



NEWSLETTER

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PUBLISHER'S NOTICE

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

The New Zealand Mathematical Society,
c/o The Royal Society of New Zealand,
Private Bag, Wellington, New Zealand.

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

Dr D R Breach,
Department of Mathematics,
University of Canterbury, Christchurch, New Zealand.

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Conferences	Michael Carter (Massey University)
Problems and Queries	Graeme Wake and Mike Hendy (Massey University)
Visitors to New Zealand	Marston Conder (Auckland University)

Honorary Correspondents

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Dr K A Broughan	Mathematics and Statistics (Waikato University)
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Dr M Morton	Mathematics and Statistics (University of Auckland)
Prof D A Nield	Theoretical and Applied Mechanics (University of Auckland)
Dr J Rayner	Mathematics and Statistics (University of Otago)
Mr G J Tee	Computer Science (University of Auckland)

LOCAL NEWS

DSIR

AMD, Wellington

Alex McNabb has taken early retirement and a part-time position at Massey University. We have not lost Alex entirely though, which helps reduce the loss, and look forward to increased collaboration with Massey as a result.

Malcolm Grant has officially left us after being on secondment to DSIR Head Office for three years. Congratulations Malcolm on your appointment as manager of the Meteorological Service.

We welcome new arrivals Sarah Harper (Statistics) and Sandy Ratana (Administration Officer).

Bruce Bensemman and Hugh Barr were in Seoul attending the first OPORS Conference, and in Tokyo for the 13th International Symposium on Mathematical Programming. They were too early for the Olympics, but just in time for the body searches. Brisbane and EXPO are popular, with both Malcolm Robbins and Peter McGavin visiting at different times. Mark McGuinness visited Japan earlier this year with other DSIR scientists on geothermal business, and goes to the International Symposium on Geothermal Energy at Kumamoto and Beppu in November this year.

There is continuing pressure in DSIR to justify research and to earn contract money. Despite this, research is alive and well. In particular, a joint research effort has recently begun in the Mathematical Physics section in the area of two-phase flow in porous media, and the Division is looking at a team-work approach to improving the quality of research and service work.

Mark McGuinness

UNIVERSITY OF AUCKLAND

Computer Science

Peter Fenwick has been elected as Deputy Dean of the Science Faculty. John Hosking presented a paper

on "Development of an expert system for seismic loading" at the Symposium on Knowledge-Based Expert Systems in Civil Engineering, held at Monash University. Werner Staringer has resigned.

Seminars

Professor Mark Lee (Aberystwyth, joint seminar with IEEE), "Research into automatic diagnosis and error recovery".

Dr A.C. Tsoi (University of New South Wales) "Artificial neural networks".

Professor Wolfgang Kreutzer (University of Canterbury) "AI Programming: tools and metaphors", and "Object-oriented programming and the role of concurrency in flavour systems".

Dr Michael J.J. Lennon (University of Auckland) "A 3.2-generation language for laboratory technicians".

Professor L.M. Delves (University of Liverpool) "Parallel computation in the UK".

Phil Sharp (University of Toronto) "Efficient implementation of Runge-Kutta-Nystrom methods".

Professor Jan Stelovsky (University of Hawaii) "Multimedia software projects".

Dr John R. Mashey (MIPS Computer Systems) "Optimizing RISC compilers and RISC architecture".

G J Tee

Mathematics and Statistics

We welcomed Charikleia Konstadilaki who is from the University of Thessaloniki in Greece and is spending a seven month study leave here working in general topology. Max Ganster has returned to Austria. While the Rudins were still here in August (and the topological group was at its peak numberwise) they convened a mini-conference. It began in a conventional manner with seminars and ended with much informal discussion during a weekend at Piha on the coast west of Auckland.

Cheryl Praeger from the University of Western Australia was with us for two weeks in October. She gave several seminars here and a group of us accompanied her to Waikato for a seminar there. This was a day of intense activity with a visit to the Picasso exhibition at the new Waikato Art Gallery, a very nice lunch supplied by our hosts, and on the way back a stop at a winery and icecreams from Marston's favourite dairy. On another day Cheryl also got to enjoy a long tramp at Piha.

The new arrivals to the department continue. In August Gaven Martin returned from the US to take up a lectureship. He and his wife Diane welcomed a baby daughter in October. Our doctoral student Sina Greenwood and her husband Antony also welcomed a baby son in October, as did part-time lecturer Jocelyn Dale and her husband John. Congratulations to Bruce and Trish Calvert on their recent marriage.

In response to requests from students we began what will hopefully be the beginning of a series of informal lunchtime lectures on careers that involve mathematics. Linita Manuatu gave an enthusiastic but realistic view of her first year as a secondary school teacher. Her reminiscences about being a student in our department were appreciated by both the students and staff. Jocelyn Dale gave an informative overview of possible careers arising from the study of statistics.

On the social side a group of senior students planned a Friday evening 'wine and cheese and other nibbles' gathering with the theme "What Do Senior Maths Students Have in Common?". We continued well into the evening with students and staff exchanging some more informal viewpoints than normally occur in our daily

working atmosphere. Our 'annual' cricket match against the Computer Science Department has just been played. The timing was excellent, we just finished before the rain started. Somewhat to our surprise our rather 'geriatric' team managed to just emerge as the victors over our younger, student infiltrated, opposition.

Seminars

Mr Colin Barry (South Australian College of Education), "Mathematical and mathematics education—partners or rivals—some ICME6 perspectives".

Professor Jonathan Borwein (Dalhousie University, Halifax), "Ramanujan and calculating pi".

Dr Peter Danaher (University of Waikato), "A Markov chain model for magazine purposes".

Dr Hugh Luckock (University of Newcastle), "Quantum geometry of strings and membranes".

Professor Cheryl Praeger (University of Western Australia), "The inclusion problem for finite primitive permutation groups" and "Subgroups of finite symmetric groups".

Professor J Robertson (Washington State University), "How many cuts are required for a fair division?".

Professor Mary Ellen Rudin (University of Wisconsin), "Is set theory necessary?".

Professor Walter Rudin (University of Wisconsin), "Some differences between one and several complex variables".

Dr Akira Saito (Tohoku University, Japan), "Secret sharing scheme realizing general access structure".

Dr Noel Walkington (University of Texas, Austin), "Solutions to degenerate parabolic partial differential equations".

Professor Wenci Yu (Fudan University, Shanghai), "DFP algorithm convergence for not necessarily convex functions".

Dr David Yost (Australian National University), "Lipschitz homeomorphisms".

Margaret Morton

Theoretical and Applied Mechanics

We shall be sorry to lose James Graham-Eagle, who has resigned from his lectureship. For personal reasons, he is returning to the USA in 1989. We have also farewelled our visitor, Bruce Murtagh, who is returning to UNSW.

David Bullivant has been awarded a PhD for his thesis on "Tracer Testing of Geothermal Reservoirs".

Seminars:

Prof C F Ansley (School of Commerce) "A fast algorithm for signal extraction, influence and cross-validation in state space models".

Mr I Anderson (AIDD., DSIR) "The physics of the violin".

Dr Ingrid Granstam (Linköping University, Sweden) "The girls and technology project".

Prof Wenci Yu (Fudan University, Shanghai) "Some results on vehicle routing problems" and "Powell's conjugate direction method without evaluating derivatives".

Assoc Prof D K Bogen (U Pennsylvania) "Engineering design of a medical procedure".

Dr R I Nokes (TAM) "Breaking internal gravity waves".

Prof M A Saunders (Stanford U) "A practical anti-cycling procedure for linear and non-linear programming", "Solving large-scale optimization problems with GAMS and MINOS", and "Interior point methods for linear programming: A challenge to the simplex method".

Prof F W Williams (UWIST, Cardiff) "General structural analysis methods for calculating exact buckling loads or natural frequencies and the associated modes".

Dr B Murtagh (UNSW) "Currency risk minimisation using portfolio theory".

Dr A B Philpott (TAM) "An interior-point algorithm for semi-infinite linear programming".

Dr Margaret Hood (Greenlane Hospital) and Mr Alistair Hookings (TAM) "Electrical activation of the heart: Clinical and computer modelling aspects".

D A Nield

UNIVERSITY OF CANTERBURY

Mathematics

Professor Shanti S Gupta (Purdue University) visited us during September and October, and gave several seminars on selection and ranking procedures in statistics. These included a series of lectures suitable for undergraduates, as well as some research seminars.

Professor Jack Robertson (Washington State University) will be staying with us until the end of the year. His interests include graph theory, topology and statistics. He has also developed some approaches to mathematical modelling at the 6th and 7th form level, and he will give a talk about this to the Canterbury Mathematical Association.

Dr Phillip Sharp (one of our former students and now at Toronto) was here in late August on a short visit. He gave a seminar about using a SUN/3 and a CRAY SMP/2 to model the distortion and necking of a viscous inclusion in a linear Stokes flow.

Brian Woods spent a week in August attending the XVIIth International Congress of Theoretical and Applied Mechanics in Grenoble. He presented a paper about the height of a source-fed blob of viscous fluid, a topic which relates to the genesis of volcanoes.

Finally Professors Mary Ellen and Walter Rudin gave two seminars during a brief visit. Mary Ellen spoke on the topic 'Is set theory necessary?' while Walter discussed 'Some differences between one and several complex variables'.

J Hannah

MASSEY UNIVERSITY

Mathematics and Statistics

Brian Hayman, Professor of Statistics and Head of Department, retires at the end of 1988. I'll say no more here, as Brian is featured as the Centrefold in this issue. Graeme Wake has been appointed HOD for a three-year term, and we expect the Chair of Statistics to be advertised sometime during 1989.

Doug Stirling returned in August after a year away on sabbatical. Much of his time was spent preparing a new version of his StatLab Statistical teaching program for the Macintosh. This is a major task which is expected to be completed sometime in 1990. There are also plans to use StatLab in our big first-year service statistics course from 1990 onwards, which will mean major changes in the way this course is taught. StatLab is already being used successfully in our other first-year statistics courses.

Gordon Knight attended the 6th International Congress on Mathematical Education in Budapest, where a major topic was the social and cultural context of teaching mathematics. Gordon was left with the feeling that "... the Maori initiatives which are evident in some of the bilingual classes in NZ are more innovative, and show more promise, than anything reported to the conference. ... The dominant overseas approach is to bring elements of the minority culture into the mathematics classroom ... The important Maori initiatives involve turning this around and bringing elements of the mathematics culture into the Maori classroom."

Hugh Morton returned from leave in Canada at peak fitness after using himself as an experimental subject in his work on athletic training!

At the cost of a great deal of trouble (mostly for Graeme Wake) but surprisingly little expense, we have just acquired from the USA the Annenberg video tapes on Contemporary Mathematics—13 hours of viewing on Management Science, Statistics, Social Science, Size and Shape, and Computer Science. We hope these will be very useful in our schools extension work, as well as in our own teaching.

Seminars:

Kishore Kumar, "MHD flow past a rotating disk."

Grant Keady (Western Australia), "Proving the Dupuit approximation for the rectangular dam problem."

Alex McNabb, "How long to freeze a chicken or boil an egg?"

Greg Arnold, "Statistical analysis for the illiterate."

Derek Holton (Otago), "Extendability."

Mike Carter, "The genesis of Euclid's parallel postulate."

Hugh Morton, "A scientific approach to athletic training: mathematical, experimental and practical."

Shanti Gupta (Purdue and Canterbury), "Statistical selection and ranking procedures: alternatives to the classical ANOVA techniques."

Jack Robertson (Washington State), "Partition graphs."

M R Carter

OTAGO UNIVERSITY

Mathematics and Statistics

We are currently making plans for and looking forward to the visit of Professor Saunders Mac Lane as William Evans Visiting Professor (February 15 to May 15, 1989).

Professor Vernon Squire was awarded the Polar Medal with Antarctic/Arctic Clasp by Her Majesty Queen Elizabeth II at an investiture at Buckingham Palace on 12 October. (While in England, Vernon and his wife Pat were also proud to introduce their son Jonathan (6 months old) to his grandparents.) During September, Vernon participated in the Ross Dependency Research Committee (RDRC) Physical Sciences Working Group meeting in Wellington, where proposals were considered for the 1989 Antarctic season. As an invited member of the International Association for the Physical Sciences of the Ocean (IAPSO) Commission on Sea Ice, Vernon attended its first annual meeting in Cambridge, England on 10-11 October. The purpose of the meeting was to establish future goals in polar oceanography and sea ice research, to recommend appropriate workshops and conferences, and to instigate working groups.

Dr Colin Fox has recently joined the Department of Mathematics and Statistics as UGC Post Doctoral Research Fellow in Applied Mathematics. He will work with Professor Squire in the area of ocean wave/ice interaction. Colin received his BSc and MSc(Hons) from the University of Auckland, and then took up a Commonwealth PhD Scholarship at the University of Cambridge, England. He was awarded a PhD degree in 1988. Colin's interests are in the fields of inverse and inference problems in geophysics, Bayesian statistics, multigrid PDE solutions, analytic local-inverses of differential operators, and much more.

Dr John Clark spent his study leave at the University of Idaho and the University of Bristol. He attended ICME 6 in Budapest before returning to Dunedin in August.

Dr John Curran will be on leave in 1989. He will be spending the first 8 months at the Mathematics Institute, University of Warwick (well known for its group theorists) followed by 4 months at ANU, Canberra, and attending the conference on the Theory of Groups (held in honour of B Neumann's 80th birthday).

Mrs Allyson Seyb (one of our top-flight mathematics graduates) has been a Research Assistant in the Department this year working with John Rayner.

Elaine Mayo (Mathematics Adviser for the Southern Region) and Andy Begg (Mathematics Curriculum Officer in the Department of Education in Wellington) contributed to a discussion on the Picot Report and Forms 5-7 Syllabus at a recent meeting of the OMRSC which was chaired by Professor Derek Holton.

Dr Gloria Olive was the Representative of the National Committee for Mathematics at the International Committee Meeting of the Royal Society of New Zealand held in Christchurch in October. Gloria will retire from the University of Otago at the end of this year (having reached the "magical" age of 65). She hopes to spend most of her time in Dunedin (and will welcome invitations to give talks—especially on Rudolf Steiner Education) Her successor as Convener of the National Committee for Mathematics should be announced shortly. Her successor as Otago Correspondent for this Newsletter is John Rayner.

Seminars:

Professor Wenci Yu (Fudan University, Shanghai), "Some results on nonlinear optimisation algorithms" and "Some results on vehicle routing problems".

Dr Martin C Henson (University of Essex, Computer Science), "Desiderata for a theory of program development".

Professor Walter Rudin (University of Wisconsin), "Some differences between one and several complex variables".

Professor Mary Ellen Rudin (University of Wisconsin) "Is set theory necessary?" (She also gave an open lecture on "Women in mathematics".)

Dr Nick Tufillaro (Bryn Mawr College, Philadelphia), "Introduction to Nonlinear Dynamics".

G Olive

VICTORIA UNIVERSITY

Mathematics

Peter Smith (PhD London) has now arrived from Glasgow, and we are very glad to welcome him to the Mathematics Department. He will soon be joined by Dr Andrew Bruce, a new temporary lecturer in Statistics and a joint appointment with the Government Department of Statistics, who is coming from the University of Washington, Seattle. The third new lecturer is Dr Stephen Glasby from Sydney, who works on computational algebra, and who will be arriving soon.

Six overseas visitors are due soon, three in pure mathematics on a NZ-US Educational Foundation grant to Rod Downey and Colin Bailey, and three in statistics (contact: David Vere-Jones). They are: Prof Carl Jokusch, U Illinois-Urbana, 5-20 Jan (logic); Prof Manuel Lerman, U Connecticut, 5-15 Jan (recursion theory); Prof Michael Stob, Calvin College, Michigan, 5-20 Jan (recursion theory and inductive learning); Prof M R Leadbetter, U North Carolina, Chapel Hill, April (point processes and extreme value theory); Prof M A J van Montfort, Wageningen Agric U, Netherlands, Apr-Jun (extreme value theory and applications in meteorology; jointly with NZ Meteorological Service); Dr Ahmad Parsian, Shiraz U, Iran, Jan-Dec 1989 (multivariate processes).

Peter Thomson is a Visiting Research Scientist at the Institute of Statistical Mathematics, Tokyo, Nov 88 - Feb 89. Chris Atkin is an invited lecturer at the College on Global Geometric and Topological Methods in Analysis, Trieste, Italy, Dec-Jan 1989. Philip Rhodes-Robinson is on sabbatical at Stanford and Brian Dawkins at Waterloo, Ontario, both of them for the whole of 1989. John Harper has been elected President of the Wellington Branch of the Royal Society of New Zealand (even though it has no Mathematics Section).

J F Harper

UNIVERSITY OF WAIKATO

Mathematics and Statistics

The newly renamed Department of Mathematics and Statistics has a new Professor as of June 1989. He is Douglas S Bridges of the University of Buckingham. We look forward to his arrival and the constructive approach to mathematics that he brings. In addition Professorial Fellow Dr N John has been appointed to be affiliated with the Centre of Applied Methods for quality improvement in conjunction with Management Studies. Mark Schroder and Alfred Sneyd are both on study leave in Europe and the U.K. respectively. We look forward to their return. The department has two vacancies for new positions at the lecturer level. One of these is in Applied Mathematics (closing date 30 November) and the second is a general position (closing date 27 January). [Further details of these positions are provided in a separate notice elsewhere in this Newsletter. Ed.]

The department is to be housed in a new building currently under construction, together with Computer Science.

Seminars:

Wenci Wu (Fudan University), "Mathematical education in universities of China."

Professor W Kohler (University of Giessen, W Germany), "Deterministic and stochastic models of the negative binomial distribution and the analysis of chromosomal aberrations."

Professor Cheryl Praeger (University of Western Australia), "Arc transitivity in graphs and digraphs."

E G Kalnins

GRANTEE REPORTS

MEGAN CLARK

I attended ICME-6 in Budapest from July 27 to August 3, 1988. I gave an oral presentation there entitled "Educational Patterns vs Social Needs" and was an invited speaker for Theme Group 6—Mathematics and Other Subjects, where I spoke on "Factors affecting the flow of students into mathematics, science and technical training". These were well received although I noted with some alarm that they were greeted most warmly and with most understanding by delegates from Iran, Uganda and India!

Overall the conference was a valuable one for me, confirming some of my ideas and providing considerable food for thought, some of which I am already working on. Please convey to the NZMS my gratitude for their grant which was of considerable assistance.

Megan Clark
Victoria University of Wellington

KEVIN BURRAGE

The 12th IMACS World Congress on Scientific Computation was held in Paris, France from 18 - 22 July. The conference attracted over 1000 participants from all over the world, including a large delegation from the Soviet Union and a smaller delegation (of 1) from New Zealand. Over 800 talks were presented in 17 parallel sessions over the 5 days—starting at 8am and finishing at 6pm. The talks encompassed a wide variety of subjects including robotics, simulation, expert systems, parallel computing, biological, chemical and economic modelling, nonlinear dynamics, numerical methods for the solution of problems in atmospheric, oceanography and astronomy, and numerical analysis, just to name a few. As can be seen, numerical analysis was just a small part of a wide coverage of topics. The session on the numerical solution of ordinary differential equations took place on Friday morning and afternoon in one of the 17 parallel sessions.

I was invited by the session organizer to present a talk on my work, and I gave a one-hour presentation on "A study of the nonlinear stability of a general class of differential equation methods". This talk was mainly a review of the developments in this important area in the last ten or so years, but some new results were also given.

The conference was extremely stimulating and at times a little overwhelming because of its sheer size and the choice of papers available. Unfortunately, it was not particularly well organized with many of the sessions not sticking to the agreed timetable, which meant that it was very difficult to move between sessions.

However, in spite of this I found the conference, and indeed Paris itself, very exciting; and I am very grateful for the grant of \$500 from the New Zealand Mathematical Society to help defray my expenses, which were considerable. (The registration fee alone was nearly \$700.) This grant not only helped me to attend the conference and present an invited talk, but it also enabled me to broaden my horizons in many other areas of applied mathematics and scientific computing in general, especially in the areas of nonlinear dynamics and parallel computing.

Kevin Burrage
University of Auckland

NOTICES

25TH AUSTRALIAN APPLIED MATHEMATICS CONFERENCE Ballarat, Victoria. 5 to 9 February, 1989

The Applied Mathematics Conference is an annual gathering of applied mathematicians, engineers and scientists working in all areas of Applied Mathematics. It is organized by the Division of Applied Mathematics of the Australian Mathematics Society and its objective is to provide a forum for the presentation and discussion of papers from a broad spectrum of applications. Traditionally it has maintained an informal atmosphere, with graduate students being especially encouraged to attend and participate.

The 1989 conference will be held on the campus of the Ballarat College of Advanced Education, which is located 8km from the centre of Ballarat, 100km from Melbourne. The Ballarat district is rich in history and includes attractions such as the famous Sovereign Hill Mining Village, The Gold Museum and the Eureka Stockade. The College has excellent conference and recreational facilities.

Major themes and invited speakers for the conference are:

Computing in Applied Mathematics
Mathematics in Engineering
General Relativity
Geophysical Fluid Dynamics
Nonlinear Waves

Dr R.A. Gingold (ANU)
Prof. D.B. Ingham (Leeds)
Prof. R.P. Kerr (Canterbury)
Prof. P.H. Roberts (UCLA)
Prof. G.B. Whitham (Cal Tech)

Contributed papers are welcome on any topic in Applied Mathematics, abstracts of which must be submitted by mid December 1988. No conference proceedings will be published, but a book of abstracts will be distributed at the time of the conference. A poster session will also be held.

For further information contact:

The Conference Secretary
25th Australian Applied Mathematics Conference
Department of Mathematics, Monash University, Clayton, 3168, Victoria, Australia.
Telephone: (03) 565 4443. Email: APM388P@MONUL.OZ.AU

1989 NEW ZEALAND MATHEMATICS COLLOQUIUM **Massey University, Palmerston North. 15-17 May, 1989**

We hope all members of the New Zealand Mathematical Community, fellow-travellers, one-and-all will join us for what we plan to be **THE MATHEMATICAL EVENT OF 1989**.

The programme is shaping up well, with many contributed papers already offered. We have been fortunate in receiving major sponsorship from Bennett's University Bookshops, and the New Zealand Mathematical Society. Professor Herb Keller of CIT, and past president of SIAM is to be the Bennett's invited speaker. His research interests cover a broad spectrum of applied mathematics. Professor Cheryl Praeger, Western Australia, is to be the New Zealand Mathematical Society invited speaker. Her research interests are in combinatorics and group theory. Other invited speakers include Dr Eve Bofinger, New England, interested in ranking and selection; Professor Hiroshi Fujita, Tokyo, interested in DE's and mathematics education; Professor Derek Holton, Otago, interested in graph theory; and Professor Saunders Mac Lane, Chicago interested in algebra and logic.

David Wallace, of Rongotai College, and silver medallist in the 1988 International Mathematics Olympiad at Canberra, and Derek Holton will conduct a session on their Olympiad experiences. Two suggested panel discussion/workshop sessions on "Funding for mathematics teaching and research in NZ" and "Basic mathematics skills at the tertiary level" will be included in the programme.

The colloquium will begin with finger food and social gathering at Wharerata (Staff Club) from 6pm Sunday May 14, and will include the annual meeting of the New Zealand Mathematical Society, Monday at 7pm and the colloquium dinner, on Tuesday evening.

On Wednesday we will be joined by teachers interested in mathematics education for a Mathematics Education Day. The programme and speakers for this day will be advertised later.

All members of the Society should have received first notices to the colloquium which were mailed out at the end of September. If you have not received a notice, or know of others to whom you think a notice ought to be mailed, please advise the Colloquium Secretary, Department of Mathematics and Statistics, Massey University. If you have not yet returned the notice from the first circular, please complete it, and **PUT IT IN THE MAIL TODAY!**

See you in May.

Mike Hendy

BRITISH MATHEMATICAL COLLOQUIUM **University of Nottingham, 3-7 April, 1989**

The principal speakers at the 41st British Mathematical Colloquium include **R Bieri** (Frankfurt), **C C Sims** (Rutgers), and **R Tijdeman** (Leiden). For further information contact:

Dr D L Johnson, BMC Secretary
Department of Mathematics
University of Nottingham
Nottingham NG7 2RD

ANNUAL MEETING OF THE AUSTRALIAN MATHEMATICAL SOCIETY Macquarie University, Sydney, New South Wales, Australia. 3-7 July, 1989

Conference themes: Number theory and its applications to cryptography, analysis with emphasis on differential equations and mathematical physics, algebra with emphasis on category theory and group theory, numerical methods and industrial mathematics.

Information: Professor J. Loxton, School of Mathematics, Macquarie University, New South Wales, 2109, Australia.

AUSTRALIAN ACADEMY OF SCIENCE NATIONAL COMMITTEES FOR MATHEMATICS Report of Joint Meeting, May 16, 1988

Australian NCM
Dr Bob Anderssen (Chair)
Professor Garth Gaudry
Professor Chris Heyde
Professor Neil Trudinger
Professor Tim Wall

New Zealand NCM
Professor John Butcher
Dr Michael Carter
Dr Murray Jorgensen
Dr Gloria Olive (Chair)

1. **Initial Briefing About Organizational Framework of AusNCM and NZNCM.** The Chairman of each National Committee first gave a summary of their operational organization and responsibilities. John Butcher explained that the NZNCM's work centred around international activities. Bob Anderssen explained the special situation in which the Aus NCM found itself since no umbrella organization existed in Australia for the mathematics-related societies. Consequently, the Aus MS seemed to concentrate more on national rather than international matters without downgrading its responsibility with regards the latter. It was acknowledged that, because of its size, population, etc., mathematical issues in Australia were intrinsically more complex than in New Zealand. Members of the NZNCM thought however that they should become more active nationally. It was agreed that

- *The Aus NCM would forward to the NZNCM a copy of its recent submission on "Mathematics Education and Training" as well as future submissions, reports, etc. it prepares;*
- *The Aus NCM and NZNCM should try to arrange for the exchange of Annual Reports, Minutes of Meetings, Memoranda to Committee Members, etc.*

In addition, John Butcher was particularly interested in the structure and operation of the Sectional Committees of the Australian Academy of Science. It was agreed that copies of appropriate AAS publications would be forwarded to the NZNCM for their information.

2. **Topics of a Trans-Tasman Nature.**

(a) **Need and Scope for Cooperation and Contact.** As well as the agreement highlighted above, there was a strong consensus that more should be done to foster much closer co-operation and contact not only between the Aus NCM and the NZNCM, but also between mathematics-related societies in Australia and New Zealand (and between the Australian Mathematical Society and the NZ Mathematical Society in particular).

In fact, it was agreed that

- *Bernard Neumann's IMU Canberra Circular greatly assisted New Zealand mathematics by widely disseminating information about mathematicians visiting New Zealand, etc., and therefore everything should be done to guarantee the continuation of this circular;*

- *Copies of these minutes be forwarded to mathematics-related Societies in Australia and New Zealand with the request that they consider closer cooperation, and, in particular, that sister-Societies consider giving each other observer status on their respective Councils.*

(b) **PR, Image, Funding** A number of issues were discussed with all agreeing that these matters were important, but that the mathematics-related societies (except for computer science) did not have an organizational structure which allowed them to do the things which should be done such as speaking for mathematics in non-academic circles.

(c) **Political Experiences and Pressures.** The national activities of the Aus NCM were discussed and in particular the submission it prepared on "Mathematics Education and Training". It was noted that there was not a greater (though still small) political awareness of the role and importance of mathematics in Australia which was reflected in the fact that one of the Sub Committees of the new Australian Research Council would be called Mathematics, Physics and Chemistry.

(d) **Coordination of Joint Meetings.** It was agreed that there was a strong need for better coordination between the Australian and New Zealand and New Zealand mathematical communities. It was felt that the above suggestion of observers on Councils of sister-Societies should assist. The possible use of the IMU Canberra Circular for this purpose was suggested.

3. International Topics

(a) **Future IMU/ICM in Australia/NZ.** The possibility of holding a future IMU/ICM in Australasia was discussed at some length. All supported the idea and agreed that a joint effort should be mounted if a formal bid were to be made. Neil Trudinger offered to discuss the matter informally with John Coates (IMU Committee Member) to gauge the likely attitude of the IMU itself. It was mentioned that ICOTS would be held at the University of Otago in 1990 and that the Australian contact was Ken Sharp, Melbourne.

(b) **S-E Asian and South Pacific Mathematics.** It was agreed that more should be done for Southeast Asian and South Pacific Mathematics. (It was noted that the work of the Australian Mathematics Olympiad Committee and the Australian Mathematics Competition as well as the holding of the 1988 IMO in Australia as a Bicentenary Activity should help to establish a foundation for future contacts.) The donation of back issues of Australian Mathematical Society Journals to South-East Asian Universities was cited as an example of what could be done.

RANGI RURU GIRLS' SCHOOL PRINCIPAL **Mrs Gillian Heald**

The new principal of Rangi Ruru Girls' School from January 1989 will be Mrs Gillian Heald. Mrs Heald, who is a principal lecturer in mathematics education at Christchurch Teachers' College, will succeed Mrs Raywyn Ramage, who will retire at the end of the year. After completing a BSc degree at the University of Canterbury in 1973, Mrs Heald taught at Christchurch Boys' High School for 12 years and was head of its mathematics department from 1980 to 1985. Mrs Heald has been fully involved in mathematics education in Canterbury, including working with pupils for the Mathematics Olympiad extension program.

From the *Christchurch Press*

NEW SERIES OF BOOKS

Braiding—Regular Knots by A.G. Schaake, J.C. Turner and D.A. Sedgwick, University of Waikato and Waikato Polytechnic.



Some Regular Knots

The Department of Mathematics and Statistics at the University of Waikato published in August the first of a planned series of books on the theory and practice of braiding. The books will present methods for constructing knots and braids, giving detailed instructions based on mathematical principles for designing and tying them. Research reports and articles which deal with the more theoretical aspects of the work will be written to complement the books. Diskettes for personal computers are being prepared, which will contain software to enable craftsmen to obtain algorithms for braids of their own design.

The project is a collaborative one, involving staff of the University and of Waikato Polytechnic. All the books are based on new mathematical discoveries about braiding processes made in the last decade by Georg Schaake, a tutor at the Polytechnic. He is being helped to develop these ideas and relate them to classical knot theory by John Turner, an Associate Professor of Mathematics at the University. David Sedgwick, a tutor at the Polytechnic, is the third author of the books; he is developing the computer software needed for the project.

It is a remarkable fact that although knotting and braiding are skills which have been practised since time immemorial, and which even today are essential for many aspects of our well-being, there are few mathematical theories to describe the processes of tying knots. Classical knot theory, which began with work of Gauss and Listing in the mid-nineteenth century, is generally concerned with combinatoric and topological problems related to the question of how to classify knots according to certain criteria of 'knottedness'. It has nothing to say on how to go about producing knots and braids with given design criteria or weaving patterns. Schaake's theories aim to answer these new, and practical, types of question about braids. He has discovered many relationships between the numbers of parts and the numbers of bights which occur in cylindrical braids, and these relationships form the basis of a beautiful theory of braiding. It turns out that this theory is a branch of number theory, involving studies of diophantine equations, continued fractions, integer sequences and number trees.

The first book, entitled *Braiding—Regular Knots*, introduces the reader to the new theories and methods, defines many of the terms and mathematical devices that will be used throughout the Series, and presents algorithms, examples and exercises for producing members of the class of regular knots. This class includes many of the knots well-known to braiders, such as Turk's Head Knots, Ring Knots, Gaucho Knots,

Head Hunter's Knots, Perfect Herringbone Knots, Slow Helix Knots and Fan Knots. Later books will deal with Semi-regular Knots, Fiador, Pineapple, and Grant Knots, and with inter-braiding techniques and the production of transition braids.

These books will be of much interest to mathematicians, particularly insofar as they give rise to new ideas, problems and methods in knot theory and number theory. For the braider, the creative craftsman working in leather, rawhide or rope, they will be essential reading. Every effort has been made by the authors to make them accessible to nonmathematical readers; all proofs of algorithms have been consigned to the research reports and articles. Not very long ago the braiding fraternity was a closed and highly secretive one; the braiding art was passed on from parent to child. Highly specialised and skilled artisans would create braidwork that was virtually or even totally copy-proof. It was not until the forties and fifties that articles (and eventually encyclopaedias) were written that gave details about specialised braiding techniques. Although this literature deals with many thousands of different knots and braids, it is purely empirically based. It gives diagrams and written instructions for producing particular braids only. No general theories or methods are enunciated. Craftsmen cannot proceed from these instructions to develop their own designs: there is no rational basis to enable them to do so. The books of Schaake, Turner and Sedgwick, at long last in the history of braiding, will supply such a basis.

The first book was produced by computer typesetting (TEX), laserprinter and offset printing. It is ringbound, in A4 size, with laminated covers and 117 pages on heavy-quality paper. It may be purchased from the Registry, University of Waikato, Hamilton, the price being \$26.50 plus GST and postage. A computer diskette is available, with software for producing algorithms for the regular knots.

Contents: Photographs, Foreword, Introduction, The Regular Knot, Graphical Representation of Regular Knots, Use of Grid Diagrams, Column-coded Regular Knots, Row-coded Regular Knots, Regular Knots which are neither Column nor Row-coded, Exercises, Appendix, Solutions, Bibliography, Index.

Comments: The methods presented for producing cylindrical braids are based on mathematical principles newly discovered by the authors. They are accessible to the non-mathematical reader; the book is addressed to braiding craftsmen, who will now be able to produce braids to their own design criteria. Very many diagrams, examples and exercises are given. The class of Regular Knots includes the Turk's Head, Ring, Gaucho, Head Hunter's, Perfect Herringbone, Slow Helix and Fan Knots. A computer diskette with software for producing algorithm tables is available, as are research reports giving full mathematical details of the methods.

J C Turner
Waikato University

BOOK REVIEW

Hadamard Matrices and Their Applications, by S.S. Azaian, Lecture Notes in Mathematics 1168, Springer Verlag, Heidelberg (1985), soft cover DM31.50, ISBN 3-540-16056-6.

A Hadamard matrix H has entries 0 or 1, is square of order n , and is such that $HH^T = nI$. Apart from the trivial cases $n = 1$ and $n = 2$ the order of a Hadamard matrix must be divisible by 4. It is a long-standing conjecture that for each natural number m there does exist a Hadamard matrix of order $4m$.

Those who wish to learn more should not begin with this book. The author is at a computer centre in Russia, but whether he has written in English or has been translated is not clear. In either case the words are English but the idiom is decidedly foreign. A sample paragraph (from p46): "So in all construction mentioned essentially is usage of a base array (for example, in (2.63) it is the Yang array, in (2.64) it is the Wallis-Whiteman array of order 4, in last two cases there are Baumert-Hall and Goethals-Siedel arrays of order 4 with

defined properties and supplement the same number of new rows and columns resulting in an Hadamard matrix. This is the idea of Paley-Wallis-Whiteman method." Such constructions do not make for easy reading. After persistent attempts the style rubs off so one finds oneself saying "Da, is true that ...".

Added to this layer of difficulty is another one, that of misprints in the mathematical statements. Starting with equation (1) of section 1 they abound and provoke frustration. That these two layers have to be penetrated before information can be extracted is definitely discouraging, which is a pity because the author is not dealing with trivialities.

After an introduction and a section on definitions and notations, there are eight further sections assembled into three chapters. The sections contain 20 or 30 pages. There is an index, but the entries are located by sections only and not by pages. Thus if one wishes to locate a particular item using the index one has to thumb through a whole section. This is not an efficient way of creating an index. There is an extensive bibliography of 329 references but in this, as in the main text, there is an irritating carelessness in the spelling of proper names. Thus 'Eades Reter' is surely 'Peter Eades' (p198); 'Read-Maller codes' must be 'Read-Muller codes' (p137); Szekers (p44), Sekenres (p45), and Szekeres (p210) are presumably references to the same person; and so on. There is also much confusion about the works of J. Wallis (now J. Seberry) and W.D. Wallis.

The sections are headed:

- §1. Basic definitions, notations and auxiliary results.
- §2. Methods of construction for Hadamard matrices.
- §3. Some problems of construction for Hadamard matrices.
- §4. New method for Hadamard matrices construction.
- §5. Generalized Hadamard matrices.
- §6. Construction of high-dimensional Hadamard matrices.
- §7. Hadamard matrices and problems of information theory.
- §8. Hadamard matrices and design theory.
- §9. Other applications of Hadamard matrices.

What a rich vein of information is suggested by these headings and, indeed, I suppose it is all there but the author's good intentions have been undermined by a poor presentation.

D R Breach,
Canterbury University

29TH INTERNATIONAL MATHEMATICAL OLYMPIAD

New Zealand was able to make its debut into the International Mathematical Olympiads (held in Canberra, July 15-16, 1988) thanks to the support of the professional mathematical bodies in this country: NZMS, NZAMT and the Mathematical Associations. The Mathematical Trust also provided sponsorship together with the Ministry of Foreign Affairs, the Lotteries Board, National Mutual and many other well-wishers. Each member of the team is grateful for the encouragement given in such a practical way.

The team was comprised of David Wallace, Rongotai College; Karl Tomlinson of Edgewater College; Rodger Tiedemann of Auckland Grammar; John Marshall and William Jones of Logan Park HS and Roger Beggs of Naenae College. Professors Holton (Otago) and Hookings (Auckland) were team leader and deputy,

and Mr Alan Parris of Linwood HS was observe/manager. Mr Gus Gale of Hornby HS was an additional observer once the meeting of Australian Mathematics Competition organisers was completed.



Rear: John Marshall, Roger Tiedemann, Roger Beggs, David Wallace, William Jones
Front: Karl Tomlinson, Alan Parris, Derek Holton, Gordon Hookings

The New Zealand IMO Team

After gathering in Auckland on July 7th for final practice the team attended a farewell in the University of Auckland Senior Common Room on July 10th at which the Prime Minister was deputised by the Hon. Jonathon Hunt, due to Mr Lange's hospitalisation. Next day we flew to Sydney and were accommodated for three nights at Basser College, UNSW. The first full day was spent in sightseeing around Sydney, but thereafter more practice in problem solving was interleaved with shopping and sight-seeing excursions. The transfer to Canberra College of Advanced Education was effected on July 14th, in the afternoon of which the official opening ceremony was held.

The first of the four and a half hour exams was held on July 15th and that afternoon some relaxation in the form of ten-pin bowling was welcome. After the second set of three questions next morning the "assessment and coordination" of the team's efforts occupied the attention of the leader and deputy, culminating with a series of meetings on the afternoon of July 18th.

It was gratifying that David Wallace gained a silver medal and that the team's placing was 34th out of the 49 competing nations. The only 'first-timers' to be placed higher than the N.Z. team were the Singaporeans, so that the challenge now is to progress further up the list. However it is highly dependent on the brilliance of the individual team members; identifying and motivating the really talented youngsters is the task for the N.Z. Mathematical Olympiad Committee, not to mention raising the funds to send teams to future Olympiads.

The following table indicates the ranking of the top eleven nations, and it is followed by the problems set for the contestants.

Rank	Country	Score
1	USSR	217
2,3	Roumania and China	201
4	FRG	174
5	Vietnam	166
6	USA	153
7	GDR	145
8	Bulgaria	144
9	France	128
10	Canada	124
11	UK	121
17	Australia	100
34	NZ	47
	Italy	44
	Algeria	42
	Mexico	40
	Brazil	39

IMO PROBLEMS

1. Consider two coplanar circles of radii R and r ($R > r$) with the same centre. Let P be a fixed point on the smaller circle and B a variable point on the larger circle. The line BP meets the larger circle again at C . The perpendicular l to BP at P meets the smaller circle again at A (if l is tangent to the circle at P then $A = P$).
- Find the set of values of $BC^2 + CA^2 + AB^2$.
 - Find the locus of the midpoint of AB .
2. Let n be a positive integer and let $A_1, A_2, \dots, A_{2n+1}$ be subsets of a set B . Suppose that
- each A_i has exactly $2n$ elements,
 - each $A_i \cap A_j$ ($1 \leq i < j \leq 2n+1$) contains exactly one element, and
 - every element of B belongs to at least two of the A_i .
- For which values of n can one assign to every element of B one of the numbers 0 and 1 in such a way that each A_i has 0 assigned to exactly n of its elements?
3. A function f is defined on the positive integers by

$$\begin{aligned}
 f(1) &= 1, \quad f(3) = 3, \\
 f(2n) &= f(n), \\
 f(4n+1) &= 2f(2n+1) - f(n), \\
 f(4n+3) &= 3f(2n+1) - 2f(n),
 \end{aligned}$$

for all positive integers n . Determine the number of positive integers n , less than or equal to 1988, for which

$$f(n) = n.$$

4. Show that the set of real numbers x which satisfy the inequality

$$\sum_{k=1}^{\infty} \frac{k}{x-k} \geq \frac{5}{4}$$

is a union of disjoint intervals, the sum of whose lengths is 1988.

5. ABC is a triangle right-angled at A , and D is the foot of the altitude from A . The straight line joining the incentres of the triangles ABD , ACD intersects the sides AB , AC at the points K , L respectively. S and T denote the areas of the triangles ABC and AKL respectively. Show that $S \geq 2T$.
6. Let a and b be positive integers such that $ab + 1$ divides $a^2 + b^2$. Show that $\frac{a^2 + b^2}{ab + 1}$ is the square of an integer.

SECRETARIAL

Wanted: A Treasurer for the New Zealand Mathematical Society. Anyone who is interested or who knows of someone who might be interested please contact one of the Council Members.

D R Breach, Hon Secretary

RSNZ FELLOWSHIP NOMINATIONS

In connection with the piece about the Royal Society of New Zealand that was in the previous issue of the Newsletter, the last sentence can be misinterpreted. I have been asked to make it clear that the Royal Society of New Zealand is a national academy of science in which the election to a Fellowship is a mark of eminence and scientific achievement. As a correspondent writes, "it is not something people can join" and indeed nominations can not be had for the asking.

D.R. Breach
Hon. Sec.

The following letter from the Dr Trevor Hatherton, RSNZ President, has been sent to Member Bodies:

GUIDELINES FOR NOMINATION TO THE FELLOWSHIP

In response to a request from a Member Body I pass on the following guidelines for election to the Fellowship in order of priority.

1. **Excellence in Scientific Research** : Essential *sine qua non*.
There must be clear evidence of excellence. Facets include: standard of research work, originality, intellectual contribution, output, persistent focus.
2. **Active Involvement in Research** : Essential.
Must still be actively involved in research; or, following an outstanding career in research, actively involved in leading research. Fellowship is *not* a reward for an undistinguished, if worthy, career in science however voluminous the output. It is certainly not a reward for diligence in administration.
3. **Other Attributes** : Desirable.
 - (a) Stature and Leadership in Science.
 - (b) Participation in Science Issues.

The environment of science has changed drastically in New Zealand in recent years. This has meant that the role of the Society has expanded from that of a learned academy to include championship of science. This role requires positive, effective contribution from the Fellows, present and future.

Trevor Hatherton
President

MINUTES OF THE TWENTY-FOURTH NZMS COUNCIL MEETING Friday, 28 October 1988, University of Canterbury.

The meeting began at 10.10 am.

Present: Brian Woods (in the Chair), Derrick Breach, John Butcher, Marston Conder, Robert Goldblatt, Christopher Triggs, Gillian Thornley.

1. **SPECIAL RESOLUTION:** According to the Constitution of the NZMS a special meeting of the Council shall be held as soon as possible after the AGM to appoint a Secretary and Treasurer from the elected members of Council. Since the presence of the President or Vice-President is required this meeting could not take place after the 1988 AGM, which was held in Canberra. It was **moved** from the Chair that:

the Council confirm D.R. Breach and J.A. Shanks in their positions as Secretary and Treasurer respectively.

The motion was carried.

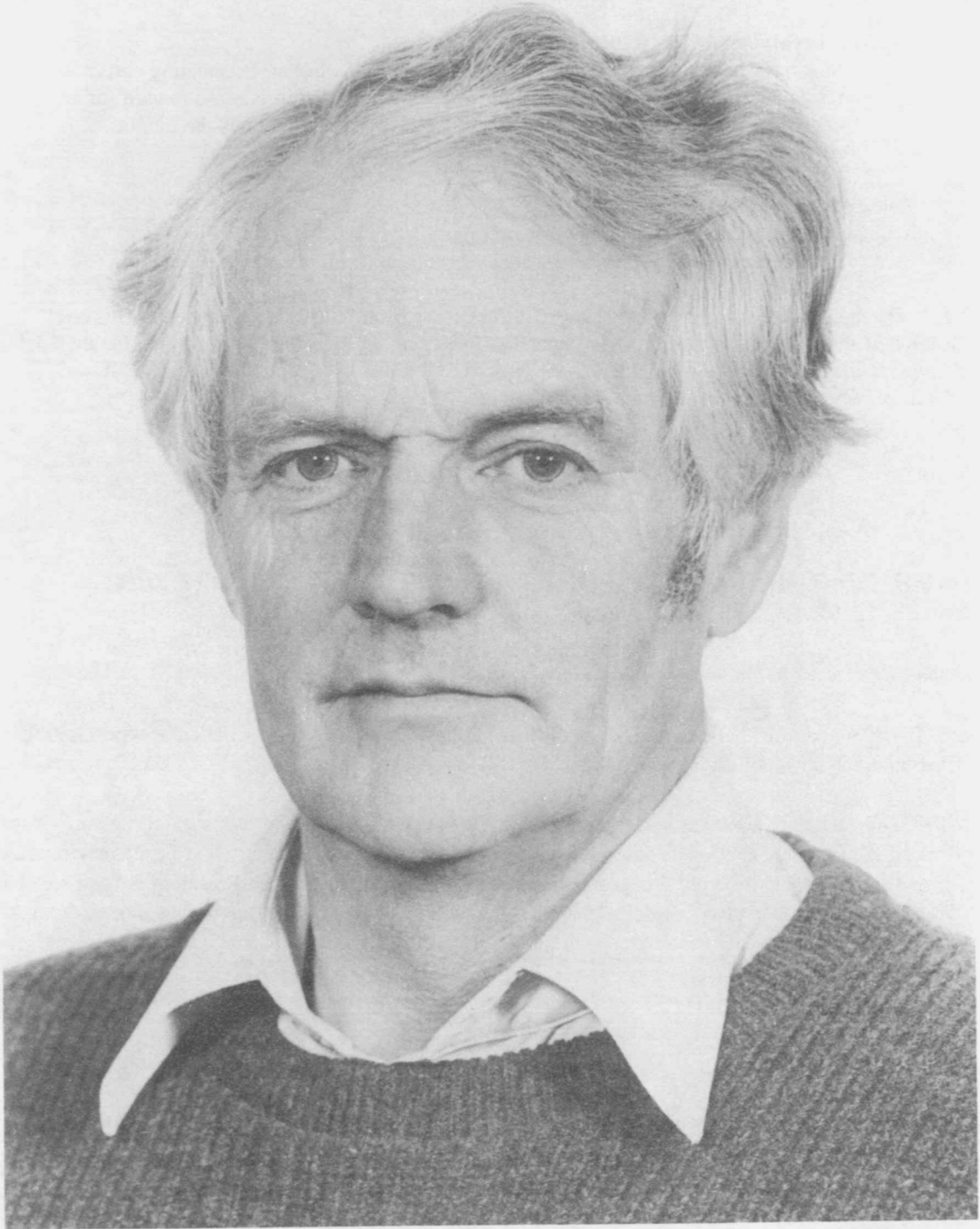
2. **APOLOGIES:** An apology was tendered by John Shanks. It was **moved** from the Chair that

this apology be received.

The motion was carried.

(Continued on p 24)

CENTREFOLD



Professor Brian Hayman

BRIAN I HAYMAN

by R J Brook

Brian Hayman retires at the end of 1988 as Professor and Head of the Department of Mathematics and Statistics at Massey University. After 25 years at the helm, it is difficult to avoid the trite comment that his going signifies the end of an era. He was given three lecturers and a junior lecturer to build a department but he will leave a double department of 2 professors, 3 readers, 16 lecturers and senior lecturers and 4 junior lecturers.

On his appointment, he was enjoined "to develop applicable areas of mathematics" and the most obvious area he tackled was that of statistics. At a time when traditional applied mathematics was taught at other New Zealand universities, Brian introduced a course in statistics at first year which led to other courses resulting in a statistics major and then graduate courses. It was in keeping with this philosophy that the first year course was modified to be a service course to all faculties within the university. Appointments of staff in statistics followed until the department became equally balanced between mathematics and statistics.

Applicable areas of mathematics were encouraged by the appointment of lecturers in computer science, numerical analysis, optimisation, mathematics education and so on. An operations research option was developed with the Faculty of Technology.

Of course, tensions arose at times with those in the department who did not fully accept Professor Hayman's general philosophy or actions in regard to specific courses. Some staff felt that he declared an analysis-shooting season almost on an annual basis. It was not just that analysis did not fit easily into an "applicable area", but that students tended to find the subject difficult which could lead to a higher than usual failure or drop-out rate. Brian had a genuine concern for the welfare of students and he would often recall with horror how, in his early years at Massey, some departments would treat students in cavalier fashion resulting in unacceptable failure rates. Over the years, tensions in the department tended to abate as the two separate sections were given more autonomy. We felt that Brian was becoming more mellow with time but perhaps history will show that the department changed at least as much as he did. Professor Hayman took very seriously his role in the university community. He was zealous in preparing and studying documents for committee meetings and attempted to be scrupulously honest in his dealing with other departments. In no way an empire builder nor political in any devious sense, he asked only for what he thought was reasonable and saw no merit in the common practice of inflating figures in anticipation of cutbacks.

Professor Hayman is justifiably proud of his input into the Extramural Studies Committee of which he was chairman. For the most part the department supported his views on extramural study even though it did result in extra work, particularly as the department was in the forefront of this method of teaching. It seems fitting that, as he leaves the department, a new Diploma in Applied Statistics is getting underway. Being a completely extramural diploma with a practical bias, it epitomizes the best of what Brian has striven to achieve and, what is more, it promises to be a very popular course. An extramural masterate in mathematics is also being offered to cater for a different market.

Brian is looking forward to his retirement. With a small farm to care for and other interests, he will not be bored. Although he is very modest about his own achievements, he should look back with pride to the impeccable qualifications he brought to his position at Massey. After outstanding academic success at school and university, including a First Class degree at Cambridge and a Ph.D. in Population Genetics at Birmingham University, he published many articles which have been widely cited. On returning to New Zealand, he became statistical consultant to DSIR, and unofficially to the College, at Lincoln. During his eight years there he discovered the joy of applying his training to the real world. He soon realised that statisticians were in short supply in New Zealand so that, on taking up the Chair at Massey, he placed emphasis on training statisticians and not on his own personal research although he kept up with reading in many areas. We should also mention that he has always been a keen supporter of the annual New Zealand Statistical Association Conference.

In the years to come, I have no doubt that he will look back with a wry smile at changes which have occurred in mathematics departments at other New Zealand universities as statistics courses have grown in number, many having an applied approach similar to those at Massey. This trend could be viewed as vindication of Brian's philosophy and efforts in his twenty-five years at Massey.

We wish him well in many enjoyable and productive years of retirement.

(Continued from p 21)

3. **MINUTES OF THE PREVIOUS COUNCIL MEETING:** It was pointed out that in Item 10(i) of these minutes the words (after '\$513.60') 'five hundred and sixteen dollars' should read 'five hundred and thirteen dollars'. It was **moved** from the Chair that:

the minutes be amended accordingly and then be received.

The motion was **carried**.

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

(i) In connection with Item 5(ii) of the minutes, about the development of an endowment fund, BAW said he had spoken to the administration of the University of Canterbury about how such funds are managed and will make further enquiries to their Finance Registrar.

(ii) With reference to Item 7(iii) of the minutes the Secretary reported that an application to the Lotteries Board for financial assistance in purchasing a word processor had been declined.

(iii) In connection with Item 9 about the Science and Technology Advisory Committee Proposal, BAW said he had not yet written to Mr Arbuckle.

5. **CORRESPONDENCE:**

(i) A letter was sent to the American Mathematical Society with formal greetings on their centenary. A letter from the American Mathematical Society acknowledging these greetings has been received.

(ii) The Secretary said that he has written to the Polish Mathematical Society about establishing reciprocity.

(iii) Mr Simon Upton, MP, as Opposition Spokesperson on Science and Technology, wrote to the NZMS asking for an opportunity to address the membership. The Secretary has replied suggesting that during the NZ Maths Colloquium there may be a suitable time and that Mr Upton should approach the organisers directly.

(iv) DRB tabled a letter from Garry Tee about the quality of the reproduction of photographs in the Newsletter and also suggesting that internal centre-stapling (as it used to be done) is to be preferred to the present outside lateral stapling. After some discussion about producing the Newsletter in an attractive way while staying within the bounds of reasonable costs it was decided to make enquiries into the costs of printing the Newsletter at various University printeries.

6. **TREASURER'S REPORT:** The Treasurer, in his absence, forwarded a short report on the Society's finances with a commentary in addition to three recommendations. John Shanks announced that this will be definitely his last year as Treasurer. It was **moved** from the Chair that:

the Treasurer's report be received.

The motion was **carried**.

[The report is appended. Ed.]

There was a general discussion of the Society's finances and the problem of finding a new Treasurer. Attention was drawn to the budgeting scheme described in Item 6 of the minutes of the previous meeting. MC strongly opposed the paying of an honorarium to the Treasurer. Council Members undertook the task of sounding out a new Treasurer. Several names were mentioned as possibilities. It was moved by MC and seconded by JCB that:

the Treasurer's first recommendation, that the Treasurership continue on the present basis, be adopted and that Members of the Council attempt to find a new Treasurer by the end of December 1988, the Secretary to be told of any success as soon as possible.

The motion was carried.

It was moved by GT and seconded by DRB that:

the Treasurer's second recommendation, that the collection of subscriptions and maintenance of the membership records be performed by a Membership Secretary, be adopted and that Gerrard Lidell be asked to continue these duties.

The motion was carried.

It was moved by BAW and seconded by CT that:

the Treasurer's third recommendation, that the Treasurer be asked to close all holding accounts currently operated by the publications convenors and that all publications business be handled through one account under the immediate control of the Treasurer, be adopted.

The motion was carried.

7. REQUESTS FOR FINANCIAL ASSISTANCE:

(i) It was moved from the Chair that:

Dr M.K. Vamanamurthy be given \$500 (five hundred dollars) towards the costs of attending a conference in Bucharest, June 1989.

The motion was carried.

(The meeting adjourned for lunch at 12 noon and reconvened at 1.35 p.m.)

(ii) It was moved from the Chair that:

(a) R.A. Sisson be given a student travel grant of \$500 (five hundred dollars) towards the costs of attending the 25th Australian Applied Mathematics Conference in Ballarat, July 1989;

(b) C.J. Price be given a student travel grant of \$500 (five hundred dollars) towards the costs of attending the International Conference on Computational Techniques and applications in Brisbane, July 1989;

(c) R.G. Brookes be given a student travel grant of \$500 (five hundred dollars) towards attending the same Brisbane conference.

The motion was carried.

(iii) Three other requests were declined.

(iv) It was moved by GT and seconded by DRB that:

for the year of 1989 the Secretary, at his discretion, be allowed to give grants for students to travel to conferences within New Zealand and that the total of such grants is not to exceed \$1000 (one thousand dollars).

The motion was carried.

(v) CT suggested that applicants for financial assistance should be asked to give details of other sources of money that they might be using. He asked that the application form be redesigned accordingly.

(vi) It was decided that the matter of sponsorship in some form by the NZMS of a lecturer at the ICOTS Conference in Dunedin in 1990 should be dealt with at the next meeting (in May 1989).

8. **PUBLICATIONS:** Within a general publications report GT

(i) presented a draft report on the joint publications venture between the NZMS and the New Zealand Association of Mathematics Teachers. It was agreed that this report should be published in the December 1988 Newsletter. [It is appended below. Ed.]

(ii) A book of about 250 pages by Russell Dear on modelling projects for secondary school students is being discussed with NZAMT who seem to be enthusiastic about its publication. The cost per copy is estimated to be about \$30. Possible sales are estimated a about 3 per school. Further negotiations were encouraged.

(iii) The booklet 'Employment Opportunities in Mathematics' needs a complete overhaul and this should be done in cooperation with the Statistics Association and other groups with mathematics career interests. A volunteer is wanted to take on this project.

(iv) 'Linear Algebra' by Smith and Teo will be ready for printing in November. It is more economical in the long run to have an initial printing of 1000 copies rather than 500 copies.

(v) It was agreed that another advertising of the 6th and 7th form texts is needed. The cost of posting to all schools will be about \$400.

It was moved by MC and seconded by DRB that:

the report on publications be received with thanks.

The motion was carried.

9. **AUSTRALASIAN MATHEMATICS CONVENTION:** In response to a proposal from the Australian Mathematical Society it was moved from the Chair that:

the NZMS regrets that it cannot take part in the proposed Australasian Mathematics Convention in Townsville in 1990.

The motion was carried.

The principal reasons for declining the invitation are firstly, the incompatibility of the Australian semester system with the New Zealand term system which makes the proposed July scheduling very awkward for New Zealanders; secondly, the proposed year is too close to the previous meeting of this kind, namely the Australian Centenary Mathematical Sciences Congress of this year; and thirdly, the last

two of these meetings have been in Australia and it is the turn of New Zealand. There is the possibility of having an Australasian Convention in Auckland in 1992.

10. VISITORS:

(i) It was thought to be a good thing if the NZMS Visiting Lecturer in 1989 could be a principal participant in the NZAMT Conference on Mathematical Education in August. Accordingly it was moved by DRB and seconded by MC that:

Professor R.B. Potts of the University of Adelaide be asked to be the NZMS Lecturer for 1989 and that Professor Ivan Reilly be asked to organize the details.

The motion was carried.

(ii) It was moved from the Chair that:

at the Colloquium at Massey University in May, 1989 the NZMS sponsor the lecture of Professor Cheryl Praeger of the University of Western Australia.

The motion was carried.

(iii) In connection with the second Forder Lectureship it was moved from the Chair that:

a letter be written to Professor Graeme Wake to say that the NZMS will provide up to \$700 (seven hundred dollars) towards the incidental expenses of Sir Michael Atiyah's visit, and to ask for details of support from the various universities.

The motion was carried.

(vi) For the third Forder Lecturer, whose tour will take place in 1991, several names were proposed. Council Members were asked to consider at their leisure and to consult with their department.

11. **RECIPROCAL ARRANGEMENTS WITH THE NZ MATHEMATICAL ASSOCIATIONS:** The Secretary said that about a year ago he had written to all fourteen of the Maths Associations to explore the possibility of establishing a reciprocal membership scheme with the NZMS. He had had replies from five expressing varying degrees of interest. However, the annual subscription to these groups is considerably less than that of the NZMS and there is the question as to who should enjoy such reciprocity—students or staff or institutions, or some combination of these? It was apparent that administrative difficulties would be considerable. The Council was of the opinion that the scheme should not be proceeded with. However, it is most desirable to have some sort of contact between the NZMS and the Mathematical Associations. It was moved by MC and seconded by RG that:

the NZMS send a copy of each issue of its Newsletter to each of the NZ Mathematical Associations.

The motion was carried.

12. **OFFICER FOR MATHEMATICS EDUCATION:** At the AGM of May 1988 a motion was passed that the Council of the NZMS consider the appointment of one of its members as an officer responsible for mathematics education. It was the interpretation of the meeting that such an officer need not be a Council Member but could be any member of the NZMS although it might be desirable to have the officer co-opted onto the Council if not already a member of it. GT undertook to approach suitable candidates.

13. **HUMAN RIGHTS:** This item was held over from the previous Council Meeting. Dr Bruce Calvert, Human Rights Officer for the NZMS, asked that the Council consider the motion that:

the NZMS authorises the Bulletin of International Campaigns for Human Rights to list it as supporting their campaigns.

After some discussion the Chair expressed the opinion that the Council cannot commit the NZMS as a learned body in such a way although it is to be hoped that the consciences of individual members will stir them to act in particular cases.

14. **OTHER BUSINESS:**

(i) The Secretary said he would ask Brent Wilson about the organising of a pre-doctoral thesis competition for 1989.

(ii) MC referred to mathematics exhibits seen at the National Science and Technology Centre in Canberra. These are working models illustrating mathematical principles from the IBM Mathematica exhibition. It was suggested that maybe it could be arranged for the collection to be displayed in NZ. MC undertook further negotiations.

(iii) It was **moved** by JB and seconded by MC that:

Dr Gloria Olive be offered Honorary Membership of the Society in recognition of her activities in fostering the well-being of mathematics in New Zealand.

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

(iv) A mathematician of New Zealand origin has been suggested by those from overseas as a candidate for a Fields Medal. JB suggested that this be drawn to the attention of the Royal Society of New Zealand and the National Committee for Mathematics and that these bodies and the NZMS should give all support and assistance in preparing the nomination. BAW undertook to write appropriate letters.

(v) In respect of the Fellowship of the RSNZ, JB reminded the meeting of the need of NZMS to continue making appropriate nominations.

The meeting ended at 3.55 p.m.

15 November 1988
D.R. Breach
Hon. Sec. NZMS

TREASURER'S REPORT to Council Meeting 28/10/88

1. The **balance of accounts** as at 26/10/88 is as follows:

General account	\$ 9226
Aitken account	354
Investments	<u>48699</u>
	\$ 58279

The total figure here represents a very approximate indicator of the Society's current assets. Council should bear in mind:

—income for book sales not yet collected or remaining in local holding accounts;

—book stocks.

2. Council may be interested in **grants issued** so far this financial year:

Sharleen Forbes	\$ 500	
Michael Steel	500	
Megan Clark	500	
Kevin Burrage	500	
Lee Peng Yee	514	(NZMS Visiting Lect.)
"	205	(Travel)
Anal & Top Conference	500	
Int Olympiad Comm	2500	
John Butcher	1000	(NZMS Lecturer)
Franz Rendl	<u>500</u>	
	\$ 7219	

as well as \$1935 spent so far on Council expenses.

3. **Regarding my position as Treasurer:**

I am acting as Treasurer for 1988 although not officially a Council member. This will definitely be my last year as Treasurer. Perhaps Council should already be looking for a successor.

4. **Membership Secretary:**

Gerrard Liddell is officially the Membership Secretary, although I have been performing this task—not through any reluctance of Gerrard's, but mainly because I had a working system of record maintenance and subscription forms, and it seemed easier for me to continue. Perhaps, in hindsight, this was a mistake.

In future, the Treasurer's load can be significantly reduced by separating off the tasks associated with the Membership.

5. **Recommendations:**

—*That the Tresaurership continue on the present basis.* Consideration at recent Council meetings of alternatives was initiated by the load on the Treasurer early in the year and difficulties associated with control of the 7 accounts. These problems can be overcome by separating the membership duties and by having a more consistent and better controlled method of handling the publishing finances.

—*That the subscriptions collection and maintenance of the membership records be performed by a Membership Secretary.* (Gerrard is willing to take up this position, though there may be good reason for the Membership Secretary to be located at the same centre as the Treasurer.)

—*That consideration be given to closing all holding accounts* (currently operated by publications

convenors) and that all publications business be handled through the one account under the immediate control of the Treasurer. Convenors would remain in charge of their publishing concerns but would deposit payments in the publications account, with information to the Treasurer.

The Treasurer would have a few more bills to pay, but this extra work would be more than compensated by the uniform accounting method that this would allow and by the simplicity of balancing the books at the end of the year.

The auditor fully supports this recommendation.

John A. Shanks
Hon Treasurer

REPORT ON JOINT PUBLICATIONS OF NZMS AND NZAMT 1983-1988

In 1981 the New Zealand Mathematical Society (NZMS) published three books in the Seventh Form Syllabus Series to support the teaching of seventh form applied mathematics courses. A number of people made substantial contributions of time on a voluntary basis to assist the production and distribution (one professor claims to have carried 6000 books to the Post Office) and so enabled the Society to make a profit whilst providing books at a modest price to the schools. The profit became the nucleus of a publications fund which provided the capital to launch the joint publications.

In November 1982 Mr Gus Gale, the President of the New Zealand Association of Mathematics Teachers (NZAMT), approached the NZMS with the suggestion that the two organisations should work together on any future publications for schools. He pointed out that NZAMT had closer connections with the school situation, and proposed that the work and the profits be shared equally between the two organisations. The NZMS Council of December 1982 agreed in principle to a cooperative publishing venture to provide textbooks for the proposed new syllabus to be introduced in Form 6 in 1985 and in Form 7 in 1986. The aim was to produce comprehensive resource material suited to the New Zealand situation and to keep the price to schools as low as possible whilst making a modest profit which would be used for the benefit of mathematics in New Zealand.

Early in 1983 some members of the Wellington Mathematics Association were considering writing a sixth form text and Ivan Reilly, convenor of the publications committee of NZMS, negotiated with them to make this a joint NZMS/NZAMT publication.

Writing groups were subsequently formed as follows:

Secondary School Mathematics

School teachers: John Powell, Sharleen Forbes

University staff: Lindsay Johnston (convenor), Ivan Reilly

Mathematics with Calculus

School teachers: Paul Ackerley, Steve Brown, Noel Johnstohn, Pauline Boyle

University staff: Dean Halford (convenor), Michael Carter

Mathematics with Statistics

School teachers: Tony Davidson, Gordon Findlay

University staff: Bob Broughton (convenor)

All three projects worked under severe time restrictions, writing for a syllabus which existed only in

brief outline and for which detailed teaching notes were yet to be provided by the Department of Education. Nevertheless, the books were completed and available to schools as they began to teach the new syllabus. There were some delays in the production process, and our meagre capital base only allowed small print runs which led to frequent reprinting.

The books have enjoyed substantial sales over a period of three or four years.

<i>Secondary School Mathematics</i>	6,000
<i>Mathematics with Calculus</i>	8,000
<i>Mathematics with Statistics</i>	10,000

Each writing group receives royalties at the rate of 10% of $1.25 \times$ wholesale price and a fee is paid for packing and posting books. The publishers have not provided the usual editor, production manager, sales manager or accountant and these tasks have largely been the responsibility of the writing group convenor with some assistance from other authors (Gordon Findlay and Sharleen Forbes have relieved their group convenors of the continuing administration of the project for substantial periods of time). In 1988 NZMS agreed to employ somebody to handle distribution and accounts on the *Mathematics with Calculus* project.

Under the joint publishing agreement the treasurer of NZMS has financial control over the projects. The high turnover from publishing in the last three years and the advent of GST has increased the treasurer's job enormously. In 1987 the NZMS employed a professional auditor and on his advice claimed an administration fee for the joint publications.

The profits have been shared equally between NZMS and NZAMT according to the agreement signed in 1986 (which also makes provision for any losses to be shared equally).

The writing of these textbooks has truly been a joint effort between teachers and university staff, although many of the teachers do not have strong links with NZAMT and some authors have since left teaching. The initiation and administration of the projects was largely carried out by NZMS members. The continuing work of negotiating further printings at frequent intervals, advertising, distribution and accounting is now being carried out entirely by the NZMS.

Gillian Thomley
Publications Convenor

MATHEMATICAL VISITORS TO NEW ZEALAND

List No. 21 : 1 November 1988

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.

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.

Professor Brian Alspach; Simon Fraser University, Burnaby, Canada; Prof. Katherine Heinrich; combinatorics/graph theory; January – March 1989; University of Otago; Prof. Derek Holton.

Professor Sir Michael Atiyah; University of Oxford; wife (Mrs Atiyah); topology, differential equations, mathematical physics; 26 February – 26 March 1989; the New Zealand Mathematical Society; Prof. Graeme Wake (Massey University). Professor Atiyah is the 1989 Forder Lecturer, and will be visiting all the N.Z. universities.

Professor Heinz Bauer; University of Erlangen-Nürnberg; potential theory & probability; 1 September – 8 October 1989; University of Canterbury; Dr. Neil Watson. Professor Bauer is an Erskine Visitor for 1989.

Professor Wim Blok; University of Illinois at Chicago; wife (Mary); logic, universal algebra; February – November 1989; University of Canterbury; Dr. Robert Bull. Professor Blok is an Erskine Visitor for 1989.

Professor Katherine Heinrich; Simon Fraser University, Burnaby, Canada; Prof. Brian Alspach; combinatorics/graph theory; January – March 1989; University of Otago; Prof. Derek Holton.

Professor Finbarr Holland; University College, Cork, Ireland; complex function theory; February 1989; University of Otago; Dr. Peter Fenton.

Professor D.S. Jankovic; East Central University, Ada, Oklahoma; topology; July 1988 – June 1989; University of Auckland; Assoc. Prof. I.L. Reilly.

Professor Carl Jokusch; University of Illinois at Urbana; logic; 5–20 January 1989; Victoria University of Wellington; Dr. Rod Downey.
Professor Jokusch is visiting with the help of an N.Z.-U.S. Education Foundation grant.

Professor K.L. Johnson; University of Cambridge; solid mechanics, tribology; 6 March – 30 April 1989; School of Engineering, University of Auckland; Prof. Ian Collins.

Dr. Charikleia Konstadilaki; Aristotle University of Thessaloniki, Greece; general topology; October 1988 – April 1989; University of Auckland; Assoc. Prof. I.L. Reilly.

Professor M.R. Leadbetter; University of North Carolina, Chapel Hill; point processes & extreme value theory; April 1989; Victoria University of Wellington; Prof. David Vere-Jones.

Professor Manuel Lerman; University of Connecticut; recursion theory; 5–15 January 1989; Victoria University of Wellington; Dr. Rod Downey.
Professor Lerman is visiting with the help of an N.Z.-U.S. Education Foundation grant.

Professor Saunders Mac Lane; University of Chicago; wife; topos theory; 15 February – 14 May 1989; University of Otago; Dr John Harris.

Dr. Ahmad Parsian; Shiraz University, Iran; multivariate statistics; January – December 1989; Victoria University of Wellington; Prof. David Vere-Jones.

Professor M.J.D. Powell; University of Cambridge; optimization & approximation, numerical analysis; 10 September – 2 December 1989; University of Canterbury; Dr. Ian Coope. Professor Powell is an Erskine Visitor for 1989.

Dr. Akira Saito; Tohoku University, Sendai, Japan; wife and one child; graph theory; April 1988 – March 1989; University of Otago; Professor Derek Holton. Dr Akira Saito is a William Evans Visiting Fellow.

Professor Michael Stob; Calvin College, Michigan; recursion theory & inductive learning; 5-20 January 1989; Victoria University of Wellington; Dr. Rod Downey. Professor Stob is visiting with the help of an N.Z.-U.S. Education Foundation grant.

Dr. Tim Swartz; Simon Fraser University, Burnaby, Canada; spouse; statistics; January - March 1989; Massey University; Greg Arnold.

Professor M.A.J. van Montfort; Wageningen Agricultural University, Netherlands; extreme value theory & applications in meteorology; April - June 1989; N.Z. Meteorological Office & Victoria University of Wellington; John Revfeim, N.Z. Meteorological Office.

Professor Yang Cheng-En; Changsha Railway Institute, China; operations research, combinatorial optimisation; July - December 1988; University of Waikato; Prof. L. Foulds, School of Management Studies.

Professor Yang Lo; Institute of Mathematics, Academia Sinica, Beijing; complex function theory; March 1989; University of Otago; Dr. Peter Fenton.

Professor Ray Zahar; University of Montreal; numerical analysis; December 1988 - May 1989; University of Auckland; Prof. John Butcher.

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.

Marston Conder
N.Z. Mathematical Society Visitors' Co-ordinator
Department of Mathematics and Statistics
University of Auckland

CONFERENCES

**** 1989 ****

January 2-5 (Ramat-Gan, Israel) **International Colloquium in Ring Theory**
Contact Conference Secretary, Research Institute for Mathematical Sciences. Bar-Ilan University, 52100 Ramat-Gan, Israel.

January 2-5 (Haifa, Israel) **Fifth Haifa Matrix Conference**
Contact A. Berman, Department of Mathematics, Technion - Israel Institute of Technology, Haifa 32000, Israel.

January 2-20 (Canberra) **Conference on Automatic Continuity and Banach Algebras**
Contact Dr R.J. Loy, Department of Mathematics, Faculty of Science, Australian National University, P.O. Box 4, Canberra, ACT 2601, Australia.

- January 3-10 (Minnesota) **Workshop on Two Phase Waves in Fluidised Beds, Sedimentation, and Granular Flows**
 Contact Willard Miller Jr., Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street SE, Minneapolis, Minnesota 55455, U.S.A.
- January 4-6 (San Diego) **American Statistical Association Winter Conference: Statistics in Society**
 Contact American Statistical Association, 1429 Duke Street, Alexandria, Virginia 22314-3402, USA.
- January 8-11 (Trinidad) **First Caribbean Conference on Fluid Dynamics**
 Contact H. Rankissoon, Chairman CACOFD 89, Department of Mathematics, University of West Indies, Saint Augustine, Trinidad, West Indies.
- January 8-11 (Tucson, Arizona) **Conference on the Arithmetic of Algebraic Curves**
 Contact S. Kamienny, Department of Mathematics, University of Arizona, Tucson, Arizona 85721, USA.
- January 9-13 (College Station, Texas) **Sixth International Symposium on Approximation Theory**
 Contact L.L. Schumaker, Center for Approximation Theory, Texas A and M University, College Station, Texas 77843-3368, USA.
- January 16 (London) **The Mathematics of Estimation Software Reliability**
 Contact IMA (see (1) below).
- January 17-19 (Kyoto, Japan) **Flow Instability and Structure of Turbulence**
 Contact RIMS (see (2) below).
- January 23-27 (Berkeley, California) **Workshop on Algorithms, Word Problems and Classification in Combinatorial Group Theory**
 Contact I. Kaplansky, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, USA.
- January 30 - February 1 (Kyoto, Japan) **Fundamental Theory of Algorithms and Computational Complexity**
 Contact RIMS (see (2) below).
- February 6-10 (Minneapolis, Minnesota) **Minisymposium on Plasticity**
 Contact Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota 55455, USA.
- February 5-9 (Ballarat, Victoria) **Twenty-Fifth Australian Applied Mathematics Conference**
 Contact Dr M.A. Page, Department of Mathematics, Monash University, Clayton, Victoria 3168, Australia.
- February 19-23 (Montreal) **Analyse quantitative de la sensibilité en optimisation**
 Contact F.H. Clarke, Director, Centre de recherches mathématiques, Université de Montréal, CP 6128-A, Montréal, Quebec, H3C 3J7 Canada.

- February 20-24 (Boca Raton, Florida) **Twentieth Southeastern International Conference on Combinatorics, Graph Theory and Computing**
 Contact Conference Director, Division of Continuing Education, Florida Atlantic University, P.O. Box 3091, Boca Raton, Florida 33431, USA.
- March 6-10 (Minnesota) **Workshop on Ellipticity in Evolution Equations**
 Contact Willard Miller Jr., Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street SE, Minneapolis, Minnesota 55455, USA.
- March 13-18 (Sofia, Bulgaria) **East European Category Seminar**
 Contact K.G. Peeva, IEC Sofia, POB 384, Bulgaria.
- March 15-17 (Princeton, New Jersey) **Second IMACS International Symposium on Computational Acoustics**
 Contact D. Lee, Code 3122, Naval Underwater Systems Center, New London, Connecticut 06320, USA.
- March 22-25 (Cincinnati, Ohio) **Computer-Aided Proofs in Analysis**
 Contact K. Meyer, Department of Mathematics, University of Cincinnati, Cincinnati, Ohio 45221, USA.
- March 28-31 (Karlsruhe, W. Germany) **Annual Scientific Conference of the Society of Applied Mathematics and Mechanics (GAMM)**
 Contact G. Alefeld, Institut für Angewandte Mathematik, Kaiserstrasse 12, D-7500 Karlsruhe 1, West Germany.
- April 3-6 (Jerusalem) **IEEE International Conference on Control and Applications**
 Contact Y. Bar-Shalom, The University of Connecticut, EECS Department, Box U-157, 260 Glenbrook Road, Storrs, Connecticut 06268, USA.
- April 3-15 (Minnesota) **Workshop on Multidimensional Hyperbolic Problems and Computations**
 Contact Willard Miller Jr., Institute for Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street SE, Minneapolis, Minnesota 55455, USA.
- April 13-15 (Fayetteville, Arkansas) **Operators and Function Theory: The Role of de Branges's Spaces**
 Contact I. Monroe, Department of Mathematical Sciences, SCEN 301, University of Arkansas, Fayetteville, Arkansas 72701, USA.
- April 17-21 (Minneapolis, Minnesota) **Minisymposium on Computational Issues for Nonlinear Hyperbolic Waves**
 Contact Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, Minnesota 55455, USA.
- May 4-5 (Pittsburgh) **Twentieth Annual Pittsburgh Conference on Modeling and Simulation**
 Contact M.H. Mickle, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, Pennsylvania 15261, USA.

- May 8-12 (Berkeley, California) **Workshop on Arithmetic Groups and Buildings**
 Contact I. Kaplansky, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, USA.
- May 15-17 (Palmerston North, N.Z.) **1989 New Zealand Mathematics Colloquium**
 Contact Dr M.D. Hendy, Department of Mathematics and Statistics, Massey University, Palmerston North, New Zealand.
- May 17-19 (Sophia Antipolis, France) **Joint IMA/SMAI - GAMNI Conference on Computational Methods in Aeronautical Fluid Dynamics**
 Contact IMA (see (1) below).
- May 22-24 (Salishan Resort, Oregon) **Sparse Matrix Meeting**
 Contact SIAM Conference Coordinator, 117 South 17th Street, Suite 1400, Philadelphia, Pennsylvania 19103-5052, USA.
- May 22-24 (Berkeley, California) **Workshop on Vortex Methods**
 Contact I. Kaplansky, Director, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, USA.
- May 23-27 (Toronto) **International Conference on Computing and Information**
 Contact W. Koczkodaj, Conference Secretary, Laurentian University, Sudbury, Ontario, Canada P3B 3X8.
- May 28-June 10 (Blacksburg, Virginia) **AMS-SIAM Summer Seminar on the Mathematics of Random Media**
 Contact B. Verducci, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940, USA.
- May 29 - June 1 (Tokyo) **Third International Conference in Mathematics: Fractional Calculus and its Applications**
 Contact K. Nishimoto, Mathematics Department, College of Engineering, Nihon University, Tamuracho, Koriyama, Japan.
- May 30-June 30 (Montreal) **Analytic Number Theory, Modular Forms and Related Topics**
 Contact F.H. Clarke, Director, Centre de recherches mathématiques, Université de Montréal, CP 6128-A, Montréal, Quebec H3C 3J7, Canada.
- June (Linz, Austria) **Geometry of Banach Spaces**
 Contact Dr. Walter Schachermayer, Johannes Kepler Universität Linz, Institut für Mathematik, A 4040 Linz, Austria.
- June (Bucharest, Romania) **International Colloquium on Complex Analysis**
 Contact Professor C. Andreian Cazacu, Central Institute of Mathematics, str. Academiei 14, Bucharest, Romania.

- June 5-7 (Winnipeg, Canada) **International Symposium on Asymptotic and Computational Analysis**
 Contact R. Wong, Department of Applied Mathematics, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.
- June 5-16 (Berkeley, California) **Workshop on the Geometry of Hamiltonian Systems**
 Contact I. Kaplansky, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, USA.
- June 6-8 (Windsor, Ontario) **Fourth International Conference on Boundary Element Technology**
 Contact N.G. Zamani, Department of Mathematics and Statistics, University of Windsor, Windsor, Ontario, Canada N9B 3P4.
- June 7-9 (Winnipeg, Canada) **Canadian Applied Mathematics Society Tenth Annual Meeting**
 Contact R. Wong, Department of Applied Mathematics, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.
- June 8-16 (Singapore) **Singapore Probability Conference**
 Contact J.H. Lou, The Organising Secretary, Singapore Probability Conference, Department of Mathematics, National University of Singapore, Lower Kent Ridge Road, Singapore 0511, Republic of Singapore.
- June 12-16 (Cambridge, Massachusetts) **Computers and Mathematics**
 Contact H. Schmidt, Conference Secretary, 62 Eastview, Pleasantville, New York 10570, USA.
- July (Oxford) **Mathematical Theory of the Dynamics of Biological Systems**
 Contact IMA (see (1) below.)
- July 3-7 (London) **Computational Ordinary Differential Equations**
 Contact IMA (see (1) below.)
- July 3-7 (Leipzig) **14th IFIP Conference on System Modelling and Optimization**
 Contact Dr. K. Tammer, Leipzig University of Technology, Department of Mathematics and Informatics, PF 66, Leipzig 7030, German Democratic Republic.
- July 5-19 (Berkeley, California) **Microprogram on Noncommutative Rings**
 Contact Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, U.S.A.
- July 10-12 (Brisbane) **International Conference on Computational Techniques and Applications**
 Contact School of Australian Environmental Studies, Griffith University, Nathan, Queensland 4111, Australia.
- July 10-14 (Brisbane) **Fifteenth Australasian Conference on Combinatorial Mathematics and Computing**
 Contact Professor Anne Penfold Street, Director, CMSA, Department of Mathematics, University of Queensland, St. Lucia, Queensland 4067, Australia.

- July 12-14 (Loughborough, England) **Robotics: Applied Mathematics and Computational Aspects**
Contact IMA (see (1) below.)
- July 24-29 (San Francisco) **Second China-U.S.A. Conference in Graph Theory, Combinatorics, Algorithms and Applications**
Contact Directors, Second China-U.S.A. Conference, C/- Department of Mathematics and Statistics, Western Michigan University, Kalamazoo, Michigan 49008-5152, USA.
- July 30-August 12 (Brunswick, Maine) **Harmonic Analysis on Reductive Groups**
Contact W. Barker, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, U.S.A.
- August - September (Novosibirsk, USSR) **International Conference on Algebra**
Contact Academician M.M. Lavrentjev, Director of the Institute of Mathematics, Novosibirsk 630090, USSR.
- August 1-9 (Hamburg and Munich) **18th International Congress of the History of Science**
Contact Professor C.J. Scriba, Institut für Geschichte der Naturwissenschaften, Bundesstr. 55, D-2000 Hamburg 13, Federal Republic of Germany.
- August 10-12 (Brisbane) **International Conference on Computational Techniques and Applications**
Contact School of Environmental Studies, Griffith University, Nathan, Queensland 4111, Australia.
- August 13-19 (Rousse, Bulgaria) **Fourth Conference on Differential Equations and Applications**
Contact Organising Committee CDE-IV, Technical University, Konsonolska Street N8, 7017 Rousse, Bulgaria.
- August 20 - September 6 (Saint-Flour, France) **Nineteenth Ecole d'ete de Calcul des Probabilités Appliquées**
Contact P.L. Hennequin, Université Blaise Pascal Clermont-Ferr., Department de Mathematiques Appliquées, B.P. 45-63170, Aubiere, France.
- August 21-25 (Prague) **EQUADIFF 7**
Contact Professor Jaroslav Kurzweil, Chairman, EQUADIFF 7, Institute of Mathematics, Czechoslovak Academy of Science, Zitna ul. 25, 115 67 Praha 1, Czechoslovakia.
- August 28-September 1 (San Francisco) **IFIP 89—11th World Computer Conference**
Contact IFIP Secretariat, 3 Rue du Marché, CH-1204 Geneva, Switzerland.
- August 29-September 6 (Paris) **47th Session of the International Statistical Institute**
Contact International Statistical Institute, 428 Prinses Beatrixlaan, Voorburg, Netherland.
- September 11-15 (Lausanne, Switzerland) **Fifth International Conference on Numerical Methods in Engineering**
Contact Professor R. Gruber, GASOV/Centre de Calcul, EPFL, 1015 Lausanne, Switzerland.
- September 21-22 (Warwick) **Mathematics in the Car Industry**
Contact IMA (see (1) below).

September 25-29 (Canberra) **Third International Conference on the Theory of Groups and Related Topics**

Contact J. Cossey, Mathematics Department, Faculty of Science, Australian National University, GPO Box 4, Canberra ACT 2601, Australia.

September 26-29 (Adelaide) **Traffic Theories for New Telecommunications Services**

Contact Dr. L.T.M. Berry, Director, Teletraffic Research Centre, University of Adelaide, GPO Box 498, Adelaide, SA 5001, Australia.

October 16-20 (Beijing, China) **Sixth World Congress on Medical Informatics**

Contacts Ms Shan Huiquin, Medinfo 89, Office of the Secretariat, China Computer Technical Service Corp, 29 Xueynan Nanlu, Haidian District, Beijing, China.

**** 1990 ****

May 25-31 (Atlantic City, New Jersey) **Tenth International Conference on Pattern Recognition**

Contact H. Freeman, CAIP Center, 605 Hill, Rutgers University, New Brunswick, New Jersey 08903, USA.

June 6-12 (Barcelona) **1990 Barcelona Conference on Algebraic Topology**

Contact M. Castellet, Director, Centre de Recerca Matematica, Institut D'Estudis Catalans, Apartat 50-08193 Bellaterra, Barcelona, Spain.

August 21-29 (Kyoto, Japan) **International Congress of Mathematicians**

Contact ICM-90 Secretariat, RIMS (see (2) below).

September 10-14 (Dresden) **Mathematiker-Kongress**

Contact Professor G. Buros, Sektion Mathematik, Wilhelm-Pieck-Universität, Universitätsplatz 1, Rostock 1, 2500 German Democratic Republic.

December 3-7 (Palmerston North, NZ) **1990 Australasian Conference on Combinatorics**

Contact Dr C.H.C Little, Department of Mathematics and Statistics, Massey University, Palmerston North, New Zealand.

Special contact addresses:

- (1) **IMA:** Miss Shirley Wardle, Conference Officer, The Institute of Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY, England.
- (2) **RIMS:** Research Institute for Mathematical Sciences, Kyoto University, Kitashirakawa, Sakyo-ku, Kyoto 606, Japan.

M R Carter
Massey University

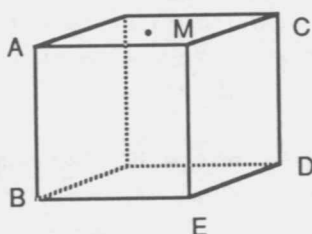
PROBLEMS AND QUERIES

No new problems came to light except the new geometrical one below as a corollary to P11. It was interesting to see the way our Olympiad Team coped with P11, which was, of course, broadcast on National Television on the day the team left for Canberra (11th July). Accordingly we set out below our solutions to just two problems P3 (December 1986), and, of course, P11.

P11 A cube is held by two corners (in three different ways) and spun around.

- (a) Which way sweeps out the least volume?
 (b) Only part of this volume is "occupied" at all times of each rotation by some points of the cube as it spins. How much?

ANSWER: Well this problem generated a great deal of comment. (Thank you Ted Zulauf for your confirmation of our answers.) Perhaps this was because yours truly (GraemeWake) used this at short notice as a problem for the news media interview on the eve of the departure of the 1988 NZ Mathematics Olympiad Team for Canberra in July 1988. What a success it was!! Here are the answers, which elementary calculus reveals easily. Let the side of the cube be of unit length.



- (a) (i) **Rotation about AB** sweeps a cylinder of radius $\sqrt{2}a$ and height a , so $V_1 = 2\pi a^3$.
 (ii) **Rotation about AC** produces twice the volume swept out by the surface ABEM, where M is the centre of the top face, so $V_2 = 7\pi\sqrt{2} a^3/6$.
 (iii) **Rotation about the diagonal AD** produces twice the volume swept out by the surface with extreme AB (a cone) plus that swept out by the surface with extreme BE, so $V_3 = \pi\sqrt{3} a^3/3$.
 Hence

$$V_1 : V_2 : V_3 = 2 : \frac{7\sqrt{2}}{6} : \frac{\sqrt{3}}{3}$$

That is, $V_1 > V_2 > V_3$. Did you notice how quickly David Wallace on TV stated V_3 is the smallest on geometrical grounds. He was right, of course.

- (b) In cases (i), (ii) clearly there is no common volume, that is $V_1 = V_2 = 0$. In case (iii), the common volume V_3 is twice that of the core which just fits into the half of the cube closest to A. This cone has height

$$\frac{\sqrt{3} a}{2} \quad \text{and radius} \quad \frac{\sqrt{3} a}{2\sqrt{2}}$$

Hence

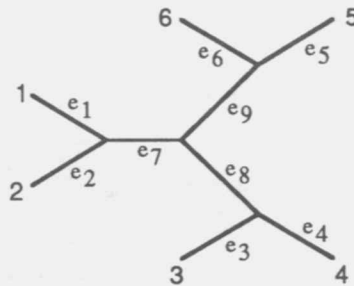
$$v_3 = 2 \frac{\pi}{3} \left(\frac{\sqrt{3} a}{2\sqrt{2}} \right)^2 \frac{\sqrt{3} a}{2} = \pi \sqrt{3} \frac{a^3}{8}$$

In his response to this problem Ted Zulauf (University of Waikato) gave the following consequential problem:

P11' Prove or disprove that the axis of rotation that sweeps out the smallest volume V , which gives the largest "common" volume v (and thus gives the largest v/V) is the axis through the centres of two opposite sides.

We thank Mark Schroder for the original problem.

P3



T is the given tree with pendant vertices $1, \dots, 6$ and edges e_1, \dots, e_9 . Let p_{ij} be the path in T from vertex i to vertex j . Given 15 positive integers d_{ij} , $1 \leq i < j \leq 6$ we are interested in assigning non-negative weights $w(e_k)$ to the edges of T to minimise

$$w(T) = \sum_{e_k \in T} w(e_k)$$

subject to the constraints

$$w(p_{ij}) = \sum_{e_k \in p_{ij}} w(e_k) \geq d_{ij}, \quad 1 \leq i < j \leq 6.$$

In this problem we want to show

- (1) There is always a solution with $w(e_k) \in \frac{1}{4}\mathbb{Z}$, $k = 1, \dots, 9$, and
- (2) The factor $\frac{1}{4}$ is necessary.

ANSWER:

The following is an outline of the solution, supplied by the proposer, Mike Hendy:

I. The edge space of T is spanned by the paths. In particular

$$e_1 = \frac{1}{2}(p_{12} + p_{13} - p_{23}), \quad e_7 = \frac{1}{2}(p_{13} + p_{25} - p_{12} - p_{35}).$$

II. In a given solution the path p_{ij} is called **precise** if $w(p_{ij}) = d_{ij}$. If we have a solution with $w(e_k) = 0$ for any edge then this can be resolved by considering the same problem on the smaller tree with e_k being contracted to a point. This simpler problem is resolved in a similar way, so we will work with the assumption that all minimal solutions have $w(e_k) > 0$. Consider a vertex of the simplex of feasible solutions. This will contain nine independent precise paths. At an optimal solution we see that each pair of adjacent edges e_i, e_j are contained in one of these paths, for if not,

$$w'(e_i) = w(e_i) - \epsilon, \quad w'(e_j) = w(e_j) - \epsilon, \quad w'(e_k) = w(e_k) + \epsilon$$

is a smaller feasible solution. Also, as no subtree of 6 edges can have more than 5 independent paths, it can be shown that in the optimal solution, edges e_1, \dots, e_6 are each contained in three of these precise paths, and e_7, e_8, e_9 are contained in four of these precise paths.

III Given a set of nine independent paths which cover edges e_1, \dots, e_6 three times and e_7, e_8 and e_9 four times we find that every path p_{ij} can be expressed as $\frac{1}{2}$ times an integer combination of these paths. This is achieved by considering cases. For example let

$$P = \{p_{12}, p_{34}, p_{56}, p_{13}, p_{15}, p_{24}, p_{26}, p_{35}, p_{46}\}.$$

Then

$$P_{14} = \frac{1}{2}(p_{13} + p_{15} + p_{24} + p_{46} - p_{26} - p_{35}).$$

IV. From I and III we find that each e_k of T can be expressed as $\frac{1}{4}$ times the corresponding combination of the d_{ij} values, ie $w(e_k) \in \frac{1}{4}\mathbb{Z}$.

V. To prove necessity consider the example where:

$$d_{12} = d_{13} = d_{15} = d_{34} = d_{35} = d_{56} = 1,$$

and $d_{ij} = 2$ for all other pairs. We find that the unique minimal solution is $w(e_2) = w(e_4) = w(e_6) = 3/4$, $w(e_k) = 1/4$ for the remaining edges e_k . For this solution we find P of III is the set of precise paths. Taking the paths p_{12}, p_{34} and p_{56} twice and the other edges singly, we cover all edges of T exactly four times. Hence we see

$$\begin{aligned} \frac{15}{4} &= w(T) \\ &= \frac{1}{2}(w(p_{12})+w(p_{34})+w(p_{56})) + \frac{1}{4}(w(p_{13})+w(p_{15})+w(p_{24})+w(p_{26})+w(p_{35})+w(p_{46})) \\ &\leq \frac{1}{2}(d_{12}+d_{34}+d_{56}) + \frac{1}{4}(d_{13}+d_{15}+d_{24}+d_{26}+d_{35}+d_{46}) = \frac{15}{4} \end{aligned}$$

Thus the solution is minimal. P is a basis for the edge space of T , so this solution is unique.

Edited by Mike Hendy and Graeme Wake
Massey University

VACANCIES

LECTURESHIP IN APPLIED MATHEMATICS

Waikato University

The School of Computing and Mathematical Sciences at the University of Waikato is expanding. Applications are sought for the position set out below, which is available from 1 February 1989.

A Lectureship in Applied Mathematics is available within the Department of Mathematics and Statistics. Applicants for the post should preferably have completed Doctoral studies and have broad research interests. Teaching and further research or industrial experience would be advantageous. The University is seeking an appointment in the general area of Scientific Modelling/Symbolic and Numeric Computation but other areas may be considered. The salary range for Lecturers is \$NZ35,000 to \$NZ46,000 per annum and for Senior Lecturers, \$NZ49,000 to \$NZ63,000 per annum. Academic enquiries may be addressed to Associate Professor Kalnins, Acting Chairperson Department of Mathematics and Statistics. Reference number A88/39.

CHAIR IN STATISTICS

Massey University, Palmerston North

Applications are invited for the Chair in Statistics in the Department of Mathematics and Statistics which falls vacant due to the retirement of Professor Brian I Hayman. The Chair in Mathematics is held by Professor Graeme C Wake, who is Head of Department from January 1, 1989.

The Department of Mathematics and Statistics offers a full undergraduate programme in Statistics including service teaching. Most undergraduate courses are taught both to internal students and by correspondence to extramural students throughout New Zealand. The graduate study programmes include masterate and PhD supervision together with a recently introduced extramural Diploma in Applied Statistics. A statistical consulting service is provided to the campus and neighbouring research organisations.

The appointee will be expected to provide leadership and direction in Statistics both within the Department and in the wider university environment. He/she should be distinguished in one or more fields of statistical research, have ability in teaching and be experienced in consulting. A background in the main areas in which service teaching takes place, namely business studies and the sciences may be an advantage, as would familiarity with statistical computing or statistical packages. The appointee will be expected to take a full part in teaching, research, consulting and administration and may be expected to serve a term(s) as Head of Department. It is envisaged that the appointee would take up the Chair by January 1990.

Further details are obtainable from the Registrar. Closing date for applications: 31 March 31, 1989,

Crossword No 25 Solution:

Across: Achradina; 8 drama; 9 in-for-ms; 10 aerial; 11 knob; 12 Syracusans; 14 geometries; 16 cone; 18 embeds; 20 odo-rous; 21 (M)orris; 22 Ct-e-si-bius.

Down: 2 Conon; 3 rhombs; 4 Democritus; 5 adze; 6 capital; 7 ballistae; 10 Archimedes; 11 King Gelon; 13 bombard (Lombard); 15 scarab; 17 Nauru; 19 disc.

Archimedes (anagrammed three times) of Syracuse is the theme of the puzzle. For details of his life consult Heath's edition of his works (in the Dover paperback series) or *Archimedes* by E J Dijksterhuis (Princeton University Press). Cicero when he went as quaestor to Sicily in 75 BC found at the gates of Achradina (which was part of Syracuse) a memorial column engraved with the figure of a sphere inside a cylinder. It was Archimedes' wish that he should have such a monument.

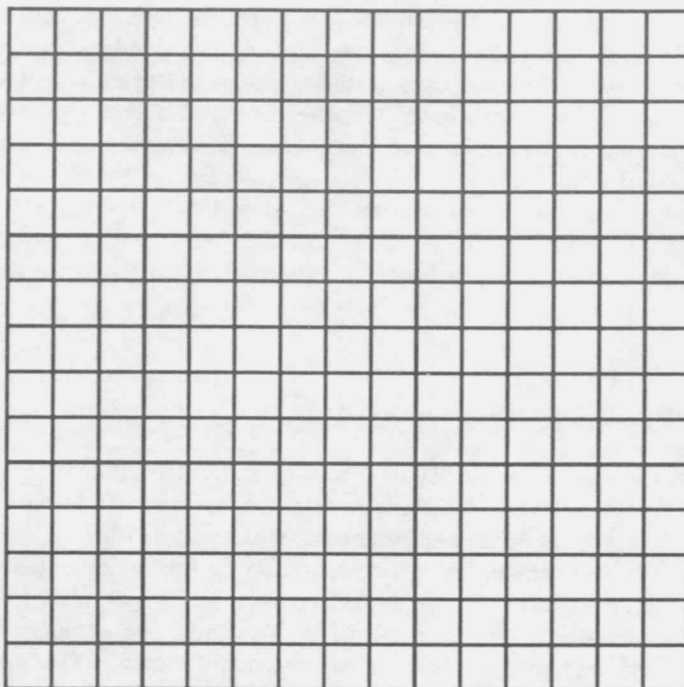
Conon of Samos was a contemporary astronomer to whom Archimedes used to write. Ctesibius was another contemporary. Archimedes' work *The Sand-Reckoner* begins: 'There are some, King Gelon, who think that the number of grains of sand is infinite.'

CROSSWORD

No 26

M

by Copal Varnish



In the absence of Matt Varnish crossword No 26 has been sent by his sister Copal Varnish from Yucatan who thinks of the grid as a $(0,1)$ matrix M in which the entries 1 correspond to black squares and the entries 0 to white squares. We think we have received enough information for the crossword to be constructed in its completed form.

For example $1a(5 - 4) = \text{Trace}(MM^T)$ and $14a(3,7) \quad 22a(3,6) = \text{Trace}\{(J - M)(J - M)^T\}$; of course J is a matrix all of whose entries are 1's. This gives the number of entries of M that are 4d(10). Now one can 10a(6) the 2d(5) with 5d(4).

Furthermore $(\text{Trace } M)^2$ is a 17d(5) (for the daring trapeze flyer who has had one over the eight?) if one is allowed to 13d(7) numbers as words. M has 16a(4) equal to 9, two more than the maximum of the 10d(3,7) of any two 6d(7). See how the answers 18a(6) and 8a(5), poetically, 7d(9) and admire the 12a(10) symmetry of M .

So you witty scoffer, one of the 20a(7) (fifty you see before one answer), if your name is Maria Theresa you can bet your bottom 3d(6) that it is as easy as falling from a 11a(4).

9a(7) there should not be any 11d(9) (= disposable) clues, but we will tell you that 15d(3,3) is hard CO_2 . Also 19d(4) could describe those that make 5, the number of w's used. Our parting comment is 21a(5) or patly, 'M, we like it.' (We have provided you with some squared paper to work on but you had better use a pencil because you may have to 14d(7) some of the entries.)

(The solution to puzzle number 25 is on the previous page)