THE LONDON MATHEMATICAL SOCIETY NEWSLETTER

No. 201

January 1993

FORTHCOMING SOCIETY MEETINGS Friday 15 January 1993, Burlington House R.A. Cuninghame-Green, L.C. Thomas Friday 19 February 1993, York 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

EDITORIAL

The first issue of the Society's Newsletter appeared in 1973. It has changed gradually in the past twenty years and this two hundred and first issue heralds another modest development, in content as well as appearance. It is intended that matters of public policy will have greater coverage, keeping pace with the Society's development of its political role. It is hoped that the Newsletter can be a medium for developing the sense of community amongst the Society's members and involving the whole membership in debate and policy formation. To facilitate these changes, there has been a change in the editorial arrangements. For the past five years, the Newsletter has been edited by the Society's Administrator, Susan Oakes. For the next five years it will be jointly edited by Susan Oakes and Alan Pears.

The Newsletter will continue to be a channel for the rapid dissemination of information to members. The coverage of activities of the Society's Computer Science, Education, Funding and Programme Committees will be extended and Society responses to government bodies, Funding Councils and so on, will be reproduced. Members may have noticed that in the past few months, several signed articles on topical issues have appeared. In future the Editors will solicit such articles and welcome unsolicited signed contributions. To stimulate debate on matters of concern to members, 'Letters to the Editors' will also be welcomed. It will be understood that decisions on whether or not to publish such contributions, in full or in part, will rest with the Editors and that the right to edit letters will be reserved. The Editors look forward to receiving much stimulating material.

The Newsletter is published monthly except in August. Items and advertisements for inclusion in the Newsletter should be sent to Susan Oakes, London Mathematical Society, Burlington House, Piccadilly, London W1V 0NL, to arrive before the first day of the month prior to publication. Contact numbers are: telephone 071-437 5377; fax 071-439 4629, email Ims@uk.ac.kcl.cc.oak. Submission of material by electronic mail is very much appreciated.

MEETING ON INDUSTRIAL AND BUSINESS MATHEMATICS

The Society Meeting to be held at the Geological Society, Burlington House, London on Friday 15 January 1993 will be devoted to Industrial and Business Mathematics. Programme Committee feels that members might be interested to see abstracts of the two lectures to be given at the meeting and these follow.

Industrial Cutting and Packing Problems R.A. Cuninghame-Green University of Birmingham

Many industries have at their heart the task of cutting shapes, without untoward wastage, from flat stock in the form of rectangular or circular sheets or blanks. Such problems are highly industry-specific and present a wide variety of simplifying or complicating factors such as: regularity or irregularity of layout; convexity or nonconvexity of pieces; congruence or incongruence of pieces; isotheticity, isotropy and so on.

Mathematically-related industrial applications include problems of 3-dimensional packing, motion planning and robotics.

The talk will discuss the general taxonomy of these problems and indicate their relationship to various branches of mathematical programming and computational geometry. Illustrations will be drawn from case-studies.

Dynamic Programming: Applications and Parallel Computing Solution Algorithms L.C. Thomas University of Edinburgh

Dynamic Programming, a suggestively simple but extremely versatile approach to sequential decision problems, was developed by Bellman nearly forty years ago. It classifies the different states the problem can be in at each decision point and if in state i with n more decisions to make, one can choose to perform one of the actions k in a set K, it assumes there is an immediate reward r(i,k) and a probability p(i,j,k) of moving to state j at the next state. The optimal action to choose is then obtained by solving the optimality equation which relates the optimal total reward $v_n(i)$ with n decisions to make and the system in state i, to $v_{n-1}(.)$ the optimal rewards with n-1 decisions to make by

$$v_{n}(i) = \max \{r(i,k) + \sum p(i,j,k)v_{n-1}(j)\}.$$

keK j

The limitations of using dynamic programming in real applications relate to the size of the state space that results, even though the calculation at each state is straightforward. This structure of dynamic programming suggests that solution algorithms could be successfully modified for use on parallel computers. This lecture will discuss three real applications of dynamic programming which lead to large state spaces, behavioural scoring, search pattern and control of a reservoir system. It also describes the results of a computational comparison of how successfully the standard solution algorithms for dynamic programming parallelize.

Behavioural scoring is the set of techniques that allow credit grantors to set and adjust credit limits for their customers in the light of their repayment behaviour. Some of the techniques are multi-variate statistical ones, but others, based on Markov chain ideas, lead to dynamic programming models. Although finding the optimal search pattern when searching for a stationary target has essentially been solved, only limited progress has been made in finding such patterns for a randomly moving target. An approach based on partially observable dynamic programming models is outlined and the computational implications of solving the problem are examined. Control of the outflow from reservoirs is a classical application of dynamic programming but again the "curse of dimensionality" growth in the size of the state space means that very careful approximations and modelling are required to deal with multi-reservoir systems.

Work on the computational comparison of parallel computing versions of the standard value iteration algorithms for dynamic programming have led to some encouraging and surprising results. These algorithms do parallelize efficiently, but also for very large problems, it is more effective to modify the algorithms rather than increase the degree of parallelization.

LONDON MATHEMATICAL SOCIETY

FRIDAY 15 JANUARY 1993

R.A. Cuninghame-Green (Birmingham) will speak at 3.30 on

Industrial Cutting and Packing Problems

L.C. Thomas (Edinburgh) will speak at 5.00 on

Dynamic Programming: Applications & Parallel Computing Solution Algorithms

The meeting will be held at the Geological Society Burlington House, Piccadilly, London W1.

All interested are very welcome.

Tea will be served at 4.30

REPORT OF THE TREASURER TO THE ANNUAL GENERAL MEETING 1992

The audited accounts give a snapshot of the Society's finances on 31 August 1992, that is, before the devaluation of sterling in September.

The general fund has increased from $\pounds 3,012K$ to $\pounds 3,333K$ and the total assets of the Society (including Special Trust Funds) now stand at $\pounds 4,123K$. Total expenditure this year was $\pounds 154K$ (compared with $\pounds 155K$ last year). Acting on the advise of our auditors, the Printing and Publications Reserve Fund was increased by $\pounds 230K$.

Investment prospects for the year ahead look bleak. Last year's recession has deteriorated to a slump with no end in sight.

The Society's membership remained

steady at slightly over 2,000. Members' subscriptions totalled £20,932 (overseas reciprocity members pay a reduced subscription and certain categories of long serving members are not required to pay any subscription).

My predecessor as Treasurer, Rolph Schwarzenberger, has died at a tragically early age. The memorial meeting in Warwick provides an opportunity for many of us to pay respect to his memory. I wish to record my personal gratitude for his wise counsel and for the privilege of his friendship.

> J.D.M. Wright Honorary Treasurer

1993 NAYLOR PRIZE AND LECTURESHIP

The London Mathematical Society's 1993 Naylor Prize and Lectureship in Applied Mathematics is awarded to Professor M. V. Berry, FRS, Royal Society Research Professor in the University of Bristol, for his work on the theory of waves, and its applications to fields such as optics and quantum mechanics, and for his recent discoveries in exponential asymptotics.

> R. Y. Sharp Council and General Secretary

GROUPS GALWAY / ST ANDREWS 1993

A conference on Group Theory sponsored by the London Mathematical Society and organised jointly by C.M. Campbell and E.F. Robertson in St. Andrews and T.C. Hurley, S.J. Tobin and J.J. Ward in Galway, will take place from Sunday 1st August to Saturday 14th August, 1993 at University College, Galway, Ireland. This conference continues the sequence of conferences held at St. Andrews in 1981, 1985 and 1989.

The invited speakers who will give courses of three to four lectures during the first week of the conference are: Professor J.L. Alperin (Chicago), Professor M. Broue (Paris), Professor A. Lubotzsky (Jerusalem), Dr. P. Kropholler (London), Professor E. Zel'manov (Madison).

During the second week, a GAP workshop will be conducted by Professor J. Neubueser and Dr. M. Schoenert both of the RWTH (Aachen). A programme of seminars and invited lectures by other conference participants will be arranged in the second week.

Further information and application forms are available from: Dr. C.M. Campbell and Dr. E.F. Robertson, Mathematical Institute, University of St. Andrews, North Haugh, St. Andrews KY16 9SS, Scotland.

TREVOR EVANS

Professor T. Evans of Emory University, Atlanta, died in May 1991. He was elected a reciprocity member of the London Mathematical Society on 19 May 1949.

DANIEL K. ABBIW-JACKSON

Dr D.K. Abbiw-Jackson of the University of Science & Technology, Kumasi, died on 9 March 1990. He was elected an ordinary member of the London Mathematical Society on 17 January 1963.

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.

CONSULTATION ON SCIENCE AND TECHNOLOGY Response by the London Mathematical Society

The Council of the London Mathematical Society discussed the News Release dated 9 July 1992, and wishes to convey the following views. To some extent this letter is framed as a response to the specific questions in the document, but we also make some more general points about the place of the mathematical sciences within the overall framework of the national scientific and technological effort.

It is our very strongly held view that the mathematical sciences can and must play a crucial and very cost-effective part in the overall effort. The best value for money is achieved when collaboration between mathematicians and experimentalists results in the right balance between the experimental approach and the (much cheaper) theoretical investigation of an appropriate mathematical model. The Kingman Report (*Mathematics Strategy Review Report, SERC, 1991*) puts it thus:

The need for mathematics and mathematicians is an expanding and all-pervasive aspect of a modern science-based economy. The understanding of fundamental scientific phenomena and subsequent technological development and implementation requires the models and techniques of the Applied Mathematician, including specialist skills of numerical analysis and scientific computing. The collection, analysis and interpretation of data for use in inference, prediction and decisionmaking require the expertise of the Statistician. The planning, analysis and optimisation of systems and processes require the inputs of the Operational Researcher and the Control Theorist. And all this, in turn, rests on the work of the mathematical tool-maker, the Pure Mathematician, who creates the discipline itself.

And the David Report, published in the USA in the same year puts the issue very succinctly:

High technology is mathematical technology.

In effect, we are counselling against an approach that overemphasises short term commercial goals and neglects the long term health of the fundamental science on which technology ultimately rests. The history of the mathematical sciences has shown again and again that even what seems to be the purest of pure mathematics can play a vital role in highly practical technology.

The reputation of the UK in the mathematical sciences is high, but is increasingly endangered by the shortage of young people in the field. The long freeze in university recruitment is taking its toll. Ultimately the science base in this or indeed any country consists of *people*, and it is essential that we should provide maximum encouragement to suitably talented young people to enter a career in science and technology, whether in industry or in the academic world. They are urgently needed in both arenas.

Then we require to create conditions under which truly fruitful cooperation between industry and academia can take place, with a view to harnessing the huge reserves of talent that do exist. This is arguably our most serious area of failure, and it will not be easy to cure, since it probably results from deeply ingrained poor attitudes on both sides of the fence. The proposed withdrawal of HEFC money from research judged to be 'near market' is in fact a high risk strategy, for it may well lead to reduced cooperation, with industry deciding to do the research 'in house' and universities perforce concentrating on less commercial activities. It would seem wise to set up consultations, initially at national level and involving government, industry and the academic world, to explore ways of improving our performance in this respect.

This may be one answer to the fundamental question of why the UK appears to be less successful than its competitors in translating inventions to the market place. Another possible answer to what must be a deep and long term structural defect in our society is that our uniquely specialised post-compulsory education produces people with expertise but deficient both in general knowledge and in the capacity for lateral thinking.

Finally, on the status of scientists and engineers, we felt that the obvious answer was probably the correct one: pay them more. Many well qualified scientists opt for careers as chartered accountants, presumably because they find the terms and conditions attractive. To persuade them to stay in science we need to make the conditions as attractive as they are in the world of finance.

> J.R. Ringrose President

SERC SUPPORT FOR MATHEMATICS

Ronald Brown (November 1992 Newsletter) makes a number of assertions about UK support for Mathematics which are unsubstantiated, and I believe that such statements do not help the cause of increasing our support. I write as an 'independent' member of SERC's Science and Engineering Boards (and a statistician); as such I have access to extensive data but since there is an element of interpretation, I will only present the results of my own calculations, for which I alone am responsible.

'The level of support for Mathematics at SERC is peanuts compared with other subjects.' This reflects a serious misunderstanding of SERC's support for UK science and engineering. The table below gives the annual allocations to the subjects per active researcher (someone who has applied for a grant in the last few years). It includes provision of research studentships. The subject definitions are SERC's, so Mathematics includes statistics and some theoretical physics. On the other hand there is considerable support of applied mathematics from the Engineering Board, which may increase by half the figures for Mathematics (and similarly increases those for Chemistry somewhat). Another factor is the provision of central facilities, which increase the provision for physics, chemistry, biology and materials science by about a quarter. The relative positions given in the table are probably a fair guide; the current position of mathematics is hardly 'peanuts', and reflects the unsung hard work and powerful advocacy of a number of our colleagues over the last decade.

| Subject | spend per active researcher (£k) | |
|-------------------------|-------------------------------------|--|
| Mathematics | 22 | |
| Physics (small science) | 38 | |
| Chemistry | 36 | |
| Biology | 28 | |
| Materials Science | 47 | |

The basis of rational funding by subject has been much discussed within SERC recently. The number of academic mathematicians (for example) needed to support undergraduate teaching is not a defensible basis for the UK investment in mathematical research. In today's political climate numerical justification is required both for the research spend and for the numbers of students trained, and I hope that mathematicians will be in the forefront in developing powerful quantitative arguments. The enhanced position of materials reflects a realization of the importance of materials research to wealth creation; we need to compete with similar arguments for the relevance of mathematics and the need for mathematicians.

'By contrast the NSF in the USA has programmes for the support of computational initiatives in Mathematics.' SERC has had a programme for support of computational science (formerly the Computational Science Initiative) for several years, and mathematicians have been very successful in obtaining support from this programme. Other sources of support include the Information Technology Advisory Board jointly between SERC and DTI. These are for research; teaching provision (including postgraduates) is part of the HEFC provision in the UK, which distorts comparisons with the US.

B.D. Ripley, University of Oxford

INTERNATIONAL MATHEMATICAL UNION TRAVEL GRANTS FOR YOUNG MATHEMATICIANS

The International Mathematical Union will award travel grants to young mathematicians to help them to attend the 1994 International Congress of Mathematicians to be held in Zürich, Switzerland from 3rd to 11th August 1994. The grants are intended primarily for young mathematicians from developing countries (not necessarily members of IMU), but applications from countries with strict monetary regulations will also be considered. The age-limit for the grantees is 35 years. The candidates should present evidence of research work on post-doctoral level (such as publications in journals or preprints), and they should be able to benefit from the interaction with mathematicians from other countries attending the Congress. In addition to the name and address of the candidate, the applications should contain

The next full European Women in Mathematics meeting will be the Sixth Meeting at the Mathematics Institute at Warsaw Technical University from 4th to 7th June 1993. The programme will include: Expository mathematical lectures; Talks and discussions on the theme "Creativity"; Meeting and talk to Warsaw students of mathematics; General discussion on the situation of women mathematicians in different countries (especially in East and Central Europe); a brief curriculum vitae plus a list of publications and preprints. The International Congress of Mathematicians will provide a special allowance to the grantees to cover their registration, board and lodging. Applications for the travel grant may be sent directly to the Secretary of the Union. Applications may also be submitted through the Committees for Mathematics, which in such a case will send all the relevant information about the candidates to the Secretary. All applications should reach the Secretary at the following adddress by 1st January 1994: International Mathematical Union, Professor Jacob Palis, Secretary, Estrada Dona Castorina, 110 Jardim Botânico, Rio de Janeiro, RJ, Brazil, email: jpalis@impa.br, fax: (55) (21) 512 4112.

EUROPEAN WOMEN IN MATHEMATICS

Organisation and business for EWM.

The expository talks will be open to the general mathematical public. We hope that some (limited) funds will be available to help participants who cannot cover their own costs. If you would like to attend please write to the organisers A. Romanowska and B. Roszkowska, Instytut Matematyki, Politechnika Warszawska, Plac Politechniki 1, 00 661 Warsaw, Poland.

REAL AND COMPLEX DYNAMICAL SYSTEMS NATO ADVANCED STUDY INSTITUTE

A meeting on Real and Complex Dynamical Systems will be held from 20th June to 2nd July 1993 at Hillerød, Denmark. The institute aims to bring together leading researchers involved in the mathematical analysis of both real and complex dynamics, to emphasise the recent exchange of ideas and tools between the two areas. The principal speakers are V. Baladi (Lyon), B.Branner (Lyngby), C. Budd (Bristol), A. Douady (Orsay), J.H. Hubbard (Cornell), P. Jones (Yale), B. Kitchens (IBM, T.J. Watson Research Center), R. Perez-Marco (Orsay), J. Milnor (Stony-Brook), M. Shishikura (Tokyo Institute of Technology), S. van Strien (Amsterdam), C.T. Sparrow (Cambridge), M. Viana (Porto/IMPA), J.-C. Yoccoz (Orsay), L.-S. Young (Arizona/ULCA).

Partial financial assistance will be available. Priority will be given to graduate students. Requests for participation and financial assistance must be received before 1st February 1993. For further information write to B. Branner, Mathematical Institute, Building 303, The Technical University of Denmark, DK-2800 Lyngby, Denmark, email: dynsys@mat.dth.dk, fax: (45) 42 88 13 99.

THE ORDER OF MERIT

Congratulations to Professor Sir Michael Atiyah, PRS, on his recent admission to the Order of Merit.

1993 LMS PRIZES

The Council proposes to award, in Summer 1993, a Polya Prize, a Senior Whitehead Prize, a Junior Berwick Prize, and one or more Junior Whitehead Prizes. Accordingly, it has appointed J. R. Ringrose, J. M. Ball, S. K. Donaldson, M. J. Taylor and C.T.C. Wall to the 1993 Prizes Committee.

The Council invites members of the Society to submit their views on possible candidates for the award of these Prizes confidentially in writing to any member of the Prizes Committee by 1 March 1993. In each case, nominations should contain explicit reference to the grounds on which the nomination is based. The Prizes Committee would particularly welcome suggestions of possible candidates for the award of the Junior Berwick Prize and the Junior Whitehead Prize(s), in view of the condition (explained below) concerning publication which applies to the former and the age conditions which apply to both. Council reserves the right not to make an award in the event that no candidate of sufficient merit is recommended by the Prizes Committee for a particular Prize.

The Polya Prize is awarded in recognition of outstanding creativity in, imaginative exposition of, and distinguished contribution to, mathematics within the United Kingdom; it may not be awarded to any person who has previously received the De Morgan Medal.

The Senior Whitehead Prize is awarded to a mathematician who is normally resident in the United Kingdom on 1 January 1993 in respect of work in, influence on or service to mathematics, or in recognition of lecturing gifts in the field of mathematics; it may not be awarded to any person who has previously received the De Morgan Medal, the Polya Prize or the Senior Berwick Prize.

The Junior Berwick Prize is awarded to a mathematician who, on 1 January 1993, is a member of the Society, is under the age of forty years, and is not already a Fellow of the Royal Society, in respect of a definite piece of mathematical research work actually published by the Society in any of its publications during the period from 1 January 1989 to 31 December 1992.

The Junior Whitehead Prizes are awarded to mathematicians who on 1 January 1993 are normally resident in the United Kingdom or members of the Society mainly educated in the United Kingdom, who are under the age of forty years, and who are not already Fellows of the Royal Society. Grounds for the award may include work in and influence on mathematics.

No person may be awarded a given Prize more than once, and the President of the Society and the members of the Prizes Committee are ineligible for any of the awards. The detailed regulations and procedure for the award of each Prize can be obtained from the Administrator, London Mathematical Society, Burlington House, Piccadilly, London W1V 0NL.

> R. Y. Sharp Council and General Secretary

ALGEBRAIC TOPOLOGY CONFERENCE

The 1994 Barcelona Conference on Algebraic Topology will be held from 1st to 7th June 1994 in Sant Feliu de Guixols, near Barcelona. It is being organised by Centre de Recerca Matematica, Institut d'Estudis Catalans. The organizing committee consists of Jaume Aguade, UAB. Manuel Castellet, CRM and Guido Mislin, OSU-ETHZ. The first announcement will be sent in April 1993. For further information write to: 1994 BCAT, CRM, Apartat 50, 08193 Bellaterra, telephone: 34-3-581.10.81, fax: 34-3-581.22.02, email: IRCM0@EBCCUAB1.bitnet.

INTERNATIONAL CENTRE FOR MATHEMATICAL SCIENCES, EDINBURGH

Call for Proposals

The ICMS Programme Committee will next meet in April 1993. Proposals are invited for research programmes, workshops and courses on any topic in the mathematical sciences, interpreted broadly; particularly welcome are proposals of an interdisciplinary nature. The Committee would be especially interested in receiving proposals for research programmes or courses related to the following areas: Numerical analysis and scientific computation, Mathematics in medicine, Applied differential geometry, Control theory, Applications of fluid mechanics to the environment (e.g. water pollution), Vibrations of complex systems (e.g. cars, aircraft), Mathematics in operations research, Modelling and inference in interactive systems. Advanced lecture courses can be related to the topic of a research programme.

Proposals should arrive by **31 January 1993** and be no longer than 2 sides of A4. In the case of a research programme proposals should indicate why a programme on the proposed topic is timely and likely to lead to significant new developments, and should contain a list of possible visitors. Proposals should be sent to: J.M. Ball, International Centre for Mathematical Sciences, Riccarton, Edinburgh EH14 4AS, Scotland, telephone 031-451 3227 (sec. 031-451 3250), fax 031-451 3249, email J.M.Ball@cara.ma.hw.ac.uk, who will be happy to provide further advice on individual applications.

Programme 1993

29th March - 8th April Workshop on Geometric and Combinatorial Methods in Group Theory (see Newsletter 198)

12th July - 16th July Workshop on Algebraic Graph Theory (see Newsletter 197)

26th July - 30th July Workshop on Randomness and Computation (see Newsletter 197)

Mathematics in Finance - The Future (The Management of Risk) The ICMS will present a two day conference at the Royal Society of Edinburgh on 22nd and 23rd April 1993. The event will provide an opportunity for top management from the financial and related sectors to explore current and future policy issues with a uniquely qualified group of internationally distinguished speakers, each of whom is a leader in both the practice and theory of investment.

Speakers are expected to be Robert Merton (Harvard), Myron Scholes (Vice President for Sales, Salomon Brothers/Stanford), Andrew Rudd (Chairman and Chief Executive, Barra Inc), Barr Rosenberg (Rosenberg Institutional Equity Management), Michael Brennan (UCLA/London Business School), Bruno Solnik (Groupe HEC), Andre Perold (Harvard), Stephen Schaefer (London Business School). Addresses will be broadly based, and will examine a range of topics associated with the management of risk in investment, and decision making in corporate finance, including international issues.

For further information contact Frank Donald, ICMS, Heriot-Watt University, Edinburgh EH14 4AS, Fax 031 451 3249, email icms@cara.ma.hw.ac.uk

Novel Mathematical Methods in Petroleum Science

The ICMS will run a workshop on Novel Mathematical Methods in Petroleum Science at the Royal Society of Edinburgh on 28th April 1993. There is a range of new methods which are potentially capable of solving many complicated problems in Petroleum Science whose solution has proved intractable by traditional means. Neural network techniques provide a way of unravelling correlations in complex systems with applications to rock recognition in subsurface reservoir mapping. Applications of Cellular Automata include modelling the flow/hydrodynamical properties of complex fluids such as structured polymers containing fluids and cement slurries; simple fluids in random media, such as the porous rock encountered in oil reservoirs; and lubricating fluids. The workshop will consider both fundamental aspects of these novel methods and examples of petroleum science based applications.

For further information contact J. Carr, Department of Mathematics, Heriot-Watt University, Edinburgh EH14 4AS, Fax: 031 451 3249, email jack@ cara.ma.hw.ac.uk

Short Course - Analysis

The ICMS will run a two week course in analysis, primarily aimed at first and second year PhD students in the UK from 7th to 18th June 1993. The SERC has indicated that it will fund 20 students to attend the course. The course will consist of two independent series, each of fifteen lectures, running in parallel with one or two research seminars on special topics following. The topics will be Geometric measure theory and Wavelets. Lecturers will include D. Preiss (University College London) and P. Mattila (Jyvaskylan).

For further information contact: M. van den Berg, ICMS, Heriot-Watt University, Edinburgh EH14 4AS, Tel 031 451 3230, Fax 031 451 3249, email mthmv@ vaxb.hw.ac.uk

MATHEMATICAL BIOLOGY: NON-LINEAR PATTERN FORMATION MODELLING IN MEDICINE AND BIOLOGY

This study centre/workshop is being held from 26th April to 8th May 1993 at Abbaye de Fontevraud, Maine-et-Loire. It will bring new classes of problems to young mathematically involved researchers, already committed to research in the biomedical sciences. A major theme of the meeting is dynamic spatio-temporal pattern formation with the aim of (i) broadening the outlook and expertise - both biological and mathematical - of the group; (ii) involving the students, during the meeting in specific interactive research problems proposed by the speakers in the first week and (iii) highlighting areas and problems which would benefit from a wider involvement and knowledge of the complex systems which all biological processes entail.

The meeting will have approximately 21 carefully selected (from applications submitted to the organisers) young mathematically oriented researchers spend an intensive two weeks with a group of approximately 16 established researchers in different areas of mathematical biology. All students will be fully supported. During the first week there will be an intensive course of lectures and discussions to bring the group up to a level where, during the second workshop week, they will be able to work on the specific research problems.

The lecturers and speakers are: J.-P. Aubin (Paris), M. Chaplain (Bath), R. Costalat (Angers), W. Jager (Heidelberg), R. Lefever (Bruxelles), A. Mikhailov (Moscow), J.-L. Martiel (Grenoble), F. Moran (Madrid), B. Grenfell (Cambridge), J. Rinzel (NIH, Bethseda). Applications (with a brief curriculum vitae and the name of one referee) should be sent by 15th February 1993 to either Professor G. Chauvet, Director, Institut de Biologie Théorique, 10 rue André Bocquel, Université d' Angers, 49100 Angers, France or Professor J.D. Murray, FRS, Applied Mathematics FS-20, University of Washington, Seattle, WA 98195, U.S.A.

TWISTOR THEORY

There will be a conference on Twistor Theory from the 23rd to 25th August 1993, in Devon. The principal speakers are: T.N. Bailey (Edinburgh), M.G. Eastwood (Adelaide), C. LeBrun (SUNY), S.A. Merkulov (Odense), H. Pedersen (Odense), R. Penrose (Oxford), K.P. Tod (Oxford) and N.M.J. Woodhouse (Oxford). All are very welcome. There will be a registration fee of the order of £25, and full board for the conference will cost about £90. For further details, contact Dr S. Huggett, School of Mathematics and Statistics, University of Plymouth, Drake Circus, Plymouth PL4 8AA, telephone: (0752) 232720, fax: (0752) 232780, email: P07406@uk.ac.plymouth. The conference is receiving financial support from the London Mathematical Society.

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Analysis and Geometry on Groups

N. TH. VAROPOULOS, L. SALOFF-COSTE and T. COULHON

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COMPUTER SCIENCE LOGIC '93

The conference Computer Science Logic '93 will be held from Monday 13th to Friday 17th September 1993, at the University College of Swansea. CSL '93 is the 1993 annual conference of the newly formed European Association for Computer Science Logic (EACSL). The conference is intended for computer scientists whose research activities involve logic, as well as for logicians working in areas related to computer science. The meeting is supported by the British Logic Colloquium and the London Mathematical Society.

The scientific programme will consist of lectures and contributed papers selected from those submitted. All contributions will be refereed for a Proceedings volume. Six copies of an extended abstract (up to 5 pages) of papers to be submitted should be sent to the programme committee chairman (K. Meinke) to arrive not later than 1st June 1993. The authors will be notified of acceptance for presentation at the workshop by 20th July 1993. The preliminary version of the complete papers to be submitted to the Proceedings volume should be available at the start of the workshop. Authors will be notified of the acceptance of their papers for the Proceedings volume by 15th January 1994. The final camera-ready version of the paper should not exceed 15 pages and must be submitted before 26th February 1994.

Invited speakers include: J.A. Bergstra (Amsterdam), A. Blass (Michigan), E. Grädel (Basle), I. Hodkinson (Imperial), P. Martin-Löf (Stockholm), R. Milner (Edinburgh), W. Thomas (Kiel) and S.S. Wainer (Leeds).

For further information write to: Dr K. Meinke (CSL '93), Department of Computer Science, University College of Swansea, Swansea SA2 8PP, email: csl93@pyr.swan.ac.uk, fax: 792 295708.

DUBLIN DIFFERENTIAL EQUATIONS MEETING

This conference covers both the theory and applications of Differential Equations, and is to be held from 12th to 16th September 1993. The following have agreed to be invited speakers: P. Cooke (Delaware), M.E. Gurtin (Carnegie-Mellon), J. Ockendon (Oxford), F. Olver (Maryland), J. Serrin (Minnesota). Participants will be encouraged to give contributed talks on relevant research, and a number of small workshops will be organised. Further information can be obtained from David W. Reynolds, School of Mathematical Sciences, Dublin City University, Dublin 9, telephone: 01 704-5290, email: math@dcu.ie.

CAMPAIGNS FOR HUMAN RIGHTS

Readers of the newsletter may well be aware of the campaigns organized by Professor Israel Halperin in the 1980s, first for the release from prison of Jose Massera (Uruguay) and later for the release and permission to emigrate from the USSR for Yuri Orlov and Anatoli Shcharansky. These were followed by a broader campaign (1986-91) for the liberation of political prisoners and the removal of oppression by the military dictatorship in Chile.

These goals having been achieved, Israel Halperin together with Gerhard Herzberg (Physics) and John Polanyi (Chemistry) is currently promoting an international campaign among the scientific community to press for a real end to apartheid in South Africa. A far-reaching campaign is also planned for the future: this calls for "an end to torture, race violence, brutal bigotry (everywhere)".

Anyone who would like to receive Bulletins on these campaigns or support the effort by distributing information or helping in other ways is invited to contact Professor Halperin at:

Department of Mathematics, University of Toronto, Toronto, Ontario, Canada M5S 1A1; tel. (416) 978-4156.

> D.R.J. Chillingworth University of Southampton

SPRING SCHOOLS FUNCTIONAL ANALYSIS POTENTIAL THEORY AND ANALYSIS

The Faculty of Mathematics and Physics of Charles University is organising Spring Schools on Functional Analysis and on Potential Theory and Analysis. They will be held at Paseky, in a chalet in the Krkonose Mountains. The Functional Analysis School (18th to 24th April 1993) will consist of a series of lectures on Recent Trends in Banach Spaces by Richard Haydon (Oxford) and Isoperimetric Inequalities for Product Measures and their Applications by Michel Talagrand (Paris VI). There will also be a special seminar on related topics supervised by Gilles Godefroy (Paris VI). The Potential Theory and Analysis School (6th - 12th June 1993) will consist of a series of lectures on Fine Regularity of Solutions of Elliptic PDE's by W.P. Ziemer (Indiana) and Elliptic PDE's with Measure Data by Jan Malý (Prague).

The purpose of the Schools is to bring together adepts who share a

common interest in the field. There will be opportunities for short communications and informal discussions. Graduate students and others beginning their mathematical career are encouraged to participate. The conference fee is US\$240. A reduced rate of US\$210 is offered, provided a letter guaranteeing one's participation reaches the organisers by 15th February 1993. The conference fee includes all local expenses (room and board) and transportation between Prague and Paseky. The fee is the same for accompanying persons. Payment will be made at the registration desk in Paseky in cash. Applications must be sent before 15th February 1993. For further information write to: Katedra matematické analýzy, Matematicko-fyzikální fakulta UK, Sokolvská 83, 186 00 Praha 8, Czechoslovakia, telephone/fax: 42-2-231 76 62, email: umzjl@csearn.bitnet.

KOUROVKA NOTEBOOK 12th edition

The 12th edition of the KOUROVKA NOTEBOOK is now available. This is a book of 154 pages, soft cover, A5 format, entirely in English. This new edition contains about 800 unsolved problems in Group Theory posed in 1965-92. Its editors are E. I. Khukhro and V. D. Mazurov.

Full information concerning the book is available from Professor E.I. Khukhro, c/o Department of Mathematics, University of Freiburg, Germany; his e-mail address is: NSFNET-RELAY"khukhro@sun1.ruf.uni-freiburg.de"

Copies are available (at a cost of £8 each) in the UK from Dr. Borovik, Department of Mathematics, P.O. Box 88, U.M.I.S.T., Manchester M60 1QD; his e-mail address is JANET"SASHA@UK.AC.UMIST.MA.LANCZOS"

COMPUTATIONAL TECHNIQUES IN SPECTRAL THEORY AND RELATED TOPICS Gregynog Workshop

A workshop on "Computational techniques in spectral theory and related topics" is to be held during the week 11th to 16th July 1993. The venue will be Gregynog Hall which is a conference centre owned by the University of Wales and situated in the mid-Wales countryside, near Newtown. Financial support for the meeting will be provided by the Science and Engineering Research Council (SERC).

We invite applications from research workers with relevant interests to participate in the workshop and to contribute a short talk if they so wish. Part of the cost of accommodation at Gregynog will be covered. The number of places is limited, so that applications should be made as soon as possible, and not later than 1st February, 1993. Please give a brief summary of your research interests and present position and write to Professor W.D. Evans at University of Wales College of Cardiff, School of Mathematics, Mathematics Building, Senghennydd Road, Cardiff CF2 4AG, email: spectral@cm.cf.ac.uk

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Membership dues for members of associations with a reciprocity agreement with the U.M.I. for 1993 are It.L.50.000 (50% reduction with respect to ordinary dues for foreign members). Membership privileges include:

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INTEGRABILITY AND CHAOTIC BEHAVIOUR

The International Conference on Hamiltonian Mechanics, Integrability and Chaotic Behaviour will be held in Torun, Poland from Monday 28th June to Friday 2nd July 1993. The aim of the Workshop is to review the present state of knowledge in Hamiltonian Mechanics and examine the achievements so far and future applications of the theory and methods of Mechanics to problems of Celestial Mechanics, Accelerator Dynamics, Plasma Physics and other fields. Invited speakers are: V.I. Arnold (Russia), G. Benettin (Italy), A. Bruno (Russia), D. Escande (France), C. Froeschlé (France), C. Grebogi (USA), J. Henrard (Belgium), A. Jamiołkowski (Poland), V.V. Kozlov members) is L.30.000; please, subscribe in this case by January, 31st, 1993. Subscription to Bollettino di Storia delle Scienze Matematiche for 1993 (discounted price for ordinary members): L.32.000.

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Participation is mainly by invitation from the Director of the Workshop. There is no registration fee. Anyone interested in participating must express their interest with a letter to The Director, J. Seimenis, Department of Mathematics, University of Aegean, 83200 Samos, Greece, fax: 30-273-33896, email: jseim@grathun1.bitnet.



H.-O. Peitgen, H. Jürgens,D. Saupe, University of Bremen,FRG

Chaos and Fractals

New Frontiers of Science

1992. XVI, 984 pp. 686 figs., 40 in color. Hardcover DM 98,-ISBN 3-540-97903-4

For almost ten years chaos and fractals have been riding a wave that has enveloped many areas of mathematics and the natural sciences in its power, creativity and expanse. Traveling far beyond the traditional bounds of mathematics and science to the distant shores of popular culture, this wave captures the attention and enthusiasm of a worldwide audience.

The fourteen chapters of the book cover the central ideas and concepts of chaos and fractals as well as many related topics including, the Mandelbrot Set, Julia Sets, Cellular Automata, L-Systems, Percolation and Strange Attractors.

Each Chapter is closed by a "Program of the Chapter" which provides computer code for a central experiment. Two appendices complement the book, the first, by Yuval Fisher, discusses the details and ideas of fractal image compression. The second, by Carl J.G. Evertsz and Benoit Mandelbrot, introduces the foundations and implications of ultifractals.



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PROGRAMME AND CONFERENCE FUND

The Society's Programme and Conference Fund is used to give financial support to various mathematical activities in the UK. This fund is administered by the Society's Programme Committee. Grants are made under three main headings.

1. Scheme 1 Visitors

Under this scheme, a speaker from abroad is invited to spend about two weeks in the UK, to address a Society Meeting and to give lectures in three or four separate institutions. The Society pays the cost of the visitor's travel to and from the UK and living expenses in London, and the host institutions are expected to share the cost of travel within the UK and local accommodation. LMS Council is anxious that greater use should be made of this scheme to enhance, by such visits, the benefit of LMS membership to those who are not easily able to attend London meetings. In planning the Society's future meetings, Programme Committee will have this scheme in mind, and suggestions from UK institutions for visitors they would like to receive but whose expenses they could not normally afford are strongly encouraged. Programme Committee tries to plan Society Meetings at least six months in advance. Thus a suggestion for a visitor under this scheme should best be made about one year before the proposed visit.

2. Scheme 2 Visitors

Under this scheme, some financial support is provided for visitors to the UK who do not address a Society Meeting but will give lectures in at least three separate institutions. Exceptionally, support under this scheme might be provided for a speaker addressing just one meeting which is regional in scope. The LMS contribution under this scheme would be for the visitor's travelling expenses to and from the UK. Host institutions are expected to share the cost of travel within the UK and local accommodation. All arrangements for a visit supported under this scheme are the responsibility of the member who makes the application. An

application, in the form of a letter to the Meetings and Membership Secretary (address below), can be submitted at any time, but should normally be made at least three months before the starting date of the proposed visit, so that the lectures to be given can be publicized in the Society's Newsletter. Applicants are encouraged to seek advantageous airfares and should quote a fare in the application. Grants under this scheme do not normally exceed £300. In the past six months, grants have been made under Scheme 2 to support the following visits: Professor N.C. Phillips (J.R. Ringrose), Professor Y. Felix (I.M. James), Professor H. von Weizsacker (D. Preiss), Professor S. Demidov (J. Fauvel), Professor M. Herrmann (R.Y. Sharp), Professor N.V. Trung (R.Y. Sharp), Dr M. Bridson (G.A. Niblo), Professor W. Browder (A. Ranicki), Professor W. Henson (N.J. Cutland), Professor C.W. Curtis (J. Saxl), Professor H. Reckziegel (S. Carter), Dr G.A. Noskov (B. Hartley).

3. Financial Support for Conferences

Grants are made from the Conference Fund to the organizers of conferences to be held in the United Kingdom. Programme Committee tends to give priority to the support of small meetings where an LMS grant can be expected to make a significant contribution to the viability and success of the meeting. Support of larger meetings of high quality is not ruled out but for such meetings an LMS grant would normally cover only part of the total cost. An Application Form, obtainable from the Meetings and Membership Secretary (address below), sets out conditions under which grants are normally made and requests the information Programme Committee usually requires when considering an application.

The following grants for support of conferences have been made within the past six months: £1275 to K.D. Elworthy for "From Deterministic to Stochastic Equations" held at Warwick in July 1992; £895 to J. Fauvel for "European Mathematics 1848-1939" held at Cambridge in September 1992; £1000 to J.W. Dold for "Theoretical Mechanics of Combustion" held at Bristol in September 1992; £500 to D. Macpherson for "Model Theory and Groups" held at Oxford in December 1992; £1800 to R.L. Hudson and J.M. Lindsay for "Quantum Probability and Applications" to be held at Nottingham in March 1993; £1000 to F.M. Leslie for the "British Applied Mathematics Colloquium" to be held at Strathclyde University in April 1993; £1925 to J. Sheehan for the "Fourteenth British Combinatorial Conference" to be held at Keele in July 1993; £1,500 to C.M. Campbell and E.F. Robertson for "Groups 1993 Galway / St Andrews" to be held at University College, Galway, in August 1993; £1850 to S.A. Huggett for "Twistor Theory" to be held at the University of Plymouth in August 1993; £1000 to K. Meinke for "Computer Science Logic '93" to be held

The Annual Lecture Series in the Mathematical Sciences at the University of Arkansas will held from 8th to 10th April 1993. Professor McIntosh of Macquarie University is the Principal Lecturer. He will give a sequence of five lectures on the following topics: Clifford Algebras; Monogenic Functions and Harmonic Functions; Monogenic Functions, Holomorphic Functions of Several Complex Variables and Fourier Transforms; Algebras of Singular Integrals and Functional Calculi of Dirac Operators on Lipschitz Surfaces; Boundary Value Problems for Elliptic Partial Differential Equations.

A tentative list of other invited

at Swansea in September 1993; £1200 to A.I. Solomon for the "Third International Wigner Symposium" to be held at Oxford in September 1993.

Further information about these functions of Programme Committee can be obtained from the Meetings and Membership Secretary, D.J. Collins, School of Mathematical Sciences, Queen Mary and Westfield College, Mile End Road, London E1 4NS, telephone 071-975-5480, email d.j.collins@uk.ac.qmw.maths, who will be pleased to discuss proposals informally with potential applicants and to give advice on submission of an application to the Society. The next meeting of Programme Committee will be held in February and it would be a great help if suggestions and applications to be considered at that meeting could be submitted no later than 31st January 1993.

CLIFFORD ALGEBRAS IN ANALYSIS

speakers includes R. Coifman, G. David, J. Gilbert, B. Jawerth, C. Kenig, C. Li, M. Mitrea, M. Murray, J. Peetre, J. Pipher, T. Qian, S. Semmes, G. Verchota, Z.J. Wu. There will also be sessions for contributed papers: abstracts should be received by 15th February 1993. The members of the conference organising committee are J. Ryan, I. Monroe, J. Duncan, M. Maliakas and W. Summers. Enquiries and abstracts should be directed to a member of the committee at the following address: Department of Mathematical Sciences, 301 Science-Engineering Building, University of Arkansas, Fayetteville, Arkansas 72701, U.S.A., telephone: (501) 575 3351.

MICHAEL FARADAY AWARD 1993

The Michael Faraday Award is made annually by the Council of the Royal Society to encourage scientists to promote the public understanding of science. It is made to the scientist or scientists who, in the opinion of the Council of the Royal Society, have done most to further, in the United Kingdom, the public understanding of science. The Award consists of a silver gilt medal and a prize of £1000 and is presented by the President of the Royal Society at the Anniversary Meeting. The recipient of the Award is invited to give a public lecture at the Society.

Nominations for the 1993 Michael Faraday Award are now invited and should be made on a form available from Dr Alison Evans or Miss Cheryl Davies, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. The closing date is 31 March 1993.

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David George Kendall (born 1918) took his MA from Oxford in 1943 and lectured in mathematics there until 1962 when he became Professor of Mathematical Statistics at Cambridge, which post he held until 1985. He is an authority on data analysis and much praised for his work on applied probability. He was elected to Fellowship of the Royal Society in 1964 and awarded their Sylvester Medal in 1976. The London Mathematical Society awarded him the Whitehead Prize in 1980 and the De Morgan Medal in 1989. He was the Society's 56th President from 1972 to 1974.

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

| IANUARY | |
|------------------|--|
| 15 15 | Edinburgh Mathematical Society Meeting, Heriot-Watt (197) London Mathematical Society Meeting, London |
| 25-5 Feb | Dynamical Systems and Nonlinear Analysis, University of Cape Town, South Africa (200) |
| FEBRUAR | Y |
| 7-11 | Australian Applied Mathematics Conference, South Australia (197) |
| 12 | Edinburgh Mathematical Society Meeting, Edinburgh (197) |
| 15-27 19 | Langlands' Programme Instructional Course, Cambridge (198) 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 (200) |
| 29-1 Apr | British Mathematical Colloquium, Reading University (200) |
| 29-8 | Edinburgh (198) |
| APRIL | |
| 5-8 | British Applied Mathematics Colloquium, Strathclyde University (200) |
| MAY | |
| 7 | Edinburgh Mathematical Society Meeting, Aberdeen (197) |
| 13-14 | London Mathematical Society Meeting, Cambridge |
| 29 | Edinburgh Mathematical Society Meeting, St Andrews (197) |
| JUNE | I - Han Mathematical Society Masting London |
| 18 20 2 Inder | Number Theoretic and Algebraic Methods in Computer Science, Moscow, |
| 29-2 July | Russia (197) |
| IIIIV | |
| 4-11 | Analytic and Geometric Aspects of Hyperbolic Space, LMS Durham Symposia, |
| 1 11 | 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) |
| 11-21 | Complex Dynamics, LMS Durham Symposia, Durham University (188)(200) |
| 12-10 | Adelaide Australia (189) |
| 12-16 | Algebraic Graph Theory, ICMS, Edinburgh (197) |
| 22-1 Aug | Vector Bundles in Algebraic Geometry, LMS Durham Symposia, |
| 0 | Durham University (200) |
| 26-30 | Randomness and Computation Workshop, Edinburgh (197) |
| 26 - 6 Aug | Séminaire de Mathématiques Supérieures, Montreal, Canada (199) |
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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 WIV 0NL, to arrive before the first day of the month prior to publication. Telephone 071- 437 5377, Fax 071-439 4629, E-mail Ims@uk.ac.kcl.cc.oak.