.0,fm,1.0),
  ansep: eval(float(anskp-fmp*(s21bcf(0.0,fm,1.0))/3.0)),
  print("   mp=",fmp,"K(mp)=",anskp,"E(mp)=",ansep),
  q: eval(float(exp(-%pi*anskp/ansk))),
        );
end_record();
```

All of Lawden's Table B is produced, on changing imax to 50, with this program. It would be equally easy to use the NAG routines to construct Lawden's longer Table D. For example, with

$$q{=}\cos^2(\phi),\ r{=}1\text{-m }\sin^2(\phi),\qquad F(\phi|m) = \sin(\phi)\ R_F(q,r,1),$$

and other related functions involve the R_J. However, enough has been said: there would have been many better uses which could have been made of the 65 pages devoted to tables in Lawden's book.

I haven't found any errors in Lawden's tables. Returning to Table B, greater accuracy is given in [1, p. 608] and in the output from the NAG routines. It is easy to load in one's own LISP code into SENAC, and I coded up the arithmetic-geometric mean algorithm in LISP and used it as a further check. For people needing arbitrarily large precision, a package such as Macsyma or Mathematica would probably be the easiest to use at present, and after that, one's own code in anything else, Maple or REDUCE for example, that supports arbitrarily large precision. (A posting by G. Fee on the Maple Forum on 16/11/90 provides the Maple code, using the same algorithm, for the complete elliptic integrals to arbitrary precision. This code is available from me.)

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Grant Keady
University of Waikato

Huygens and Barrow, Newton and Hooke, by Vladimir Igorevich Arnol'd, translated from the Russian by Eric J. F. Primrose. Birkhäuser Verlag, Basel-Boston-Berlin, 1990, 118 pp. ISBN 3-7643-2383-3 and ISBN 0-8176-2383-3.

Arnol'd examines a number of themes in late 17th-century mathematics which had not previously attracted much attention, and he reveals remarkable connections with some recent and strikingly novel developments in mathematics.

Isaac Newton's well-known antipathy to Robert Hooke restrained him from accepting the Presidency of the Royal Society until after Hooke died in 1703, and thereafter Hooke's immense reputation declined markedly. Newton's mathematical skill was vastly greater than Hooke's, and yet Hooke presented to Newton a profound physical theory of motion and of gravitation which seems to have been a major stimulus for Newton to develop his epoch-making work *Philosophiæ Naturalis Principia Mathematica* (1687). Indeed, Hooke's ideas about orbits inside planets (suitably pierced) were more accurate than Newton's early ideas on that topic. Some modern commentators have claimed that Newton's treatment of orbits in the *Principia* is incomplete, since he did not prove that the Keplerian orbits are the unique solutions of the differential equations of motion. However, Arnol'd considers that Newton's proof is complete, in the sense that he shewed that the only smooth solutions of the equations are the Keplerian orbits.

Newton solved many differential equations by power series with integer powers, but he also employed fractional powers when finding an expansion for an algebraic function $y(x)$ defined by a polynomial equation $f(x,y) = 0$. Newton used a polygon constructed from the exponents of the polynomial to expand any branch of the algebraic function $y(x)$ in a series in fractional powers near the origin (often called the Puiseux series). That Newton polygon is used in the modern theory of toric manifolds, and also in physics and mechanics in the theory of similarity, dimension and scaling.

Newton's teacher Isaac Barrow presented his *Lectiones Geometricæ* (1670) in geometric form, which makes very difficult reading for people accustomed to algebraic formulæ. Nonetheless, Barrow demonstrated the duality between problems on tangents and problems on areas, corresponding to the inverse relation between differentiation and integration. He gave a method for change of variable in an integral, and shewed how to solve o.d.e.s with separated variables.

Huygens published in 1673 the centrifugal force for circular motion, and proved that a pendulum moving on a cycloid is strictly isochronous. He created the theory of evolvents and involutes of curves in order to construct such cycloidal pendulums. Each evolvent of a smooth curve has a cusp of type 3/2. Huygens developed greatly the wave theory of light, with wave fronts as evolvents, and he found that such cusps arise in wave fronts for caustic curves. In 1693, l'Hôpital found that, for a plane curve with a point of inflexion, the evolvents have cusps of type 3/2 on the curve and cusps of type 5/2 on the tangent at the point of inflexion. That pattern can now be understood in terms of the group of symmetries of the regular icosahedron, generated by reflections in its 15 planes of symmetry. That icosahedral group is not a crystallographic group, so that no crystal could have 5-fold symmetry—and yet the modern theory of quasiperiodic tilings leads to quasicrystal patterns with 5-fold symmetry.

Newton's exact solution of gravitational motion for the 2-body problem was extended by Euler and Lagrange to special 3-body problems; and those solutions are now used for some spacecraft. Gravitational resonances lead to the gaps within planetary rings and the asteroid belt, and modern chaos theory is very useful for understanding the process.

Arnol'd draws the attention of mathematicians to Newton's "astonishingly modern topological proof of a remarkable theorem on the transcendence of Abelian integrals". Newton carefully distinguished local algebraicity from global algebraicity, and asserted that any locally algebraically integrable oval is algebraic. His proof of transcendence was the first "impossibility proof" of modern mathematics. Leibniz conjectured that

an Abelian integral along an algebraic curve with rational coefficients, taken between limits which are rational, is generally a transcendental number—that conjecture has not yet been decided.

The translation reads very clearly, and I have noticed only a few minor discrepancies in transliteration, e.g. Coxter for Coxeter (p.8) and Kutlerian for Cutlerian (p.108). This book is a striking demonstration of the fresh insights into mathematics which can be produced by a distinguished modern mathematician re-examining the works of great masters of former ages.

<div style="text-align: right">

G. J. Tee
University of Auckland.

</div>

SPRINGER-VERLAG PUBLICATIONS

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

David Alcorn
Department of Mathematics and Statistics
University of Auckland

Graduate Texts in Mathematics

84.	Ireland K	A classical introduction to modern number theory. (2nd ed). 394pp.
96.	Conway JB	A course in functional analysis. (2nd ed). 399pp.
124.	Dubrovin BA	Modern geometry – methods and applications. Part 3: Introduction to homology theory. 465pp.

The IMA Volumes in Mathematics and its Applications

27.	Keyfitz BL (ed)	Nonlinear evolution equations that change type. 290pp.
28.	Meyer KR (ed)	Computer aided proofs in analysis. 265pp.
31.	Friedman A (ed)	Mathematics in industrial problems. Part 3. 187pp.

Lecture Notes in Mathematics

1439.	Bujalance E	Automorphic groups of compact bordered Klein surfaces. 210pp.
1441.	Coornaert M	Géométrie et théorie des groupes. 165pp.
1445.	Schulz F	Regularity theory for quasilinear elliptic systems and Monge-Amperè equations in two dimensions. 123pp.
1446.	Cellina A (ed)	Methods of nonconvex analysis. 206pp.

Perspectives in Mathematical Logic

| | Sacks GE | Higer level recursion theory. 344pp. |

Texts in Applied Mathematics

| 6. | Sontag ED | Mathematical control theory. 396pp. |

Undergraduate Texts in Mathematics

| | Flanigan FJ | Calculus two – linear and nonlinear functions. (2nd ed). 619pp. |

Miscellaneous

	Dautray R	Mathematical analysis and numerical methods for science and technology. Vol.4: Integral equations and numerical methods. 465pp.
	Fang K-T	Generalized multivariable analysis. 220pp.
	Mishchenko AS	Topology of Lagrangian manifolds. 320pp.

Associate Professor Mervyn Rosser

MERVYN STANLEY ROSSER

By Cecil Segedin

Mervyn Rosser has now retired after nearly thirty years' service in the University of Auckland. He was appointed in 1962 to the Mathematics Department with responsibilities in the School of Engineering. A year later he and I became foundation members of the newly established Department of Theoretical and Applied Mechanics, now renamed the Department of Engineering Science. As lecturer, senior lecturer and, since 1975, Associate Professor, he has played a vital role in all aspects of the work of the department, especially in the setting up and development of the degree course in Engineering Science.

I first met Mervyn in 1944 when he was a first-year student, and was soon aware of his calibre. In 1948, he graduated M.Sc. with First Class Honours in Mathematics. This was followed by studies in music and in 1952 he graduated Mus.B., which very few have managed to combine with an M.Sc. After a year at Training College in 1948, he taught at Avondale College and Pukekohe High School. During this time he was awarded a Rotary Foundation Fellowship and spent the 1954-5 academic year at Brown University, Rhode Island, USA. In 1959 he returned to his old school, Mt. Albert Grammar, as Head of Mathematics and then, to my great delight, followed this by a return to his alma mater in 1962.

Mervyn claims that the main thrust of his work has been paedagogical. Certainly as a schoolmaster he was widely considered to be a top-ranking teacher. In the University he has enjoyed a similar acclaim. After all, a teacher who can give a lucid and tidy exposition and at the same time transmit his enthusiasm for his subject evokes the interest and respect not only of the more talented of his pupils, but also of those of somewhat lesser aptitude.

But Mervyn is by no means merely a teacher. During the late 50's and early 60's there appeared in several disciplines—engineering, commerce and military logistics among them—the first intimations of the subject now called Operations Research. Mervyn was quick to appreciate the importance of this. In 1968 he helped to mount a course in Operations Research of interest to students in all branches of engineering, to mathematicians and others, one of the earliest of its kind in New Zealand. From these beginnings, Operations Research has grown under his guidance to be an important ingredient of the Engineering Science degree. It is interesting to record that among those who took these early courses can be counted a chief economist of a bank, a professor of Operations Research and a Minister of the Crown. Mervyn's own researches and those of his students on queueing problems and their simulation, particularly at traffic intersections, have been significant.

Mervyn's talents have not been limited to academe. He has been active in the affairs of the Operations Research Society of New Zealand. For many years he was Chairman of the Auckland Branch and was New Zealand President from 1980 to 1983; he has recently had the distinction of being made an Honorary Life Member of the Society. He has also served on the governing body of Manukau Polytechnic, for the last four years as deputy chairman. And he has maintained his interest in music. For many years he has been the enterprising choirmaster of the Mt. Albert Methodist Church presenting, in addition to regular sabbath fare, occasional performances of rather more ambitious works, for example, by Vaughan Williams, Britten, Fauré and Vivaldi.

Some ten years ago, in a valedictory article on me, he wrote, "He will certainly continue to enjoy the admiration and affection of his colleagues, of his students and of his friends, and especially of those of us who have been honoured to be in all three categories". This is undoubtedly true for Mervyn. While I cannot claim to have been one of his students he has nonetheless taught me much, particularly the true meaning of loyalty, for loyalty has always been Mervyn Rosser's hallmark—loyalty to his colleagues, loyalty to his students and loyalty to his academic discipline.

MATHEMATICAL VISITORS TO NEW ZEALAND

List No.28 :   1 March 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.

Professor Richard Anstee; University of British Columbia, Canada; combinatorics; September 1990 to June 1991; University of Otago; Prof. Derek Holton.

Professor Heinz Bauer; Mathematisches Institut, Universität Erlangen - Nürnberg; unaccompanied; potential theory, probabilty theory, measure theory; 27 February - 29 March 1991; University of Canterbury; Dr Neil Watson.

Professor Adriano Barlotti; University of Florence; wife (Margherita); Geometry; September 1991; University of Canterbury; Dr David Glynn; very likely.

Professor F.H. Chipman; Acadia University, Nova Scotia; wife and one son; numerical analysis; 20 December 1990 to 30 June 1991; Auckland University; Prof. John Butcher.

Professor Dennis Cook; University of Minnesota; regression analysis, diagnostics and graphics; mid-February to mid-April 1991; University of Waikato; Prof. J. A. John.

Professor James Dickey; University of Minnesota; spouse (Martha); subjective probability, decision theory, computational methods; 6 June to 15 August 1991; University of Canterbury; Prof. John Deely.

Dr Charles E Gates; Texas A & M University; estimation problems in wildlife research; August 1991; University of Otago; Professor Bryan Manley; very likely.

Dr Robert Gentleman; University of Waterloo, Ontario; not accompanied; biostatistics, statistical computing; February-July 1991; University of Auckland; Dr Chris. Wild.

Professor Chris Godsil; University of Waterloo, Ontario; wife (Gillian Nonay) & daughter; graph theory & algebraic combinatorics; March to April 1991; University of Auckland; Dr. Marston Conder.

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.

Ms Helen Joseph; University of California, Berkeley; educational equity in mathematics and technology; 5 February to 20 May 1991; Auckland University/ Auckland College of Education; Margaret Morton.

Dr. Grant Keady; University of Western Australia; wife & daughter; symbol manipulative computation, differential equations; 1 July 1989 to 30 June 1991; University of Waikato; Dr. Kevin Broughan.

Professor Roger Mead; University of Reading, U.K.; wife; statistics; August 1990 to April 1991; University of Otago; Prof. Bryan Manly.

Professor Regina Mladineo; Rider College, Lawrenceville, New Jersey, USA ; global optimisation; June/July 1991; University of Canterbury; Dr. Graham Wood.

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

Professor Mila Mrsevic;   University of Belgrade, Yugoslavia;   topology;   August 1990 to July 1991; University of Auckland; Prof. Ivan Reilly.

Dr. Gillian Nonay;   Wilfrid Laurier University, Ontario;   husband (Chris Godsil) & daughter;   graph theory, combinatorics; March to April 1991; University of Auckland; Dr. Marston Conder.

Dr. Philip Rottier; University of Cambridge, U.K.; geophysical acoustic modelling; May 1991; University of Otago; Prof. Vernon Squire.

Dr. Jiang Shouli;   Shandong University, People's Republic of China;   topology;   February to July 1991; University of Auckland; Prof. Ivan Reilly.

Dr Günter Steinke; Christian-Albrechts Universität zu Kiel, Germany; wife and son; topological projective planes; from present indefinitely; University of Canterbury; Dr David Glynn.

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

Professor Hoang Tuy; Institute of Mathematics, Hanoi, Vietnam; global optimisation; May, 1991; University of Canterbury; Dr. Graham Wood.

SPECIAL NOTICE

The Council of the New Zealand Mathematical Society would be very pleased to know about visitors who may be suitable candidates for the annual N.Z.M.S. Visiting Lectureship. This lectureship usually entails a 3-week tour of the main centres of New Zealand, giving two or three lectures to general and specialist audiences in each place. Suggestions or nominations may be sent either to the N.Z.M.S. President (Dr. Gillian Thornley, Department of Mathematics & Statistics, Massey University, Palmerston North), or to David Robinson (Department of Mathematics, University of Canterbury, Christchurch).

NZAMT CONFERENCE

The following overseas visitors are expected to attend the NZAMT Conference to be held at Victoria University of Wellington in September 1991. Further information from Dr Rod Downey, Victoria University, Wellington.

Keynote speakers:

Mary Barnes, Mathematics Learning Centre, University of Sydney, NSW 2006, AUSTRALIA   Topic: Developing gender inclusive curriculum.

Dr Martin Hughes, School of Education, Exeter University, Exeter EX1 2LU, ENGLAND. Topic: Children and Number.

Alan Rogerson, 22 Violet Grove, Hawthorn, VIC 3122, AUSTRALIA. Topic: Unknown.

Hilary Shuard, CAN Continuation Project, Homerton College, Cambridge CB2 2PH, ENGLAND. Topic: Towards 2000.

Others (workshops etc):

Dr Dudley Blane, Director of Maths Education Centre, Faculty of Education, Monash University, Clayton, VIC 3168, AUSTRALIA (Unconfirmed)

Dr Jules Tibeiru, University of Moncton, 636 Elmwood Drive, Moncton, New Brunswick E1A 2X5, CANADA.

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
Department of Mathematics
University of Canterbury

SECRETARIAL

MINUTES OF THE TWENTY-EIGHTH COUNCIL MEETING
Friday November 23, 1990

The meeting was held in Room 4, Science House, 11 Turnbull Street, Thorndon, Wellington. and began at 10.05am.

PRESENT: Gillian Thornley (in the Chair), Sylvia Anderson (Secretary-Treasurer of NZAMT), John Butcher, Marston Conder, John Giffin, Rob Goldblatt, Derek Holton, David Robinson and Kee Teo.

1. **APOLOGY**: Ingrid Rinsma.
   It was **moved** from the Chair that this apology be accepted.

   The motion was **carried**.

   Gillian Thornley welcomed the new Councillors, Derek Holton and David Robinson to the meeting, and also Sylvia Anderson, representing NZAMT. She also extended the congratulations of the Council to Rob Goldblatt on his election as a Fellow of the Royal Society of New Zealand.

2. **MINUTES OF THE TWENTY-SEVENTH COUNCIL MEETING:** It was **moved** from the Chair that, the minutes of the previous meeting be received and signed as a true and accurate record.

   The motion was **carried**.

3. **MATTERS ARISING FROM THE MINUTES:**

   (a) In the matter of the Forder Lecturer for 1993, Gillian Thornley noted that the short-list will be considered at the May Meeting of the Council. Councillors were urged to gather suggestions for candidates who were good communicators. Marston Conder offered to bring LMS documentation to the May meeting.

   (b) Regarding item 5, Sylvia Anderson reported that Gordon Knight had communicated to NZAMT the Council's decision on book profits. NZAMT agreed that the auditor's definition of profits should not be allocated to them until profit exceeds half the value of book stocks, and will therefore not expect more money from the Society until such time as the current imbalance has been redressed.

   (c) With respect to Mathematical Science funding, Rob Goldblatt reported that he had circulated the report to all HOD's. Few responses had been received, but were unanimously negative, observing that the report appeared unfocussed, especially on providing reasons for extra funding, and had a whinging tone to it.

   Marston Conder suggested that an alternative, specific, factually-based case against Mathematics being resourced at the lowest level in the Ministry of Education's funding formula be initiated, and reported that he had already been in communication with the Ministry. Support from the Vice-Chancellors would likely be forthcoming, as success in this would mean greater funding for the universities; guarantees would have to be provided to ensure that such increases trickled down to the departmental level. Further, the Ministry is apparently considering funding at the level appropriate for the faculty of the **majority** of students in classes, based upon EFTS figures over a three-year period, with two-yearly reviews. Rob Goldblatt noted that VUW's proportions of Science students were 60% and 80% at the first year and above, respectively, implying that Science level funding would ensue if such a policy were to be accepted (per EFTS funding levels are approximately $5800 for Arts and $9300 for Science under the present formula). Derek Holton noted that, at Otago University, Mathematics was taught as a laboratory subject already, and that, in the Commerce Faculty, the QCS Department currently had Science-level funding despite half their teaching being (lower-level) mathematics. Further the Department of Engineering Science at the University of Auckland, was also funded at a high level, with a 1 : 12 ratio.

John Butcher reminded the Council that, in order to justify full Science-level funding, and in order to ensure its continuity in the future, more and more Mathematics instruction would have to become individualised and/or laboratory-based, akin to traditional physics and chemistry teaching. He also stressed that Mathematics departments need to 'reclaim' the teaching of applied mathematics before it became the proviso of other less qualified domains. An appropriate share of students' attention and commitment, in terms of, for example, increased numbers of compulsory assignments, consultancy sessions and tutorials, needed to be governed in order to maintain the profile of Mathematics.

David Robinson remarked that details of the relationship between the funding that the Universities receive relative to the funding that departments receive should be sought.

Gillian Thornley added that it should be the task of NZMS to maximise what the universities receive (at the higher level) first. Marston Conder volunteered to coordinate and collect Mathematics EFTS allocations per faculty from each university, via circulation of the Ministry of Education document to HOD's (who could also be asked to put pressure on Vice-Chancellors), including information on other comparable courses, if any, that are being funded at higher levels.

The Society will respond to the Ministry of Education document, in view of its being more broadly-based than just the University sector.

The Australian funding formula, outlined by Marston Conder found favour with the Council, whereby Mathematics was funded in line with Social Science/Psychology in a 5-tier system. Within that formula, the top funding rate stands at a factor of 2.2 of the lowest funding rate, compared with a factor of 2.95 for the NZ version.

Gillian Thornley thanked Marston Conder, on behalf of the Council, for his efforts.

(d)   With regard to a NZ Journal of Mathematics, Marston Conder reported that some of the Mathematical Chronicle committee were keen to broaden its scope. Draft proposals that could see NZMS involvement in the Chronicle were being developed.

After considerable discussion, Gillian Thornley summarised the questions that the Council will have to address, if and where any formal proposals are presented.

1.   Does the NZMS want to become involved in The Chronicle?

2.   Does the Council agree to the terms of the proposal?

3.   What financial commitment should the NZMS make?

4.   What steps can the NZMS take to ensure that regular issues and high publication standards are maintained?

There was widespread agreement that a Journal with NZ-wide representation was desirable, especially as a means of providing a focus for NZ publication and of encouraging younger NZ Mathematicians to publish. John Butcher noted that, without a broad-based editorial board (within and without NZ), high refereeing standards would be difficult to maintain.

Derek Holton suggested writing to the Australian Mathematical Society in order to obtain an independent assessment of publication costs. Gillian Thornley referred this to the Committee that had already been set up.

Resolved: The Council should continue negotiations with The Mathematical Chronicle Committee, and await details of any definite proposals.

4.   CORRESPONDENCE:

No correspondence not considered elsewhere on the agenda had been received.

5. REPORTS:

(a) TREASURER:
Kee Teo reported that cash reserves of the Society were currently around $100,000, with interest currently accruing at about $1000 a month. Only approximately $5000 has been paid in 1990 for printing.

(b) MEMBERSHIP:
Gillian Thornley reminded Councillors that new staff members and new postgraduate students are eligible for one year's free membership of the Society. A list of fourth-year students from each University department is to be forwarded to John Shanks in March 1991.

(c) PUBLICATIONS:
Gillian Thornley advised that the Sixth Form Mathematics textbook (Secondary School Mathematics) will be offered at half-price until June 1, 1991, after which time sales will be discontinued. The Employment Opportunities brochure is being worked on at Waikato University over the Summer, and is likely to follow a "glossy" format similar to that produced by the Australian Mathematical Society. It was noted that, in spite of the inclusion of several company logos in the Australian production, there had been no underwriting by them.

Ingrid Rinsma will take over from Alfred Sneyd in May 1991.

(d) ROYAL SOCIETY:
(i) PRESIDENTS OF SCIENTIFIC SOCIETIES MEETING:
Gillian Thornley reported on a meeting of the Presidents of Scientific Societies, held under the auspices of the Royal Society of New Zealand. A suggestion was made to form a link with working scientists "at the coalface", initially to provide a means of rapidly obtaining information requested by the Ministry of Research, Science and Technology. A model similar to the Australian FASTS, with the acronym COSTS, comprising a representative confederation of six groups, is to be set up. Nominees from Mathematical and Information Sciences are Graeme Wake (Massey) and Geoff O'Malley (DoSLI, Wellington).

(ii) MEMBER BODIES AGM:
Rob Goldblatt attended the RSNZ Member Bodies AGM on November 19, and reported that A R Bellamy (Auckland) and C Jean Thompson (NZ Statistical Association) had been elected to the Council of the RSNZ.

The per member affiliation fee for RSNZ was set at $3, and Ross Moore was to coordinate member body membership lists. There was some concern expressed from member bodies regarding the service they were receiving from the RSNZ. He also noted that FOSTS (Federation of Scientific and Technological Societies) will evolve out of the present Member Bodies Management Committee, and that the NZMS should recognise its 'luck' in obtaining a separate Information and Mathematical Sciences division, essentially to itself, since the Computer Science and Operations Research Societies have withdrawn their affiliation to the RSNZ. The main activity of FOSTS would become the promotion of science, but the reorganization of the RSNZ to achieve this will require a change to the Royal Society Act of Parliament. COSTS will comprise a committee of seven, with a further 12 nominees from member bodies.

John Butcher commented that the provision for individual membership of the RSNZ (with appropriate vetting procedures), in addition to Fellows and Member Bodies, was under consideration.

(iii) NOMINATIONS FOR HAMILTON AWARD:
Nominations for the Hamilton Award are due at the end of December 1990. Nominees must be New Zealand residents whose first publication appeared at most seven years ago. Mathematics Departments may make nominations on behalf of a candidate. John Butcher suggested that a list of suitable candidates be kept.

The meeting adjourned at 12.15 pm, for lunch, and reconvened at 1.18 pm.

6. APPLICATIONS FOR FINANCIAL ASSISTANCE:

Gillian Thornley presented a summary of the distribution of NZMS funds over the previous 12 months. The Secretary noted that the award of $500 (five hundred dollars) made previously to Ms S Greenwood had not been taken up.

REGULAR COMMITMENTS:

It was **moved** from the Chair that:

The 1991 Colloquium Committee be given $1500 (fifteen hundred dollars) towards the running of the Colloquium, to be held in Dunedin in May 1991.

The Prince and Princess of Wales Award Scheme be given $500 (five hundred dollars). It was suggested that NZMS members be encouraged to apply for grants from this scheme, via a notice in a future newsletter.

RESPONSE TO APPLICATIONS:

It was **moved** from the Chair that:

Dr Colin Fox be given $500 (five hundred dollars) towards the cost of attending and presenting a paper at the 1990 Technology Conference at Cambridge University.

Professor David Gauld be given $500 (five hundred dollars) towards the cost of travel to the Conference on topological manifolds to be held in Wisconsin, June 1991.

Mr Paul Watson be given $500 (five hundred dollars) towards the cost of visiting the Institute of Astronomy at the University of Hawaii, Summer 1990-91.

Mrs Marijcke Vlieg-Hulstman be given $250 (two hundred and fifty dollars) towards the cost of attending and presenting a paper at the 27th Applied Mathematics Conference in Hanmer Springs, February 1991.

Dr Grant Keady be given $300 (three hundred dollars) towards the purchase of materials for a display at the Symbolic Computation workshop to be held in February. (This grant was given upon receipt of further documentation).

The organising committee of the 1990 Australasian Conference on Combinatorial Mathematics and Combinatorial Computing be given a further grant of $200 (two hundred dollars) towards the running of the Conference.

The Secretary was also empowered to disburse up to $1250 (twelve hundred and fifty dollars) in funds for student travel to the 1991 Mathematics Colloquium. The sum of $1000 (one thousand dollars) was earmarked to come out of the 1991 budget for the purpose of the New Zealand Mathematics Teachers' Award (see 7, below).

7. NEW ZEALAND MATHEMATICS TEACHERS AWARD:

Derek Holton spoke to the document "New Zealand Mathematics Teacher's Award", which had been initiated with Trevor Boyle and Megan Clark, with the aim of providing recognition for school mathematics teachers who have made significant contributions to the promoting of mathematical education in the schools of New Zealand. The framework for the award was modelled on a similar scheme in Waterloo, Ontario. Sylvia Anderson pointed out that awards already exist for contributions to resourcing, and that this new award had a different emphasis. NZAMT is willing to contribute $2500, already set aside, and Derek Holton sought an equal amount from the NZMS (see 6). He has also approached the National Bank for funding and reported that they were still interested. The Council agreed that "outside" funding sources were preferable, and whole-heartedly supported the idea as providing good publicity and well-justified rewards. Further financial support decisions will be reconsidered at the next Council meeting, as finalisation is not required until May 1991.

Marston Conder cautioned that relativity of the monetary aspects of this award and the NZ Mathematics Research Award should be monitored. The actual title of the award remains under consideration.

8. AITKEN CENTENARY:

In the matter of the 1995 Aitken Centenary, it was **moved** from the Chair that:

> Derek Holton write to the CEO of New Zealand Post regarding a possible commemorative stamp issue.

Gillian Thornley will write to the Edinburgh Mathematical Society to discuss an appropriate commemoration.

9. SUPPLY OF MATHEMATICS STAFF FOR NZ UNIVERSITIES:

Derek Holton spoke to his document "The Future of Mathematics in New Zealand", noting that the issues addressed therein pertained also to Physics and Chemistry. Major concerns include: the wider perception of mathematics and lack of recognition of its importance and usefulness, the provision of specialist mathematics teachers in primary schools, addressing the problems of special needs groups (especially talented students, women, and ethnic minorities), the "greying of mathematical academe", and improved teacher training.

Regarding the likely future shortfall of tertiary professionals, Gillian Thornley suggested that current age profiles be documented so as to predict the actual needs.

John Butcher stressed that more mathematicians were needed now to provide better staffing ratios and to improve (maintain!) current quality levels. Both local and international candidates needed to be encouraged.

Gillian Thornley thanked Derek Holton for his work on the document.

10. COOPERATIVE LINKS WITH NZAMT:

In order to improve cooperative links with NZAMT, the NZAMT Council minutes and the NZAMT newsletter will be sent to the NZMS Secretary on a continuing basis. Marston Conder is to ask the NZAMT Secretary to regularly forward a summary of NZAMT activities for inclusion in the NZMS Newsletter.

11. NZ MATHEMATICAL OLYMPIAD COMMITTEE:

Derek Holton expressed thanks to the NZMS for its support of the activities of New Zealand Mathematical Olympiad Committee. He reported that the 1990 NZ team received 2 bronze medals (with a third team member only one point shy of one). The University of Auckland is running a "Mathematical Olympiad Certificate" course, administered by Gordon Hookings and Ivan Reilly, involving a series of six assignments, projects, essays (on prominent mathematicians) and the submission of a problem "containing" 1991. It is hoped that twenty "cluster groups" will be formed throughout NZ (not necessarily aimed purely at the Olympiad, but to foster talented students) involving teachers and academics, and about twenty students per group. Pre-"Razor-gang" government funding had been promised to cover the costs incurred by group leaders attending the May training camp.

Gillian Thornley thanked Derek Holton for his large contribution to the Olympiad success, and for establishing lasting contacts with secondary schools.

12. 1991 NZMS LECTURER:

In the matter of the choice of 1991 NZMS Lecturer, Gillian Thornley noted that there were, as yet, no viable overseas candidates who could come during the second or third terms. It was decided to approach a local person.

13. 1991 COLLOQUIUM LECTURER:

Derek Holton advised that the 1991 Colloquium Lecturer is Vaughan Jones.

14. PREDOCTORAL THESIS COMPETITION:

Adrian Swift (Massey) has taken over the organization of the Pre-Doctoral Thesis Competition, and has sent a notice to all NZ Mathematics Departments inviting them to submit their three best (examined) theses or projects (1987-1990). The winner will be invited to attend the 1991 Colloquium (if possible), and the NZMS will contribute the prize money.

15. NZMS RESEARCH AWARD:

Gillian Thornley reported that a panel of two is assessing material for five candidates for the inaugural NZMS Research Award(s). A decision is expected by February. The Massey University illustrator will be contacted regarding the design of an appropriate certificate, and the panel will be asked to provide the citation(s). It was agreed that the NZMS President should present the Award(s) at the 1991 Colloquium Dinner.

16. NOMINATIONS FOR 1991/92 NZMS COUNCIL:

It was noted that nominations for the two upcoming vacancies on the Council are due by April 1, 1991. Concern was expressed that no Councillors were from outside the University System. An undertaking to publish the complete Society Membership list in the Newsletter was made.

17. INTERNATIONAL MATHEMATICAL UNION:

Gillian Thornley spoke briefly to her report on the International Mathematical Union, stressing the lack of democracy in their election and decisionmaking procedures. Ivan Reilly, Gillian Thornley and Graeme Wake will write to the IMU Executive expressing their concerns about the process, and the total lack of communication.

18. OTHER BUSINESS:

David Robinson raised the matter of inter-University cooperation regarding library journal cancellation, but it was believed that the respective Acquisitions Sections already communicate over this. The Australian Mathematical Society Gazette may be switched from Canterbury to Victoria, in accordance with revised NZMS policy.

Derek Holton **moved** (seconded by John Butcher) that the Council declare Vaughan Jones an Honorary Life Member of the NZMS.

The motion was **carried**, with acclamation.

The Secretary will notify the Membership Secretary.

The meeting closed at 3.51 pm.

Dr John Giffin
Hon Secretary

CONFERENCES

May 2–3 (Pittsburgh, Pennsylvania) **22nd Annual Pittsburgh Conference on Modeling and Simulation**
Contact W.G. Vogt, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, PA 15261, U.S.A.

May 2-4 (Paris) **International Conference on Polynomials with Concentration at Low Degrees**
Contact Institut de calcul Mathématique, Université de Paris 7, 2 Place Jussieu, F-75251 Cedex 05, France.

May 5-8 (Ottawa) **International Symposium on Non-Parametric Statistics and Related Topics**
Contact Professor A.K. Md E. Saleh, Department of Mathematics and Statistics, Carleton University, Ottawa, Ontario, Canada K15 5B6

May 5–11 (Oberwolfach, Germany) **Darstellungstheorie Endlich–Dimensionaler Algebren**
Contact MFOG: see (1) below.

May 6–8 (Norfolk, Virginia) **Fifth SIAM International Symposium on Domain Decomposition Methods for Partial Differential Equations**
Contact SIAM: see (6) below.

May 7–10 (Casablanca, Morocco) **IMACS Symposium on Modelling and Simulation of Control Systems**
Contact A. El Moudri, Laboratoire d'Automatique, Faculte des Sciences, BP 5366–Maarif, Casablanca, Morocco.

May 7–14 (Singapore) **Singapore Number Theory Workshop**
Contact S.L. Ma, Secretary, Singapore Number Theory Workshop, Department of Mathematics, National University of Singapore, Kent Ridge, Singapore 0511, Republic of Singapore.

May 9-11 (Orlando, Florida) **A Conference on History, Geometry and Pedagogy in honour of the 80th birthday of Howard Eves**
Contact J. Anthony, Department of Mathematics, University of Central Florida, Orlando, FL 32816-6990, U.S.A.

May 12–18 (Oberwolfach, Germany) **Nichtlineare Evolutionsgleichungen**
Contact MFOG: see (1) below.

May 13–17 (Princeton, New Jersey) **Conference in Harmonic Analysis in Honor of E.M. Stein**
Contact S. Kenney, Mathematics Department, Princeton University, Princeton, NJ 08544, U.S.A.

May 13-18 (Minneapolis, Minnesota) **IMA Workshop on Degenerate Diffusions**
Contact IMA: see(3) below.

May 15-18 (Edinburg, Texas) **International Conference on Theory and Applications of Differential Equations**
Contact Professor Joseph Wiener, Departmentof Mathematics, University of Texas - Pan American, Edinburg, TX 78539, U.S.A.

May 17–20 (Lafayette, Louisiana) **Conference/Workshop on Continuum Theory and Dynamical Systems**
Contact Conference Director, T. West, Department of Mathematics, Uniersity of Southwestern Louisiana, Lafayette, LA 70504, U.S.A.

May 19–23 (Dunedin) **1991 New Zealand Mathematics Colloquium**
Contact Colloquium Secretary. Department of Mathematics and Statistics, University of Otago, P.O. Box 56, Dunedin, New Zealand.

May 19–25 (Oberwolfach, Germany) **Differentialgeometrie im Grossen**
Contact MFOG: see (1) below.

May 21–24 (Reims, France) **Quantization and Microlocal Analysis**
Contact Professor André Unterberger, Department of Mathematics, Université de Reims, Moulin de la
Housse, BP 347 F-51062 Reims Cedex, France.

May 22–24 (Iowa City, Iowa) **Second International Conference on Algebraic Methodology and
Software Technology**
Contact T. Rus, University of Iowa, Department of Computer Science, Iowa City, IA 52242, U.S.A.
(email rus@herky.cs.uiowa.edu)

May 26–29 (Victoria, Canada) **21st International Symposium on Multi-valued Logic**
Contact D.M. Miller, Department of Computer Science, University of Victoria, P.O. Box 1700 Victoria,
British Columbia, Canada V8W 2Y2.

May 26–31 (Cetraro, Italy) **Signal Theory and Image Processing**
Contact D.C. Struppa, Department of Mathematical Sciences, George Mason University, Fairfax, VA
22030, U.S.A.

May 26–June 1 (Oberwolfach, Germany) **Optimalsteuerung und Variationsrechnung-Optimal
Control**
Contact MFOG: see (1) below.

May 29–June 1 (Wheaton, Illinois) **Eighth Biennial Conference of the Association of Christians
in the Mathematical Sciences**
Contact R.L. Braberec, Wheaton College, Wheaton, Illinois 60187, U.S.A.

May 29–June 1 (Colorado Springs, Colorado) **Methods in Module Theory**
Contact Methods in Module Theory, Department of Mathematics, University of Colorado, Colorado
Springs, CD 80933, U.S.A.

May 30–31 (Minneapolis, Minnesota) **Polymer Configurations: Nonlinear and Nonlocal
Diffusion Problems**
Contact IMA: see (3) below.

June 2–8 (Oberwolfach, Germany **Diskrete Geometrie**
Contact MFOG: see (1) below.

June 3–8 (Lille, France) **International Singularity Conference**
Contact Congès Singularités Mathématiques, USTL, 59655 Villeneuve d'Ascq Cedex, France.

June 3–10 (Wolfville, Canada) **29th International Symposium on Functional Equations**
Contact Professor Mark A. Taylor, Department of Mathematics, Acadia University, Wolfville, Nova
Scotia, Canada BOP 1X0.

June 3–13 (Kupari-Dubrovnik, Yugoslavia) **Fifth International Workshop in Analysis and its
Applications**
Contact Professor C.V. Stanojevic, International Workshop in Analysis and its Applications,
Dubrovnik-Kupari, Yugoslavia.

June 5–8 (Nolay, France) **NATO Advanced Research Workshop: Asymptotic-induced
Numerical Methods for PDE's, Critical Parameters, and Domain Decomposition**
Contact Dr H.G. Caper, Division of Mathematics and Computer Science, Argonne National Laboratory,
Argonne, IL 60439, U.S.A.

June 9–12 (New York) **11th International Symposium on Forecasting**
Contact Dr Lilian Shio-Yen Wu, Mathematical Sciences Department, IBM Thomas J. Watson Research
Center, P.O. Box 218 Yorktown Heights, NY 10598, U.S.A.

June 9–12 (Blaubeuren/Ulm, Germany) **International Workshop on Elementary Operators and
Applications**
Contact M. Mathieu, Mathematisches Institut, Universität Tübingen, Auf der Morgenstelle 10, D-7400
Tübingen, Germany.

June 9–14 (Halifax, Canada)   **Second International Conference on Fixed Point Theory and Applications**
Contact Department of Mathematics, Statistics and Computer Science, Dalhousie University, Halifax, Nova Scotia, Canada B3H 3J5.

June 9-15 (Oberwolfach, Germany) **Singuläre Störungsrechnung**
Contact MFOG: see (1) below.

June 10–14 (Nahariya, Israel) **Bernoulli Society Twentieth Conference on Stochastic Processes and their Applications**
Contact R. Adler, Industrial Engineering and Management, Technion, Haifa 32000, Israel.

June 12–19 (Barcelona) **Symposium on the Current State and Prospects of Mathematics**
Contact Centre de Recerca Matematica, Institut d'Estudis Catalans, Aparat 50–08193 Bellatera, Spain.

June 14–17 (Darmstadt, Germany) **Symposium on Lattice Theory and its Applications, in Honor of the 80th Birthday of Garrett Birkhoff**
Contact Professor Rudolf Wille, Fachbereich Mathematik, Technische Hochschule, D-6100 Darmstadt, Germany

June 16-19 (Ramat Gan, Israel) **Bar-Ilan Symposium on the Foundation of Artifical Intelligence**
Contact Dr Ariel Frank, Department of Mathematics and Computer Science, Bar-Ilan University, Ramat Gan, Israel.

June 17–21 (Port á Mousson, France) **European Conference on Elliptic and Parabolic Problems**
Contact C. Bandle, Mathematisches Institut der Univ, Rheinsprung 21, CH–4051 Basel, Switzerland.

June 17–21 (Kobe, Japan) **1991 International Symposium on the Mathematical Theory of Networks and Systems**
Contact H. Kimura, Department of Mechanical Engineering for Computer-Controlled Machinery, Faculty of Engineering, Osaka University, Yamada-oka, Suita, Osaka 565, Japan.

June 18–20 (Tehran, Iran) **International Conference on Applied Mathematics**
Contact Professor A. Shidfar, Head, Department of Mathematics, Iran University of Science and Technology, Narmak, Tehran 16, Iran.

June 19–22 (Columbia, Missouri) **International Research Conference on Reliability**
Contact Professor Asit P. Basu, Department of Statistics, Mathematical Sciences Building, University of Missouri-Columbia, Columbia, MO65211, U.S.A.

June 19–July 1 (Erice, Sicily) **Nonsmooth Optimization Methods and Applications**
Contact M. Pappalardo, Department of Mathematics, University of Pisa, Via Buonarotti 2, I-56100 Pisa Italy.

June 20–27 (Erice, Sicily) **NP–Completeness: The First 20 Years**
Contact Professor G. Gallo, Department of Computer Science, University of Pisa, Corso Italia 4D, I–56100 Pisa, Italy.

June 22–28 (Seattle, Washington)   **Stochastic Modelling and Statistical Inference for Selected Problems in Biology**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

June 22–July 5 (Seattle, Washington) **Graph Minors**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

June 23–29 (Oberwolfach, Germany) **Mathematische Methoden des VSLI-Entwurfs und des Distributed Computing**
Contact MFOG: see (1) below.

June 23–30 (Montréal) **International Category Theory Meeting**
Contact Category Theory 1991, Department of Mathematics, McGill University, 805 Sherbrooke St. W., Montréal, Québec, Canada H3A 2K6.

June 24–27 (Abano Terme, Italy) **Barsotti Memorial Symposium on Algebraic Geometry**
Contact V. Cristanic, Dipartimento de Matematica Pura ed Applicata, Universita di Padova, I–35131 Padova, Italy.

June 24–27 (Xian, China) **2nd International Conference on Numerical Optimization and its Applications**
Contact Xu Chengxian, Department of Mathematics, Xian Jiaotong University, Xian 710049, People's Republic of China.

June 24–28 (Sydney) **Conference to celebrate George Szekeres' Eightieth Birthday**
Contact Mathematics for George Szekeres, School of Mathematics, University of New South Wales, Kensington, NSW 2033, Australia.

June 24–29 (Strasbourg, France) **Geometry Conference in Honour of Claude Godbillon and Jean Martinet**
Contact Mne M. Stephan, Institut de Mathématiques, Colloque de Géométrie, 7 rue René Descartes, F–67084, France.

June 24–29 (Porto Novo, Republic of Benin) **International symposium on Recent Research Developments in Mathematics and Computer Science**
Contact Professor A.O. Kuku, Department of Mathematics, University of Ibadan, Ibadan, Nigeria.

June 25–27 (Firenze, Italy) **International Conference on Game Theory**
Contact Piero Tari, Dipartimento di Science Economiche, Universita di Firenze, via Curtatone 1, I-50123 Firenze, Italy.

June 25–28 (Paris) **8th International Conference on Logic Programming**
Contact INRIA-Rocquencourt, Relations Exterieures, Bureau des Colloques - ICPL '91, Domaine de Voluceau, BP 105, F-78153 Le Chesney Cedex, France.

June 25–28 (Dundee, Scotland) **14th Biennial Conference on Numerical Analysis**
Contact The Organising Secretaries, Biennial Conference on Numerical Analysis, Department of Mathematics and Computer Science, University of Dundee, Dundee DD1 4HN, Scotland.

June 26–28 (Cambridge, Massachusetts) **Third IMACS International Symposium on Computational Acoustics**
Contact D. Lee, Code 3122, Naval Underwater Systems Centre, New London, CT 06320, U.S.A.

June 29–July 5 (Seattle, Washington) **Theory and Applications of Multivariate Time Series Analysis**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

June 30 – July 3 (Chicago, Illinois) **6th Annual Conference on Structure in Complexity Theory**
Contact J. Royer, School of Computer and Information Science, Syracuse University, Syracuse, NY 13244, U.S.A.

June 30–July 6 (Oberwolfach, Germany) **Elliptische Operatoren auf Singulären und Nichtkompakten Mannigfaltigkeiten**
Contact MFOG: see (1) below.

July 1–3 (London) **The Bicentenial Conference on Computing (to commemorate the 200th anniversary of the birth of Charles Babbage)**
Conctact the Bicentennial Conference on Computing, IEEE Conference Services, Savoy Place, London WC2R OBL, England.

July 1–5 (Bath, England) **The Mathematics of Nonlinear Systems**
Contact J.F. Toland, School of Mathematical Sciences, University of Bath, Claverton Down, Bath BA2 7AY, England.

July 1–5 (Coolangatta, Queensland) **Combined Statcomp/Biological Statistics Meeting**
Contact Dr. R.J. Wilson, Department of Mathematics, University of Queensland, Queensland 4072, Australia.

July 1–19 (Brighton and Isle of Thorns, England) **Geometric Methods in Group Theory**
   Contact Dr G.A. Niblo, School of Mathematical and Physical Sciences, University of Sussex, Brighton BN1 9QH, England.

July 2–5 (Trieste, Italy) **International Conference on Complexity: Fractals, Spin Glasses and Neural Networks**
   Contact ICTP: see (5) below.

July 2–5 (Grenoble, France) **European Control Conference**
   Contact Secretariat de la Conference, GR Automatique/ENSIEG, B.P. 46, F–38402 saint-Martin d'Heres, France.

July 4-11 (Oaxtepec, Mexico) **International Conference on Algebraic Topology**
   Contact P. Shick, Department of Mathematics, John Carroll University, University Heights OH 44118, U.S.A.

July 6–12 (Seattle, Washington) **Stochastic Inequalities**
   Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

July 6–12 (Seattle, Washington) **Biofluiddynamics**
   Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

July 7–12 (Gregynog, Wales) **5th Gregynog Symposium on Differential Equations**
   Contact N.G. Lloyd, Department of Mathematics, The University College of Wales, Aberystwyth SY23 3BZ, Wales

July 7–13 (Oberwolfach, Germany) **Computational Number Theory**
   Contact MFOG: see (1) below.

July 7–20 (Brunswick, Maine) **8th International Conference on Probability in Banach Spaces**
   Contact Professor Marjorie G. Hahn, Department of Mathematics, Tufts University, Medford, MA 02155, U.S.A

July 8–10 (Sydney) **Sixth International Conference in Australia on Finite Element Methods**
   Contact C. McIvor, Department of Aeronautical Engineering, University of Sydney, NSW 2006, Australia.

July 8–12 (Melbourne) **35th Annual Conference of the Australian Mathematical Society**
   Contact J.H. Rubinstein, Mathematics Department, University of Melbourne, Parkville, Victoria 3052, Australia (email rubin@mundoe.maths.mu.oz.au).

July 8-12 (Washington D.C.) **Second International Conference on Industrial and Applied Mathematics**
   Contact IMA: see (7) below.

July 8–12 (Hanstholm, Denmark) **NATO Advanced Research Workshop: Approximation by Solutions of Partial Differential Equations, Quadrature Formulae, and Related Topics**
   Contact Professor Myron Goldstein, Department of Mathematics, Arizona State University, Tempe, AZ 85287, U.S.A.

July 8–14 (Canberra) **17th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing**
   Contact Dr B.D. McKay, Department of Computer Science, Australian National University, GPO Box 4, Canberra, ACT 2601, Australia.

July 8–14 (Szekszárd, Hungary) **ICOR '91 International Conference on Radicals**
   Contact L. Márki, Mathematical Institute, Hungarian Academy of Science, PF. 127, H-1364 Budapest, Hungary.

July 10–12 (Canberra) **Design of Longitudinal Studies and Analysis of Repeated Measures of Data**
   Contact Dr. Sue R. Wilson, Statistics Research Section, School of Mathematical Sciences, Australian National University, GPO Box 4, Canberra, ACT 2601, Australia.

July 14–20 (Oberwolfach, Gemany) **Dynamische Systeme**
Contact MFOG: see (1) below.

July 14–20 (Linz, Austria) **Near-rings and Near-fields**
Contact Professor Günter Pilz, Institut für Mathematik, Johannes Kepler Universität Linz, A-4040 Linz, Austria.

July 14–27 (Lucca, Italy) **Probabilistic and Stochastic Methods in Analysis, with Applications**
Contact J. Byrnes, Prometheus Inc., 21 Arnold Ave., Newport, RI 02840, U.S.A.

July 15–17 (Adelaide) **CTAC 91 (Computational Techniques and Applications Conference)**
Contact Len Colgan, School of Mathematics and Computer Studies, South Australian Institute of Technology, The Levels, SA 5005, Australia

July 15–17 (Bonn, Germany) **ISSAC '91 (International Symposium on Symbolic and Algebraic Computation)**
Contact ISSAC '91 Conference Office, Mrs Christine Harms, Schloss Birlinghoven, P.O. Box 1240, D-5205 St Augustin, Germany

July 15–18 (Amsterdam) **6th Annual IEEE Symposium on Logic in Computer Science**
Contact D. Leivant, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA 15213, U.S.A.

July 15–19 (Trento, Italy) **International Workshop on Statistical Modelling and Latent Variables**
Contact Klaus Haagen, Instituto di Statistica e R.O. Università di Trento, Via Verdi 26, I-31800 Trento, Italy.

July 15-August 2 (Laramie, Wyoming) **Recent Developments in Differential Equations and Ecological Modeling**
Contact Professor A.D. Porter, Department of Mathematics P.O. Box 3036, University Station, University of Wyoming, Loramie, WY 82071-3036, U.S.A.

July 17–19 (Canberra) **Saddlepoint Methods in Statistics**
Contact Dr J.G. Booth, Statistics Research Section, School of Mathematical Sciences, Australian National University, G.P.O. Box 4, Canberra, ACT 2601, Australia.

July 17-20 (Rio de Janeiro) **Workshop in Partial Differential Equations**
Contact Institute de Matemática Pura e Aplicada, Estrada Dona Castorina, Jardim Botaanico, Rio de Janeiro RJ, Brazil.

July 20–26 (Seattle, Washington) **Mathematical Aspects of Classical Field Theory**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

July 20-August 2 (Seattle, Washington) **Motives**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

July 21-26 (San Diego, California) **International Symposium on Optical Applied Science and Engineering (Program on Mathematical Imaging)**
Contact Professor Gerhard X. Ritter, Department of Computing and Information Science, University of Florida, Gainesville, Florida 32611, U.S.A.

July 21–27 Oberwolfach, Germany) **Halbgruppentheorie**
Contact MFOG: see (1) below.

July 22-26 (Dublin) **Thirteenth IMACS World Congress on Computing and Applied Mathematics**
Contact J.H. Miller, University of Dublin, School of Mathematics, 39 Trinity College, Dublin 2, Ireland.

July 27–August 2 (Seattle, Washington) **Systems of Coupled Oscillators**
Contact Summer Research Conference Coordinator, Meetings Department, American Mathematical Society, P.O. Box 6887, Providence, RI 02940, U.S.A.

July 28–August 2 (New Haven, Connecticut) **Conference on Symbolic Dynamics and its Applications (in honor of Dr. Roy L. Adler)**
Contact B. Kitchens, Department of Mathematical Sciences, IBM-Thomas J. Watson Research Center, P.O. Box 218, Yorktown Heights, NY 10598, U.S.A.

July 28–August 3 (Oberwolfach, Germany) **Gruppen und Geometrien**
Contact MFOG: see (1) below.

July 29–August 9 (Montréal) **Algebra and Orders**
Contact Ghislaihe David, secrétaire, Séminaire de Mathématiques Supérieures, Université de Montréal, CP 6128-!, Montréal, Quebec, Canada H3C 357.

August 3–7 (Coral Gables, Florida) **Interamerican Conference on Mathematics Education**
Contact U. D'Ambrosio, Institute of Mathematics, Univ. Estadual de Campinas, CP6063 (13081), Campinas (SP), Brazil.

August 4–10 (Oberwolfach, Germany) **Effiziente Algorithmen**
Contact MFOG: see (1) below.

August 5–8 (Beijing) **ICMI China Regional Conference on Mathematics Education**
Contact Professor Zhong Shanji, Department of Mathematics, Beijing Normal University, Beijing 100875, People's Republic of China.

August 5–9 (Amsterdam) **Fourteenth International Symposium on Mathematical Programming**
Contact 14th International Symposium on Mathematical Programming, Paulus Potterstraat 40, 1071 DB Amsterdam, The Netherlands.

August 11–17 (Oberwolfach, Germany) **European Young Statisticians Meeting**
Contact MFOG: see (1) below.

August 12–18 (Baden-Baden, Germany) **3rd International Symposium on Systems Research and Cybernetics**
Contact Professor George E. Lasker, School of Computer Science, University of Windsor, Windsor, Ontario, Canada N9B 3P4.

August 14–16 (Bern, Switzerland) **Short Conference on Uniform Mathematics and Applications**
Contact Organizing Committee (Conference on Uniform Mathematics), Department of Mathematics, University of Bern, Sidlerstrasse 5, 3012 Bern, Switzerland

August 14–16 (Waterloo, Canada) **Recent Concepts in Statistical Inference (A Symposium in honour of Professor V.P. Godambe on the occasion of his 65th birthday)**
Contact Dr. Mary E. Thompson, Department of Statistics and Actuarial Science, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1.

August 18–24 (Kingston, Ontario) **3rd Conference of the Canadian Number Theory Association**
Contact Dr Yuriko Yui, Department of Mathematics and Statistics, Queen's University, Kingston, Ontario, Canada K7L 3N6.

August 18–24 (Oberwolfach, Germany) **The Navier-Stokes Equations: Theory and Numerical Methods**
Contact MFOG: see (1) below.

August 18–September 4 (Saint Flour, France) **Twenty-first Summer Ecole des Calcul des Probabilites**
Contact P.L. Hennequin, Mathématiques Appliquées, F-63177 Aubiere Cedex, France.

August 19–23 (Prague) **7th Prague Topological Symposium**
Contact Matematicky ustav CSAV, Topological Symposium, Zitna ulice 25, 115 67 Praha 1, Czechoslovakia.

August 19–September 6 (Trieste, Italy) College on Singularity Theory
Contact ICTP: see (5) below.

August 20–25 (Barnaul, USSR) International Conference on Algebra in Honour of A.I. Shirshov
Contact Professor Sergei A. Syskin, Institute of Mathematics, Novosibirsk 630090, U.S.S.R.

August 20–30 (Nairobi) Third Pan-African Congress of Mathematicians
Contact Professor Caleb Oyake, Department of Mathematics, Kenyatta University, Nairobi, Kenya.

August 21–23 (Tulsa, Oklahoma) 13th Boundary Element Method International Conference
Contact S. Gipson, School of Civil Engineering, 314 Engineering South, Oklahoma State University, Stillwater, OK 74078, U.S.A.

August 21–24 (Budapest) Colloquium on Differential Equations and Applications
Contact János Bolyai Mathematical Society, Anker Köz 1-3, H-1061 Budapest, Hungary.

August 24–30 (Sydney) 12th International Joint Conference on Artificial Intelligence (IJCAI-91)
Contact Professor Michael A. McRobbie, Centre for Information Science Research, I Block, Australian National Unviersity, GPO Box 4, Canberra, ACT 2601, Australia.

August 25–31 (Oberwolfach, Germany) Klassifikation Komplex-Algebraischer Varietäten
Contact MFOG: see (1) below.

August 25–31 (Göttingen, Germany) Conference on Classifying Spaces of Compact Lie Groups and Finite Loop Spaces
Contact Professor L. Smith, Mathematisches Institut der Universität Göttingen, Bunsenstrasse 3-5, D-3400 Göttingen, Germany.

August 26-31 (Barcelona) International Conference on Differential Equations (EQUADIFF 91)
Contact Professor Carlos Perello, EQUADIFF 91, Department of Mathematics, Universita Autonorma de Barcelona, E-08193 Bellaterra Spain.

September 1–7 (Oberwolfach, Germany) Topologie
Contact MFOG: see (1) below.

September 3–6 (Triese, Italy) Functional Integration and its Applications
Contact ICTP: see (5) below.

September 3–10 (Erice, Sicily) Applied Mathematics in the Aerospace Field
Contact A. Salvetti, Dipartimento del Ingegneria Aerospaziale, Universita di Pisa, Via Diotisalvi, I-57100 Pisa, Italy.

September 4–7 (Bilbao, Spain) IMSIBAC 4 (4th International Meeting of Statistics in the Basque Country)
Contact Professor J.P. Vilaplana, Faculty of Mathematical Sciences, University of Bilbao, E-48070, Spain.

September 8–14 (Oberwolfach, Germany) Niedrigdimensionale Topologie
Contact MFOG: see (1) below.

September 8–14 (Oberwolfach, Germany) Knoten und Verschlingungen
Contact MFOG: see (1) below.

September 9–13 (Geneva) Journées Arithmétique
Contact D. Coray, Section de Mathématiques, Université de Genève, 2-4 rue de Lièvre, CH-1211 Genève 24, Switzerland.

September 9–17 (Cairo, Egypt) International Statistical Institute: 48th Biennial Session
Contact ISI Permanent Office, 428 Prinses Beatrixlaan, P.O. Box 950, 2270 A2, Voorburg, The Netherlands.

September 9-27 (Trieste, Italy) School on Dynamical Systems
Contact ICTP: see (5) below.

September 11-14 (Minneapolis, Minnesota) **4th SIAM Conference on Linear Algebra**
Contact Professor R.A. Brualdi. Department of Mathematics, University of Wisconsin-Madison, Van Vleck Hall, 480 Lincoln Drive, Madison, WI 53706, U.S.A.

September 13-15 (Eugene, Oregon) **Representation Theory Conference**
Contact Representation Theory Conference, Department of Mathematics, University of Oregon, Eugene, OR 97403, U.S.A.

September 15-20 (Bieleveld, German) **DMV-Jahrestagung 1991**
Contact MFOG: see (1) below.

September 15-21 (Oberwolfach, Germany) **Geometrie der Banachräume**
Contact MFOG: see (1) below.

September 16-21 (Santiago de Compostela, Spain) **Minimal Models, Lie Groups and Differential Geometry**
Contact Antonio Gomez Tato, Departamento de Geometria e Topologia, Faculdad de Matematicas, Universidad de Santiago de Compostela, E-15707 Santiago de Compostela, Spain.

September 22-28 (Oberwolfach, Germany) **Nonlinear and Random Vibrations**
Contact MFOG: see (1) below.

September 23-29 (Kazimierz Dolny, Poland) **Sixth Symposium on Classical Analysis**
Contact T. Mazur, Technical University, Department of Mathematics, Malczewskiego 29, 26-600 Radom, Poland.

September 24-27 (Sendai, Japan) **International Conference on Theoretical Aspects of Computer Software**
Contact T. Ito, Department of Information Engineering, Tohoku University, Sendai, Japan 980.

September 25-27 (Lausanne, Switzerland) **Ninth GAMM Conference on Numerical Methods in Fluid Mechanics**
Contact I.L. Ryhming, IMHEF/DME, EPFL, Lausanne CH–1015, Switzerland.

September 29–October 5 (Oberwolfach, Germany) **Kombinatorik Geordneter Mengen**
Contact MFOG: see (1) below.

October 7–10 (New Orleans, Louisiana) **9th International Symposium on Applied Algebra, Algebraic Algorithms, and Error Correcting Codes**
Contact H.F. Mattson, School of Computing and Information Sciences, 4-166 Center for Science and Technology, Syracuse University, Syracuse, NY 13244-4100, U.S.A.

October 7-11 (Trieste, Italy) **Workshop on Stochastic and Deterministic Models**
Contact ICTP: see (5) below.

October 13–19 (Oberwolfach, Germany) **Geometrie**
Contact MFOG: see (1) below.

October 14–18 (Minneapolis, Minnesota) **IMA Workshop on Sparse Matrix Computations: Graph Theory Issues and Algorithms**
Contact IMA: see (3) below.

October 16–18 (Leesburg, Virginia) **SIAM Workshop on Micromechanics**
Contact SIAM: see (6) below.

October 18–19 (Ames, Iowa)   **Differential and Delay Equations (to mark the retirement of Professor George Seifert)**
Contact Dr A.M. Fink, Department of Mathematics, 400 Carver Hall, Iowa State University of Science and Technology, Ames, IA 50011, U.S.A.

October 21–26 (Hansur-Lesse, Belgium) **3rd International Workshop Conference on Evolution Equations, Control Theory and Biomathematics**
Contact Professor G. Lumer, Institut de Mathématique, Universite de Mons, Place du Parc 20, B-7000 Mons, Belgium.

November 3-9 (Oberwolfach, Germany) **Mengenlehre**
Contact MFOG: see (1) below.

November 4-8 (Tempe, Arizona) **2nd SIAM Conference on Geometric Design**
Contact SIAM: see (6) below.

November 11-15 (Minneapolis, Minnesota) **IMA Workshop on Combinatorial and Graph-Theoretic Problems in Linear Algebra**
Contact IMA: see (3) below.

November 17-23 (Oberwolfach, Germany) **Singularitäten der Kontinuumsmechanik: Numerische und Konstruktive Methoden zu Ihrer Behandlung**
Contact MFOG: see (1) below.

November 20-26 (Oberwolfach, Germany) **C* - Algebra**
Contact MFOG: see (1) below.

November 24-30 (Oberwolfach, Germany) **Numerische Methoden der Approximationstheorie**
Contact MFOG: see (1) below

December 1-7 (Oberwolfach, Germany) **Statistik Stochastischer Prozesse**
Contact MFOG: see (1) below.

December 2-4 (St Petersburg, Florida) **4th International Conference on Numerical Combustion**
Contact Professor John D. Buckmaster, University of Illinois, 101 Trans Building, 103 S. Mathews Ave, Urbana, IL 61801, U.S.A.

December 8-14 (Oberwolfach, Germany) **Stochastic Geometry, Geometric Statistics, Stereology**
Contact MFOG: see (1) below.

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

December 23-26 (Varanasi, India) **International Conference on Generalised Functions and their Generalisations**
Contact R.S. Pathak, Department of Mathematics, Banares Hindu University, Varanasi 221 005 India

December 27-31 (Las Cruces, New Mexico) **Holiday Symposium on the Impact of Software Systems in Mathematical Research**
Contact R.J. Wisner, Homotopy Theory Symposium, Dept. of Mathematical Sciences, New Mexico State University, Box 30001, Las Cruces, New Mexico 88003-0001, U.S.A.

** 1992 **

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

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

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

June 1-5 (Minneapolis, Minnesota) **IMA Workshop on Linear Algebra for Control Theory**
Contact IMA: see (3) 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 15–19 (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.

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 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.

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.

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

We have been disappointed by the nil response to our requests for problems and solutions recently. No new problems have been submitted to us since early 1990. Perhaps there is insufficient interest to sustain this section? Are the problems really of little general interest?

We offer two puzzles which occupied GCW's time on recent flights. The first is an undergraduate exercise. Come on readers!

Problem 19 (Australian Math Exhibit)

A rod AB is attached by an arm OC in the XY plane, and is free to rotate about the OZ axis. A plate in the YZ plane has a curved slot cut to allow the rod to pass through. What is the locus of the intersection of the skew line segment AB and the YZ plane, as AB rotates about the OZ axis?
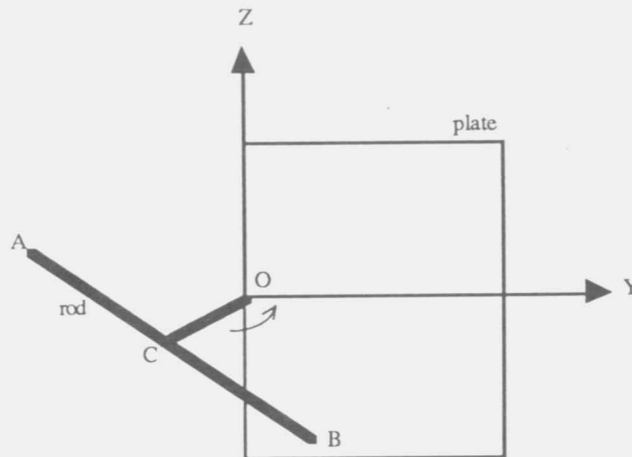
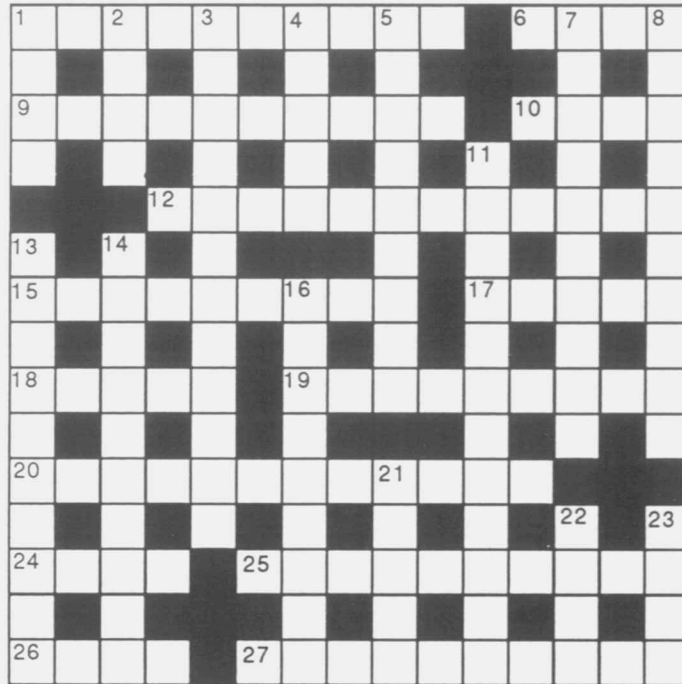**Problem/Query 20** (A "knowing" example of GCW)

$g(x) = \exp(x^2)$ is not a function of slow growth as defined by Laurent Schwartz. Hence its (generalised) Fourier transform cannot easily be found by the methods perfected by Schwartz, Lighthill etc. Yet its Fourier transform can be found in terms of generalised functions. What is its Fourier transform? (This problem arose in analysing probability density functions associated with earthquake data in t e presence of normally distributed noise.)

Mike Hendy
Graeme Wake

CROSSWORD

Dr Matt Varnish is on leave. This year's guest setter is K. N. Tode who is thought to be at the University of Queensland.

No 33

Across

1. Phrase ever stolid about bowls (8,2)
6. Entrance (do not subtract?) (4)
9. Tangles in clique of interest for 3 (10)
10. Earnest request shortened fold (4)
12. Insomnia with the king's confounded two on board (5,7)
15. Surplus sent to tundra den (9)
17. J. Woodser's unity in sides (5)
18. Cotton twill backing on greek letter (5)
19. Plants early risers' contented sounds (9)
20. See merit ride moves forerunner of 3 (12)
24. Cat primate cross (4)
25. "O! No man can", I garbled being hooked on one idea (10)
26. Small space instrument with nothing left off (4)
27. Isn't secret about meets linewise (10)

Down

1. Cube cast on Rubicon (4)
2. Connection could give light (4)
3. Take enough Javans for one with one of 11 (7,5)
4. Trifle left out to renovate the suit? (5)
5. Sly deceiver of the right skirt, etc (9)
7. Tall plant of sacred place with twisted scarface (10)
8. To break the law confused stress and rang (10)
11. Myself apart, you don't get them with an aimless fiddle; but you do! (6,6)
13. Colourful, wealthy to a Tee, right order, I see a hue! a hue! a hue! (10)
14. To do with 6? No, but it is extra (10)
16. Sad satellite rarity (1,4,4)
21. Broke range (5)
22. Princess overstate flat and round (4)
23. Part of New Testament plays (4)

Solution to Crossword No 32