

THE LONDON MATHEMATICAL SOCIETY NEWSLETTER

No. 225

March 1995

FORTHCOMING SOCIETY MEETINGS

Friday-Saturday, 12-13 May 1995, Oxford University
A Hundred Years of Analysis

P.R. Halmos, J-P. Kahane, J. Lützen, S.J. Patterson,
R. Remmert, F. Smithies

Friday 16 June 1995, Burlington House

D.G. Vassiliev, K.R. Parthasarathy

Friday-Saturday 20-21 October 1995, Scientific Societies Lecture Theatre
Stochastic Analysis

Friday 17 November 1995, Burlington House

LMS COUNCIL DIARY

The new Council of 1995 met for the first time on 20 January, a little dazed by the unaccustomed publicity: over Christmas the Society's concerns about school mathematics had made their way into the headlines of a national daily and several radio programmes. A number of people wrote to the Society's Education Committee offering support, and for this we are most grateful. Elsewhere in this Newsletter Peter Saunders describes Council's plans in this area.

One important item on our agenda was to make recommendations on panels for the 1996 Research Assessment Exercise. We marked out key subject areas, and we agreed a proposed list of eight panellists with three reserves.

The Society has a number of reciprocity agreements with other national Mathematical Societies. We discussed proposals to set up two more. Though these agreements often run at a loss for the Society, we are happy to maintain

them where they are a help to LMS members (as for example with the American Mathematical Society), or where the Society feels it should support the mathematicians of some country.

Speaking of international help, the Society's recent discussions with Professor Kuku of the African Mathematical Union led us to ask whether the LMS should have an International Committee. The International Centre for Mathematical Sciences in Edinburgh has gone further down this road than we have, and for the moment we agreed to send a donation to support the work of the ICMS in this field.

We heard with pleasure that a national bank had invited some of the Society's officers to a small ceremony to celebrate the centenary of the opening of the Society's bank account on 27 December 1894.

Wilfrid Hodges

SYMPOSIUM ON FUNCTIONAL ANALYSIS AND RELATED TOPICS

(In Memory of Dr Yau-Chuen Wong)

The Symposium will be held at the Chinese University of Hong Kong from 14 - 18 December 1995 in the memory of the late Dr Y.C. Wong (2 October 1935 - 7 November 1994). For over four decades Dr Wong had made many significant contributions. His devoted teaching and prolific mathematical research will be remembered as well as his endeavours in the linkage and co-operation of mathematicians in different parts of the world especially between mainland China, Hong Kong and Taiwan. Besides a number of local mathematicians from the Asian region, the following is a partial list of invited speakers from overseas.

Keynote/Invited Overseas Speakers: T. Ando (Sapporo, Japan); H. Araki (Kyoto, Japan); H. Bauer (Erlangen, Germany); M.D. Choi (Toronto, Canada); C.H. Chu (London, England); Ky Fan (Santa Barbara, USA); K.S. Lau (Pittsburgh, USA); W. Luxemburg (Caltech, USA); K.K. Tan (Halifax, Canada); S.T. Yau (Harvard & CUHK).

The main purposes of the Conference are: to honour the memory of Dr Yau-Chuen Wong on the anniversary of his death; to bring together mathematicians with interests consistent with the late Dr Wong's field of research; to convey recent results through lectures/research talks; to introduce (especially to postgraduate students) the frontiers of various fields through mini-courses/invited talks. Topics included: Partial Ordering in Analysis, Fractals, Wavelets, Convolution Equations and Operator Algebra. The registration fee is US\$200/HK\$1500 (before 1 August, 1995) or HK\$2000 (after 1 August 1995). Concession may be given to students and those who cannot obtain financial support from their own institutions.

Contributed papers (including abstracts) must be submitted by 1 August 1995 to: K.F. Ng, Department of Mathematics, Chinese University of Hong Kong, Shatin, Hong Kong; e-mail: ngkf@cuhk.hk; fax: (852) (2)603-5154; tel: (852) (2)609-7968.

CONFERENCE ON TECHNOLOGY IN MATHEMATICS TEACHING

The International Conference on Technology in Mathematics Teaching will bring together classroom practitioners, curriculum developers and mathematical education researchers, all of whom share a desire to improve the quality of student learning. Main lectures by distinguished speakers will be complemented by a programme of specialist short talks and workshops. There will be an exhibition of books and products by publishers, software and calculator companies. The conference will take place from 4 - 7 September 1995 at the Craiglockhart Campus of Napier University, two miles from Edinburgh's city centre. Napier University takes its name from the inventor of logarithms, John Napier, whose birthplace, a fortified tower house,

is incorporated in the University's Merchiston Campus.

A wide range of good quality accommodation is available in Edinburgh, from luxury hotels to student residences. Limited accommodation (single and double rooms) will be available at the Craiglockhart Campus during the conference. The conference fee will be £80 and will include the cost of lunches, coffees, teas and a free bus service to the city centre at the end of each day. Further details may be obtained from: Mr T.D. Scott, Conference Secretary, ICTMT 1995, Department of Mathematics, Napier University, 219 Colinton Road, Edinburgh EH14 1DJ; tel: 0131 455 4378; fax: 0131 455 7122; e-mail: td.scott@uk.ac.napier.central.

LONDON MATHEMATICAL SOCIETY AND BRITISH SOCIETY FOR THE HISTORY OF MATHEMATICS

JOINT TWO-DAY MEETING
FRIDAY 12th & SATURDAY 13th MAY 1995
MATHEMATICAL INSTITUTE, OXFORD

A HUNDRED YEARS OF ANALYSIS

FRIDAY

- 2.20 Opening Session
- 2.30 Professor Jean-Pierre Kahane (Paris) *Interplay between Taylor series, Fourier series and Brownian motion*
- 3.30 Tea
- 4.00 Professor S.J. Patterson (Göttingen) *The Riemann Hilbert Problem*
- 5.15 Professor Dr Reinhold Remmert (Münster) *From Riemann surfaces to complex manifolds*

SATURDAY

- 9.15 Professor Jesper Lützen (Copenhagen) *An overture to functional analysis. The beginnings of spectral theory*
- 10.15 Coffee
- 10.45 Dr Frank Smithies (Cambridge) *The shaping of functional analysis, 1900 to 1950*
- 12.00 Professor Paul R. Halmos (California) *A century of operators*

A dinner will be held at St Cross College, Oxford on the evening of Friday 12 May at 7.00 pm for 7.30 pm. The cost of the dinner will be £20.00 per person, inclusive of wine. Those wishing to attend should inform Miss Susan M. Oakes, London Mathematical Society, Burlington House, Piccadilly, London W1V 0NL, enclosing a cheque payable to "The London Mathematical Society" to arrive no later than Friday 5 May.

Enquiries may be addressed to Dr Peter M. Neumann, The Queen's College, Oxford OX1 4AW (e-mail: neumann@vax.ox.ac.uk).

SCHOOL MATHEMATICS

There has been a lot about school mathematics in the media in the past couple of months: items in most of the national press and on *The World at One*, a large number of letters to the editor (I'm told that far more were received than could be published) and long articles in Sunday papers. It made the front page lead in the *Guardian*, it was mentioned in the extracts from the papers on the Today programme on Radio 4, and there was even an item on the satirical *Week Ending* programme. Many people, not just those who teach mathematics at university, are obviously concerned about the situation.

Most of us who were involved found it a somewhat nervous experience. When we write mathematical papers or even documents for committees, we take great pains to ensure that we say precisely what we mean. Crucially, we are in control of what we say. When you deal with the media, they decide, and something is bound to come out slightly differently from what you meant, or thought you meant. Sub-editors have to cut articles to length, and the loss of a few sentences can alter the tone of a piece even if the sense is strictly speaking the same.

All the same, I think there is a consensus that the media did their best to get the story straight, and that the outcome is positive. Everyone is aware that there is something that has to be discussed, but nothing has happened that will prevent fruitful discussions taking place.

That there is widespread concern doesn't necessarily mean that something has gone wrong, but it does mean we ought to make a serious attempt to find out. As a contribution to the next stage in the process, the LMS Council agreed at its January meeting to set up a working group to produce a formal 'position paper', possibly in cooperation with some sister organizations. Its brief is to produce evidence, including statistical evidence, concerning the present situation and to identify possible ways in which things might be improved. It is not attempting to offer solutions to any observed problems.

Professor G. Howson has agreed to chair the group, and anyone who has evidence to provide is asked to send it to him at Southampton University (e-mail agh@maths.soton.ac.uk) or to Professor J.C. Robson at Leeds University (e-mail: j.c.robson@leeds.ac.uk).

P.T. Saunders

FIFTH WORKSHOP ON ORDER IN ALGEBRA AND LOGIC

This workshop (the four previous ones were held in Naples) will take place at Merton College, Oxford, from 21 to 25 March 1995. The meeting is made possible by grants from the Istituto Italiano per gli Studi Filosofici, the London Mathematical Society, The British Council, The Royal Society and the British Logic Colloquium.

The main topics will be: a) model theory of C^∞ functions; b) C^* -algebra, MV algebras and toric varieties; c) computation and quantum theory; d) group theory and model theory.

The following speakers have accepted: Sir Roger Penrose (Oxford); Dr A. Ekert (Oxford); Professor L.P.D. van den Dries (Urbana); Dr A.J. Wilkie (Oxford); Profes-

sor D. Mundici (Milan); Dr A. Baudisch (Berlin); Professor P. Hajek (Prague); Professor R. Grigolia (Tbilisi); Professor M. Scafati (Rome); Dr A. Bichara (Rome); Dr P. Longobardi (Naples); Professor M. Dalla Chiara (Florence); Professor A. Di Nola (Naples); Dr C. Mulvey (Sussex); Dr J. Truss (Leeds); Professor R. Cignoli (Buenos Aires); Professor M. Curzio (Naples); Dr H. Priestley (Oxford); Dr P.M. Neumann (Oxford).

For further information please contact Angus Macintyre at the Mathematical Institute, 24/29 St Giles, Oxford OX1 3LB, tel: (01865) 273535, or e-mail: ajm@maths.oxford.ac.uk

LONDON MATHEMATICAL SOCIETY

INVITED LECTURES

Professor Paul F. Baum
(Pennsylvania State University, U.S.A.)

will give a course of ten lectures on

**TREES, BUILDINGS, SYMMETRIC SPACES AND
K-THEORY FOR GROUP C^* -ALGEBRAS**

at Dalton-Ellis Hall, University of Manchester
18 - 22 April 1995

Accommodation and meals will be available in Dalton-Ellis Hall and further particulars can be obtained from Professor R.J. Plymen, Mathematics Department, University of Manchester, Manchester M13 9PL (e-mail: roger@ma.man.ac.uk). Reservations for accommodation need to be confirmed by 31st March 1995.

VISIT OF PROFESSOR NGUY HUNG

Professor Nguy Hung of the University of Hanoi, currently at the CRM, Barcelona, will visit the UK under the London Mathematical Society Scheme 2 grant programme during the second week of May. He will lecture in Aberdeen on May 8, Glasgow on May 10 and in Manchester on May 12. Further information can be obtained from J. Hubbuck (j.hubbuck@maths.abdn.ac.uk), A. Baker (andy@maths.gla.ac.uk) and G. Walker (grant@ma.man.ac.uk).

VISIT OF PROFESSOR MARTIN GUEST

Professor Martin Guest (University of Rochester, NY) is visiting the UK from 13 to 24 March. This visit is supported by a London Mathematical Society Scheme 2 grant and by funds from a Human Capital and Mobility programme. He will speak on "Topology of spaces of harmonic maps" in Leeds on Thursday 16 March and on "Explicit formulae for harmonic maps" at the Durham Differential Geometry Day on Monday 20 March. Further details may be obtained from the local organisers: J.C. Wood (j.c.wood@leeds.ac.uk), L.M. Woodward (L.M.Woodward@durham.ac.uk).

EIGHTH SCHRÖDINGER LECTURE

Professor Bruno Latour from Ecole Nationale Supérieure des Mines, will give the Eighth Schrödinger Lecture on "Should Science Studies be X-Rated - Thoughts on the Pasteur Scandal on the Centenary of his Death?", on Thursday 16 March at 5.30 pm in the Great Hall of Imperial College, London SW7. For further information write to Dr P. Dolan, Department of Mathematics, Imperial College, London SW7 2AZ.

1995 NAYLOR PRIZE AND LECTURESHIP

The London Mathematical Society's 1995 Naylor Prize and Lectureship in Applied Mathematics is awarded to Professor J.M. Ball, FRS, of Heriot-Watt University for his contributions to applied analysis, and particularly for the advances he has made in the fundamental existence theory for nonlinear elasticity.

R.Y.Sharp
Council and General Secretary

JOHN A. TODD

Dr John A. Todd, FRS, who was elected a member of the London Mathematical Society on 12 November 1931, died on 22 December 1994. He served on the LMS Council from 1951-71, Secretary from 1951-67, President from 1967-69 and Vice-President from 1969-71.

ALAN B. TAYLER

Dr Alan B. Tayler, CBE, who was elected a member of the London Mathematical Society on 17 January 1974, died on 29 January 1995. He served on the LMS Council from 1974-76.

NEW DEVELOPMENTS IN HOMOTOPY THEORY

A research workshop, financially supported by the London Mathematical Society and the University of Oxford, will take place between 15 May and 17 June 1995, at the Mathematical Institute in Oxford. Further particulars can be obtained from I.M. James, Mathematical Institute, 24-29 St Giles, Oxford OX1 3LB.



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Orthogonal Decompositions and Integral Lattices

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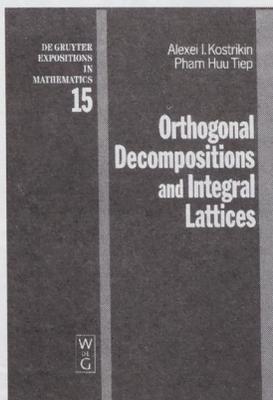
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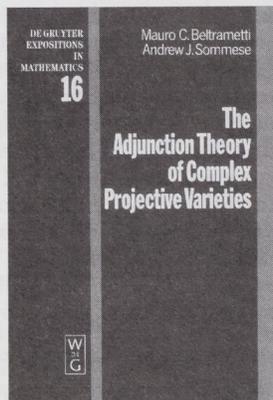
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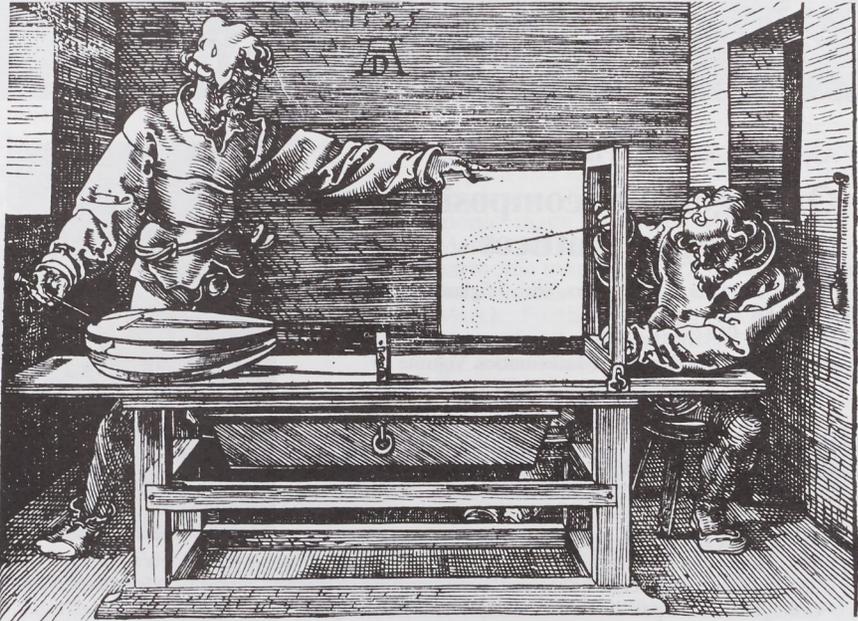
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THE BRITISH LIBRARY'S INITIATIVES FOR ACCESS



An image from the Electronic Photoviewing system - an illustration from the Literary Works of Albrecht Dürer, published in Nureberg in 1527.

The British Library holds over 18 million volumes and is one of the world's greatest treasure houses of recorded information from every age and culture. In 1993 it published its Strategic Objectives for the year 2000 in which it made a commitment to becoming a major centre for the capture, storage and transmission of electronic documents. In addition, the Library undertook to investigate the means of providing maximum access to the existing collections, which include books, journals, patents, photographs, manuscripts, stamps and sound recordings, for on-site and remote users through the exploitation of digital and networking technologies.

Initiatives for Access is a programme of 20 development projects which was inaugurated in July 1993. The projects are investigating hardware and software platforms for the digitisation and subsequent networking of a range of Library materials. In addition to enhancing Library services and facilitating access, the programme will establish standards for the storage, indexing, retrieval and transmission of data, and will examine the copyright issues involved with digitisation of material and its provision over networks.

Major projects within the Initiatives for Access programme include:

The Patent Express Jukebox

The Library is one of the major international patent information stores, holding 34 million patents. Over 1 million of the current UK, US, European and Patent Cooperation Treaty patents are now held on 16 linked CD-ROM jukeboxes, each holding 100 discs containing 800 patents. The software, developed by Middletreat Limited, searches and prints high-quality copies for users in under 2 minutes.

The Electronic Beowulf

The Library holds the unique manuscript of the eleventh-century Anglo-Saxon epic, which draws scholars and admirers from all over the world. With the collaboration of two major US scholars, Kevin Kiernan of the University of Kentucky and Paul Szarmach of the State University of New York, Binghamton, the manuscript has been digitised under white and ultra-violet light and with fibre-optic cable using a ProgRes 3012 digital camera scanning at 2000 x 3000 pixels in 24 bit colour. The resulting images at this maximum resolution are 21-25 megabytes, and allow examination of the manuscript in minute detail. Letters and words erased by the original scribes, damaged by fire in 1731 or hidden by nineteenth century restoration are now discernible and test images have been mounted on the Internet to allow international scholars to see the progress of the project.

Electronic Photo Viewing System

The Library holds major photographic collections, including Victorian Spiritualist photographs of ghosts and seances and a large number of Canadian images from the turn of the century. Ten thousand images, which also include illuminations from manuscripts, printed book illustrations and sheet music covers have been digitised and made available to researchers. The system gives access by subject, which has never previously been possible for the Library's photographic material, and provides a hypertext link to the descriptive text which accompanies each image.

The Network OPAC

The Library's major catalogues, holding over 6 million bibliographic records detailing items from the beginning of printing up to current scientific journals, are now available over the UK Joint Academic Network (JANET), which links all UK university and research institutes. Beta-test sites are now being selected in the US to work with the Library on establishing communications links and usage requirements for a future international Network OPAC.

Other projects in the Initiatives for Access programme include:

- Digitisation of ageing microfilm, which will provide searchable indexes for popular microfilm collections
- Testing of Excalibur PixTex/EFS for catalogue conversion and other indexing and retrieval applications
- Multimedia publications programme: Medieval History and Inventors and Inventions are two of the Library's first interactive multimedia CD-ROM publications

Contact Information: Full details of Initiatives for Access are available on the Internet on the Library's gopher server, Portico. To access Portico, gopher to [portico.bl.uk](gopher://portico.bl.uk). For WWW users the URL is <http://portico.bl.uk/>.

A newsletter about Initiatives for Access is mailed free of charge to all those interested in the projects, the hardware and software platforms, the details of new developments and the results of experiments. If you would like copies, please contact Jonathan Purday, The British Library, Boston Spa, Wetherby, West Yorks, LS23 7BQ, tel: +44 1937 546614; fax: +44 1937 546586; e-mail: jonathan.purday@bl.uk.

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DURHAM DIFFERENTIAL GEOMETRY DAY

There will be a Differential Geometry Day at the University of Durham on Monday 20 March. The speakers will be Professor S. Donaldson (Oxford), Professor M. Guest (Rochester, NY), Professor F. Pedit (Amherst) and Dr D. Salamon (Warwick). Lunch will be available at a cost of £9 per head. Those wishing to have lunch should inform one of the organisers by Tuesday 14 March.

Further details may be obtained from the organisers: J. Bolton (John.Bolton@durham.ac.uk), L.M. Woodward (L.M.Woodward@durham.ac.uk). This meeting is supported by a London Mathematical Society Scheme 2 grant and by funds from a Human Capital and Mobility programme.

WORKSHOP ON INFORMATION PROCESSING IN CELLS AND TISSUES

The purpose of international this workshop, to be held in Liverpool, 6th-8th September 1995, is to bring together a multidisciplinary group of scientists working in the general area of modelling cells and tissues. A central theme will be the nature of biological information and the ways it is processed in cells and tissues. It is hoped that the workshop will draw together researchers from a range of disciplines including: Computer Science, Cell Biology, Mathematics, Physiol-

ogy, Biophysics, Experimental Medicine, Biochemistry, Electronic Engineering and Biotechnology. The workshop is intended to provide a forum to report research, discuss emerging topics and gain new insights into information processing in biological and computational systems. For further information, contact Ray Paton, Department of Computer Science, The University of Liverpool, Liverpool L69 3BX.

INTERNATIONAL CENTRE FOR MATHEMATICAL SCIENCES Call for Proposals

The ICMS Programme Committee will next meet in May 1995. Proposals are invited for research programmes, workshops and courses on any topic in the mathematical sciences. Proposals of an interdisciplinary nature are particularly welcome. The Committee would be especially interested in receiving proposals related to the following areas:

- Scientific computation
- Geometry and robotics
- Risk analysis of disasters
- Reliability theory and code verification
- Models for interference and damage
- Control theory
- Modelling and inference in interactive systems
- Mathematics and large scale

computation

- Computational aspects of operations research

The Scientific Director welcomes opportunities to discuss ideas and proposals for ICMS activities. Proposals should be no longer than two sides of A4 paper and when accepted they form the starting point for the preparation of more detailed plans. Proposals may be received at any time but for full discussion at the 1995 meeting of the Programme Committee they should be received by 17 March 1995. They should be sent to Professor A.J. Macintyre, FRS, Scientific Director, ICMS (Proposal), 14 India Street, Edinburgh EH3 6EZ, e-mail: icms@maths.ed.ac.uk, tel: 0131 220 1777, fax: 0131 220 1053.



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Application forms and further particulars are available from Personnel Services, University of Aberdeen, Regent Walk, Aberdeen AB9 1FX, telephone (01224) 272727 quoting reference number FMA 023A. A 24-hour answering service is in operation. Closing date: 23 March 1995.

An Equal Opportunities Employer

DEPARTMENT of MATHEMATICS and STATISTICS CHAIR OF STATISTICS

The University seeks to appoint to the Chair of Statistics a distinguished statistician or applied probabilist with a substantial international reputation in research. The successful candidate will be expected to take a leading role in research and teaching in statistics within the Department and to foster collaborative research, especially with the many active users of statistics in the University and neighbouring institutes.

The position is available from 1 October 1995 or as agreed. A supporting package for the Chair is negotiable and will include at least one permanent Lectureship in Statistics, available after an appointment to the Chair has been made, in addition to posts currently being advertised.

Informal enquiries may be made to Dr J Martin (Telephone: 0131-650 5062, Fax: 0131-650 6553 or email: hod@maths.ed.ac.uk).

Applications (14 copies, except for candidates from overseas who need submit only one copy), including a curriculum vitae and giving the names and addresses of three referees should be lodged with

**THE SECRETARY TO THE UNIVERSITY,
THE UNIVERSITY OF EDINBURGH,
1 ROXBURGH STREET, EDINBURGH EH8 9TB.**

Further information may be obtained from this address or from the Internet via the Departmental WWW home page (<http://www.maths.ed.ac.uk>).

Closing date: 31 March 1995. Please quote REF: LMS 590042.



A SERIES OF LECTURES BY PROFESSOR OLIVER PENROSE

Professor Oliver Penrose, FRS, will present a series of lectures during March 1995

The titles of his talks are as follows:

- March 6
The Becker-Döring equations I: formulation and basic properties
- March 13
The Becker-Döring equations II: metastability and coarsening
- March 20
Macroscopic kinetic equations for phase transitions I: derivation
- March 27
Macroscopic kinetic equations for phase transitions II: properties and predictions.

The lectures will take place at 15:30 in Room L8.31 of Livingstone Tower, University of Strathclyde (26 Richmond Street, Glasgow G1 1XH). Everyone is welcome to attend.

For more information please contact M. Grinfeld, tel. 041-552-4400, ext 3651
(m.grinfeld@strath.ac.uk).

Full-time Research/Computing Posts for Mathematicians for Applied Research

The Posts Applications are invited for at least one and perhaps several research posts which will be filled within the next few months. The precise timing of appointments will in part depend on the availability of candidates in the various fields of interest to the company. The research of interest involves forecasting, optimisation, heuristic search techniques, and game theoretic problems. The software developed by the company is written mostly in C++, but Matlab, Mathematica and Maple are also used.

Qualifications required Proven ability in mathematical research, computational skills (C++, symbolic languages,...); interest in problem solving, rather than theorem-proving, some experience with data, willingness to work as a member of a team.

Salary and Compensation Depending on age and experience, £18,000 to £25,000 plus bonuses.

Contact Applications (a CV, list of publications and names of references) to: The General Manager, Oxford Forecasting Services Ltd, 57 Folly Bridge Court, Shirelake Close, Oxford, Oxon OX1 1SW; tel: (0865) 249998; fax: (0865) 200565.

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MATHEMATICAL ABILITIES OF STUDENTS ENTERING HIGHER EDUCATION

Introduction

I think we are all aware of the decline in mathematical knowledge amongst undergraduates in general over recent years, as discussed for example in the Guardian at the turn of the year following an article by Tony Barnard and Peter Saunders of the LMS. I think we may also agree that a student entering with (say) an A-level grade C in mathematics does not know as much formal algebra as would have been the case ten years ago, although some evidence seems to call us to investigate that belief further (see for example Arthur Rowe writing from the School of Biological Sciences in Leicester, Guardian 24 January).

I think we are also agreed that not enough students are studying A-level mathematics.

What we probably disagree about are the relative strengths of the contributing causes and what is to be done about them. I would claim that mathematics educators are very worried about what is happening in schools but perhaps not for the same reasons as some LMS members and I would like to point to some contributory causes which may be stronger than has been suggested in the debate so far. I would then like to offer some suggestions for action as far as the LMS is concerned.

I offer three main points:

- 1 There has been a dramatic fall in the number of 17-year-old students over the last 10 years, from 750 to 550 thousand students, at a time when A-level and higher education has expanded dramatically.
- 2 There has been an increase in popularity of mathematics up to GCSE, which has not been matched by significantly improved take-up at A-level.
- 3 There has been a major increase in the participation at A-level of girls. There has not been an equivalent increase in the proportion of girls studying mathematics, or physics, which goes part way to explaining how participation in other subjects has increased more than in mathematics.

At the same time there has been an unprecedented level of change in schools, not just in the curriculum, but in management, the infrastructure of education, the way schools are organised, and teacher training. This will have affected the success of many of the curriculum changes implemented, but will not be discussed further here. I just ask you to bear it in mind.

Student numbers

There has been a rapid expansion of higher education at the same time as a dramatic fall in the size of the age cohort. The age cohort has declined dramatically from 761200 17-year-olds in 1980 to 556700 in 1994. If nothing else changed you would have expected to see a big reduction in the number of students with A-level mathematics at all grades.

At the same time there has been a rapid increase in the number of 17 year old students studying A levels as a proportion of the total age cohort. It is these new kinds of students who have not in general chosen to study A-level mathematics, which is seen as hard and uninteresting.

The figures in table 1 are taken from a recent Ofsted report (HMSO, 1994). In the context of these falling rolls, the proportion of the whole age cohort who gain a pass in Mathematics at A level is increasing fairly steadily from 1980 to 1993.

Table 1: Trends over time: proportion of 17-year-old students taking GCE A level

	Maths	Physics	Chemistry	Biology	Geography	English	Any subject	(Numbers)
1980	6.0	4.6	3.8	3.5	2.8	5.7	21.4	162900
1983	6.5	4.6	4.2	3.8	3.1	5.9	22.8	182200
1986	7.1	4.7	4.4	3.7	3.1	5.9	24.4	181600
1989	6.7	4.3	4.1	3.9	3.6	6.9	26.1	189000
1990	7.0	4.6	4.7	4.9	4.2	8.6	30.0	202900
1991	7.0	4.5	4.7	4.6	4.8	9.5	32.6	206800
1992	7.3	4.7	5.0	5.5	5.5	12.3	38.3	230600
1993	7.7	4.9	5.1	5.9	6.1	14.4	41.4	238600

What is more, table 2 shows that the absolute number of students gaining grades A and B in A level Mathematics has remained steady from 1989 to 1994, despite the declining population in the age cohort. In fact, the decline in the number of candidates for A-level mathematics has largely occurred in the grades E, N and U.

Table 2:

Numbers of A level mathematics candidates attaining each grade from 1989 to 1994

	A	B	C	D	E	N	U	Total
1989	14108	12448	11618	11618	10788	9129	13278	82987
1990	13137	10819	10819	10819	10819	8500	12364	77277
1991	14245	11246	10496	10496	9746	7497	11246	74972
1992	14477	10858	10134	10134	9410	7238	10134	72384
1993	15522	10995	10348	9055	7114	5174	6468	64676
1994	15432	11111	10123	8580	6728	4691	4876	61726

I would like to raise two questions about these figures in particular.

The first is, how do the grades compare from year to year in a system which is nominally norm referenced and which is experiencing such demographic change? I am told by SEAC that mathematics and physics are still a grade harder by pair-wise comparisons than other A-levels.

Secondly, why is it that mathematics is not attracting the extra numbers of students that are staying on? In particular, young women have been increasingly successful at GCSE in mathematics, a greater number are staying on to do A-levels, but are not choosing A-level maths. This accounts for a significant part of the failure to recruit from the increased proportion of the cohort. From interviews (for example Landau 1994) it appears that the young women are making informed and wise decisions when looking at the situation from their point of view.

Curriculum Change

The introduction of the GCSE represented an attempt to move away from the norm-referenced national assessment of the GCE and CSE to assessment against a set of grade-related criteria. At the same time there was encouragement from the then DES to move the focus of attention in the school curriculum away from the top 20% of the cohort, and towards those between the 20th and 60th percentiles. Such a strategy

may have contributed to what many secondary teachers perceive as an increase in the proportion of pupils who claim to enjoy mathematics. It has also required significant change in the mathematical content addressed between the ages of 11 and 16, as is apparent in what many have identified as a reduced emphasis on algebraic manipulation and the foundation skills of arithmetic.

The introduction of coursework assessment encouraged a new emphasis on mathematical processes. This has almost certainly been at the expense of some mathematical content, but in the best cases it has led to increased motivation and commitment to the study of mathematics from many pupils (see for example HMSO, 1994).

The numbers achieving GCSE grades A to G in mathematics have fallen from just over 500000 in 1988, to 430000 in 1993, but the proportions of the age cohort achieving this have increased from 75% to 79%. There has been a most significant change in the achievement of girls, and more girls now achieve these grades than boys. Although it is possible to blame the introduction of the GCSE for a decline in the amount and level of mathematical content covered by the most able, the examination has largely succeeded in meeting the targets that were set before its introduction.

In 1987 work began on the development of a National Curriculum for children aged between 5 and 16. The Task Group for Assessment and Testing reported in 1988 with a proposal for a criterion-referenced assessment scheme based on a ten level scale. Against this scale any individual pupil's progress could be charted during the school years. Mathematics educators warned the government of the day that such a development would be very expensive, and that there would be no guarantee that it could be implemented in schools nation-wide without giving rise to undesirable and unforeseen side effects (see for example Brown, 1993).

The main message here is that during the last ten years there has been an excessive degree of change in school mathematics curricula for ages 5 to 16. However the A-level curriculum has continued almost unchanged since the 1960s (some would claim even longer). Even after the introduction of GCSE, the content of A level syllabuses has remained the same. The result has been an ever-widening gulf between GCSE and A-level.

In recent years there have been several important new initiatives in A level mathematics: SMP 16-19 Mathematics, MEI Modular Mathematics and Nuffield Advanced Mathematics. These new courses have attempted to take as a starting point the GCSE and the experiences it has given to students. They also make extensive use of new technology in their teaching approaches. Students passing through these courses are apparently showing much greater success than those on more traditional courses, and they are clearly maintaining the motivation and interest in mathematics they showed at GCSE. As students enter Higher Education from these courses, there is likely to be a further noticeable change. This will not mean that students will have covered all the content that used to be expected in the day of O level, or that algebraic skills will be restored, but there will be clearer understanding of the concepts which have been covered, and these students are likely to show a greater confidence in mathematics.

Conclusions

I am concerned that any improvements which may have taken place will have been masked by the very dramatic changes I have touched on here, and the inordinate workload on those teachers working to implement the National Curriculum over the past few years.

I am also concerned that we are still failing to recruit to A-level mathematics students who are looking for challenge, but have preferences for the graphical, the numerical, and for relational rather than instrumental (rote) understanding. These are not necessarily students destined for mathematics at university but for other roles as decision makers with influence in the future.

I am concerned that unless we look carefully at the evidence and at what are the needs of all the end users of A-level mathematics, we may do the country an even greater disservice than the rushed introduction of the National Curriculum has done. I appreciate it is probably infeasible to suggest two alternative maths A-level syllabuses, but there must be room here for discussion since we need to recruit more students to A-level.

I hope the LMS will continue to find ways to support local teachers, and to provide material and courses for the most able, but that it will avoid suggesting more fundamental change too soon. I hope members might continue to develop appreciation of the myriad of changes which have contributed to the impressions you have formed of your new students.

Perhaps I could end with a quote from Dr Rowe's letter, bearing in mind the likely differences between your students and his:

'I came across a pre-test of algebra knowledge...which I had set in 1967...The 1993 class scored slightly better overall than the class of 1967. This contradicted not only my own private prediction but also that of every single colleague I asked.' Rowe, 1994

References

- Brown, M., 1993, Clashing Epistemologies: the Battle for Control of the National Curriculum and its Assessment, Teaching Mathematics and its Applications, volume 12, no. 3.
- DFE, March 1994, Science and Maths: a consultation paper
- HMSO, 1994, Science and Mathematics: a review, HMSO
- Rowe, Arthur J, 1994, Guardian January 24
- Landau, 1994, unpublished MA dissertation, King's College London

S. Burns
Nuffield Foundation

GROUPS IN GALWAY 95 (In Honour of Professor S.J. Tobin)

A three day group theory conference to mark the forthcoming retirement of Professor Sean Tobin will be held at University College Galway from 18 to 20 May 1995. The speakers are expected to include: C. Campbell (St. Andrews), D.L. Johnson (Nottingham), T. Laffey

(Dublin), J. McDermott (Galway), D. MacHale (Cork), P.M. Neumann (Oxford), and J. Wiegold (Cardiff). For further details please e-mail: graham.ellis@ucg.ie or write to John Burns, Mathematics Department, University College Galway, Ireland.

ALEX P. ROBERTSON

Professor Alex P. Robertson, FRSE, who was elected a member of the London Mathematical Society on 16 December 1954, died on 31 January 1995.



J.W. GIBBS
Honorary Member 1892

DIARY

The diary lists Society meetings and other events publicized in previous issues of the Newsletter. For further information, refer to the figure in brackets, which is a cross reference to the LMS Newsletter number.

MARCH 1995

- 6 North British Functional Analysis Seminar, Newcastle University (224)
10 Edinburgh Mathematical Society Meeting, Abertay, Professor A.D. Wood (219)
17-24 Science, Engineering and Technology Week (219)(221)
19-22 Carolus Magnus on Arithmetic and Geometry Colloquium, Aachen, Germany (217)
19-1 April Several Complex Variables ICMS Instructional Conference, Edinburgh (224)
26-29 Postgraduate Conference in Probability & Statistics, Keble College, Oxford (222)
26-3 April ERASMUS Intensive Programme, Edinburgh (224)
27-29 Applications of Logic, University of York(221)
27-31 Workshop on Stochastic Evolution Equations as Dynamical Systems, Warwick University (222)
27-1 April Dynamical Systems International Congress, Montevideo, Uruguay (223)

APRIL 1995

- 3-6 British Mathematical Colloquium, Heriot-Watt (221)(223)
3-6 Conference on Numerical Methods for Fluid Mechanics, Oxford (221)
18-22 Professor P.F. Baum, LMS Invited Lectures, Manchester University (218)(223)
23-26 Korteweg and de Vries International Symposium, Amsterdam, The Netherlands (210)
24-28 Operator Algebras Symposium, Fields Institute, Canada (212)

MAY 1995

- 5 Edinburgh Mathematical Society Meeting, Stirling University, Dr C.J.H. McDiarmid (219)
6 A Celebration of Two Lives, William Kingdon Clifford and Lucy Clifford, Kent University, Canterbury (222)(224)
12-13 Two-day London Mathematical Society Meeting, 'A Hundred Years of Analysis', Oxford University.
29-1 June Mathematical Modelling Conference, University of Brunei Darussalam (214)

JUNE 1995

- 2 Edinburgh Mathematical Society Meeting, St Andrews University, Dr M.A. Berger (219)

- 4-8 50th Anniversary Summer Meeting, Canadian Mathematical Society, Toronto (224)
16 London Mathematical Society Meeting, Burlington House, London
25-29 European Consortium for Mathematics in Industry Conference, Technical University of Denmark, Lyngby (222)
28-30 Conference on the Legacy of George Boole, University College, Cork (219)

JULY 1995

- 3-7 Fifteenth British Combinatorial Conference, University of Stirling (210)(223)
3-7 International Congress on Industrial and Applied Mathematics, Hamburg (213)
3-7 Mathematics of Neural Networks and Applications, Lady Margaret Hall, Oxford (221)(223)
3-14 Gauge Theory and Symplectic Geometry Seminar, Montreal University, Canada (222)
9-16 European/Gregynog Stochastic Analysis Symposium, Gregynog, Wales (222)
10-12 Linear Algebra and Its Applications Conference, Manchester University (220)
10-13 The ATLAS 10 Years On, Birmingham University (223)
10-20 Mathematical Models of Liquid Crystals and Related Polymeric Systems, LMS Durham Symposium, Durham University (223)
10-21 Workshop on Ergodic Theory on Riemannian Manifolds, Warwick (222)
11-14 Finite Fields & Applications International Conference, University of Glasgow (219)(223)
13-16 British Congress of Mathematics Education, Manchester Metropolitan University (220)
17-21 Symposium on Sieve Methods, Exponential Sums and their Applications in Number Theory, University of Wales College of Cardiff (221)

AUGUST 1995

- 17-4 Completely Bounded Maps and Cohomology in Operator Algebras EPSRC Workshop, Newcastle University (223)

SEPTEMBER 1995

- 4-7 Technology in Mathematics Teaching International conference, Napier University (2230)
18-26 Pan-African Congress of Mathematicians, Ifram, Maroc (224)

The Newsletter is published monthly except in August. Items and advertisements for inclusion in the Newsletter should be sent to the Editor, Susan Oakes, London Mathematical Society, Burlington House, Piccadilly, London W1V 0NL, to arrive before the first day of the month prior to publication. Telephone 071-437 5377, fax 071-439 4629, e-mail lms@uk.ac.kcl.cc.bay. The London Mathematical Society is registered with the Charity Commissioners.