THE NEW ZEALAND MATHEMATICAL SOCIETY

NEWSLETTER

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Secretarial

N.Z.M.S. COUNCIL AND OFFICERS

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SECRETARY	Dr Derrick Breach (University of Canterbury
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NEWSLETTER EDITOR	Dr Mark Schroder (University of Waikato)

COUNCIL NOMINATIONS

Nominations are invited for three positions on the Council of the Society.

Candidates for these positions must be financial members of the NZMS. They must be nominated by two other financial members of the Society, and the nomination must be accompanied by a signed statement by the nominee that s/he is prepared to accept nomination. The election will take place at the Annual General Meeting in May 1987, and the new Councillors will be expected to hold their positions for 3 years from that date.

Nominations should reach the Secretary of the NZMS not later than 1 March 1987. Candidates are invited to submit a thumbnail biography for inclusion in the April issue of the Newsletter. This should accompany the nomination.

The Newsletter is the official organ of the New Zealand Mathematical Society. It is produced in the Mathematics Department of the University of Waikato and printed at the University of Otago Printery. The official address of the Society is:

> New Zealand Mathematical Society (Inc.)
> c/- The Royal Society of New Zealand
> Private Bag
> WELLINGTON

However correspondence should normally be sent direct to the Secretary, Dr Derrick Breach, Department of Mathematics, University of Canterbury, Christchurch, New Zealand.

Editorial

Distance and isolation pervade New Zealand mathematics. In a letter printed shortly, Peter Lorimer indirectly addresses that theme, and David Vere-Jones echoes it, in my sub-editorial exhortation to our honorary correspondents.

None-the-less despite distance and isolation, we do have quite a lot of visitors, and quite a lot of us do go overseas. Most of us retain this as a fading memory - and to be fair, some of the visitors and some of our experiences deserve that oblivion.

Here at Waikato, we decided (purely by chance) to arrange interviews for some of our distinguished visitors: you may have heard excerpts of an interview with Terry Speed in "University Report" on National Radio. This barely scratches the surface...

We can - and in suitable cases, should - preserve seminars, lectures, and other performances on tape, or better, on videotape or film, since mathematics loses a lot without the visual media. We should preserve our past by talking to people such as Professor J.T. Campbell; we should "import" relics of events such as ICME V ... the audio-tapes of the invited addresses make much more sense to me now that I have the book of ICME V.

Another task for the NZMS, to correlate and encourage such individual initiatives (or even to organise them)?

                                                              Mark Schroder

Sub-editorial

HONORARY CORRESPONDENTS

"Long distances and small populations are the bugbear of national ventures on the New Zealand scene... This Newsletter, therefore, is addressed to a major problem. If it succeeds, even to a modest degree, in providing a link between mathematicians in different towns and with different occupations, ..."

With these words, our founder President, David Vere-Jones, began the very first Newsletter in October 1974. Even in that issue, local news featured and by the third, it was supported by "honorary correspondents". Without their help, it would decay or even die. Unfortunately, some correspondents have lapsed into silence, leaving us to wonder ... How is old X at Y? Has P finally found a way of perfecting numbers down at Q? Did the user pay for his sinking lid at the M.A.F. hatters' tea-party?

Does your section never rate a mention? Does it deserve better coverage? We would welcome your help as a correspondent, or your advice on possibilities for improvement. The active correspondents are listed below.

Prof. R.H.T. Bates	Electrical and Electronic Engineering, University of Canterbury
Dr K.A. Broughan	Mathematics, Waikato University
Dr M.R. Carter	Mathematics and Statistics, Massey University
Mr M. Doherty	Department of Statistics, Wellington
Dr J.F. Harper	Mathematics, Victoria University
Dr J. Heath	School of Maths and Science, Wellington Polytechnic
Dr R.A. Littler	Ministry of Agriculture and Fisheries
Mr R.S. Long	Mathematics, University of Canterbury
Mr J.H. Maindonald	D.S.I.R., A.M.D., Mt Albert
Dr G. Olive	Mathematics and Statistics, University of Otago
Ass.Prof. I.L. Reilly	Mathematics and Statistics, University of Auckland
Dr D.M. Ryan	Theoretical and Applied Mechanics, University of Auckland
Mr G.J. Tee	Computer Science, University of Auckland
Dr G.J. Weir	D.S.I.R., A.M.D., Wellington

THE HOT SEAT

As I intend to go on sabbatical leave in 1988, I shall relinquish the editor's seat sometime in 1987. If you wish to take over, or if you can make a suggestion, please let Brian Woods know.

<div style="text-align:center">M.S.</div>

Letter

Dear Editor:

Henry Forder came to Auckland as the Professor of Mathematics at the University during the 1930's. He told me, sometime about 1970, that he had only been out of Auckland twice since then, once when he returned to England on sabbatical leave soon after the Second World War and the other time within New Zealand, but I forget where he went. During the post war decades when air travel was becoming easier he regarded it as a matter of pride that he had never been to the U.S.A. though all his colleagues seemed to be going there.

This seems a prescription for provincialism, all those years in what they call, here in Singapore, a corner of the world. And he was very provincial but not a provincial New Zealander; he was a provincial Englishman. In spirit he never lived too far from Cambridge or Oxford, whichever one it was. While he was an inspiration to many of his brighter students he was so different, culturally, from most New Zealand students, that he had a barrier around him that most never penetrated. He would have only been a little harder to understand if he had spoken a foreign language.

He was, for many years, the Chairman of the Library Committee at Auckland University and he used his position to build up its Mathematics holdings. (Is this a unique occasion when the University Committee System was not used to the disadvantage of Mathematics?) Books and periodicals that he couldn't persuade the University to include in its budget he bought himself and lodged in the Library on loan, eventually donating them or leaving them in his will. He laid the foundation of one of the best mathematical libraries in the world.

Given his personality and this legacy to Auckland University, it is not surprising that he left a large sum of money to the London Mathematical Society. While I wish he had left it to a local institution, he didn't, and we can be grateful to the LMS for their willingness to use it to increase the contact between our two countries.

The Forder Lectureship was outlined by I.M. James, the President of the LMS in the April 1986 issue of the NZMS newsletter and he has asked us to take part in a review they anticipate holding after the second lecturer has been to New Zealand. However, for reasons that I will leave until the end of the letter, it seems to me appropriate to make some comments about it now.

The scheme envisages a mathematician from the United Kingdom coming to New Zealand for a period of about four weeks and visiting all the Universities. This means three or four days at each, giving two or three lectures and having discussions with the staff; in other words behaving exactly like many of the visitors we now get. The last four newsletters of the NZMS, covering a period of about 16 months, report 27 occasional seminars from visitors to the University of Auckland Mathematics Department: 7 from the U.K., 7 from Canada, 5 from the U.S.A., 2 from Australia, 1 each from the Netherlands and Japan and 4 from other parts of New Zealand.

The LMS intends to use the Forder legacy to pay for the lecturer's fares to and from New Zealand while "the NZMS will arrange to cover the cost of the lecturer's internal travel and living expenses, bearing in mind that in some cases the lecturer may be accompanied by his or her spouse". A quick estimate of costs for 28 days for one person gives a minimum of $2800. To put this in context, here are a few facts about financial conditions in New Zealand, some gleaned from recent issues of this Newsletter. Total membership subscriptions to the NZMS for 1984 were $3059. Professor A asked the NZMS for money to (1) support a regional conference in Combinatorial Mathematics (yes, up to a maximum of $300); (2) support a New

Zealand contingent to the 1988 International Mathematical Olympiad (no); (3) contribute towards the cost of travel to New Zealand by a distinguished overseas mathematician (no: Associate Professor B, who has been around longer, never makes requests like this). The NZMS made grants of $50 to an Applied Mathematics Workshop and $500 to sponsor an invited speaker to the 1987 Australian Applied Mathematics Conference which will be held in New Zealand. Three postgraduate students were helped by the NZMS to go to conferences in Australia: what they got, I don't know, but about $200 each was on offer. The University of C makes a grant, each year, of about $150 per staff member to enable them to travel to local conferences. The Mathematics Department at the University of D pays about $100 towards the expenses of visitors who give seminars. When Dr E from the University of F visited the University of G to examine a thesis, and offered to visit the University of H on the same trip, that University had no money to pay for the extra travel involved. New Zealander I, on sabbatical leave in England, gave a seminar the University of J for lunch and expenses of £6.60.

While the NZMS will nominate the subject area and can suggest names, the final choice of lecturer will be made by the LMS. Do they anticipate a proposal of a subject area in the generality of, say "Differential Geometry", or something like "Embeddings of graphs in 3-dimensional Euclidean space"? What criteria will they use to choose the lecturer? What do people in London know about needs in New Zealand? However, I admit that my objections on this procedure become muted when I reflect on some decisions that have been made in New Zealand. Who has been responsible for the choices of some of the people we have spent a lot of money on in the past?

My principal objection to the Forder lectureship is that it duplicates, at too great a cost, something that we already have. We don't need money for more Mathematicians to come to New Zealand from Europe, they come all the time, and we don't need to commit our very meagre funds to pay for their expenses (and their spouse's) while they are here, we need it for other things. Of course the NZMS doesn't intend to pay for all their expenses itself. It can reasonably anticipate that each University will pay $100 to $200. That presents no problem, but as soon as it begins tapping funds like the University of Auckland Foundation it will inevitably mean a reduction in grants made by them to other mathematical activities. You will notice that we had no occasional seminar in Auckland from anyone in our hemisphere outside Australia and New Zealand. I know a methematician in a developing nation whose salary is one tenth of mine. There are plenty of things for the likes of the University of Auckland Foundation to do.

At this stage, I suppose I must make some positive suggestions about what should be done with the Forder fund. First, as the income from it will not be large, I feel that it should be given out in small amounts. Mathematicians in the Universities in our two countries find it reasonably easy to visit the other on sabbatical leave. Could they be given small amounts, of the order of $1000, say, to enable them to attend conferences while they are there and make visits to Universities other than the one they are based at? Could some money be used to sponsor investigations into the historical relationship between mathematicians and mathematical institutions in our two countries? Could it be extended to developing Commonwealth countries to help their mathematicians visit New Zealand? Whatever it becomes, could it be innovative?

When it comes to the end of all this, the legacy does belong to the LMS. If they want to continue with the lectureship, so be it, but I would appeal to them to finance it completely from the legacy, even if it means having a lecturer less often. Also, I hope they will use it to promote Professor Forder's interests, two of which I take to be Auckland University and geometry. He was not a research mathematician but he was a deep scholar, having an intimate knowledge of a lot of mathematics. After he retired he gave series of lectures on topics of hiw own choice for many years; they were mostly close to geometry and set at about early postgraduate level. Could the lectureship evolve into the local sponsorship of a series of expository lectures for the benefit of the staff and senior students at some New Zealand University, either by a visitor from overseas who happens to be in the country or by someone from another New Zealand University?

Finally, I promised to say why I am writing this letter before any of the lecturers have come. The first reason is that my arguments are independent of whoever those people are and cannot, being written now, be taken to reflect on them in any way. Secondly, rather than being too early, my letter may be too late; perhaps I should have written it long ago, before anything had developed this far. Thirdly, as the Newsletter comes out only three times per year, I must anticipate a long delay in having it published. And, fourthly, if we are going to have a lectureship, I want it to be a good one and this gives the organisers a chance to anticipate

some objections that may be made later.

Peter Lorimer

Present address: National University of Singapore
Usual address: University of Auckland

News and Notices

UGC POSTDOCTORAL FELLOWSHIP

MASSEY UNIVERSITY

Modelling and Analysis of Ecological Management Systems

A person is sought to collaborate with an interdisciplinary research team concerned with an ongoing program analysing and developing models of ecological management systems. At present the team is working on a model of a stream flowing into Lake Taupo. The model incorporates the vegetation, nutrients and the interactions thereof and the concern is with the overall effect on water quality. These models commonly involve systems of coupled partial and ordinary differential equations. Scope exists for the application of numerical methods, numerical optimisation, system dynamics, and control theory.

It is envisaged that, within this program, a number of similar applications will be considered and the appointee will have opportunity to direct the thrust of the effort. This work is being developed in conjunction with other Departments of Massey University and the Division of Freshwater and Marine Science (Taupo Research Laboratory) within the Department of Scientific and Industrial Research.

Our requirements are for a graduate who has recently completed a PhD in Applied or Engineering Mathematics. Experience with dynamical systems modelling will be an advantage.

The conditions of appointment are as set out in the 1986 New Zealand UGC Grant Committee Handbook pp. 73-75. Tenure is for up to two years. The project covers the period February 1986 up to January 1989. Salary is at the first step of the NZ University Scale for Lecturers (current, $30,500 p.a.).

Enquiries should be sent urgently to:

Professor G.C. Wake,
Department of Mathematics and Statistics,
Massey University,
Palmerston North,
New Zealand.

Tel. (963)69-099 ext. 8668.

Applications, addressed to the Registrar, Massey University, will be considered after the deadline of 28 November 1986, if an appointment has not already been made.

BOOKS FOR REVIEW

Applied Mathematical Sciences

Analysis of Approximation Methods for Differential and Integral Equations, by H.-J. Reinhardt, 398 pages.
Theoretical Approaches to Turbulence, edited by D.L. Dwoyer, M.Y. Hussaini, R.G. Voigt, 272 pages.
Singularities and Groups in Bifurcation Theory (in 2 volumes) Volume 1, by M. Golubitsky, D.G. Schaeffer, 463 pages.
Linear Turning Point Theory, by W. Wasow, 246 pages.
Differential Manifolds, by S. Lang, 230 pages.
Topology and Analysis: The Atiyah-Singer Index Formula and Gauge-Theoretic Phsyics, translated from German, by B. Booss, D.D. Bleecker, 451 pages.
Complex Analysis: A Functional Approach, by D.H. Luecking, L.A. Rubel, 176 pages.
Lectures on Sieve Methods and Prime Number Theory, by Y. Motohashi, 205 pages.

HAMILTON AWARD 1987

The Council of the Royal Society of New Zealand has called for nominations for the Hamilton Award 1987. This award is made for scientific research carried out in New Zealand or in the islands of the South Pacific, which has been published within the five years preceding 31 January 1987. Such publication may consist of one or more papers, and shall include the first investigation published by the author. No candidate shall be eligible for the prize who prior to such period of five years has published the results of any scientific investigation in a recognised scientific journal. (For the purpose of this award a recognised scientific journal will be interpreted as one for which papers are submitted to a referee prior to publication.)

The prize for the Hamilton Award for 1987 consists of a certificate and $NZ250.00 in cash. No award will be made unless in the opinion of the R.S.N.Z. Council, there is evidence of scientific work of great merit. In 1986 no award was made.

Nominations for the above award whould be sent to:

> The Exective Officer,
> Royal Society of New Zealand,
> Private Bag,
> Wellington,

by 31 December 1986. At least two copies of the relevant publications and a supporting statement should accompany the nomination. Applicants must attest that their first published investigation has been included, along with the date of that publication. In the event of joint-authored papers being submitted, please identify the percentage of applicant's input.

NZMS POSTGRADUATE STUDENT TRAVEL GRANTS

The NZMS has set up a fund to assist postgraduate students in the mathematical sciences to attend conferences in 1987. We are especially hoping to encourage attendance at the N.Z. Mathematics Colloquium to be held at the University of Waikato, 20-23 May 1987, however the fund may be used to assist travel to any conference. The amount available per student will depend on the number of applicants, but is likely to be about $300.

Applicants need not be NZMS members. If you know of any eligible students, please mention the existence of this fund to them and encourage them to apply. If you are yourself eligible and interested, you are invited to apply on the standard form attached as a liftout.

NZMS RESEARCH SUPPORT FUND

The Council of the NZMS has established a fund for the support of mathematical research in New Zealand. This shall be interpreted in the widest possible sense, and may include such things as the funding of items such as books or computer software, the funding of temporary research assistance, and the support of travel either by New Zealand mathematicians in furtherance of their research, or by overseas mathematicians travelling to New Zealand to assist or co-operate in research in New Zealand.

The amount of the fund for each year (between successive Annual General Meetings of the NZMS) shall be determined by the Council of the NZMS at the Council meeting immediately preceding each Annual General Meeting. The manner in which the fund for a particular year shall be spent shall be determined by the NZMS Council. Any amount not spend in a particular year shall revert to the general funds of the Society.

The amount of the fund for the 1986/87 year has been set at $NZ 2,000.00.

Applications are now invited for assistance from the NZMS Research Support Fund. Every application should state clearly the nature and amount of assistance required, and the details of the research which is to be supported, and be sent to:

> Dr Derrick Breach,
> Secretary NZMS,
> Department of Mathematics,
> University of Canterbury,
> Private Bag,
> Christchurch.

Applications for assistance may be made at any time, but will not necessarily be considered before the next regular Council meeting following receipt of such applications.

(The next Council meeting will take place in May 1987.)

56th ANZAAS CONGRESS

26-30 January 1987

Mathematical Sciences are included in Group 1 of the programme for this Congress which is to be held in Palmerston North, New Zealand.

A half-day session entitled "Mathematical Sciences in the Community" is planned for Friday morning, 30 January. The theme is mathematical modelling and will be introduced by keynote speaker Dr Noel Barton (Principal Research Scientist, Division of Mathematics and Statistics, CSIRO, Lindfield, New South Wales). Dr Barton has wide experience in the application of mathematics, and was recently Director of the Mathematics in Industry Study Group held at the University of NSW. His address entitled "Mathematical Modelling: Neither Art nor Science, but a Practical Tool" will be followed by four case studies, each explaining how modelling and mathematics have contributed to solving a particular community problem.

The case studies include the mathematics of combustion and the assessment of risk, frost forecasting for fruit growers, improving cost effectiveness in geothermal exploration, and simple statistical models in management. The speakers presenting the case studies are Professor Graeme Wake (Massey University), Professor David Vere-Jones (Victoria University of Wellington), Dr Hugh Barr (Applied Mathematics Division, DSIR, Wellington), and Mr Tim Ball (Deming Institute of New Zealand, Auckland).

Scientific and mathematical teaching is the topic for another half-day activity on Thursday, 29 January. Andy Begg, from the Curriculum Development Division of the Department of Education will be speaking on "Mathematics and Science Teaching - Who Helps Who?" (This leads the Editor to ask, "Who checks the Curriculum Developer's grammar?") Other speakers will be discussing aspects of science teaching in secondary schools.

Other mathematical activities will include individual contributions in the form of poster displays, and there will be other sessions which will be of interest for mathematicians.

Anyone wishing to make a mathematical contribution to ANZAAS should contact Dr Dean Halford, Department of Mathematics and Statistics, Massey University, Palmerston North. Copies of the Second Circular which include registration forms are available from the Organising Secretary, ANZAAS Congress, Massey University, Palmerston North.

Please note also that the Australian Mathematical Society is holding its annual Applied Mathematics Conference in Wairakei, New Zealand from 8-12 February 1987. Mathematicians are encouraged to participate in both ANZAAS and the AMC. The director of the latter conference is Professor Ian Collins, Department of Theoretical and Applied Mechanics, University of Auckland, Private Bag, Auckland.

Make a holiday of it and enjoy New Zealand plus these conferences in early 1987!

RECIPROCITY AGREEMENTS

American Mathematical Society

Members of the NZMS may join the AMS at a much reduced subscription rate which entitles you to all rights of ordinary members including the right to vote for officers of the AMS. A reciprocal member receives free copies of the *Notices* of the AMS and the *Bulletin*, and is entitled to substantial price reductions on other publications of the AMS. Application forms for reciprocal membership can be obtained from our Treasurer who will endorse your application provided you are currently a financial member of the Society.

Australian Mathematical Society

The terms of the agreement provide for individuals who are members of one Society to join the other for half the usual fee and thereby enjoy all the privileges of that Society, other than the right to vote. This applies, of course, provided you do not reside in the country of the second Society.

To take advantage of this, obtain a note of authentication and an application form from our Treasurer and send both to the Australian Mathematical Society, W.R. Bloom, School of Mathematical and Physical Sciences, Murdoch University, Murdoch WA 6150, Australia.

Canadian Mathematical Congress

The same terms apply as for the Australian Mathematical Society, and members of the NZMS may join for half the appropriate subscription fee. Applications should be addressed to the Secretary, Canadian Mathematical Congress, 3421 Drummond, Suite 15, Montreal, Canada H3G 1X7.

Edinburgh Mathematical Society

Members of the New Zealand Mathematical Society may join the Edinburgh Mathematical Society on payment of the reciprocity member's subscription. A reciprocity member receives the *Proceedings of the Edinburgh Mathematical Society*, but does not have voting rights. To become a reciprocity member, write to The Honorary Secretary, Edinburgh Mathematical Society, James Clerk Maxwell Building, Mayfield Road, Edinburgh EH9 3JZ, Scotland.

Mathematical Society of Japan

Reciprocal members enjoy practically all the privileges of regular members except the right to vote. Applications together with dues should be sent to the Treasurer, NZMS, by 30 June each year.

Southeast Asian Mathematical Society

The same terms apply as for the Australian Mathematical Society. Privileges of membership include a quarterly newsletter and members' rates for conferences, meetings and occasional publications. Application forms may be obtained from our Secretary.

London Mathematical Society

The same terms apply as for the Australian Mathematical Society except that reciprocal members do have the right to an LMS vote. Other privileges include the LMS Newsletter, and reduced rates for most LMS publications. Application forms may be obtained from our Secretary.

"If you start on a sphere, or a cube, you must keep on until you have seen it from all sides."

Ezra Pound

Local News

MINISTRY OF AGRICULTURE AND FISHERIES

For puzzled but dedicated readers of Local News, the new honorary correspondent is happy to report that despite our temporary silence, we still exist. Indeed about 25 statisticians still grace MAF habitats at Invermay, Lincoln, Head Office, Wallaceville, Palmerston North and Ruakura. However our precise identities are subject to perturbation due to such comings and goings as:

Goings
Stuart Crosbie from Invermay to Victorian Department of Agriculture,
Anthony Byett from Palmerston North to Auckland (as a futures analyst),
Hans Hockey from Ruakura to U.S.A., U.K., Europe, ... the world, and
Murray Jorgensen from Head Office to Waikato University.

Comings
Martin Upsdell back to Ruakura from U.K.,
David Baird back to Lincoln from U.K.,
Ken Dodds to Invermay from North Carolina State,
Sharleen Forbes expected at Wallaceville from Education Land.
(We salute them all.)

Commercialisation
We are all grappling with the implications of reduced government funding, "user-pays" and other similar concepts which both excite and terrify us. One result has been a changed perception of the Centre for Applied Statistics, which we hope will be launched in February as a University/Ruakura joint venture. We now expect it to engage in external consultancy from its inception.

Visitors
Ruakura staff have benefitted greatly from recent visits from Nye John (thanks to AMD) and Terry Speed and Emlyn Williams (both from DMS, CSIRO). We have had to bow to their undoubted skill not only in the realms of statistical design and analysis but also on squash and tennis courts and jogging tracks.

RAL (exhausted correspondent)

OTAGO UNIVERSITY

Associate Professor Bryan Manly has been appointed to the Chair of Mathematical Statistics that was held by Professor Ivor Francis until his recent resignation. Bryan will also become Director of the Statistics Unit.

Dr Laimonis Kavalier is our new lecturer in Statistics. He arrived here from M.I.T. (where he was an instructor) in August with his wife Winifred. He received his Ph.D. in statistics at A.N.U. under Professor Ted Hannan - and his main research interest is in the area of parametric models for time series.

Our department will host the 3rd International Conference on Teaching Statistics in August, 1990. There may be more that 500 participants at this conference, which has been arranged by Bryan Manly.

Robert "Tank" Aldred (who recently persuaded our secretary of long standing, Karen Smeets, to give up her freedom on 19 September 1986) has been appointed a Beverly Research Fellow for 1987.

Seminars

Tony Broad (a First Class Honours graduate from the University of Otago in 1979 who is now an investment analyst in the Research Department of Jarden and Company in Wellington), "A Day in the Life of an Investment Analyst". (It was the best attended seminar in many years - for there were more than 50 people in attendance.)

Dr Laimonis Kavalieris, "Estimation of Time Series Models".

Dr Peter Neumann (Oxford University), "A Lamb and Flag Problem" and "Graphs and Permutation Groups".

Mr Richard Monypenny (James Cook University, Australia), "Decision Support for Research Workers".

Dr Terry Speed (1986 NZMS Visiting Lecturer from CSIRO), "Triangulated Graphs and their Applications".

Professor Graeme Wake (Massey), "Some Applications of Nonlinear Functional Analysis (Fire Prevention and Initiation using Maths)".

Professor Bryan Manly, "Comparing and Scaling Assessment Marks using CUSUMS".

Dr J.A. John (University of Southampton), "Recent Advances in Experimental Design and Analysis".

Dr Vernon A. Squire (Cambridge University), "On Various Ice-coupled Waves".

Dr Terry Speed also gave a Faculty of Science Open Lecture on "Quantifying Risks: When can you believe the Experts?" as well as a 2-hour teleconference on "Creative Statistics" with about 60 school teachers in Invercargill, Gore, Balclutha, Alexandra, Oamaru, and Dunedin. (This teleconference was arranged by the Otago Mathematics Association via the University Extension.)

Dr Gerrard Liddell organised a "seminar cum workshop" on "Authoring Systems" in conjunction with The Computer Aided Learning Software Society.

<div align="center">G.O.</div>

VICTORIA UNIVERSITY

Our long-awaited replacement for Ken Russell is due to arrive in March: Bernard Flury from Basle. His field is multivariate statistics.

Peter Thomson has been promoted to Reader, elected President of the NZ Statistical Association, and invited to work for four weeks at ANU with Prof. Hannan.

Steve Haslett has been appointed as Lecturer in the Institute of Statistics and Operations Research.

David Vere-Jones is hard at work for the Royal Society of NZ (with Prof. R.I. Walcott, Geology, VUW) reporting on the state of school science (including mathematics) teaching. His itinerary for 1987 includes Italy, Manchuria, Japan, ...

The 1990 ICOTS conference (where TS = Teaching Statistics) will be in NZ, at Otago, owing to the hard work of Prof. Brian Manly (OU), David Vere-Jones, Peter Thomson and Sharleen Forbes (all VUW or ex-VUW).

Peter Donelan has recently been to conferences in Iowa and Berkeley. He spoke at the latter on the role of unfoldings in kinematics.

Tony Vignaux has gone on sabbatical to Berkeley.

Rob Goldblatt will become Chairman of the VUW Mathematics Department when he returns from sabbatical early in 1987; the position has been ably filled by Doug Harvie, who will take a sabbatical later in the year.

Brian Dawkins is the leader of a joint project with AMD, DSIR to assess the usefulness of the S statistical software package for the UNIX operating system.

Emeritus Professor J.T. Campbell turns 80 on 30 November 1986 - Happy Birthday!

John Harper has been re-elected as Vice-President of the Wellington Branch of the Royal Society of N.Z.

One of our newly appointed lecturers is wondering why the University said it encouraged research when one of the first things it did for mathematics after his arrival was to cancel several journal subscriptions. Can anybody help me give him a satisfactory answer?

J.F.H.

UNIVERSITY OF CANTERBURY

Dr John Hannah arrived in August to take up his appointment in the department. He was previously at University College, Galway. He is an algebraist, and is a graduate of this department, having obtained his Ph.D. in 1978 under the supervision of Kevin O'Meara.

Dr Murray Smith was awarded an Erskine Fellowship to visit the U.S.A. and Canada, in July. He attended the International Biometrics Conference in Seattle, the International Conference on the Teaching of Statistics at Victoria, B.C., and the Joint American Statistical Association/Institute of Mathematical Statistics Meeting in Chicago. He also visited the statistics department at Purdue University for two weeks, and made brief visits to several other North American statistics departments.

Dr Graham Wood visited North America in August. He presented a paper at the International Congress of Mathematicians at the University of California, Berkeley, and also at the International Conference on Teaching Statistics at the University of Victoria, Vancouver Island. In addition, he gave a seminar at the University of British Columbia.

Dr Rick Beatson presented a paper at the Conference on Constructive Function Theory, in July at Edmonton.

Our unusual shortage of visitors has continued. In fact, our sole visitor in this period was Dr Terry Speed, the NZMS visiting lecturer for 1986. He was here on 9 and 10 October, and spoke to the dpeartment on "Triangulated graphs and their applications". In addition, he sopke to the interdisciplinary discussion group of the university on "The hidded contribution of the mathematical sciences in everyday life", and to the BNZ Senior High School Competition prizegiving on "What statistics should be taught in schools?".

R.S.L.

D.S.I.R.

Applied Mathematics Division - Wellington

The USENET news is operational on both AMD UNIX micros which have electronic mail links to VUW and elsewhere (via Melbourne or Calgary).

Sirimathie Wewala (Siri to her friends) has joined the Palmerston North substation, as a replacement for Dick Sedcole. Siri was an undergraduate from Sri Lanka, and has a Ph.D. from Massey.

Vicky Mabin has spent three months observing production and inventory control in Europe. She attended the International Inventory Control Symposium in Budapest, the European O.R. Conference in Portugal, Philips and Eindhoven Technical University in the Netherlands, and observed Optimized Production Technology (OPT) in Britain.

Graham Weir spent two weeks at LSU working on irrigation modelling, and also attended the Society of Petroleum Engineers conference in New Orleans. He visited Stanford and Berkeley briefly.

Tony Aldridge has returned from the US after one year with the statistical consulting group of Joiners Associates.

Peter Thakurdas attended the ASA in Chicago in August.

Jean Thompson spent one week at the 8th Australian Statistical Conference in Adelaide. Topics covered were Genetics, Quality Control and Experimental Design.

Hugh Barr has visited Indonesia at the request of Foreign Affairs and the Indonesian Government, to evaluate Indonesian geothermal fields. Methods used unvolved uncertainty and risk analysis. Our belated congratulations to Hugh on his recent marriage.

Karen Garner is now working half-time after one year's maternity leave.

G.J.W.

Applied Mathematics Division, Mt Albert Substation

We welcome Tony Aldridge back from a year spent gaining industrial experience with Joiner Associates in the U.S.A. He has gained useful ideas on involving management in quality and productivity improvement techniques and in industrial experiments.

Susan Brown took up a five months temporary position with us at the beginning of November. Her work includes attending to numerical and computing aspects of software that will assist in analysing bio-assay data, and the setting up of a database on fish processing.

Along with AMD Wellington we have recently acquired an AT&T 3B2 microcomputer, which is nearly equivalent to a Microvax II in computing power. It gives us access to the 'S' statistical package - itself a product of Bell Laboratories and widely used in statistical research establishments in the U.S.A. The excellent graphics are particularly welcome.

J.H.M.

MASSEY UNIVERSITY

Charles Lawoko arrived early in November to take up a lectureship in Statistics. He studied initially at Dar-Es-Salaam University (Tanzania) and Imperial College (London). Charles then held a short appointment at Makerere University in Kampala before undertaking graduate studies at the University of Queensland, where he recently submitted his Ph.D. thesis. His research interests include pattern recognition, statistical inference and mathematical programming.

Several staff members have recently left or are about to leave. Sirimathie Wewala has not gone far - she has taken up a post at the D.S.I.R. just across the road from Massey. Neville Jean is travelling a little further - he leaves on Christmas Day to take up a position as a Research Associate in the Department of Computer Science, University of Manitoba, Winnipeg. He intends to work with Professor Hugh Williams (who was one of the examiners for Neville's Ph.D.) on computational algebraic number theory. Fianlly, John Hearne will return to South Africa in January after a year spent here on a U.G.C. postdoctoral fellowship. He has been working on the simulation modelling of nutrient transport in the Whangamata stream, which flows into Lake Taupo.

While on the subject of U.G.C. postdoctoral fellowships, it should be mentioned that three of these are currently being advertised within our Department. One, on the modelling and analysis of ecological management systems, will be continuing with the research programme in which John Hearne was involved. The others are also for research of an interdisciplinary nature, one on the development of shape factors for the freezing and thawing times of irregularly-shaped foods (in cooperation with the Department of Biotechnology), and the other on the alignment of multiple DNA sequences (in cooperation with the Department of Botany and Zoology). Although the closing date for applications for all three fellowships was the end of November, late applications may be considered.

Having completed his studies for an M.Sc. at the University of Canterbury, Paul Rhodes has taken up a postgraduate scholarship funded by the D.S.I.R. to undertake doctoral research on the effects of water content on the ignition characteristics of coal, working under the supervision of Graeme Wake and Professor Bill Monteith of the Department of Production Technology.

Hugh Morton took a short period of sabbatical leave during August. He attended the Second International Conference on the Teaching of Statistics (ICOTS II) at the University of Victoria, Canada, and also the Eighth Statistical Society of Australia Conference in Adelaide.

Graeme Wake spent three weeks in Canada during November and December. He was a guest speaker at the University of Guelph (Ontario) as part of their Distinguished Short-Term Visiting Professor programme. While there he gave two short series of lectures, on :Nonlinear Partial Differential Equations" and on "The Reaction-Diffusion Equations" as well as a general lecture to a non-specialist audience.

Charles Little left in August for a year's sabbatical leave. He will be spending most of that time at the Department of Combinatorics and Optimisation, University of Waterloo, Canada, pursuing his research in graph theory.

Seminars:
Dr Marston Conder (University of Auckland), "Symmetric graphs of degree 3".
Dr Hugh Barr (AMD, DSIR, Wellington), "Operations research for industry".
Terry Speed (CSIRO), "What statistics should be taught in schools" and "Triangulated graphs and their applications.
Howard Edwards, "On the lack of significance of significant results"
Gerard Palmer, "Generalisations of lattice isomorphisms"
Sirimathie Wewala, "Methods of accounting for maternal effects in the estimation of genetic parameters".
Prof. Ivan Reilly (University of Auckland), "Happenings at the Berkeley meetings, August 1986".
Dr Nigel Barlow (MAF), "The role of modelling in population ecology".
Gordon Knight, "Visual stimuli in mathematical behaviour".
Prof. M.J. Pratt (Dept of Accounting and Finance), "What are decision support systems?"

M.R.C.

AUCKLAND UNIVERSITY

Computer Science

Barbara Reilly has been awarded a Churchill Fellowship, to enable her to study facilities for women to become professional mathematicians.

Kevin Burrage attended a conference on Numerical Solution of Differential Equations, held at Albuquerque in August.

Garry Tee attended the ICM-86 at Berkeley in August, and the Second Symposium on the Early Uses of Metals and Alloys at Zhengzhou, Peoples Republic of China, in October.

Seminars:
Dr Grant Cowie (Systems Science and Research), "Sailmaker - a Startup Software Product".
Paul Hargreaves (Datacom Group Ltd), "Datacom Group Ltd - the development of a New Zealand computer company".
Professor J.D. Spraggins (Clemson University, U.S.A.), "Current Computer Communication Network Reliability Models: A Critical Assessment".
Dr Albert Yeap (University of Otago), "Artificial intelligence".
Dr Norman Foo (University of Sydney), "An introduction to data abstraction".
Dr Paul Lyons (Massey University), "Masseynet - a local network using wide area techniques".
Mark Apperley (Massey University), "Soup's off dear! (or, The trouble with menus)".

G.J.T.

Mathematics and Statistics

This is the report you get when the reporters, Marston Conder and Ivan Reilly, are on leave. Ivan did leave this photograph though, probably a relic of his travels a year ago. It shows, from left to right, Terry Speed and Ivan (whom you may just recognize), Jose-Luis Massera (released from Uruguayan prison) and Lee Lorch.

Photo: *Vivian Raineri, Berkeley, California.*

Springer books available for review:

Grundlehren der mathematischen Wissenschaften

Riemann-Roch Algebra, by W. Fulton, S. Lang, 203 pages.
Elliptic Functions, by K. Chandrasekharan, 189 pages.
The Analysis of Linear Partial Differential Operators III Pseudo-Differential Operators, by L. Hörmander, 525 pages.
IV Fourier Integral Operators, 352 pages.
Interacting Particle Systems, by T.M. Liggett, 488 pages.
Quadratic and Hermitian Forms, by W. Scharlau, 421 pages.
Geometry of Algebraic Curves (in 2 volumes) Volume 1 by E. Arbarello, M. Cornalba, P.A. Griffiths, J. Harris, 386 pages.
Microdifferential Systems in the Complex Domain by P. Schapira, 214 pages.
Arithmetic Functions and Integer Products, by P.D.T.A. Elliott, 461 pages.
Toposes, Triples and Theories by M. Barr, C. Wells, 345 pages.

WAIKATO UNIVERSITY

Ernie Kalnins brought a term on study leave to an end by spending a month with his colleague Bill Miller in Minnesota.

Professor Teddy Zulauf, due to retire at the end of January, will then become Professor Emeritus. At his farewell function, he was given several tokens of his 18 years here: a stainless steel thermos (to recall the "interminable meetings" he had to attend), a chocolate "Z" (his signature), a Rubik's chain (a reminder of real-life mathematics), and the wherewithal for a book.

Terry Robb, one of our first class graduates a few years ago, returned after completing a doctorate at King's College, London, and took up a Research Fellowship. This makes him a planet wandering round our two Suns; today in bright sunshine, he, Kevin Broughan and Philip Etheridge all took up pick and shovel to lay plastic pipe for more Ethernet connections...

Besides the second Sun (forecast in August), two microVAX graphics workstations have arrived and will be installed shortly.

Negotiations are under way to have Senac (the Software Environment for Numeric and Algebraic Computation which succeeds Pipi) and Naglink distributed in New Zealand by the University of Waikato, and in Australia by Siromath.

Ian Craig and Alfred Sneyd continue their joint work on solutions of the force-free field equations, shortly with the help of those microVAXes, and Ian will spend six weeks in Hawaii this summer, working with Sandy McClymont.

Seminars: *
G. Williams and Dr E. Kalnins (Waikato University), "Spin Perturbations of a Black Hole".
Prof. M.K. Bennett (U. Massachusetts), "Connections between Geometry and Algebra".
Dr J. Scott (Management Studies, Waikato University), "Lagrangian Relaxation, Benders Decomposition and a Craft Scheduling Problem".
Dr T.P. Speed (C.S.I.R.O.), "Generalised Wreath Product Groups and their Role in Statistcs", "What Statistics should be taught in Schools?", and "Quantifying Risks: When Can You Believe the Experts"?
Dr A.D. Sneyd (Waikato University), "Time Development of Waves due to a Steadily Moving Source".

Waikato Centre for Applied Statistics

The University and the Ruakura Agricultural Research Centre have jointly established this Centre, in order to unite the talents of the University and Ruakura statisticians to the benefit of both institutions. The Centre will provide a statistical consultancy service for the wider community as well as the host institutions. It will, we all hope, gain recognition throughout the nation for its expertise in applied statistics.

The Centre will be run by a director paid jointly by the University and Ruakura and its membership will be confined at first to staff in either institution with a substantial interest in applied statistics. Even so, it offers a range of expertise and a wealth of experience without equal in New Zealand. In the end, it should support itself, employ staff and help induct senior students into the arts of applied statistics, all on the income earned on its contracts. In order to establish and maintain its integrity and reputation, the Centre will referee all its reports.

The inaugural Director, Dr R.A. Littler, whose appointment has just been announced, will not only have to set the Centre up and run it, he will also have to "tout for business" in government and industry.

K.A.B.

* Also -- I. Ziedins (Edinburgh University), "Modelling Circuit-Switched Networks".

Visitors

The information is arranged as follows: name of visitor; home institution; whether accompanied; principal field of interest; dates of visit; principal host institution; principal contact; comments.

Definite Visits

Professor G.D. Anderson; Michigan State University; spouse and son; complex analysis, extremal rings and quasiconformal mappings; September 1986 – September 1987; University of Auckland; Dr M.K. Vamanamurthy.

Professor Charles G. Broyden; University of Essex; numerical analysis, optimization; March – May 1987; University of Canterbury; R.L. Broughton; Prof. Broyden is an Erskine Fellow.

Professor Charles K. Chui; Texas A. & M. University; approximation theory, multivariate spline approximation, digital filter design; September – November 1987; University of Canterbury; Dr R.K. Beatson; Professor Chui is an Erskine Fellow.

Professor M. Golubitsky; University of Houston; bifurcation theory; 27 January 1987 – 30 January 1987; Massey University; Professor G.C. Wake.

Professor B.F. Gray; School of Chemistry, Macquarie University, Australia; Mathematics of Chemistry; 12 February 1987 – 28 February 1987; Massey University; Professor G.C. Wake.

Dr Herbert Huppert; University of Cambridge; geophysical fluid mechanics; April 1987; University of Canterbury; Professor B.A. Woods; Dr Huppert is an Erskine Fellow.

Dr J.A. John; University of Southampton; spouse and children; design of experiments; 1 February 1986 – 31 January 1987; DSIR Applied Maths Auckland Substation; Dr J. Maindonald.

Professor Saunders MacLane; University of Chicago; Philosophy of Mathematics, topos theory, category theory; 15 February – 31 March 1987; University of Otago; Dr G. Olive; Professor MacLane will be the 1987 NZMS Visiting Lecturer.

Professor Michael D. Perlman; University of Washington; wife and children; Multivariate Statistics; 21 February 1986 – 11 April 1987; University of Canterbury; Dr G.R. Wood; Professor Perlman will hold an Erskine Fellowship.

Professor Mendel Sachs; University of Buffalo; spouse; philosophy of science, relativity; 16 February – 30 March 1987; University of Canterbury; Professor B.G. Wybourne, Department of Physics.

Dr Richard Slansky; Los Alamos; spouse; particle physics, group theory, strings, Kac–Moody algebras; 15 March – 24 April 1987; University of Canterbury; Professor B.G. Wybourne, Department of Physics;Dr Slansky is an Erskine Visitor.

Professor Ivar Stakgold; University of Delaware; wife; nonlinear partial differential equations; 15 January – February 1987; Massey University; Professor G.C. Wake.

Dr John Strathdee; Trieste; spouse; particle physics, strings; 20–25 April 1987; University of Canterbury; Professor B.G. Wybourne, Department of Physics.

Professor Anne Penfold Street; University of Queensland; combinatorics; September – November 1987; University of Canterbury; Dr D.R. Breach; Professor Penfold Street is an Erskine Fellow.

Dr L.A. Szekely; Eotvos L University, Budapest; combinatorics; January 1986 – December 1986; University of Auckland; Dr N.C. Wormald.

Dr Alan B. Tayler; University of Oxford; wife; differential equations, mathematics in industry; 4–13 February 1987; Massey University; Professor Wake.

Dr Peter Wood; Australian National University; observation and numerical modelling of variable stars; 9-31 March 1987; University of Canterbury; Dr Peter Cottrell, Department of Physics.

Professor Christopher Zeeman; University of Warwick; wife; topology, catastrophe theory; 21 March 1987 - 11 April 1987; University of Auckland; Professor D. Gauld; Professor Zeeman holds the Forder Lectureship for 1987.

The following people will be attending the Applied Mathematics Conference, 8-12 February 1987, Wairakei. Conference Director is Professor I.F. Collins, Department of Theoretical and Applied Mechanics, University of Auckland.

Doctor R. Anderson, DMS, CSIRO, Canberra.

Professor Fritz John, New York University.

Professor J.W. Miles, University of California.

Dr Mike Saunders, Stanford University.

Professor Ivar Stakgold, University of Delaware.

Professor Gil Strang, Massachusetts Institute of Technology.

Dr Alan B. Tayler, University of Oxford.

One of the main aims of this listing is to enable institutions other than the principal host institution to invite visitors to spend time with them. Anyone wishing to issue such an invitation should do so through the listed contact person.

Please Note: The production of these lists and the coordination of visits is dependent upon my receiving information. When you have information about a visit, whether it be definite, very likely or possible, would you please forward it to me at the earliest convenience.

Gillian Thornley, NZ Mathematical Society Visitors' Coordinator, Department of Mathematics and Statistics, Massey University.

Next List closes on March 10, 1987.

PROFESSOR   SAUNDERS   MAC LANE

Professor Mac Lane, the NZMS Visiting Lecturer for 1987, offers six seminar topics -

> the Structure and Philosophy of Mathematics,
>
> the Rise and Fall of Abstract Mathematics,
>
> Set Theory and Category Theory,
>
> Topos Theory: Logic meets Geometry,
>
> Homotopy Types of spaces and their Algebraic Descriptions, and
>
> Steenrod Operations and Eilenberg-Mac Lane Spaces in Topology.

The first, closely related to his recent book, Mathematics: Form and Function, deals with general questions about the nature of mathematics and its philosophy. The second topic deals with the extraordinary development of abstract mathematics, beginning with Emmy Noether, and the sense in which the influence of Bourbaki may now be in retreat.

The third and fourth topics, closely related, involve the use of category theory instead of set theory as a foundation for mathematics; the fourth discusses the recent lively interest in topos theory, which combines ideas from both logic and geometry. The remaining pair of lectures cover his present research on the nature of topological spaces and the use of algebraic machinery in analyzing them.

He will spend most of his time at Otago University, February 15 till March 14. Then he will visit Canterbury (March 16-18), Victoria (March 18-21), Massey (March 23-24), Waikato (March 25) and finally, Auckland (March 26-27).

THE FORDER LECTURER

Professor Christopher Zeeman

Professor Henry George Forder was born in England on 27th September 1889, and died in New Zealand on 21st September 1981. Professor of mathematics at Auckland University College from 1934 until his retirement in 1955, he continued to lecture until about 1970. In his will, he bequeathed a sum of money to the London Mathematical Society. Part of the income is used for the Forder Lectureship.

As President Reilly announced in his annual report, the first Forder Lecturer is Professor E. C. Zeeman, FRS, whose research in topology and the applications of catastrophe theory is well known. Professor Zeeman is especially keen to present lectures to students, and because of this, his tour was moved to March/April 1987. Provisionally, he will visit Otago on March 23-25, Canterbury on March 26-27, Victoria on March 30-31, Massey on April 1-3, Waikato on April 6-8, and Auckland on April 9-10.

For more up to date information, contact Professor D. B. Gauld, Auckland University.

COLLOQUIUM 87

The 21st New Zealand Mathematics Colloquium, COLLOQUIUM 87, will be held at the University of Waikato from the evening of Tuesday May 19 to Friday May 22, 1987. Please send any inquiries to

> Dr M. A. Jorgensen,
> University of Waikato,
> Private Bag, Hamilton, N. Z.

Two of the key-note speakers will be Professors Peter Hilton (SUNY, Binghampton, New York) and Jean Pedersen (Santa Clara, California); they will also give public lectures and seminars at several other centres. Details are still fluid; contact Dr J. C. Turner, University of Waikato for more details.

Perspectives in Mathematical Logic

Model-Theoretic Logics, edited by J. Barwise, S. Feferman, 893 pages.
Methods in the Qualitative Theory of Dynamical Systems in Astrophysics and Gas Dynamics, by O.I. Bogoyavlensky, 301 pages.
Representations of Integers as Sums of Squares, by E. Grosswald, 251 pages.
Geometry of Quantum Theory, by V.S. Varadarajan, 412 pages.
Selected Works, by I.M. Vinogradov, 401 pages.
The Beauty of Doing Mathematics, Three Public Dialogues, by S. Lang, 127 pages.
Papers on Fuchsian Functions, by H. Poincaré, 483 pages.

Springer Series in Computational Mathematics

Minimization Methods for Non-Differentiable Functions, translated from Russian, by Shor, N.Z., 162 pages.
Solving Elliptic Problems Using ELLPACK, by J.R. Rice, R.F. Boisvert, 497 pages.

Centrefold

PROFESSOR GRAEME WAKE

Early in 1986, Graeme Wake left his readership at Victoria University of Wellington to take up the newly created chair of mathematics in the Department of Mathematics and Statistics at Massey University. Thus the Victoria department lost an enthusiastic and lively colleague and Massey gained a bright and shiny new professor.

In many ways Graeme's career reflects the coming-of-age of mathematics in New Zealand over the last decade. He has studied and taught in New Zealand and has built an international reputation in mathematical combustion from this base. He is a particularly fine example of a new endemic species "apteryx mathematicus".

His juvenile form was first seen near Eketahuna in early 1943. Somewhat later and further north in Hastings, some of his characteristics were becoming evident. Graeme was dux (equal) of Hastings Boys' High School in 1960. He entered the hallowed halls of Vic, the following year, and completed a brilliant B.Sc. in Mathematics, Physics and Chemistry.

In 1964, Graeme gain an M.Sc. in Mathematics with first class honours. The nefarious honours class included such personalities as Mark Schroder, John Gamlen, Lindsay Hall, Ian Wright, Jim Ansell, Martin Manning, F.D. Ward and Shirley Thompson (maintenant Pledger). All took their mathematics further and all except Graeme and Shirley soon turned out to be migratory mathematicians.

Graeme joined the Victoria Mathematics Department as a Teaching Fellow and under Professor George Mackie began his research. He was awarded his Ph.D. in 1967 for his thesis entitled "Equations of Heat Conduction with Slow Combustion". This was the first mathematical Ph.D. at Victoria and marked the turning point in the department, from a purely teaching department to a teaching and research department. So it has remained, though with a continuing interest in the quality of teaching and a concern for students, that Graeme embodies.

Thus began Graeme's programme of research which has led to 42 publications. He has been deeply involved in the mathematical theory of ignition, which has led him through non-linear eigenvalue and boundary value problems, on search for the disappearance of criticality to the theory of thermal explosions with simultaneous parallel reactions (parts I, II and III appearing in the Proceedings of the Royal Society of London in 1984, 1985 and 1986). On the way it was not all bifurcation and phase-plane analysis, there were fires to prevent in wool, wood-chips and milk-powders, and fires to start in lignite and other fuels. He is both a mathematical fire-man and a fire-raiser.

But here we have not just a research mathematician but a committed and caring teacher, as shown by the quality of his lectures, his supervision of a number of research students and his personal concern for students. A wider concern was also shown by his terms as Academic Dean of Science, and as V.U.W. Branch Chairperson of the Association of University Teachers.

On the N.Z.M.S. Council in 1974/75 and 1977/79, Graeme was President in his last year and represented New Zealand at the 1978 Helsinki International Mathematics Union General Assembly. As editor/organiser of the N.Z.M.S. Syllabus Series on Applied Mathematics, he sold over 10,000 volumes from 1981 to 1985. He is currently responsible for finance and publicity on the N.Z. Mathematics Olympiad Committee.

Graeme has undertaken mathematical missionary work abroad with his research leaves at Brasenose College, Oxford, and the University of Leeds, and as an invited speaker to a recent AMS/SIAM research seminar at Cornell. But he is equally adept at attracting distinguished co-workers to New Zealand.

A keen tennis player and football manager/coach, Graeme found the transfer offer as a mathematical player/manager for the Massey Club, too good to refuse. We at Vic miss both Graeme and his wife Elizabeth, who has hosted many a successful mathematical function. We wish them and their family well in the wind less north.

<div align="right">

Jim Ansell
V.U.W.
</div>

Forum

GRADUATE INFORMATION PROJECT

In 1983, the NZMS initiated a scheme whereby graduates in the mathematical sciences would be asked after three years to report on their experiences as users of mathematics in the workplace. The intention is to build up gradually a file of such reports and to publish suitable extracts or summaries, in a revised employment brochure, say. These reports will, one hopes, provide valuable information on employment opportunities in the mathematical sciences, and also on the requirements of the workplace. The first reports came in this year, two from Massey and three from Auckland. I thought members might be interested in seeing a summary...

Reports A and E came from women graduates, and the others from men. They were asked eight questions. (Editor's query: How would you have answered, at the same stage in your career?)

1. Where have you been employed since graduation?

    A. Secondary teacher.
    B. Accoustical consultant.
    C. Costing clerk.
    D. Secondary teacher.
    E. Electronics technician (1 year), then forecasting analyst/production planner in a printing works.

2. What has been the general nature of your work?

    A. Teaching mathematics, science, and remedial mathematics.
    B. Specification of noise control systems.
    C. Preparing quotes.
    D. Teaching history and mathematics.
    E. Repair and design of electronic equipment. Then forecasting product demand and planning production to meet demand.

3. What were the minimum formal qualifications required by your employer?

    A. University degree, teachers college.
    B. None, 'basic knowledge of accoustics and a general grasp of mathematical skills'.
    C. University Entrance.
    D. University degree, teachers college.
    E. NZCE. Then B. Tech, B. E. or B. Sc. in operations research.

4. What mathematical techniques and knowledge have you used in your job?

    A. Very little beyond high-school topics, some stage two calculus.
    B. Arithmetic, logarithmic relationships, trigonometric skills, differentiation and integration.

Not long before its abolition was announced. the National Research Advisory Council (NRAC) asked the NZMS to write a review of the Mathematical Sciences by June 1987. Then the Ministerial Working Party: Review of Science and Technology asked for a quick response - by 11th August 1986. Our Auckland officers accordingly prevailed on the three councillors at Massey to draft an interim statement and send it directly to the Working Party. You may be interssted in their statement, printed below.

The NRAC Review seemed to call for a survey of our members; the Council of the NZMS decided to carry out the survey of mathematical research, as its results will be of interest in any case. As Editor, we urge you to fill in and return the survey form on the 'lift-out' centre section.

Brief Report to the Ministerial Working Party:

Review of Science and Technology

Mathematical Sciences

Mathematical scientists (as represented by the New Zealand Mathematical Society)share the concerns of scientists in other disciplines over the relatively low level of support for research in NZ and the directions in which this research might be driven with the increasing emphasis on 'immediate financial return'. Mathematical research is particularly vulnerable wnen subjected to this sort of pressure. Particular points that need to be made in the light of the terms of reference of the working party are the following:

1. The role of mathematics

The development of ideas and research in the mathematical sciences, although often stimulated by applications, needs to be allowed to mature in an independent way. Other problems and applications may well benefit from ideas and/or methodology developed in this way. The efficiency of mathematics ("same equations, different applications") is proven historically and is well accepted as one of its strengths. Ongoing theoretical work should not be neglected for it provides users with access to a range of tools with which to address current and future problems. Further, NZ as a small country needs to contain a pool of able and active theoreticians who can interact with the large international mathematical community within which progress in the development of new mathematical ideas is proceeding more rapidly than ever before. The importation of these new ideas via competent local people represents one of our most precious resources (see point 5 of the terms of reference).

2. The importance of mathematics

Mathematics continues to underpin other disciplines. As reported recently to the US National Research Council "significant and deep interactions are occurring directly between core mathematics and other fields, including the natural sciences, engineering and social sciences". The report goes on to describe the fact that recently increasing interactions are occurring with the traditional areas of physics, chemistry and engineering but also with new fields such as molecular genetics, business (here in New Zealand the discipline of "financial engineering" is arising), sociology, information sciences, and studies in policy analysis". Indeed it is fair to say that few areas of human activity have failed to benefit from this "mathematization process".

3. Mathematical support for other sciences

An "accountant's view" of research often fails to notice the role of the mathematician in being the "consultant to the consultant". The level of such activity, although perhaps small in particular instances, when taken together makes a significant contribution to our overall success at problem-solving. Any system of research funding should take account of this valuable

activity. (See point 7 of the terms of reference.)

4. Appropriate groupings for support of the Mathematical Sciences

There is no clear demarcation between pure and applied research. They stand or fall together - it is just a matter of balance. It is clear that, mathematical scientists need to "rub minds together" in groupings of sufficient size so as to generate ideas in a supportive environment. Mathematicians working successfully in isolation are rare indeed. The body of knowledge described as "mathematical science" is so vast, that one or two persons cannot be aware of its ramifications across all fields.

The particular needs of mathematical scientists seem to be in the areas of the provisions of groupings of sufficient size (with links to other disciplines of course), the provision of support personnel and facilities, and opportunity for travel to maintain links with the international community (both travel overseas to important subject gatherings and visitors to NZ).

Mathematical work is carried out in many different agencies (DSIR, Universities, MAF, MWD, Meteorological Office, ...) and the rigidity of institutional boundaries could prevent the best use of resources and cause duplication of effort. (See point 6 of the terms of reference). A move to joint appointments and contracts would be welcome to free up this rigidity, provided career paths can continue to be identified.

5. Funding of research

It is felt that a "user pays" policy will inhibit interaction, prevent free-exchange of information, and lead to possible duplication of effort. A charging system can be justified in part but the disadvantages might well outweigh the advantages (see point 7 of the terms of reference). In particular the funding of basic, theoretical work will suffer if too much emphasis is placed on research for which some customer is willing to pay.

<div align="right">

G.C. Wake
G.M. Thornley
M.R. Carter

Massey University,

On behalf of the NZ Mathematical Society
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Book Reviews

From time to time, Springer-Verlag offers books for review: if you wish to review any of the books listed below (and in other odd corners of this issue), please contact the reviews editor, John Clark, Mathematics Department, Otago University.

Undergraduate Texts in Mathematics

Intermediate Calculus, by M.H. Protter, C.B. Morrey Jr, 650 pages.
Calculus I, by J. Marsden, A. Weinstein, 385 pages.
From Fermat to Minkowski, Lectures on the Theory of Numbers and Its Historical Development, by W. Scharlau, H. Opolka, 184 pages.
Nonlinear Functional Analysis and Its Applications Part III: Variational Methods and Optimization, by E. Zeidler, 662 pages.
Methods for Solving Incorrectly Posed Problems, by V.A. Morozov, 257 pages.
Ramanujan's Notebooks, Part 1, by B.C. Berndt, 357 pages.
Lectures on Stochastic Control and Nonlinear Filtering, by M.H.A. Davis, 109 pages.
Differential Equations, by A.N. Tikhonov, A.B. Vasil'Eva, A.G. Sveshnikov, 238 pages.
Nonlinear Functional Analysis, by K. Deimling, 450 pages.

Miscellaneous

Foundations of Constructive Mathematics, by M.J. Beeson, 466 pages.
Vertex Operators in Mathematics and Physics, Proceedings of a Conference, November 1983, 482 pages.

COMPUTATIONAL MATHEMATICS: AN INTRODUCTION TO NUMERICAL APPROXIMATION, by T.R.F. Nonweiler, Ellis Horwood (1984).

As, in the preface, Professor Nonweiler states that the student should have some familiarity with Taylor series and its remainder, as well as the integral mean-value theorem, the book is presumably aimed at NZ 200-level students with 100-level Calculus as a prerequisite. Little linear algebra is used, which may explain the omission of any material on numerical linear algebra. Another obvious omission is a chapter on the numerical solution of differential equations. However one must assume that the book would have been too long had these been included.

Chapter 1 deals at some length with errors in floating-point operations. The omission of augmentation (or 'boosting', to use the author's term) would cause less confusion in the otherwise clear discussion of the effects of rounding error. Following sections dealing with transmitted and generated error, and error in arithmetic operations, are fairly comprehensive, but like much of the book, would benefit from more numerical examples.

Chapter 2 commences with a comprehensive discussion of the control of error in summation and is a natural consequence to Chapter 1. The introduction to continued fractions really prefaces rational approximation later in the book and is rather lengthy at this introductory stage. The final section gives a good introduction to numerical instability of recurrence relations. Overall, I found this the most satisfactory chapter of the five.

Interpolation is the focus of Chapter 3. It commences with a rather laboured introduction to Lagrange Interpolation, mitigated by a good explanation of the Runge phenomenon. However the description of linear cross-means could present difficulty for an average undergraduate student. Subsequent development of the Newton form is not very clear and his use of non-standard divided-difference notation makes cross-reference to other texts unnecessarily difficult. Sections on Hermite and piecewise polynomial interpolation are followed by a comprehensive (at this level) section on spline approximation which would benefit from additional numerical examples: the same criticism may be levelled at the next section on rational approximation. Remaining sections cover Tchebyshev polynomials and their use in approximation (including minimax) in a readable manner.

Chapter 4 is a very comprehensive introduction to the univariate root-finding problem, a topic obviously of special interest to the author. After covering the standard methods, he describes various modified Regula Falsi methods, followed by a timely section on multiple roots and, as a useful bonus, a brief section on univariate minimisation. Curiously, in view of his detailed treatment of the root-finding problem, only passing reference is made to the commonly used hybrid methods.

The final chapter covers aspects of numerical quadrature. The first section indicates, without much detail, how to derive Newton-Cotes open and closed formulae and lists them up to order 6. Composite formulae then lead into a clear exposition of the Romberg technique. The use of Gaussian-type formulae is described together with a brief introduction to Patterson-type ideas and some examples of transformation of the integrand. An adequate coverage of adaptive quadrature follows and the text concludes with sections on line integrals and singular integrands.

An appendix contains a selection of BASIC subroutines for some of the more commonly used algorithms developed in the preceding chapters, each with an explanation of use. While such subroutines (in BASIC or some other language) have become almost obligatory in recent texts, in my experience they are of limited use, as the majority of the ucrrent generation of students possess the necessary programming skills and those with particular interest in performing calculations almost certainly would prefer to develop their own subroutines.

The book concludes with a reasonable number of problems of varying difficulty: some additional routine numerical problems would make the problems more accessible to the average student. The hints and solutions which follow generally provide the student with enough detail to complete her/his attempted solutions.

I find myself in an ambivalent position in attempting to give an overall impression on the book, which claims to make "a complete break from other texts on numerical analysis, pioneering new ground and giving fresh emphasis to a familiar subject", and that it "will appeal to students with a particular interest in performing calculations". I am inclined to agree with the first statement as I found much of interest and an able 300 level student with a sound grasp of basic material could well have the same experience. However I have serious reservations about the second statement, as I feel that a textbook, as well as presenting the more able students with real challenges, should provide the average student with ready access

to relevant theory and numerical examples: in my opinion this latter purpose is not well served by this book.

Adrian Swift
Massey University

    C. Arithmetic, trigonometry, geometry.
    D. Mathematics, statistics and computing up to 7th form level.
    E. Electrical formulae and once, Fourier analysis. Then forecasting techniques using moving experimental averages; a general background in operations research was useful.

5. Do you feel that your mathematical training at University prepared you adequately for your job?

    A. Yes. More advanced knowledge was useful in motivation of elementary material. There should be more emphasis at University on where and how the material is applied.
    B. Yes. Have not needed to read technical papers containing mathematical derivations. Mathematical training has improved ability to 'talk technical' with someone lacking U. training.
    C. Overprepared.
    D. Adequate. but more real-world applications and less theory would have helped.
    E. Yes - Technology training more important than mathematical training in this job. And yes, training excellent for this job.

6. Have you found it necessary to supplement your mathematical knowledge since graduating?

    A. Refresher material only, relearning techniques not adequately grasped as a student. Some calculus applications and physics had to be learned.
    B. No. Occasional revision of course notes and text books.
    C and D. No.
    E. Some specialised reading on forecasting required for the second job.

7. Can you foresee any future changes in the nature or amount of mathematical knowledge that may be required in order to be able to do your present job?

    A. Because of shrinking secondary school syllabus, possibly not. Probably some computer science.
    B. Mathematical requirements are not likely to change significantly. More use of computers expected.
    C. No, not in the present job.
    D. More knowledge of computer science likely to be required.
    E. No and no.

8. Any other comments?

    A. Still unsure of what jobs are available with present mathematical background. Would have appreciated lunch-time speeches from graduates or future employers to improve perspective of possible careers.
    B. Concerned that students not come to rely too heavily on calculators and computers without understanding methods, because lack of such understanding can cause disastrous mistakes.
    C. Mathematical training has made a not-too-difficult job relatively easy.
    D. No.
    E. Important to be able to explain mathematical ideas to non-mathematical management.

Michael Carter, Massey University,
NZMS Graduate Information Co-ordinator.

Conferences

1987

January 5–9
(Molokai,
Hawaii)

Conference on Lattice Theory and Universal Algebra
Details from J.B. Nation, Department of Mathematics, University of Hawaii,
2565 The Mall, Keller 401A Honolulu, Hawaii 96822, U.S.A.

January 12–14
(Claremont,
California)

*Conference on Industry-University Collaborations in the Mathematical
Sciences*
Details from E. Cumberbatch, Claremont Graduate School, Claremont,
California 91711, U.S.A.

January 12–16
(Havana,
Cuba)

Seminar on Approximation and Optimization
Details   from H.T. Banks, Applied Mathematics Division, Brown University,
Providence, Rhode Island 02912, U.S.A.

January 19–30
(Armidale,
New South Wales)

27th Summer Research Institute of the Australian Mathematical Society.
Details from Dr B. Sims, Department of Mathematics, Statistics and Computer
Science, University of New England, Armidale, NSW 2351, Australia.

January 20–24
(Berkeley,
California)

Workshop on Iwasawa Theory and Special Values of L-functions
Details from J. Coates, Mathematical Sciences Research Institute,
1000 Centennial Drive , Berkeley, California 94720, U.S.A.

January 26–30
(Palmerston
North, N.Z.)

*56th Congress of the Australian and New Zealand Association for the
Advancement of Science*
Details from Dr M. Baxter, Dept of Microbiology & Genetics, Massey
University, Palmerston North, New Zealand.

February 8–12
(Wairakei, N.Z.)

Australian Mathematical Society Applied Mathematics Conference
Details from Dr S.J. Byrne, Department of Theoretical and Applied Mechanics,
University of Auckland, Private Bag, Auckland 1, New Zealand.

March 16–20
(Toulouse,
France)

Seminaire de Probabilités XXII
Details from G. Letac, Laboratoire de Statistiques et Probabilités,
Université Paul Sabatier, 118 Route de Narbonne, 31062 Toulouse Cédex, France.

March 17–27
(Manila)

Conference on Analysis
Details from Dr Norman F. Quimpo, Department of Mathematics, Ateneo de Manila
University, P.O. Box 154, Manila, Philippines.

March 23–27
(Minneapolis,
Minnesota)

Workshop on Scientific Software
Details from Institute for Mathematics and its Applications, University of
Minnesota, 514 Vincent Hall, 206 Church Street S.E., Minneapolis,
Minnesota 55455, U.S.A.

March 23–28
(Haifa)

*Fifth International Conference on Geometry, Combinatorial Structures,
Convexity*
Details from J. Zaks, Department of Mathematics, University of Haifa, 31999,
Haifa, Israel.

March 23–30
(Columbus,
Ohio)

NSF-CBMS Conference on Mathematical Statistics
Details from S. Leurgans, Department of Mathematics, Ohio State University,
Columbus, Ohio 43210, U.S.A.

March 30–Apr 2
(Cesme, Turkey)

Conference on Statistical Computing
Details from Prof. Aydin Oztürk, Conference Secretary, First International
Conference on Statistical Computing, Ege Üniversitesi, Bilgisayar Arostirma
ve Uygulama Merkezi, 35100 Bornova, Izmir, Turkey.

April 6–8
(Reading,
England)

*Joint IMA/SMAI Conference on Computational Methods in Aeronautical Fluid
Dynamics*
Details from Deputy Secretary, The Institute of Mathematics and its
Applications,Maitland House, Warrior Square, Southend-on-Sea, Essex S51 2JY.

April 21–25 (Antwerp)	*Conference on Nonlinear Numerical Methods based on the use of Rational Functions* Details from A. Cuyt, Department of Mathematics and Computer Science, University of Antwerp (UIA), Universiteitsplein 1, B–2610 Wilrijk (Antwerp), Belgium.
April 27–30 (Lyon, France)	*Workshop on Mathematical Modelling in Combustion and Related Topics* Details from C. Schmidt-Laine, École Centrale de Lyon, B.P. 163, 69131-Ecully Cedex, France.
April 28–May 1 (Uxbridge, England)	*The Mathematics of Finite Elements and Applications* Details from Secretary, The Institute of Computational Mathematics, Brunel University, Uxbridge, Middlesex UB8 3PH, England.
May 11–15 (Geelong, Victoria)	*31st Annual Meeting of the Australian Mathematical Society* Details from Dr K. McAvaney, Division of Computing and Mathematics, Deakin University, Victoria 3217, Australia.
May 14–15 (Melbourne)	*Statcomp 87* Details from Conference Secretary, STATCOMP 87, Department of Statistics, La Trobe University, Bundoora, Victoria 3083, Australia.
May 20–23 (Hamilton, New Zealand)	*1987 New Zealand Mathematics Colloquium* Details from Dr M.A. Jorgensen, Mathematics Department, University of Waikato, Private Bag, Hamilton, New Zealand.
May 20–23 (Victoria, Canada)	*Combinatorial Matrix Analysis Conference* Details from P. van den Driessche, Department of Mathematics, University of Victoria, Victoria, British Columbia, Canada V8W 2Y2.
May 25–27 (Berkeley, California)	*Workshop on Nonlinear Hyperbolic Waves* Details from J. Glimm, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, U.S.A.
May 25–29 (Montréal)	*Ninth International Symposium on Noise in Physical Systems* Details from S. L'Ecuyer, Centre de recherches mathématiques, Université de Montréal, C.P. 6128, Succursale A., Montréal, Québec H3C 3J7, Canada.
May 28–June 1 (Singapore)	*Fourth South-East Asian Conference on Mathematical Education* Details from Dr Ong Sit Tui, Department of Mathematics, Institute of Education, Bukit Timah Road, Republic of Singapore 0511.
June 8–19 (Singapore)	*Singapore Group Theory Conference* Details from Singapore Group Theory Conference, Department of Mathematics, National University of Singapore, Kent Ridge Road, Republic of Singapore 0511.
June 11–13 (Rome)	*Congress on Educational Computing in Mathematics* Details from M. Emmer, Dipartimento di Matematica, Università di Roma I, Piazzale A. Moro, 00815 Roma, Italy.
June 15–July 3 (Berkeley, California	*Microprogram on Commutative Algebra* Details from Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, California 94720, U.S.A.
June 17–19 (Dublin)	*Nasecode V - Fifth International Conference on the Numerical Analysis of Semiconductor Devices and Integrated Circuits* Details from Nasecode V, Conference Management Services, P.O. Box 5, 51 Sandycove Road, Dun Laoghaire, Co. Dublin, Ireland.
June 23–26 (Bethlehem, Pennsylvania)	*Sixth IMACS International Symposium on Computer Methods for PDE's* Details from IMACS Secretariat, Department of Computer Science, Rutgers University, New Brunswick, New Jersey 08903, U.S.A.

June 23-27
(Dubrovnik,
Yugoslavia)

International Conference on Generalised Functions, Convergence Structures and their Applications
Details from Institute of Mathematics (GFCA-87), Dr Ilije Djuricica 4, 21000 Novi Sad, Yugoslavia.

June 29-July 4
(Paris)

First Joint International Conference on Industrial and Applied Mathematics
Details from Deputy Secretary, The Institute of Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY, England.

July 6-10
(Gregynog,
Wales)

Third Gregynog Symposium on Differential Equations
Details from Dr M.G. Lloyd, Department of Mathematics, The University College of Wales, Aberystwyth, Dyfed, SY23 3B2, Wales, U.K.

July 6-16
(London)

Research Symposium on Complex Analysis
Details from Dr I.N. Baker (Research Symposium on Complex Analysis), Mathematics Department, Imperial College, 180 Queens Gate, London SW7 2BZ, England.

July 13-17
(Karlsruhe,
Germany)

Fourteenth International Colloquium on Automata, Languages and Programming
Details from International Colloquium on Automata, Languages and Programming, Institut für Angewandte Informatik und Formale Beschreibungs-verfahren, University of Karlsruhe (TH), Postfach 6980, 7500 Karlsruhe, Federal Republic of Germany.

July 13-17
(London)

Eleventh British Combinatorial Conference
Details from Mrs C. Whitehead, Department of Mathematical Sciences, University of London, Goldsmith's College, London SE14 6NW, England.

July 13-17
(Birmingham)

Inequalities Conference
Details from the Organising Secretary, Inequalities Conference, Department of Mathematics, University of Birmingham, P.O. Box 363, Birmingham B15 2TT, England.

July 19-24
(Prague)

Conference on Potential Theory
Details from E. Cermáková, matematicko-fyzikálni fak. UK, Solovská 83, CSSR-18600 Praha 8, Czechoslovakia.

August 1-6
(People's
Republic of
China)

Fifth Conference on Graph Theory of China
Details from Z. Zhong-fu, Lanzhou Railway Institute, Lanzhou, Gansu, People's Republic of China.

August 9-15
(Nedlands,
W. Australia)

International Conference on Abelian Groups
Details from Dr P. Schultz, Mathematics Department, University of Western Australia, Nedlands, Western Australia 6009, Australia.

August 16-21
(Stanford,
California)

Sixteenth Conference on Stochastic Processes and their Applications
Details from D. Iglehart, Department of Operations Research, Stanford University, Stanford, California 94305-4022, U.S.A.

August 17-20
(Sydney)

International Conference on Computational Techniques and Applications
Details from Dr C.A.J. Fletcher, CTAC-87, Department of Mechanical Engineering, University of Sydney, NSW 2006, Australia.

August 24-28
(Xanthi,
Greece)

Conference on Differential Equations "Equadiff 87"
Details from J. Schinas, Equadiff '87, Democritus University of Thrace, Section of Applied Mathematics, 67100 Xanthi, Greece.

August 24-28
(Canberra,
Australia)

Second International Conference on Combinatorial Mathematics and Computing
Details from B. McKay, Computer Science Department, Australian National University, P.O. Box 4, Canberra, ACT 2601, Australia.

August 24-28
(Szeged,
Hungary)

International Conference on Web Geometry and Related Fields
Details from P. Nagy, Bolyai Institute, Szeged University, Aradi Vértanük
tere 1, H-6720 Szeged, Hungary.

August 24-29
(Mons,
Belgium)

Meeting on Geometry of Banach Spaces
Details from C. Finet, Université de l'Etat à Mons, Faculté des Sciences,
15 avenue Maistriau, 7000 Mons, Belgium.

Sept 9-12
(Kassel,
Germany)

*Internationale Konferenz uber Anwendungen und Modellbildung in
Mathematikunterricht*
Details from W. Blum, Univ. GHS Kassel, FB Mathematik, Heinrich-Plett-Str.
40, D-3500 Kassel, Federal Republic of Germany.

Sept. 13-19
(Ulm,
Germany)

Journées Arithmétiques 1987
Details from E. Wirsing, Univ. Ulm, Abt. Mathematik II, Postfach 4066,
D-7900 Ulm, Federal Republic of Germany.

Sept. 28-30
(Valencia,
Spain)

International Conference on Linear Algebra and Applications
Details from Prof. Vicente Hernandez, E.T.S. Ing. Industriales, Universidad
Politécnica, Apartado 22012, 46071 Valencia, Spain.

Oct. 19-23
(Johannesburg,
South Africa)

*20th International Conference on the Application of Computers and Mathematics
in the Mineral Industries*
Details from Conference Secretary (c.31), Mintek, Private Bag X 3015,
Randburg 2125, South Africa.

Oct. 25-31
(Schwerin,
East Germany)

International Conference on Population Mathematics
Details from the Secretariat ICPM 87, A. Kollat, Gesellschaft für
physikalische und mathematische Biologie der Deutschen Demokratischen
Republik, Am Kupfergraben 7, Berlin 1080, German Democratic Republic.

Oct. 26-30
(Beijing)

Third Asian Conference on Mathematical Logic
Details from Yang Dongping, Institute of Software, Academia Sinica,
P.O. Box 8718, Beijing, Peoples Republic of China.

Oct. 26-31
(Sofia)

International Conference on Mathematical Methods in Operations Research
Details from Institute of Mathematics with Computer Centre, Bulgarian
Academy of Science, 1113 Sofia, Acad. G. Bonchev, Block 8, Bulgaria.

1988
Jan.20-Feb.5
(Newcastle,
N.S.W.)

28th Summer Research Institute of the Australian Mathematical Society
Details from Dr R. Eggleton, Department of Mathematics, Statistics and
Computer Science, University of Newcastle, Rankin Drive, Shortland,
NSW 2308, Australia.

May 16-20
(Canberra)

*1988 Mathematical Sciences Congress and 32nd Annual Meeting of the Australian
Mathematical Society*
Details from Prof. C.C. Heyde, Department of Statistics, Institute of
Advanced Studies, Australian National University, GPO Box 4, Canberra,
ACT 2601, Australia.

May 23-27
(Chiangmai,
Thailand)

Conference on Mathematical Methods and Applications
Details from Prof. Suwom Tangmanee, Faculty of Science, Kasetsart University,
Bangkok 10900, Thailand.

July 27-Aug. 3
(Budapest)

Sixth International Congress on Mathematical Education
Details from Dr M.F. Newman, Department of Mathematics, Research School of
Physical Sciences, Institute of Advanced Studies, The Australian National
University, P.O. Box 4, Canberra, ACT 2601, Australia.

August 20-26
(Pusan,
Republic of
Korea)

Groups - Korea 1988
Details from Prof. A.C. Kim, Department of Mathematics, The Pusan
National University, Pusan 607, Republic of Korea.

Two entries were inadvertently left off the 1987 section of this list:

1987

August 17-20
(Hobart,
Tasmania)

International Conference on Rings, Modules and Radicals
Details from Dr B.J. Gardner, Mathematics Department, University of
Tasmania, G.P.O. Box 2520, Hobart, Tasmania 7001, Australia.

August 24-28
(Seattle,
Washington)

Sixth National Conference on Artificial Intelligence
Details from L. Cooper, American Association for Artificial Intelligence,
445 Burgess Drive, Menlo Park, California 94025, U.S.A.

In addition, readers may be interested in the Oberwolfach Tagungen, week-long seminars held
in that scenic Black Forest township. One attends by invitation; the Editor (Mark Schroder)
has a list of topics, dates and organisers, but for more details, contact

Mathematisches Forschungsinstitut Oberwolfach, Geschäftstelle:
Albertstrasse 24,
D-7800 FREIBURG,
Federal Republic of Germany.

The Newsletter will print this information, if enough of you ask for it: contact the collator,

Dr M.R. Carter,
Massey University.

Springer books available for review: see page 24.

Lecture Notes in Mathematics

Ordinary and Partial Differential Equations, Dundee, Scotland, 1984, 357 pages.
Asymptotic Expansions for Pseudodifferential Operators on Bounded Domains, by H. Widom,
   150 pages
Probability in Banach Spaces, V. Medford, USA, 1984, 457 pages.
Singular Perturbation Analysis of Discrete Control Systems, by D.S. Naidu, A.K. Rao,
   195 pages.
Stability Problems for Stochastic Models, Uzhgorod, USSR, 1984, 447 pages.
Global Differential Geometry and Global Analysis 1984, 339 pages.
Classifying Immersions into $\mathbb{R}^4$ over Stable Maps and 3-Manifolds into $\mathbb{R}^2$, by H. Levine,
   163 pages.
Schrödinger Operators, Como 1984, 272 pages.
Characterization of Distributions by the Method of Intensively Monotone Operators, by
   A.V. Kakosyan, L.B. Klevanov, J.A. Melamed, 175 pages.
Measure Theory Oberwolfach 1983, 327 pages.
Multifunctions and Integrands, Stochastic Analysis, Approximation and Optimization,
   Proceedings of a Conference held Italy, 1983, 234 pages.
Complete Intersections, Lectures given at C.I.M.E., Italy, 1983, 299 pages.
Stochastic Analysis and Applications Proceedings of the International Conference held in
   Swansea, 199 pages.
Théorie du Potentiel Proceedings of the Colloque Jacques Deny held at Orsay, 582 pages.
Ecole d'Eté de Probabilités de Saint-Flour XII - 1982, 396 pages.
Precise Spectral Asymptotics for Elliptic Operators Acting in Fiberings over Manifolds with
   Boundary, by V. Ivrii, 238 pages.
Resolution of Surface Singularities by V. Cossart, J. Giraud, U. Orbanx, 132 pages.
Stratified Mappings - Structure and Triangulability by A. Verona, 160 pages.
Models and Sets. Computation and Set Theory, Proceedings of the Logic Colloquium held in
   Aachen, 1983, Parts I, II, 484 pages.
Rational Approximation and Interpolation Proceedings of the Conference at Tampa, Florida,
   528 pages.
Techniques of Admissible Recursion Theory by C.T. Chong, 214 pages.
Nonlinear Analysis and Optimization Proceedings of the Conference in Bologna, 214 pages.
Global Analysis - Studies and Applications I. Editors: Y.G. Borisovich, Y.E. Gliklikh,
   301 pages.

Secretarial

MINUTES OF THE TWENTIETH COUNCIL MEETING OF THE

NEW ZEALAND MATHEMATICAL SOCIETY

held at the University of Auckland on Thursday, 23 October 1986, commencing at 10.10 a.m.

PRESENT: Ivan Reilly (in the Chair), Marston Conder, John Harper, Murray Jorgensen, Ernie Kalnins, John Shanks, Gillian Thornley, Brent Wilson, Brian Woods, and Mark Schroder (for item 13 only).

The President also welcomed Derrick Breach and David Gauld for part of the meeting (see item 3(i) below).

APOLOGIES: Earl Irving (N.Z.A.M.T.)

MINUTES OF 19TH COUNCIL MEETING AND THE SUBSEQUENT BRIEF COUNCIL MEETING

Moved (JH/GT) that the Minutes of the two previous Council meetings be taken as read, and approved.

CARRIED

MATTERS ARISING FROM THE MINUTES:

(From here on, the items listed are not necessarily the order in which they were considered.)

(a) National Committee Nominations:

It was noted that Dr Michael Carter and Prof. Roy Kerr had been elected to the National Committee for Mathematics, and there would be no need for an election for either this committee or the National Committee for Theoretical and Applied Mechanics in 1987.

(b) Profile of Mathematicians in the R.S.N.Z.:

BWi reported that the number of R.S.N.Z. fellowship selection panels had been increased, but that of course it was still possible for one panel to select more than one candidate in any particular year. Also some concern had been expressed about the small number of fellows who are still active. IR and MC agreed to write a letter to the R.S.N.Z. applauding the changes to the selection procedure, but suggesting possible further improvements could be made. It was agreed also that liaison with the N.Z. Statistical Association, the Operational Research Society of N.Z. and the N.Z. Computer Society would be worthwhile at the appropriate times.

(c) Booklet on N.Z.M.S. aims and activities:

MC tabled a draft copy of the proposed N.Z.M.S. booklet, some corrections and improvements were suggested, and approval given for distribution of the revised draft to all present members and prospective members of the Society.

(d) Agreement with N.Z.A.M.T.:

IR tabled a copy of the agreement pertaining to the distribution of profits from textbooks published in conjunction with N.Z.A.M.T.

Moved (JH/BWi) that Council ratify the agreement with N.Z.A.M.T. signed by the Presdient on behalf of the Society.

CARRIED

It was suggested that N.Z.A.M.T. be reminded that they are welcome to use the N.Z.M.S. newsletter to keep N.Z.M.S. members aware of other N.Z.A.M.T. activities.

(e) Review of Mathematics research:

IR reported on the demise of the National Research Advisory Council, the subsequent formation of a Ministerial Working Party to review Science and Technology in New Zealand and the submissions made on behalf of the N.Z.M.S. by the review committee set up at the last meeting.

Moved (from the Chair) that the Council thank Graeme Wake and his team for writing up the review submissions on behalf of the Society.

CARRIED with acclamation

As a member of that committee, GT stressed that the submissions had been made from the point of view of the whole mathematical community (and not just universities). She also asked about a questionnaire proposed by the committee, and Council members responded positively, with some suggestions for improvement.

Moved (GT/EK) that the review committee be asked to send a questionnaire to N.Z.M.S. members to ascertain information on their research activities.

CARRIED

It was suggested also that the questionnaire be publisehd in the N.Z.M.S. Newsletter.

(f) Membership drive:

It was agreed that the new booklet on N.Z.M.S. issues and activities be sent to all mathematical departments of N.Z. universities, and to the appropriate Government departments. Further discussion ensued.

Moved (MJ/MC) that Mathematics Departments be invited to nominate postgraduate students for one year's free membership of the Society.

CARRIED

Some concern was expressed about the "follow-up" mechanism, and more generally with the large number of members who have not paid their subscriptions for 1986 (and 1985 and earlier). Copies of the N.Z.M.S. membership list were circulated for the information of the Council members.

(g) N.Z.M.S. Research Fund:

MC reported that no applications had been received, and offered to put another notice in the December issue of the Newsletter, encouraging members to apply.

(h) N.Z.M.S. Legal Adviser:

BWo reported that Peter Renaud had agreed to act as N.Z.M.S. Legal Adviser. It was suggested that he be asked to store one of the signed copies of the agreement between N.Z.M.S. and N.Z.A.M.T., and resolved that he be approached in future whenever a document of this nature is to be drawn up.

(i) Council officers:

IR reminded Council members that both he and MCo would be on study and research leave for most of 1987.

Moved (BWo/EK) that Dr Derrick Breach be coopted onto Council as N.Z.M.S. Secretary from November 1986 until the next A.G.M. of the Society.

CARRIED

Moved (BWo/GT) that Prof. David Gauld be coopted onto Council from December 1986 until Ivan Reilly returns from leave.

CARRIED

Discussion took place also on the matter of Council vacancies arising in May 1987, with John Harper, Murray Jorgensen and Ernie Kalnins completing their 3-year terms. Strong feeling was expressed that at least one Councillor should be elected who is not a university staff member.

(j) Copyright problem:

IR reported that the problem outlined in item 5 of the minutes of the brief Council meeting (held on 21 May 1986) had been resolved satisfactorily, with an assurance from the Principal of the school in question that their booklet was no longer being sold.

(k) General:

It was noted (to the delight of Council members) that Orlov had been recently freed by authorities in the Soviet Union.

(The meeting adjourned for lunch at 12 noon, and resumed at 1.00 p.m.)

CORRESPONDENCE:

Moved (from the Chair) that the Inwards Correspondence be received and the Outwards Correspondence be noted.

CARRIED

MATTERS ARISING FROM THE CORRESPONDENCE:

(a) R.S.N.Z. questionnaire on Science Education:

IR reported that he and MC had responded to a questionnaire sent out by Professors David Vere-Jones and Richard Walcott on behalf of the R.S.N.Z., concerning the participation of the Society in education matters. Discussion followed.

Moved (MJ/JH) that a letter be written to the Minister of Education expressing surprise that the Society was not invited to provide a representative on the Mathematics Syllabus Review Committee (Forms 5 to 7).

CARRIED

(b) Visit of Prof. Christopher Zeeman (Forder Lecturer):

DG reported that Prof. Zeeman would be arriving in N Z. on 22 March 1987, and was prepared to spend about half a week at each university centre, moving through the country from south to north. IR added that local institutions could expect Prof. Zeeman to give at least one talk to a general/public audience, and that as usual they would be expected to be responsible for the costs of local accommodation and a proportion of internal travel. BWi suggested that local centres be provided with a publicity sheet containing background information about both Forder and Zeeman, and DG agreed to attend to this. IR reported later that the R.S.N.Z. had been approached with regard to a function to he held in Wellington in honour of Prof. Zeeman's visit, and that the Minister(s) of Education and/or Science and Technology would be invited to this function.

(c) Administrative services of the R.S.N.Z.:

A letter from the R.S.N.Z. enquiring about member bodies' requirements in terms of R.S.N.Z. administrative services was discussed. MC agreed to reply, stating the need for archival storage of N.Z.M.S. material, and mentioning the possible need for legal advice about financial matters.

(d) Commercial publication of N.Z.M.S. texts:

An offer by Holt-Saunders Pty Ltd, to take over publication of the "Calculus" text was discussed and it was decided that this offer should be declined (with thanks).

(e) Suggestions from Garry Tee:

Council considered a letter from Garry Tee, including suggestions for the venue of the 1998 International Congress of Mathematicians, and celebrations of the centenaries of the births of Forder, Comrie and Aitken.

Moved (BWo/EK) that a letter be written to the Australian Mathematical Society suggesting that they make a bid to hold the 1998 International Congress of Mathematicians, and offering the Society's support in this regard.

CARRIED

It was decided also that a reply be sent to Garry Tee, thanking him for his suggestions and indicating that the Society is sympathetic to them, but also that it is a matter for local institutions and not the N.Z.M.S. to arrange for the renaming of buildings.

(f) General:

MC reported that a $300 donation had been sent to the organisers of the regional conference on Combinatorial Mathematics (to be held in Dunedin in December 1986).

Also Council members were pleased to note the award of M.B.E. to Desmond Sawyer in the Queen's Birthday Honours List, and his reply to the Society's letter of congratulations.

TREASURER'S REPORT:

JS gave a verbal report on the healthy state of N.Z.M.S. finances, highlighting the sum of $40,000 held on fixed deposit, and the increase in funds over the same time in 1985. It was agreed that the level of the Society's support for conferences, postgraduate students and other mathematical activities could be increased, where appropriate.

JS reported also on the alarming number of N.Z.M.S. members who had not paid their subscriptions for 1986 and earlier. He further announced that Dr Gerard Liddell had agreed to act as N.Z.M.S. Membership Secretary from January 1987.

PUBLICATIONS REPORT:

GT tabled a report in which she highlighted the increased sales of the secondary school texts, along with price increases made in order to cover printing costs and set a more sensible profit margin. She also suggested centralizing the facilities for ordering, distribution and payment, and this matter was discussed along with the need for local convenors to be responsible for insurance of stock-piles of texts against fire and theft. Further, she asked for suggestions for new members of the Publications Committee, and commented on a possible new venture.

Moved (from the Chair) that the Publications Committee be empowered to pursue the proposal of a new text on Linear Algebra for second-year university students.

CARRIED

IR reminded members that the Publications Committee is always open to suggestions for new ventures.

R.S.N.Z. REPRESENTATIVE'S REPORT:

MJ reported (as immediate past R.S.N.Z. representative) about the concern that had been expressed about the lack of professional representation on the Department of Education's Syllabus Review Committees. JH (as new representative) had nothing further to report.

SOUTH PACIFIC FUND

DG mentioned his visit to the University of the South Pacific in May, and the recently founded exchange agreement between the University of Auckland and the University of the South Pacific for the purpose of staff training and/or short visits to aid in teaching and course development. Discussion took place on these matters, and on the further needs of mathematicians in the South Pacific region.

Moved (MC/JH) that the amount available in the South Pacific Fund be increased to $1000.

CARRIED

DG and EK agreed to make further moves in encouraging potential applicants.

ARCHIVIST'S REPORT:

JH reported that because of alterations to R.S.N.Z. office space, some archival material was being stored temporarily in his office.

VISITING LECTURER SELECTOR'S REPORT:

MJ reported that Terry Speed's visit had been a success, and that arrangements for the visit of Saunders Mac Lane were underway. A suggested itinerary for Mac Lane's visit (during the second half of March 1987) had been sent out to heads of departments at the University centres. Also some suggestions for 1988 were made, and discussion took place on the success of the Visiting Lecturer scheme in general.

MATHEMATICAL VISITORS LIST

GT indicated that members should be reminded of the desirability of keeping an up-to-date list of mathematical visitors to the country, and that details of possible visitors could be sent to her at any time.

NEWSLETTER EDITOR'S REPORT:

MS advised that he would be going on leave in 1988 and suggested that a new Editor be found to take over in 1987. He further reported on the possibility of having the Newsletter printed at an alternative site, and possibly using a type-setting process.

Moved (Bwi/MC) that Mark Schroder be thanked for his services as Newsletter Editor.

<div align="right">CARRIED with acclamation</div>

It was agreed that MS should advertise the vacancy of Newsletter Editor in the next issue of the next issue of the Newsletter, and also that Council members should mention it within their regional centres.

Also some discussion took place on the proposal of a questionnaire to be sent to N.Z.M.S. members to aks their views on the content and format of the Newsletter, and possibly even on the other services provided by the Society.

HONORARY MEMBERSHIP:

Two long standing members of the N.Z. mathematical community were considered for Honorary membership of the N.Z.M.S., in view of their services to the Society and to mathematics in N.Z. in general.

Moved (JH/BWi) that Honorary Membership be conferred upon William Davidson.

<div align="right">CARRIED</div>

Moved (JH/BWi) that Honorary Membership be conferred upon Desmond Sawyer.

<div align="right">CARRIED</div>

RECIPROCITY AGREEMENTS:

MC reported on the confusion surrounding N.Z.M.S. reciprocity agreements. GT agreed to confer with Graeme Wake and ascertain exactly with which other mathematical societies the N.Z.M.S. has a reciprocity agreement.

Moved (JS/BWi) that members of the N.Z.M.S. resident in New Zealand should pay the full subscription rate for N.Z.M.S. membership in spite of their membership of other mathematical societies overseas.

<div align="right">CARRIED</div>

POSTGRADUATE STUDENT TRAVEL GRANTS:

IR commented on the success of this scheme, but also on the small number of applicants.

Moved (MJ/JS) that the Postgraduate Student Travel Fund for 1987 be set at $2000.00.

<div align="right">CARRIED</div>

GENERAL:

(a) Graduate Information Scheme:

   GT presented a report from Mike Carter that several work experience reports had been received, and that summaries of these and subsequent reports would be published in the N.Z.M.S. Newsletter, and used in preparing the next revision of the Employment Brochure.

(b) State of N.Z.M.S. funds:

   A general discussion took place on the maintenance of N.Z.M.S. funds, and on the possibility of obtaining the services of commercial bodies to assist with administrative and financial matters.

(c) 56th ANZAAS Congress:

   Members were reminded of the need to advertise the forthcoming ANZAAS Congress (26-30 January 1987), and to support the mathematical section in particular.

(d) Ivan Reilly and Marston Conder were thanked by the rest of Council for their service as President and Secretary over the previous 17 months.

There being no further business, the meeting closed at 4.10 p.m.

<div align="right">Marston Conder
Secretary, N.Z.M.S.</div>

Problems

PROBLEMS

P3 (submitted by Mike Hendy, Massey University, corrected from August 1986)

Let T be the tree, with edge set E labelled as below. The path p_{ij} is the set of edges in E which connect v_i to v_j, and $D = (d_{ij})$ is a 6×6 symmetric matrix with zero diagonal and integer entries.

The

Hendy

Tree
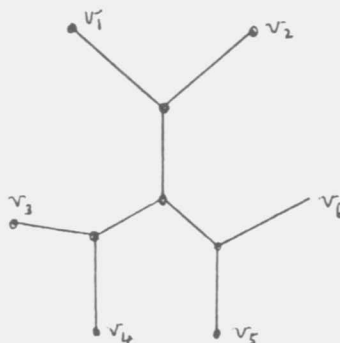
A function $w: E \to \mathbb{R}_0^+$ which satisfies the 15 constraints:

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

is a *weighting* of T. A *minimal weighting* of T is a weighting which minimises

$$w(T) = \sum_{e \in E} w(e).$$

Prove: 1. For all such D, there is a minimal weighting w such that $4w(e) \in \mathbb{Z}$ for all $e \in E$.

2. There is a matrix D and a corresponding minimal weighting w such that $4w(e) \in \mathbb{Z}$, for all e in E, but $2w(e) \notin \mathbb{Z}$.

Query (Editor): When you get down on all fours, do you get enough to fill a pillow?
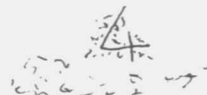
P5   (from Terry Moore, Massey University)

It is often necessary to factorise a function of several variables. It is also often necessary, for some functions, to show that such a factorisation is impossible.

1. Find a necessary and sufficient condition for the 'variables to separate' in a function $f(x,y)$, that is, for $f(x,y) = g(x)h(y)$.

2. Generalise this to functions of n variables.

3. Find a necessary and sufficient condition for a function of two variables to be expressible in the form
$$f(x,y) = a(x) + b(y) + c(x)d(y).$$

4. Generalise this to a function of n variables.

The proofs of the first two are particularly easy and ought to be well known. However they were not known to us. We would appreciate a reference. Statisticians will instantly recognise the expression
$$f(x;\theta) = \exp\{a(\theta) + b(x) + c(\theta)d(x)\}$$
which motivated these problems.

<div align="center">SOLUTIONS</div>

P1

Construct the sequence (x_n) by the iterative formula
$$x_{n+1} = x_n(x_n + \tfrac{1}{n}), \qquad n \geqslant 1; \qquad x_1 \text{ given.}$$

Prove that there exists exactly one value of x_1 for which $0 < x_n < x_{n+1} < 1$ for every n (and $(x_n) \to 1$ as $n \to \infty$ in this case). Find this unique value of x_1.

Editors' Note:

Two correct, elegant and quite different solutions were received from Professor Ted Zulauf (Waikato University) and Dr Michael Carter (Massey University). We display the former below, and again acknowledge Professor Zulauf's efforts as the first Problems Editor.

Solution (by Ted Zulauf, Waikato University):

Let $p_1(x) = x$, $p_{n+1}(x) = p_n(x)\{p_n(x) + \tfrac{1}{n}\}$ if $n \geqslant 1$.

Result:

There is exactly one value of x such that
$$(1) \qquad 1 - \tfrac{1}{n} < p_n(x) < 1 \qquad \text{for all } n \geqslant 1,$$
and consequently, that the sequence $\{p_n(x)\}$ increases strictly to the limit 1 as $n \to \infty$.

Proof:

Clearly $p_n(0) = 0$ for all $n \geqslant 1$, and $p_n(x) \geqslant 0$ for all $x \geqslant 0$ and all $n \geqslant 1$. Also it is easily seen by induction on n that $p_n(x) > 1$ for all $x \geqslant \tfrac{2}{3}$ and all $n \geqslant 2$, and that $p_n'(x) > 0$ for all $x \geqslant 0$ and all $n \geqslant 1$. It follows that, for each $n \geqslant 2$, there exist numbers a_n and b_n such that
$$p_n(a_n) = 1 - \tfrac{1}{n}, \qquad 0 < a_n < \tfrac{2}{3}, \qquad \text{and}$$

$$p_n(b_n) = 1, \qquad 0 < b_n < \tfrac{2}{3}.$$

Now

$$p_{n+1}(a_n) = p_n(a_n)\{p_n(a_n) + \tfrac{1}{n}\} = 1 - \tfrac{1}{n}$$

$$< 1 - \tfrac{1}{n+1} = p_{n+1}(a_{n+1}) < 1 = p_{n+1}(b_{n+1})$$

$$< 1 + \tfrac{1}{n} = p_n(b_n)\{p_n(b_n) + \tfrac{1}{n}\} = p_{n+1}(b_n).$$

Since $p_{n+1}(x)$ is strictly increasing for $x \geq 0$, it follows that

$$0 < a_n < a_{n+1} < b_{n+1} < b_n < \tfrac{2}{3} \quad \text{for all} \quad n \geq 2.$$

Let $\lim_{n\to\infty} a_n = a$, $\lim b_n = b$. Then

$$1 - \tfrac{1}{n} = p_n(a_n) < p_n(a) \leq p_n(b) < p_n(a_n) = 1 \quad \text{for all} \quad n \geq 2.$$

Since trivially, $0 < p_1(a) \leq p_1(b) < 1$, it follows that (1) is satisfied for $x = a$ and

$x = b$.

Now suppose that a' and b' are any two values of x for which (1) is satisfied, with

$b' - a' = d \geq 0$. Then it is easily seen by induction that

$$1 \geq p_n(b') \geq p_n(a') + (n-1)d \quad \text{for all} \quad n \geq 2.$$

This implies that $d = 0$, so that $a' = b'$. This completes the proof of the result.

Note: Now use (1) in the recurrence formula to derive the strict monotonicity of $(p_n(x))$.

Further:

(2) $|a - 0.446534917| < 5 \times 10^{-10}$, and

(3) $$\lim_{n\to\infty} p_n(x) = \begin{cases} 0 & \text{if} \quad 0 \leq x < a \\ 1 & \text{if} \quad x = a \\ +\infty & \text{if} \quad x > a \end{cases}$$

Proof of (2):

Note that $p_n(x) = \lambda_n$, where $0 < \lambda_n < 1$ and $x > 0$, if and only if $p_{n-1}(x) = \lambda_{n-1}$ where
$x > 0$ and

$$0 < \lambda_{n-1} = \sqrt{\{\lambda_n + \tfrac{1}{4(n-1)^2}\}} - \tfrac{1}{2(n-1)} < 1.$$

After $(n-1)$ steps, one finds $0 < x = p(x) = \lambda_1 < 1$. It is thus easy to calculate that
$a_{31} = b_{31} = 0.446534917$ correct to 9 decimal places and (2) follows since $a_{31} < a < b_{31}$.

Proof of (3):

If $0 \leq x < a$, one must have $x < a_m$ and therefore $p_m(x) < 1 - \tfrac{1}{m}$ for some m. It follows
easily by induction that $p_n(x) < 1 - \tfrac{1}{n}$, and therefore $p_{n+1}(x) < p_n(x)$ for all $n \geq m$. Hence
$p_n(x)$ converges to some limit between 0 and $1 - \tfrac{1}{n}$ as $n \to \infty$, and that limit must obviously
be 0. If $a < x$ then, by induction, $p_n(x) > p_n(a) + (n-1)(x-a)$ for all $n \geq 2$ and
therefore $p_n(x) \to +\infty$ as $n \to \infty$.

Crossword

CROSSWORD NO. 20   SPANNER IN THE WORKS   by Matt Varnish
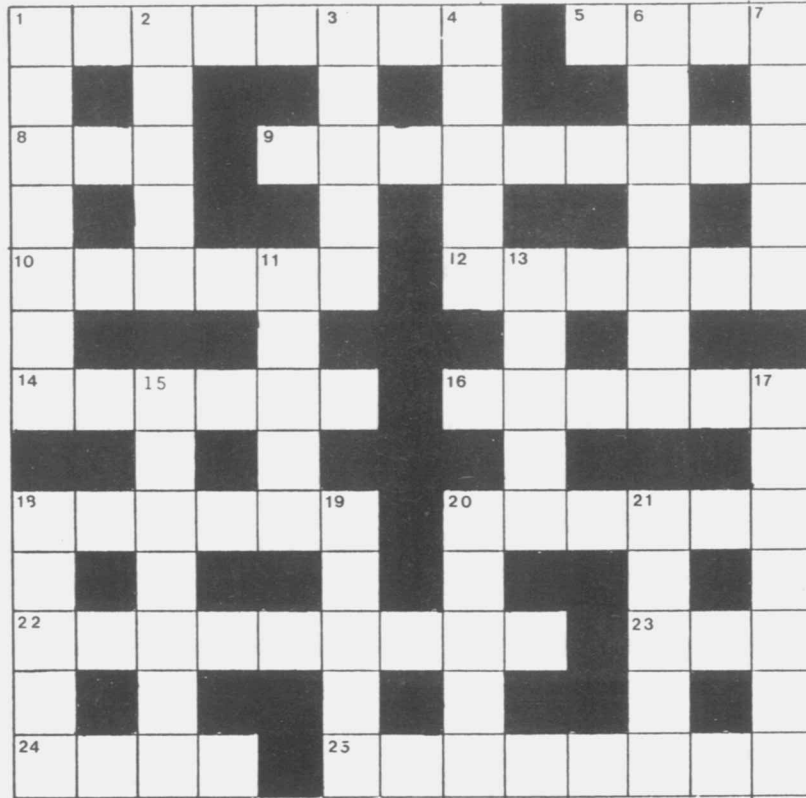
This is dedicated to H. Cocles, (20a,6) *the one-eyed*, who while on the (22a,9) allowed (24a,4)
a one to (1d,7) until the gap had (6d,7) so much that, his actions (9a,9), he had to (3d,5)
into the (21d,5) to reach the (4d,5) cast from the (25a,8) to help him (15d,7) up the (12a,6).
Some (10a,6) scholars say that this is in (2d,5), he not being seen to have (18d,5) from
below: to these I say "(23a,3)", and may a (13d,5) give perpetual (20d,5), as it did to Billy
Goat Gruff, to those who besmirch his (11d,5)-like glory. He should be remembered at all
crossings; from those of the (7d,5) to the famous one of (16a,6); from the (18a,6) to the one
at (8a,3) (where Maggie lost her tail); and let us not forget the (19d,5) winning one on
(1a,3,5)(5a,4). However we had better ignore the one at (14a,6)(17d,7) whose builders did
not know the (4d,5).

CROSSWORD NO.19 SOLUTION

ACROSS:

7. (Franklin) Carmichael; the original *Group of Seven* Canadian painters. 9. Nell; *Seven
Little Australians*. 10. Gluttony; *The Seven Deadly Sins*. 11. Treves; the original *Electors
of the Holy Roman Empire*. 12. Decca (Jessica); *The Mitford Children*. 13. Nicholas; *The
Seven Deacons*. 15. Soldier; *The Seven Ages of Man*. 17. Grammar: *The Seven Liberal Arts*.
20. Bernicia: *The Heptarchy of England*. 22. Dorat; *La Pléiade* of French poets. 24. Ithaca;
The Seven Islands. 26. Pittacus; *The Seven Sages of Greece*. 28. Life; *The Seven Lamps of
Architecture* of Ruskin. 29. Sir Desmond (Murgatroyd); the seven ghosts of *Ruddigore* by
Gilbert and Sullivan.

DOWN:

1. Caul. 2. Emetic. 3. Accolade. 4. Mary-Ann. 5. Anteroom. 6. Blue. 8. Lytic. 12. Drove.
14. Apart. 16. Dungaree. 18. Redotted. 19. Carpark. 21. Class. 23. Realms. 25. Trio.
27. Urns.