## THE LONDON MATHEMATICAL SOCIETY NEWSLETTER

# FORTHCOMING SOCIETY MEETINGS <br> Friday 18 October 1991, Burlington House Meeting on Group Theory B. Hartley, P.H. Kropholler, C.R. Leedham-Green, A. Weiss <br> Friday 15 November 1991, Burlington House Annual General Meeting <br> Friday 17 January 1992, Burlington House Friday 21 February 1992, Bristol Friday 20 March 1992, Burlington House Friday 15 May 1992, Burlington House Friday 19 June 1992, Burlington House Monday 29 June - Wednesday 1 July 1992 Joint meeting of AMS and LMS, Cambridge <br> Friday 16 October 1992, Burlington House <br> Friday 20 November 1992, Burlington House 

## ANNUAL GENERAL MEETING

The Annual General Meeting of the London Mathematical Society will be held on Friday 15th November 1991 at 3.00 p.m. at the Geological Society, Burlington House, Piccadilly, London W1V ONL.

At the Annual General Meeting the report of the Treasurer will be read, the Council and Officers of the Society for the coming year will be elected, and Auditors appointed. The election of Council and Officers is governed by Article 9 of the Charter of the Society, by Articles 18, 24 and 31 of the Statutes of the Society and by By-Law I of the By-Laws of the Society.

A Ballot Paper is enclosed which contains a list of those names recommended by the present Council, in accordance with By-Law I.6, for election as Officers and Members-at-Large of the Council. It should be noted that the following four Members-at-Large of Council elected for two-year terms at the last AGM have one remaining year to
serve: D.G. Crighton, E.C. Lance, H.R. Morton, M.J. Taylor.

The election is (again) uncontested because no nomination from a Member of the Society was received by the Council and General Secretary by the deadline of 1st September 1991.
A member of the Society is entitled to vote in the election by striking out on the Ballot Paper those names for which he does not vote. The member must then validate the Ballot Paper both by writing his name legibly on it and by signing it.
The completed Ballot Paper should either be brought to the AGM or sent to "The Scrutineers, London Mathematical Society, Burlington House, Piccadilly, London W1V ONL", to arrive at least 36 hours before the time of the AGM. An appropriate envelope is enclosed.

> R.Y. Sharp

Council and General Secretary

## ANNUAL DINNER

The 1991 Annual dinner will be held after the Annual General meeting on Friday 15th November at 6.30 pm for 7.00 pm at the Chuen Cheng Ku Restaurant, 17 Wardour Street, London W1V 3HD. The cost is $£ 16.50$ per person and members
may book places for guests. The booking form enclosed with this Newsletter, should be returned together with payment to the London Mathematical Society office by Friday 8th November.

## LONDON MATHEMATICAL SOCIETY

Notice is hereby given that at the Annual General Meeting of the Society to be held in the Meeting Room of the Geological Society, Burlington House, Piccadilly, London W1V ONL at 3.00 p.m. on Friday, 15th November 1991, the following resolution will be proposed to be passed by a majority of not less than two-thirds of the Members present either in person or by proxy and voting at the meeting. A Member entitled to attend and vote at the meeting is entitled to appoint one or more proxies to attend and vote instead of him.

BY ORDER OF THE COUNCIL
Secretary: RODNEY Y. SHARP.

## RESOLUTION

THAT Statutes 11, 13 and 39 of the Society's Statutes be and are hereby amended by deleting the existing Statutes and substituting therefor the following new Statutes subject only to such modifications as the Lords of the Privy Council may require:-
11. The Council shall have the power to determine the rates of subscription to be paid by Ordinary Members, and by Corporation and Institutional Members; Provided that this power shall not enable the Council without the prior approval of the Society in General Meeting to increase any of the subscriptions payable by the Members or any class of them by more than ten per cent from one year to the next.
13. The power conferred by Statute 11 shall not authorise the Society to require any additional subscription or other payment of money by any Member who shall already have compounded his subscription.
39. The Society in General Meeting may from time to time by a majority of two-thirds of the votes given make, vary or revoke By-Laws for the regulation of the business of the Society and its officers and servants; provided that no By-Law shall be made which would in effect alter or amend these Statutes.
(The old Statute 11 gave specific rates of annual subscription to be paid by Ordinary Members and by Corporation or Institutional Members; the old Statute 13 empowered the Society to alter these subscriptions by the By-Laws, except that the Society was not empowered, without the prior approval of the Lords of the Privy Council, to increase the subscriptions to more than twice the rates specified in the old Statute 11. Thus the old Statutes imposed overall 'ceilings' of $£ 50$ on the annual subscription to be paid by Ordinary Members and of $£ 400$ on the annual subscription to be paid by Corporation or Institutional Members. The annual subscription currently paid by Ordinary Members is much less than £50, but recent and current inflation have brought the annual subscription currently paid by Corporation or Institutional Members close to $£ 400$.
The new Statutes 11 and 13, if approved, would not give any rates or maxima, would empower the Council to make increases of up to $10 \%$ annually, but would make higher increases subject to the approval of members in General Meeting.
The effect of the above-mentioned amendment to Statute 39 would be to delete the phrase 'except as provided in Statute 13' from the requirement that no By-Law shall be made which would change the Statutes, but would leave other aspects of Statute 39 unaltered: the old Statute 13 permitted some change to the rates of subscription specified in the old Statute 11, but, as the new Statute 13, if approved, would not provide for any change to the Statutes, the exception stipulated in the old Statute 39 would no longer be relevant.)

## LONDON MATHEMATICAL SOCIETY

MEETING ON GROUP THEORY

## FRIDAY 18th OCTOBER 1991

2.00 P.H. Kropholler (London)

Group Cohomology and Low-dimensional Topology
2.50 C.R. Leedham-Green (London)

Classifying Finite Groups of Prime Power Order
> 3.40 B. Hartley (Manchester)

> Simple Locally Finite Groups

> A General and Ordinary Meeting will commence at 5.00
A. Weiss (Alberta) will speak on

Finite Groups of Units

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

All interested are very welcome.
Tea will be served at 4.30 pm .

# Journals in Pure and Applied Mathematics from coidon and Breach 

New
JOURNAL OF NONPARAMETRIC STATISTICS

Edited by
Ibrahim A. Ahmad
ISSN 1048-5252

APPLICABLE
ANALYSIS

## Edited by

Robert P. Gilbert
ISSN 0003-6811

INTERNATIONAL
JOURNAL OF
GENERAL
SYSTEMS
Edited by
George J. Klir
ISSN 0308-1079

New
OPTIMIZATION METHODS AND SOFTWARE

Edited by
Yu.G. Evtushenko ISSN 1055-6788

## COMPLEX

VARIABLES

Edited by
Robert P. Gilbert and
Klaus Habetha
ISSN 0278-1077

LINEAR AND MULTILINEAR ALGEBRA

Edited by
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Robert C. Thompson
ISSN 0308-1087

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INTERNATIONAL JOURNAL OF COMPUTER MATHEMATICS

Edited by
David J. Evans
ISSN 0020-7160

STOCHASTICS AND
STOCHASTICS REPORTS

Edited by
M.H.A. Davis

ISSN 1045-1I29

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## 1993 HARDY LECTURER

In Spring 1992 the Council proposes to appoint the 1993 Hardy Lecturer. The Lectureship is awarded to a distinguished overseas mathematician, who then comes to the United Kingdom and Ireland for from four to six weeks, visits a number of universities, and addresses the June meeting of the Society, giving in all about twelve lectures during this stay. The visit usually takes place during the months of May and June.

The Council invites members of the Society to submit their views on possible candidates for the award of this Lectureship, together with reasons for their choice, confidentially in writing to any member of the General Purposes Committee of the Society (Sir John Kingman, J.D.M. Wright, R.Y. Sharp, A.R. Pears, D.A. Brannan) by 30th November 1991.

R.Y. Sharp<br>Council and General Secretary

## 1992 INVITED LECTURES

The next meeting in the LMS Invited Lectures series will be held at the University of Bath, with Professor Peter J. Olver of the University of Minnesota speaking on the topic Symmetry and Equivalence of Differential Equations. Professor Olver will deliver about ten hours of lectures from Monday 13th to Thursday 16th April 1992, beginning at a level accessible to postgraduate students, and will write up his lecture notes for publication by the Society as a book.

The 1992 SERC Nonlinear Systems Spring School will be organised around Professor Olver's

Lectures at Bath, supplementing them with a further ten hours of introductory lectures for postgraduates on various tópics in nonlinear mathematics. SERC support for this meeting will be available to a limited number of students.

Accommodation will be available at the University. Full details will be announced in due course. Contact Dr G.R. Burton, School of Mathematical Sciences, University of Bath, Claverton Down, Bath BA2 7AY (0225 826218, grb@uk.ac.bath.maths).

## LONDON MATHEMATICAL SOCIETY ANNUAL SUBSCRIPTION

The annual subscription, including publications, for the session November 1991 - October 1992 is due on 1st November 1991. Together with this Newsletter, is a renewal form to be completed and returned with your remittance in the enclosed envelope.
No action is required if you are already paying by Direct Debit, and do not wish to change your choice of publications. Fully complete and return the form if you are paying by Direct Debit but wish to change your choice of publications. Bank accounts of members paying by Direct Debit will be debited on 15th January 1992.
Other members should either enclose a cheque
( $£$ sterling or US\$) with their form or, if they have a UK bank account and wish to take advantage of this convenient form of payment, request a Direct Debit mandate.
The Society reserves the right to discontinue the supply of publications to members whose subscriptions remain unpaid by 31st January 1992. Where the subscription arrives after 31st January back issues will be supplied but with some delay.
If the renewal form is missing from this Newsletter, write to Susan Oakes, The Administrator, London Mathematical Society, Burlington House, Piccadilly, London W1V 0NL, or e-mail:Ims@uk.ac.kc.cc.oak.

## PUBLICATION PRICE POLICY

The London Mathematical Society has a pricing structure for its journals which allows individual members to purchase them at a substantial discount. These discounted prices are intended for personal use only and the journals should be kept among your personal belongings and not
deposited, even temporarily, in a library, common room or other public area. Issues of the journals should be accessible to other mathematicians or students only with your permission, given individually on each instance.

## MATHEMATICAL SCIENCES ANNUAL 1992

The new, and much improved, edition of the Annual is now available. It gives the addresses, telephone and fax numbers of departments in universities and polytechnics. Copies have already been distributed to departments but in-
dividuals who wish to receive copies may obtain them free of charge by sending a 28 p stamped addressed envelope to I.M. James, Mathematical Institute, 24-29 St Giles, Oxford OX1 3LB.

## FRANK RICHARD KEOGH

Professor Frank Keogh who had been a member of the London Mathematical Society from 1957 to
D. Revuz, Université de Paris VII;
M. Yor, Université Pierre et Marie Curie, Paris

## Continuous Martingales and Brownian Motion

1991. IX, 533 pp. 8 figs. (Grundlehren der mathematischen Wissenschaften, Bd. 293) Hardcover £56.50 ISBN 3-540-52167-4


#### Abstract

This work provides a detailed study of Brownian Motion, via the Itô stochastic calculus of continuous processes, e.g. diffusions, continuous semi-martingales: it should facilitate the reading and understanding of research papers in this area, and be of interest both to graduate students and to more advanced readers, either working primarily with stochastic processes, or doing research in an area involving stochastic processes, e.g. mathematical physics, economics. The emphasis is on methods, rather than generality. After a first introductory chapter, each of the subsequent ones introduces a new method or idea, e.g. stochastic integration, local times, excursions, weak convergence, and describes its applications to Brownian motion; some of these appear for the first time in book form. One of the important features of the book is the large number of exercises which, at the same time, give additional results and will help the reader master the subject more easily.


## M. Ledoux, Université Louis Pasteur, Strasbourg; <br> M. Talagrand, Université de Paris VI and The Ohio State University, Columbus, OH

## Probability in Banach Spaces

## Isoperimetry and Processes

1991. XII, 480 pp. 1 fig. (Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge. A Series of Modern Surveys in Mathematics, Vol. 23) Hardcover $£ 58.50$ ISBN 3-540-52013-9

New isoperimetric inequalities and random process techniques have recently appeared at the basis of the modern understanding of Probability in Banach spaces. Based on these tools, the book presents a complete treatment of the main aspects of Probability in Banach spaces (boundedness and continuity of random processes, integrability and limit theorems for vector valued random variables, . . .) and of some of their links
to Geometry of Banach spaces.
Its purpose is to present some of the main aspects of this theory, from the foundations to the latest developments, treated with the most recent and updated tools. In particular, the most important features are the systematic use of isoperimetry and related concentration of measure phenomena (to study integrability and limit theorems for vector valued random variables), and recent abstract random process techniques (entropy and majorizing measures). Some examples of these probabilistic ideas to classical Banach space theory complete this exposition.

## CLAUDE BERNARD LECTURE

Professor E. Brézin of the Ecole Normale Superieure, Paris, will be giving a lecture entitled "Random Surfaces" on Monday 28th October at 17.30 at The Royal Society, 6 Carlton House Terrace, London SW1.
Random surfaces are met in a number of situations in condensed matter physics: interfaces, microemulsions, membranes, polymer sheets, etc., and they manifest new features such as roughening, crumpling or wetting transitions. They are also present in string theory, the unified quantum approach to all interactions, which has
been formulated as a two-dimensional theory of quantum gravity, i.e. as the statistical theory of random surfaces of arbitrary topologies.
The Claude Bernard Lecture is given annually by a senior French scientist as part of an exchange agreement between the Royal Society and the Academie des Sciences of the Institut de France.
All are welcome to attend. Tea will be served at 17.00. For further information, telephone 071-8395561, extension 203.

## VISIT OF PROFESSOR A. KUFNER

Professor A. Kufner of the Czechoslovakia Academy of Science, Prague, will visit the United Kingdom in the autumn. He will be visiting the University of Sussex from 25th October to 1st November, Strathclyde University from 1st November to 8th November, giving a seminar on the 6th, and then Cardiff from 8th November to 15th

November. For further information contact Professor D.E. Edmunds, Mathematics Division, University of Sussex, Falmer, Brighton BN1 9QH, telephone 0273606755 ext.2904. Professor Kufner's visit is partially supported by a Scheme 2 grant from the London Mathematical Society.

## VISIT OF DR K. ZIETAK

Dr K. Zietak from Poland will be visiting the United Kingdom during November. She will be giving the following seminars: Wednesday 20th, "Chebyshev solution of matrix equation $\mathrm{AX}+\mathrm{YB}=\mathrm{C} "$, Liverpool (contact Dr R . Wait, telephone (051) 794 4740, email: ryw.uk.ac.dl.cxa); Tuesday 26th, "Chebyshev solution of matrix equation $A X+Y B=C "$, Dundee (contact Professor
A. Watson, telephone (0382) 23181 ext 4472, email: gawatson@uk.ac.dund.mcs.) and Wednesday 27th, "Spectral linear approximation of matrices", Manchester (contact Dr N. Higham, telephone (061) 275 5822, email: mbbgsnh@uk.ac.mcc.cms. Dr Zietak's visit is partially supported by a Scheme 2 grant from the London Mathematical Society.

## UNIVERSITY OF OXFORD

## JUNIOR LECTURERSHIP IN MATHEMATICS

## Salary on the scale $£ 12,690$ to $£ 14,170$ (under review)

Applications are invited for a Junior Lecturership from persons qualified in any area of Pure or Applied Mathematics. The appointment is for a period of three years from 1st October 1992 (or such earlier date as may be arranged) and is not renewable.

Applications on a form available from: The Chairman of the Mathematical Institute, 24-29 St Giles', Oxford OX1 3LB
(Tel: Oxford (0865) 273576)
not later than 1st November 1991.

## LMS Student Texts

## Order your textbooks for the new term at $25 \%$ discount!

LMS members are entitled to $25 \%$ off the retail prices shown below. To order, return this form to Cambridge University Press, Science Publicity Department, The Edinburgh Building, Cambridge CB2 2RU.
Please remember to enclose a sterling cheque payable to Cambridge University Press. Alternatively, ring 0223325970 of Fax 0223315052 at any time to order on your credit card.

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## MATHEMATICS OLYMPIADS

The International Mathematical Olympiad (IMO) takes place each July. Each country can enter up to six students. This year's event was in Sweden, where 318 students from 56 countries took part.

It is easy to dismiss an event which involves only six students from each country as being irrelevant to most able young mathematicians. However, the students who represent each country are chosen from a much larger group namely all those who take part in the various stages of that country's national Olympiad sequence. Most of these students do not expect to reach the final six; they simply enjoy the experience of trying to solve unusual and challenging problems up to the highest level they can reach.

The 'Olympiad sequence' in the UK has recently been reorganised and the London Mathematical Society has been active in making these changes possible. The National Mathematics Contest (NMC) a $11 / 2$ hour multiple choice paper which takes place in November each year, continues to be run by a subcommittee of the Mathematical Association. They aim to make this a genuinely popular, though challenging, event, suitable for all students who are interested in mathematics. Last year's paper (1990) had an entry of 16500 (compared with the previous year's entry of around 9000 ). This year they are hoping for an entry of 20-25000.

In 1990 the best 250 students in the NMC were invited to enter Round 1 of the British Mathematical Olympiad, a $3 \frac{1}{2}$ hour written paper taken in January 1991. Teachers were encouraged to use their judgement in entering other pupils whose NMC performance did not reflect their ability; the final entry was over 400 . The best 60 of these (including quite a few who would not have qualified automatically for Round 1) were invited to take Round 2. Using all the information available, 20 students were then chosen to take part in a residential 'long weekend' held in Trinity College, Cambridge, which ended with a final paper of approximately IMO standard. The UK IMO team of six was then chosen.

The large multiple choice NMC together with this sequence of three written papers constitutes the UK 'Olympiad sequence'. However, the three written papers, and the preparation of the UK team for the IMO are very different from the largescale multiple choice NMC. In future these three written papers, and all associated activities, will be run not by the Mathematical Association, but by the British Mathematical Olympiad Committee
(BMOC) - a free standing committee whose members are nominated by the London Mathematical Society, the EMS, the IMA and the MA. Professor Sir Michael Atiyah has agreed to be its President, and its Chair is Professor Fred Piper (RHBNC). It is currently reviewing its áctivities, and any comments or queries which London Mathematical Society members may wish to raise should be fed either to the London Mathematical Society representatives (Dr Peter Shiu at Loughborough and Dr Alan Camina at UEA), or to the BMOC Secretary (Dr Tony Gardiner at Birmingham). We would be particularly interested to hear from colleagues who might be willing to get involved - if only in a small way.
The IMO involves two $41 / 2$ hour papers, held on successive mornings, with three questions each day. Each question is worth 7 marks. None of the questions are standard, so they all demand considerable ingenuity. However, two or three of the six are usually an order of magnitude harder. I give one specimen of each kind from this year's papers:

Question 3 Let $S=\{1,2,3, \ldots, 280\}$. Find the smallest integer $n$ such that each n-element subset of $S$ contains five numbers which are pairwise relatively prime.

Question 5 Let $A B C$ be a triangle and $P$ an interior point in $A B C$. Show that at least one of the angles $P A B, P B C, P C A$ is less than or equal to $30^{\circ}$

About half the contestants receive medals. Twenty students (those scoring $\geq 39 / 42$ ) received Gold medals, 51 (those scoring $\geq 31$ ) received Silver medals, and 84 (those scoring $\geq 19$ ) received Bronze. There is also a category called Honourable Mention for any student who does not receive a medal but who gets at least one problem completely correct.

This year's UK IMO team consisted of Michael Fryers (Altrincham GS), Oliver Johnson and Adam Shepherd (KES, Birmingham), Robin Michaels (Haberdashers Askes Boys School), Luke Pebody (Rugby), and Steve Wilcox (Portsmouth GS) Michael performed quite outstandingly - achieving a perfect score of $42 / 42$. Robin (29/42) and Steve $(20 / 42)$ received Bronze medals, while Oliver, Adam and Luke all scored $17 / 42$ and received Honourable Mentions. This was, on the whole, a highly creditable performance.

Anyone who would like a more detailed report should write to Tony Gardiner, School of Mathematics, University of Birmingham B15 2TT.

## DIOPHANTINE APPROXIMATION AND ABELIAN VARIETIES

An instructional conference on arithmetic algebraic geometry will be held at the Conference Centre, Centrum Kontakt der Kontinenten, Soesterberg, The Netherlands from 12th to 16th April
1992. For further information write to Professor F. Oort, Mathematical Institute, PO Box 80010, 3508 Utrecht, The Netherlands. E-mail: oort@math.ruu.nl.

## RIMS, KYOTO UNIVERSITY

The following conferences are being held at the Research Institute for Mathematics, Kyoto University, Japan up until March 1992.

| Algebraic Theory of Codes and Combinatorics on Words | 3-40ct | Masami Ito | Kyoto Sangyo University |
| :---: | :---: | :---: | :---: |
| Mathematical Topics in Biology | 7-90ct | Masayasu Mimura | Hiroshima University |
| Spectral and Scattering Theory for Partial Differential Equations | 7-9 Oct | Mitsuru Ikawa | Osaka University |
| Variational Problems and Nonlinear Elliptic Differential Equations | 15-17 Oct | Kazuya Hayasida | Kanazawa University |
| General Topolgy and Geometric Topology | 22-24 Oct | Yasunao Hattori | Yamaguchi University |
| Evolution Equations and Nonlinear Problems | 23-25 Oct | Yoshikazu Kobayashi | Niigata University |
| The Recent Development of Algebraic Topology | 28 Oct-1 Nov | Yutaka Hemmi | Kochi University |
| Combinatorial Aspects in the Analysis of Mathematical Models | 30 Oct - 1 Nov | Masakazu Jimbo | Gifu University |
| Study of Structures of Solutions to P.D.E. | 5-7Nov | Shigetake Matsuura | Kyoto University |
| Optimization Theory for <br> Mathematical Programming Models | 11-13 Nov | Masami Kurano | Chiba University |
| Phase Transition and Optimal Control | 18-20 Nov | Hideo Kawarada | Chiba University |
| Mathematical Aspects on Nonlinear Waves in Fluids | 18-20 Nov | Masayuki Oikawa | Kyusyu University |
| Researches on the Structure of Statistical Model | 20-22 Nov | Masafumi Akahira | Tsukuba University |
| Numerical Analysis and its Algorithms | 20-22 Nov | Taketomo Mitsui | Nagoya University |
| Formula manipulation and its Applications to Mathematical Study | 25-27 Nov | Hidetsune Kobayashi | Nihon University |
| Nonlinear Analysis and Mathematical Economics | 28-30 Nov | Wataru Takahashi | Tokyo Inst of Tech. |
| Recent Topics in Algebraic Number Theory | 9-12 Dec | Aichi Kudo | Nagasaki University |
| Complex Analytic Geometry and Related Topics | 16-19 Dec | Toshitake Kohno | Kyushu University |
| Groups and Combinatorics | 18-20 Dec | Hiroyoshi Yamaki | Tsukuba University |
| Automorphic Forms and Associated Zeta Functions | 6-10 Jan | Koichi Takase | Miyagi University |
| Numerical Analysis for Partial Differential Equations in Engineering and its Related Topics | 16-18 Jan | Yuusuke Iso | Kyoto University |
| Generation and Statistics of Turbulence | 21-23 Jan | Shigeo Kida | Kyoto University |
| Number Theory and Related Area | 26-28 Mar | Yasutaka Ihara | Kyoto University |



Edward Charles Titchmarsh (1899-1963) went to Balliol, Oxford, but his education was interrupted by the war. He graduated in 1922 and worked nominally on his D.Phil under Hardy, but failed the residency requirement. Eventually he succeeded Hardy as Savilian Professor at Oxford, where he became a dominating influence although he would only lecture on analysis. It was his habit to work on a topic until he felt he had had enough, whereupon he would sign off with a book on the topic Such books include his accounts of the Fourier integral, the Riemann zeta function, and his Theory of functions. In 1931 he was elected an FRS and in 1955 awarded the Sylvester medal. The London Mathematical Society awarded him the De Morgan medal in 1953 and the Senior Berwick Prize in 1956. He was the Society's 41st President, from 1945-1947

## 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.

## 1991

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International Congress on Mathematical Education, Canada (175)
OCTOBER
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LMS Meeting, London
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LMS Meeting, London
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 ONL, to arrive before the first day of the month prior to publication. Telephone 071-4375377, Fax 071-439 4629, E-mail Ims@uk.ac.kcl.cc.oak.

