THE LONDON MATHEMATICAL SOCIETY NEWSLETTER

No. 202 **February 1993**

FORTHCOMING SOCIETY MEETINGS

Friday 19 February 1993, York
C.G. Gibson, D.M.Q. Mond
Friday 19 March 1993, Burlington House
Thursday, Friday 13-14 May 1993, Cambridge
Friday 18 June 1993, Burlington House
Friday 15 October 1993, Burlington House
Friday 19 November 1993, Burlington House

COUNCIL RETREAT 1993

The Council of the Society will be holding an extended meeting at Cambridge over the weekend of 7th to 9th May 1993. Part of this meeting will be devoted to consideration of the long-term aims of the Society and means for their attainment.

The views of the members of the Society are an important part of the information which ought to be available to members of Council when they undertake this review of the Society's activities.

If you have thoughts or opinions on directions in which the Society ought to be moving, suggestions of activities in which it ought to be involved, or comments on the role of the Society in the general context of mathematics in the UK or a wider community, please send your comments in writing to the President, Professor J. R. Ringrose, FRS, Department of Mathematics and Statistics, The University, Newcastle upon Tyne NE1 7RU, preferably to reach him by 31st March 1993.

OXFORD CENTRE FOR INDUSTRIAL AND APPLIED MATHEMATICS

The London Mathematical Society has awarded the Oxford Centre for Industrial and Applied Mathematics a grant of £2,500 for 1992/93 to pay the expenses of British mathematicians who wish to attend the following activities.

Workshops on Mathematical Problems in Industry. These are usually held on Friday mornings and details may be obtained from Dr Tayler's Assistant, OCIAM, Mathematical Institute, 24-29 St Giles, Oxford, OX1 3LB, Tel 0865-270501, Fax 0865-270515, Email ecmigb@vax.ox.ac.uk

Study Group with Industry week. This year the Study Group will be held in Nottingham from 29th March to 2nd April. Enquiries should be sent to Dr R.H. Tew (Secretary), Department of Theoretical Mechanics, University of Nottingham, Nottingham, NG7 2RD, tel 0602-513855, fax 0602-513837.

Funds are only available for those who cannot obtain support from the SERC or their home institutions to attend. Applications for the use of this grant should be made to either of the above addresses.

LONDON MATHEMATICAL SOCIETY
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U.K.PERIODICALS' BACKLOG	S. Brenner, C.T.C. Wall (1992-97)
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David A Brannan
Publications Secretary

LONDON MATHEMATICAL SOCIETY

FRIDAY 19 FEBRUARY 1993

C.G. GIBSON (Liverpool) will speak at 3.30 on

Singular Movements

D.M.Q. MOND (Warwick) will speak at 5.00 on

Real versus Complex in Singularity Theory

The meeting will be held in Room V045, Vanbrugh College, University of York

Tea will be served at 4.30 in the Vanbrugh Senior Common Room

All interested are very welcome

Enquiries may be addressed to Dr A. Sudbery, Department of Mathematics, University of York, Heslington, York YO1 5DD. Telephone 0904 433070.

MATHEMATICS DEPARTMENTS SURVEY 1992

1. The publication last year of the results of the 1991 survey was widely welcomed. This brief account of the 1992 survey draws attention to certain trends. As last year, a fuller account will be circulated to Heads of Departments.

2. Again we confined our attention primarily to the pre-binary-abolition universities, though in preparation for the enlarged university sector we did contact a few polytechnics. The experience did alert us to the difficulties that will face gatherers of information in the future. British universities never were an entirely homogeneous group - for example the Scottish universities have always had difficulty in answering questions framed in terms that did not really correspond to their distinctive structures, and both Oxford and Cambridge clearly have had problems of a similar sort. The diversity in the post 1992 university sector is, however, an order of magnitude greater, and questions attracting useful answers will have to be most carefully devised.

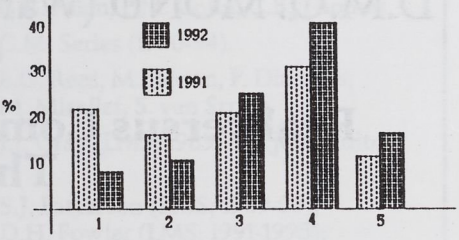
3. The results of the 1992 survey do have to be treated with some caution. Despite reminders, some universities failed to respond, and in a few cases they were institutions so far from typical that averages are bound to be distorted. In particular, any conclusions on postgraduate numbers and research grants are bound to be a bit unreliable.

4. Last year there were alarming indications that major users of mathematical service teaching such as engineering departments were likely to take over this responsibility (and the accompanying FTEs) themselves. From a number of universities it has been reported that this has actually happened, and the fact that the proportion of effort being expended on service teaching by mathematics departments has risen (from 30 to 37%) since last year in truth conceals a double whammy: the loss of service teaching is accompanied by a sharp drop in mathematics undergraduates. Maybe one should call it a triple whammy, for despite the loss of FTEs on both fronts the reported student/staff ratio has risen from 14.0 to 14.3.

5. In the midst of all this gloom it is good to report a degree of optimism among departmental chairmen. Nearly 32% of our respondents claimed to expect an increase in fully funded undergraduate students in Cost Centre 17 (Mathematics), and only 2% expected a decrease. On the other hand, realism was also in evidence: only 7% expected the entrance qualifications of their entrant undergraduates to improve.

6. The picture as regards postgraduate students has not changed dramatically since last year. From among universities reporting, there were 102 PhDs from the UK, 10 from the EC and 65 from the rest of the world. The total of 177 is not hugely different from last year's reported total of 190.

7. By contrast, the passing of a year has very considerably changed the picture as regards departmental funding. We asked departments to describe their funding regime on a scale from 1 (Historical Funding) to 5 (Full Formula Funding - salaries and space charged to Departments). The average moved in a single year from 2.8 to 3.4:



Change in Departmental Funding Regimes

8. Possibly because of the strength of the pound against the dollar for most of the period in question, the position regarding library expenditure was better than might have been expected. Though more than 80% of departments regarded expenditure on periodicals as either 'inadequate' (62%) or 'seriously inadequate' (20%), exactly half of the departments responding saw their allocation for books as 'adequate'.

9. As ever, there was difficulty in framing the right question on computer availability. Last year we asked for the percentage of staff having a BBC or better in their offices, and got the average answer 80%. This year we replaced BBC by PC and got the answer 92%. The percentage of staff connected to JANET rose from 68%

to 81%. Clearly computer availability is increasing rapidly, and we receive a further pointer from a question we did not ask last year: 28% of staff either have a workstation in their office or access to a departmental workstation via a graphic terminal in their office. The number of FTE students per terminal has fallen from 21 to 15.

Comments

The comments made in last year's report (Newsletter February 1992) seem as relevant as ever. There does not appear to have been any dramatic worsening of the position of Mathematics since last year, and in terms of computer availability things actually seem to have improved. On the other hand the recent decision to reduce fees in Category 1 subjects, and the pushing of Mathematics into the 'cheap' category, is bound to have a noticeable negative effect. Next year's report might be of a real crisis in funding.

John M Howie,
University of St Andrews
January 1993

PROBABILITY THEORY OF SPATIAL DISORDER AND PHASE TRANSITION - NATO ADVANCED STUDY INSTITUTE

This NATO Advanced Study Institute will be held at the Isaac Newton Institute, Cambridge, during the period 4th-16th July 1993. Invited probabilists and physicists will deliver series of lectures concerned with the rigorous theory of spatial random processes, particularly those of physical origin. Topics which will receive special attention include random walk, interacting particle systems, percolation, Ising and Potts models, spin glasses, cellular automata, quantum spin systems, metastability, ergodic theory of spatial processes, and some aspects of random media. The principal emphasis will be upon rigorous probability theory; as a subsidiary component, some lecturers will highlight certain areas of physics ripe for development by probabilists. This meeting is part of a longer term programme at the Isaac Newton Institute devoted to 'Random Spatial Processes'.

The principal speakers will include: M. Aizenman (Princeton), B. Derrida (Ecole Polytechnique), D. Fisher (Harvard), D. Griffeath (Wisconsin), G. R. Grimmett (Cambridge), M. Keane (Delft), G. Lawler (Duke), T. M. Liggett (UCLA), C. M. Newman (Courant Institute), G. Papanicolaou (Courant Institute), R. H. Schonmann (UCLA), S. Shlosman (Moscow), G. Slade (McMaster).

Individuals seeking information or invitations should contact Geoffrey Grimmett (Statistical Laboratory, 16 Mill Lane, Cambridge CB2 1SB, UK) as soon as possible, and certainly by 15th March 1993. As part of its grant towards the meeting, NATO will provide some financial support for the travel and subsistence costs of some participants.

J. COPPING

Dr James Copping who was elected a member of the London Mathematical Society on 16 April 1953, died on 6 October 1992.

J.W. HARDING

Dr John William Harding who was elected a member of the London Mathematical Society on 18 March 1937, died on 5 October 1992.

R.C.H. TANNER

Dr R.C.H. Tanner who was elected a member of the London Mathematical Society on 5 February 1931, died on 24 November 1992.

PARTNERSHIP AWARD FOR MATHEMATICIANS

Dr Graham Bell, Dr Edmund Robertson and Dr John O'Connor from the Department of Mathematics and Computer Science at the University of St Andrews, have won the 1992 Mathematics prize, sponsored by British Nuclear Fuels, in the Partnership Awards scheme. This is a national scheme which annually awards 23 prizes worth £4500 each for successful innovation in teaching and learning in higher education. The prizes were presented to all winners during a special reception at the Institute of Directors in London on Monday 7th December 1992.

The St Andrews team won the prize for their computer based learning system called MacTutor. The MacTutor system is designed to be used on the Apple Macintosh range of computers, and was first developed in 1988 as a tutorial system, to supplement existing teaching methods. It has evolved into an innovative software package which encourages students to regard mathematics as an experimental science, so that they are able to explore concepts and investigate ideas behind mathematical problems through interaction with the computer. Students are able to use MacTutor within minutes of first starting the programme and can work with it at their own pace.

QP - PQ

A conference on Quantum Probability and Applications is to be held at the University of Nottingham from 29th March to 3rd April 1993. The conference seeks to bring together mathematicians and physicists interested in various aspects of quantum probability. The mornings will be reserved for expository lectures which are intended to be accessible to non-specialists. Research presentations will be scheduled for early evening, leaving afternoons free for less formal seminars and discussions. Among the topics to be discussed are: quantum stochastic flows and non-commutative geometry; markov structures and quantum groups; quantum martingales and stopping times; non-commutative independence and central limit theorems; non-causal, Wiener space and white noise analysis; quantum measurement and open systems; quantum entropy and statistical mechanics.

There is a registration fee of £90.00 and accommodation (including breakfast) for £150.00. R.L. Hudson and J.M. Lindsay are the organisers. For further information contact: Jo Frampton, Conference Secretary, Department of Mathematics, University of Nottingham, University Park, Nottingham NG7 2RD, email: jof@uk.ac.nott.maths, fax: 602-514951, telex 37346 UNINOTG.

LONDON MATHEMATICAL SOCIETY

INVITED LECTURES

Professor L. de Branges
(Purdue University)

will give a course of ten lectures on

Factorization and Invariant Subspaces

at Lancaster University during the week
Monday 22 - Friday 26 March 1993

To obtain an abstract of the lecture series or to reserve accommodation on campus (from £24.25 + VAT per day half board) contact Professor N.J. Young, Department of Mathematics, Fylde College, Lancaster University, Lancaster LA1 4YF, email N.J.Young@uk.ac.lancs.cent1. Reservations need to be confirmed by 1st February 1993.

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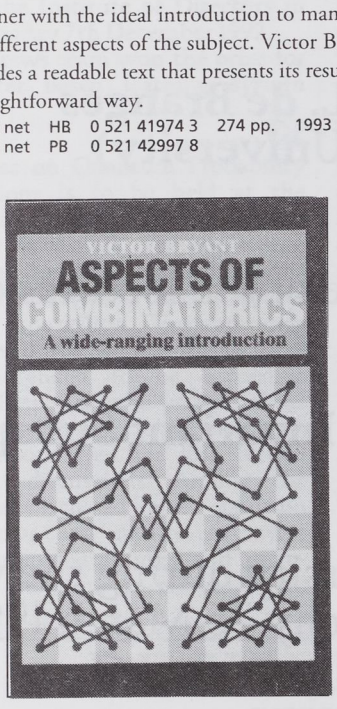

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EULER INTERNATIONAL MATHEMATICAL INSTITUTE

In 1988 the USSR Government and the Academy of Sciences of USSR decided to organise an international research institute in Mathematics, in order to strengthen links between USSR and the international mathematical community. In spite of the many political and economic changes that have occurred in the meantime, the Academy steadfastly pursued this goal. The location was eventually decided as Leningrad (now St Petersburg), with Academician Ludwig D. Faddeev as its Director. The Institute itself is named after Leonhard Euler who spent most of his life in St Petersburg, and who is buried there. Several scientific meetings have already been held, some in accommodation borrowed from the St Petersburg branch of the Steklov Institute.

The formal inauguration of the Institute took place on 11th September 1992, in presence of a large number of mathematicians from the St Petersburg area, Academician Yu S. Osipov (President of the Russian Academy of Sciences), Academician A.A. Gonchar (First Vice-President), Academician V.S. Vladimiroff (Director of the Moscow branch of the Steklov Institute), Professor A.B. Zizcenko, T. Mira (Japan), B. Bojarski (Warsaw), L. Carleson (Stockholm), O. Lehto (Helsinki), J. Palis (Rio de Janeiro), R. Seiler (Berlin), Sir Michael Atiyah, O.M., Sir Christopher Zeeman and D.A. Brannan (U.K), and various local civic dignitaries.

L.D. Faddeev related the interesting history of the building in which the Institute is situated, and the story of how the Academy's decision to have some type of Institute had been transformed into bricks and mortar - and mathematical activity. Then Professor S. Tian-Shanskii gave a fascinating talk about the setting up in the 1620s of the Russian Academy of Sciences in the city by Catherine (wife of Czar Peter the Great), and the progress of mathematics in St Petersburg over the last 250 years.

The Institute has received some financial assistance from Japan, Germany, UNESCO and the LMS - in particular for hard currency purchases of equipment and furniture. It is connected to the world by direct telephone, fax and electronic mail.

The principal research areas of the Institute's activities are algebra and number theory, geometry and topology, mathematical analysis and the theory of probability, modern applied mathematics and mathematical physics. It is planned that every year there will be three one-term long scientific meetings, each culminating in a two-week workshop/mini-conference. Each year will have a full-time coordinator in charge of the programme, corresponding with participants, guiding the progress of the year, and preparing the Proceedings. The Institute also has a Deputy Director (Professor S.V. Khrushchev), a Scientific Secretary (Professor A.I. Lanin), and a permanent staff of 15 people (administrators, librarians, computing staff, editors, secretaries, etc).

The St Petersburg authorities donated the Institute building to the venture in 1988 - a two-storey house, called Novinskii's House, surrounded by a fairly large piece of adjacent land in the Viazemkii Garden placed on a bank of one of the River Neva's channels in the northern part of old St Petersburg. The original wooden building on this site was built in 1827 by the family of A. Engelgart, who was a director of the Imperial Lyceum between 1813 and 1827. Between 1865 and 1917 the land was owned by the rich merchant family Novinskii, who replaced the wooden building by a stone building in 1912-13. The building had been disused for a considerable period, and a condition of its donation to the Institute was that it be restored to its original design to a very high standard. This has been painstakingly done, and the wood floors and the ceilings of the Institute are particularly impressive features. The classical traditions of old St Petersburg are well represented in the architectural style of the beautiful building.

For accommodating visitors the In-

stitute has upgraded 15 apartments (each with 2 or 3 rooms, kitchen and bathroom) in a single building in a newly developed area of the city, about 5.5 kilometres from the Institute. There is frequent tramcar and metro service between the apartments and the Institute, taking only 15-20 minutes.

Russian mathematicians are very anxious to foster contacts with the West, and would be delighted to receive mathematical visitors to any of the mathematical institutions in the City. If you are interested in the possibility of visiting St Petersburg, I would be very happy to put you in contact (by e-mail) with local mathematicians.

David A Brannan
Publications Secretary

CLASSICAL AND AXIOMATIC POTENTIAL THEORY NATO ADVANCED RESEARCH WORKSHOP

A Workshop on Classical and Axiomatic Potential Theory will be held from 26th - 30th July 1993 at Château de Bonas, France. The organisers are J. Bliedtner (Frankfurt), D. Feyel (Paris), M. Goldstein (Montreal), K. GowriSankaran (Montreal), W.K. Hayman (York) and I. Netuka (Prague). The keynote speakers are the organisers and D. Armitage (Belfast), N. Bouleau (Paris), A. Eremenko (West Lafayette), H. Foellmer (Bonn), W. Hansen (Bielefeld), W. Hengartner (Ste. Foy, Canada), A. de la Pradelle (Paris), T. Murai (Nagoya), J.-M. Wu (Urbana).

Attendance is by invitation only. For further information contact K. GowriSankaran, Department of Mathematics & Statitistics, McGill University, 805 Sherbrooke St.W., Montreal, Canada H3A 2K6, email: gowri@math.mcgill.ca.

MEMORIAL MEETING FOR ROLPH SCHWARZENBERGER

The London Mathematical Society held a meeting dedicated to the memory of Rolph Schwarzenberger (1936-1992) at the Mathematics Institute, University of Warwick, on Friday 11 December 1992. The President of the Society presided at the meeting and an opening address was given by the Treasurer of the Society. Lectures were given by Professor D.O. Tall, Dr S. Pirie, Professor S.A. Robertson and Professor Sir Christopher Zeeman. The opening address and a summary of Professor Tall's lecture follow.

Opening Address

Rolph Schwarzenberger had a very full and well-spent life, despite his tragically early death. He was blessed with great abilities and achieved success in many different spheres.

Sir Michael Atiyah told me that Rolph's early work on vector bundles has now, some twenty five years later, come into fresh prominence and is much quoted in recent research. Rolph's desire to help others and his concern for the welfare of young people made his transition into Mathematics Education natural.

Rolph had great charm and powers of persuasion. You would go to a meeting with Rolph intending to say "no" but, by some mysterious alchemy, find yourself saying "yes". This was how I agreed to succeed him as Treasurer of the London Mathematical Society.

The Society owes Rolph an immense debt of gratitude for his wisdom and guidance over many years, as Treasurer, as Vice-President, as Chairman of the Education Committee and as member of Council.

We, his friends, admired Rolph for his wisdom and we loved him for his kindness and generosity of spirit. We sorrow that he is no longer with us but rejoice that we had the privilege of his friendship.

J.D.M. Wright
Treasurer

MATHEMATICIANS THINKING ABOUT STUDENTS THINKING ABOUT MATHEMATICS

There is a perceived change in the nature of students entering mathematics degrees, in part from the changes in school - with mixed ability teaching, investigational work and less emphasis on routine manipulation - and in part from the widening of access to a larger proportion of the population. However, difficulties that students have in learning mathematics are not new and have been with us for many years. It proves difficult for mathematicians to fully comprehend the causes of these difficulties for, as Freudenthal has observed, "one finally masters an activity so perfectly that how and why students don't understand is not asked any more and is not even understood as a meaningful and relevant question". A major difficulty is in the compressibility of mathematical concepts which Thurston (1990) described as follows: "You may struggle a long time, step by step, to work through some process or idea from several approaches. But once you really understand it and have the mental perspective to see it as a whole, there is often a tremendous mental compression. You can file it away, recall it quickly and completely when you need it and use it as just one step in some other mental process. The insight that goes with this compression is one of the real joys of mathematics."

Gray & Tall (1991) defined the amalgam of process and compressed concept that can be signalled by the same symbolism a "procept". This includes notions such as number, $3+2$, $5/8$, $+2$, $2+3x$, the limit notation, and such things as elements of transformation groups, etc. Based on evidence from young children learning arithmetic through to university level they hypothesise that those who are successful think flexibly with symbolism that stands dually as a process to do mathematics and as a concept to manipulate mentally. They contend that mathematicians rarely pass on the flexible and ambiguous use of symbolism on to students. Instead students are often presented with the formalisms of mathematics in lectures which convey, in the words of Skemp (1971), the product of mathematical thought rather than the process of mathematical thinking.

Evidence in interviews and written comments from students show that they are well aware of the problems. One student remarked that because "the tutor knows what's going on, he expects us to know what's going on" by "working through a couple of examples", and that "I can't listen and think and keep up with the notes"; afterwards, looking at the notes "I can't remember what he said in between, so it's a non-starter from the beginning". Others report "with personal experience" that "the student looks upon the subject as something to pass and then forget most of it immediately after the exam". W. W. Sawyer (1987) found that students taking a functional analysis course remembered little of their previous analysis course on which had hoped to build because the "formal lectures had not conveyed any intuitive meaning" and the students "had passed their examinations by last minute revision and by rote".

In attempting to improve the situation, the London Mathematical Society has proposed changes in course length from three to four years. There are moves to cover the material more slowly. In my lecture I posed the question "If mathematicians succeed through compressibility of knowledge, then does it help students compress knowledge better by spreading it out more?"

The notion of "concept image" is helpful here. This is "the total cognitive structure that is associated with the concept, which includes all the mental pictures and associated properties and processes" (Vinner & Tall, 1981). Through their experiences, individuals develop beliefs about concepts that are not part of the formal definition. For instance, that the terms of a sequence can never equal

the limit, or that a function must be given by a simple formula. Students bring their own personal concept images to the formal presentations of mathematics and this can cause great conflict and prevent understanding (Schwarzenberger & Tall, 1978).

What is needed is not just doing the same mathematics at a slower pace, but to focus on the nature of mathematical thinking and to help students reconstruct their own knowledge in a way which becomes meaningful for them.

Poincaré, Hadamard and Polya are but three mathematicians to concentrate on the processes of mathematical thinking as opposed to the formal structure of final mathematical knowledge. Based on their ideas, an approach appropriate for students has been developed (e.g. Mason et al: Thinking Mathematically, Addison Wesley, 1982). This requests students to first ENTER a problem, by thinking what is wanted, what is known, and what needs to be introduced to get to the former from the latter. An ATTACK phase follows which may be successful or unsuccessful The emotion of pleasure with success must be enjoyed for a moment before the serious business of REVIEW is undertaken to check that the arguments are formally correct and to consider how they might be generalised and extended. The negative emotions associated with being unsuccessful are seen as signals that the problem needs reconsideration, and that some gain has been made - even if only that the route taken has not proved fruitful and other routes need to be considered by returning to re-enter the problem. Such relatively simple ideas, used in a supportive and flexible context without the time pressure to solve the given problem in a fixed period, can prove dramatically successful in raising students' personal esteem and develop a framework for doing mathematics meaningfully instead of just learning by rote to pass exams.

My thesis is that it is futile to focus on the undergraduate degree purely in terms of mathematical content to be learnt in a fixed time scale. Many (most?) students are now leaving university with a sense of alienation and frustration having spent three years committing mathematical content to memory sufficiently long to pass an exam. Apart from the successful minority who go on to do graduate research, few students remember the content of their courses for long afterwards. What matters is quality of learning rather than quantity of content. It is far more important for students to see mathematics at university as a time when they learnt to think mathematically and to have the confidence to tackle new problem situations in a truly mathematical way. By spending part of their time learning to use problem-solving techniques, they may be able to apply these to help them understand material given in more concentrated form in other parts of their course and to reconcile their concept images with the formalities.

This was expressed eloquently by the psychologist Jerome Bruner (1966): "A body of knowledge enshrined in a university faculty and embodied in a series of authoritative volumes is the result of much prior intellectual activity. To instruct someone in these disciplines is not a matter of getting him to commit results to mind. Rather, it is to teach him to participate in the process that makes possible the establishment of knowledge. We teach a subject not to produce little living libraries on that subject, but rather to get a student to think mathematically for himself, to consider matters as an historian does, to take part in the knowledge getting. Knowing is a process, not a product."

True reform of undergraduate mathematics can only happen if mathematicians think seriously about students thinking about mathematics.

The full text of this talk, including references, may be obtained from Professor David Tall, Mathematics Education Research Centre, University of Warwick, Coventry CV4 7AL.

RECENT LMS PUBLICATIONS

Groups, Combinatorics and Geometry, edited by M.W. Liebeck and J. Saxl, pp 512, ISBN 0 521 40685 4, LMS Lecture Note Series 165, £27.95, LMS members discount price £20.95.

Since the classification of finite simple groups was announced in 1980 the subject has continued to expand opening many new areas of research. This volume contains a collection of papers, both survey and research, arising from the 1990 Durham conference in which the excellent progress of the decade was surveyed and new goals considered. The material is divided into eight sections: sporadic groups; moonshine; local and geometric methods in group theory; geometries and related groups; finite and algebraic groups of Lie type; finite permutation groups; further aspects of Lie groups; related topics. The list of contributors is impressive and the subjects covered include many of the fascinating developments in group theory that have occurred in recent years. It will be an invaluable document for mathematicians working in group theory, combinatorics and geometry.

Surveys in Combinatorics, 1991, edited by A.D. Keedwell. pp 312, ISBN 0 521 40766 4, LMS Lecture Note Series 166, £22.50, LMS members discount price £16.85.

This volume contains the invited papers presented at the British Combinatorial Conference, held at the University of Surrey in July 1991. As in previous years, the speakers were mathematicians of the highest quality who spanned the subject area, and their papers will provide excellent reading for all those interested in combinatorics.

Boolean Function Complexity, edited by M.S. Paterson, pp 300, ISBN 0 521 40826 1. LMS Lecture Note Series 169, £22.95, LMS members discount price £17.20.

By considering the size of the logical network needed to perform a given computational task, the intrinsic difficulty of that task can be examined. Boolean function complexity, the combinatorial study of such networks, is a subject that started back in the 1950's and has today become one of the most challenging and vigorous areas of theoretical computer science. The papers in this book stem from the 1990 London Mathematical Society Durham Symposium on Boolean function complexity. The range of topics covered will be of interest to the newcomer to the field as well as the expert, and overall the papers are representative of the research presented at the Symposium. The list of participants includes very well known figures in the field.

Discrete Groups and Geometry, edited by W.J. Harvey and C. Maclachlan, pp 256, ISBN 0 521 42932 3, LMS Lecture Note Series 173, £22.95. LMS members discount price £17.20.

This book constitutes the proceedings of a conference held at the University of Birmingham to mark the retirement of Professor A.M. Macbeath. The papers cover topics in the theory of discrete group actions, complex analysis, algebraic geometry and number theory.

Applications of Categories in Computer Science, edited by M.P. Fourman, P.T. Johnstone and A.M. Pitts, pp 352, ISBN 0 521 42726 6, LMS Lecture Note Series 177. £24.95, LMS members discount price £18.70.

Category theory and related topics of mathematics have been increasingly applied to computer science in recent years. This book contains selected papers from the 1991 London Mathematical Society Durham Symposium. Participants at the conference were leading computer scientists and mathematicians working in the area and this volume reflects the excitement and importance of the meeting. All the papers have been refereed and represent some of the most important and current ideas. Hence this book will be essential to mathematicians and computer scientists working in the applications of category theory.

Hyperbolic Geometry, by B. Iversen, pp 200, LMS Student Texts Series 25, Hardback ISBN 0 521 43508 0, £29.95, LMS members discount price £22.45, Paperback ISBN 0 521 43528 5, £13.95, LMS members discount price £10.45.

Although it arose from purely theoretical considerations of the underlying axioms of geometry, the work of Einstein and Dirac has demonstrated that hyperbolic geometry is a fundamental aspect of modern physics. In this book, the rich geometry of the hyperbolic plane is studied in detail, leading to the focal point of the book, Poincaré's polygon theorem and the relationship between hyperbolic geometries and discrete groups of isometries. Hyperbolic 3-space is also discussed, and the directions that current research in this field is taking are sketched.

These books have recently been published and are available from Cambridge University Press, Customer Services, FREEPOST, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU. Payment should be sent with your order.

Sir Michael Francis Atiyah (born 1929) was educated first in Egypt and then at Manchester Grammar School and Trinity College, Cambridge, where he was first Smith's Prizeman in 1954. He became Savilian Professor at Oxford in 1963, and was awarded a Fields Medal in 1966 for his work on K-theory and the index theory of elliptic operators. He is now Master of Trinity College, Cambridge, and actively involved in attempts to restore links between mathematics and physics. He was elected to Fellowship of the Royal Society in 1988, and is currently their President. The London Mathematical Society awarded him its De Morgan Medal in 1989. He was knighted in 1983 and was the Society's 57th President, from 1974 to 1976.

DIARY

The diary lists Society meetings and other events publicised 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.

1993

FEBRUARY

7-11	Australian Applied Mathematics Conference, South Australia (197)
12	Edinburgh Mathematical Society Meeting, Edinburgh (197)
15-27	Langlands' Programme Instructional Course, Cambridge (198)
19	London Mathematical Society Meeting, York

MARCH

12	Edinburgh Mathematical Society Meeting, Stirling (197)
19	London Mathematical Society Meeting, London
22-26	LMS Invited Lectures, Professor L. de Branges, Lancaster University (201)
29-1 Apr	British Mathematical Colloquium, Reading University (200)
29-8 Apr	Geometric and Combinatorial Methods in Group Theory Workshop, ICMS, Edinburgh (198)

APRIL

5-8	British Applied Mathematics Colloquium, Strathclyde University (200)
8-10	Clifford Algebras in Analysis Lecture Series, Arkansas, U.S.A. (201)
18-24	Functional Analysis Spring School, Czechoslovakia (201)
22-23	Mathematics in Finance - The Future, ICMS Conference, Royal Society Edinburgh (201)
26-8 May	Mathematical Biology Study Centre/Workshop, Maine-et-Loire, France (201)
28	Novel Mathematical Methods in Petroleum Science, ICMS Workshop, Royal Society Edinburgh (201)

MAY

7	Edinburgh Mathematical Society Meeting, Aberdeen (197)
13-14	London Mathematical Society Meeting, Cambridge
29	Edinburgh Mathematical Society Meeting, St Andrews (197)

JUNE

4-7	European Women in Mathematics, Warsaw, Poland (201)
6-12	Potential Theory and Analysis Spring School, Czechoslovakia (201)
7-18	Analysis, ICMS Short Course, Edinburgh (201)
18	London Mathematical Society Meeting, London
20-2 Jul	Real and Complex Dynamical Systems, Hillerod, Denmark (201)
28-2 Jul	Integrability and Chaotic Behaviour Conference, Torun, Poland (201)
29-2 July	Number Theoretic and Algebraic Methods in Computer Science, Moscow, Russia (197)

JULY

4-11	Analytic and Geometric Aspects of Hyperbolic Space, LMS Durham Symposia, Durham University (200)
5-9	14th British Combinatorial Conference, Keele University (188)(200)
5-9	Annual Meeting of the Australian Mathematical Society, Wollongong, Australia (198)
11-16	Computational Techniques in Spectral Theory and Related Topics Workshop, Gregynog, Wales (201)
11-21	Complex Dynamics, LMS Durham Symposia, Durham University (188)(200)
12-16	Combinatorial Mathematics and Combinatorial Computing Conference, Adelaide, Australia (189)
12-16	Algebraic Graph Theory, ICMS, Edinburgh (197)
22-1 Aug	Vector Bundles in Algebraic Geometry, LMS Durham Symposia, Durham University (200)
26-30	Randomness and Computation Workshop, Edinburgh (197)
26-6 Aug	Séminaire de Mathématiques Supérieures, Montreal, Canada (199)

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.oak.

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