LONDON MATHEMATICAL SOCIETY

NEWSLETTER

No. 409 December 2011

Society Meetings and Events

2012

Friday 24 February
Mary Cartwright Lecture, London [*page* 3]

26–30 March
LMS Invited Lectures, Glasgow [*page* 17]

Saturday 19 May
Poincaré Meeting, London

Wednesday 6 June
Northern Regional Meeting, Newcastle

Friday 29 June
Meeting and Hardy Lecture, London

Monday 1 October
SW & South Wales Regional Meeting, Bristol

Friday 16 November
Annual General Meeting, London

NEWSLETTER ONLINE:

Go to www.lms.ac.uk/newsletter

LMS COUNCIL DIARY

7 October 2011

A personal view

In these turbulent times there is always plenty to discuss in Council meetings. It will not be news to LMS members that the EPSRC Shaping Capability agenda is one matter which worries us greatly. While individual reactions probably range from outrage to despair, and individual comments from condemnatory to unprintable, the LMS Council is keenly aware of the need, through CMS, to keep open lines of communication with EPSRC, even if our representations appear to be achieving little at present. Our hopes rest mainly with The Royal Society, which is the only body with the breadth and the clout to be able to stand up to EPSRC.

Another recurring problem is the frequent refusal of visas for short-term visitors on some of our grant schemes. While on the one hand we are making high-level representations to the UK Border Agency, at a practical level Marco Marletta explained to us some of the words that need to be used, or avoided, in visa applications and letters of invitation. For example, the applicant must be an 'academic visitor' (not a 'visiting researcher', which requires a work permit), and must not be giving a 'lecture' (which is interpreted as teaching students, and therefore 'working'), but a 'scientific presentation' (which is not).

We approved the Annual Accounts, and the draft Trustees' Report (subject to a few minor amendments), for presentation to the AGM in November. The Society is in a strong financial position, mainly due to a significant increase in publishing income. We considered a draft Strategic Plan prepared by the Executive Secretary, Fiona Nixon, but recognised that this requires more thought outside the meeting, before bringing a revised version to the new Council in January.

We considered briefly how to respond to the Education Select Committee inquiry on 'How should examinations for 15–19 year olds in England be run?'. The Education Committee will prepare a draft response and circulate it to Council in the near future. So far our main recommendation is the obvious one of separating the running of examinations from the writing and publishing of textbooks. If this is implemented, of course, there will suddenly be a big hole in the textbook market, and we discussed ways in which we might help to ensure that such a hole would be filled with good quality teaching materials. Members of the Education Committee will be developing ideas in this direction. Another issue being actively considered by

Education Committee is that of training of lecturers. With the likely demise of the MSOR network of the Higher Education Academy, the suggestion was made for the LMS to take over the running of the induction day for new lecturers. This will be investigated.

An outline bid for a two-year extension to the LMS–EPSRC short courses was successful, and work is going on to finalise details of the contract. We agreed in principle to support the annual *Prospects in Mathematics* meeting for final-year undergraduates thinking of doing a PhD. Details of the scheme are still to be worked out, and it would of course be subject to review after a few years. Another possible new venture is in Undergraduate Research Bursaries, currently funded by the Nuffield Foundation, who are withdrawing from the scheme in order to concentrate their funding at school level. We made no decision on this, as it would cost a significant amount of money, and we need time to weigh this up against other ways this money could be used.

There was bad news from the Website Working Group, who unanimously recommended parting company with the developers we had been using until now. This was agreed, but we now need to come up with a Plan B.

Robert Wilson

LMS SUBSCRIPTION

Reminder

Members are reminded that their annual subscription, including payment for publications, for the period November 2011 – October 2012 was due on 1 November 2011, and should be paid by **31 December 2011** at the latest.

In the case of members who already have a direct debit set up, no action need be taken. All members should now have received a reminder via email or letter, detailing how to pay their subscription. If you have not received a reminder please contact the Membership Department (email: membership@lms.ac.uk; tel. 020 7291 9973 or 020 7927 0808).

Subscription forms, direct debit mandate forms and further information about the current subscription rates can also be downloaded from the LMS website at www.lms.ac.uk/content/paying-your-subscription.

LMS PRIZES 2012

Call for Nominations

The London Mathematical Society welcomes nominations for the 2012 prizes to recognise and celebrate the achievements in and contributions to all aspects of mathematics, including applied mathematics, mathematical physics and mathematical aspects of computer science.

In 2012 the LMS Council expects to award:

- The **Pólya Prize** in recognition of outstanding creativity in, imaginative exposition of, or distinguished contribution to, mathematics within the United Kingdom
- The **Senior Berwick Prize** in recognition of a piece of mathematical research of the highest quality actually published by the Society during the last eight years (i.e. between 1 January 2004 and 31 December 2011 for the 2012 award)
- The **Fröhlich Prize** for original and extremely innovative work in any branch of mathematics
- The **Whitehead Prizes** for work in and influence on mathematics

The Prizes Committee is keen to increase the number of nominations it receives and, in particular, the number of nominations for women, which are disproportionately low each year. The prize regulations refer to the concept of 'academic age' – rather than date of birth – in order to take account more fully of broken career patterns.

For further information and nomination forms, please visit the LMS website (www.lms.ac.uk/content/nominations-lms-prizes) or contact Elizabeth Fisher, Secretary to the Prizes Committee at the Society (tel: 020 7291 9973, email: prizes@lms.ac.uk).

The closing date for nominations is **Friday 13 January 2012**.

LONDON MATHEMATICAL SOCIETY

MARY CARTWRIGHT LECTURE AND SOCIETY MEETING

Friday 24 February 2012

Black Suite, BMA House, Tavistock Square, London WC1H 9JP

Programme:

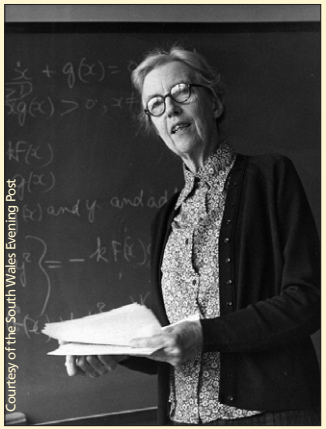
3.30 Opening of the meeting

Tom Lenagan (Edinburgh)
Totally nonnegative matrices

4.30 Tea

5.00 **Mary Cartwright Lecture**

Agata Smoktunowicz (Edinburgh)
Old and new questions in noncommutative algebra



Mary Cartwright giving a lecture at Swansea University

A reception will be held after the meeting at BMA House followed by a dinner at the Number Twelve Restaurant, Ambassador Hotel, at a cost of £32 per person, inclusive of wine. If you would like to attend the dinner, please contact Elizabeth Fisher (meetings@lms.ac.uk) by **17 February**.

There are limited funds available to contribute in part to the expenses of members of the Society or research students to attend the meeting. Contact Duncan Turton/Elizabeth Fisher (womeninmaths@lms.ac.uk) for further information.

LMS Newsletter www.lms.ac.uk/newsletter

Editorial office: newsletter@lms.ac.uk; London Mathematical Society,
De Morgan House, 57–58 Russell Square, London WC1B 4HS (t: 020 7637 3686; f: 020 7323 3655)

Events calendar: please send updates and corrections to **calendar@lms.ac.uk**

General Editor: Mr A.J.S. Mann (a.mann@gre.ac.uk)
Reports Editor: vacant
Reviews Editor: Dr C.M. Roney-Dougal (colva@mcs.st-and.ac.uk)
Administrative Editor: S.M. Oakes (newsletter@lms.ac.uk)

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Advertising: for rates and guidelines, see www.lms.ac.uk/newsletter/ratecard.html

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Cecil King Travel Scholarship

LONDON MATHEMATICAL SOCIETY

The London Mathematical Society annually awards a £5,000 Cecil King Travel Scholarship in Mathematics to a young mathematician of outstanding promise. The Scholarship is awarded to support a period of study or research abroad, typically for a period of three months. Study or research in all areas of mathematics is eligible for the award.

The award is competitive and based on a written proposal describing the intended programme of study or research abroad and the benefits to be gained from such a visit. A shortlist of applicants will be selected for an interview during which they will be expected to make a short presentation on their proposal.

Applicants should normally be nationals of the UK or Republic of Ireland, either registered for or having recently completed a doctoral degree at a UK University.

Applications should be made using the form available on the Society's website (www.lms.ac.uk/content/cecil-king-travel-scholarship) or by contacting education@lms.ac.uk. The closing date for applications is **Friday 2 March 2012**. It is expected that interviews will take place in London in late April or early May.

The Cecil King Travel Scholarship was established in 2001 by the Cecil King Memorial Fund. The award is made by the Council of the London Mathematical Society on the recommendation of the Cecil King Prize Committee, nominated by the Society's Education Committee.

BRITISH POSTGRADUATE MODEL THEORY CONFERENCE

The second *British Postgraduate Model Theory Conference* will take place at the University of Oxford from 4 to 6 January 2012. It is mainly aimed at postgraduate students and postdocs working in model theory and related subject areas, but anybody interested in the subject is very welcome.

The conference fee is £10. For further information email bpgmt2012@gmail.com or visit the website at http://tcc.maths.ox.ac.uk/bpgmt12. Registration is now open. The conference is supported by an LMS Postgraduate Research Conference Scheme 8 grant.

LMS GRANT SCHEMES

Funds are available for the following mathematical research visits (see further information under Call for Applications on **page 10**).

Visitors to the UK (Scheme 2)
To provide partial support for visitors to the UK, who will give lectures in at least three separate institutions. Applications should be made by the host in the UK.

Research in Pairs (Scheme 4)
To support visits for collaborative research
- by the grant holder to another institution within the UK or abroad, or
- by a named mathematician from within the UK or abroad to the home base of the grant holder.

International short visits with the main focus on Africa (Scheme 5)
To support visits for collaborative research
- by the grant holder to a country in Africa (or countries where mathematics is in a similar position), or
- by a named mathematician from a country in Africa (or countries where mathematics is in a similar position) to the home base of the grant holder.

The Society is pleased to report that in 2010–11 the Programme Committee awarded a total of **£59,021** for the following research visits:

Visitors to the UK

Visitor	From	Three Institutions where lectures are given	Applicant	Grant
T. Arakawa	Kyoto University	Manchester, York, Edinburgh	A. Premet	£1,200
M. Bickis	Saskatchewan, Canada	Durham, Newcastle, Oxford Brookes	F. Coolen	£1,200
A. Biswas	Kolkata, India	Warwick, Birmingham, Aston	A. Guha	£1,200
M.G. Brin	Binghamton University	St Andrews, Newcastle, Southampton	C. Bleak	£1,200
J. Burillo	Universitat Politècnica de Catalunya, Barcelona	Newcastle, Southampton, St Andrews	S. Rees	£1,200
P. Cossey	Australian National University	Birmingham, East Anglia, Warwick	S.E. Stonehewer	£1,200
M. Demers	Fairfield University	Loughborough, Surrey, Bristol	C. Dettmann	£1,200
O. Derzo	Memorial University of Newfoundland	Loughborough, UCL, St Andrews	R. Grimshaw	£1,200
E. Frenkel	Moscow State University	Manchester, Heriot-Watt, Newcastle	A. Duncan	£1,200
A. Grigoryan	Universität Bielefeld	Oxford, Warwick, Imperial College London, Cambridge	B. Zegarlinski	£671
N. Joshi	University of Sydney	UCL, Kent, Loughborough	F.W. Nijhoff	£1,200
A. Karlsson	University of Geneva	Durham, Warwick, Bristol	N. Peyerimhoff	£1,100
D. Konstantinides	University of the Aegean	Heriot-Watt, Strathclyde, Edinburgh	S. Foss	£1,000
H. Long	Florida Atlantic University	Swansea, Warwick, York	Z. Brzezniak	£1,200
A. Loskutov	Moscow State University	Imperial College London, Bristol, Warwick	V. Gelfreich	£950
C. Mueller	University of Rochester	Manchester, Swansea, Oxford	J.-L. Wu	£1,150
E. O'Brien	University of Auckland	Warwick, QMUL, Cambridge	D. Holt	£1,000
H. Ombao	Brown University, Providence, USA	Warwick, Lancaster, Bristol	J. Aston	£700
J-E. Pin	University Paris Diderot; LIAFA & CNRS	Manchester, Heriot-Watt, York	V. Gould	£819
V. Rothos	Aristotle University of Thessaloniki	Nottingham, Imperial College London, Surrey	H. Susanto	£1,000
F. Santos	University of Canatabria	UCL, Oxford, Cambridge	I. Bárány	£950
S.H. Sargsyan	Gyumri State Pedagogical Institute, Armenia	Keele, Brunel, Imperial College London	G. Rogerson	£1,200
V. Schomerus	DESY Theory Group, Hamburg	King's College London, Durham, Heriot-Watt	A. Recknagel	£1,200
M. Schweizer	ETH Zürich	Imperial College London, Warwick, Manchester	H. Zheng	£1,200
L. Vainerman	Caen, France	York, Nottingham, Swansea	A. Daletskii	£760
M. Xu	Chinese Academy of Science	Oxford, Imperial College London, Loughborough	Z. Qian	£1,200
D. Yafaev	Rennes	King's College London, Lancaster, Cardiff	A. Pushnitski	£875
P. Zegeling	Utrecht	Leeds, Heriot-Watt, Surrey	J. Niesen	£466
S. Zwicknagel	Bonn	Edinburgh, Glasgow, Newcastle	I. Gordon	£500

Research in Pairs

Applicant	Institution	Collaborator	Institution	Grant
R.J. Archbold	Aberdeen	A. an Huef	Otago, New Zealand	£640
S. Astill	Bristol	C. Parker, R. Waldecker	Martin Luther Universität Halle-Wittenberg, Germany	£700
W. Bahsoun	Loughborough	A. Ferguson	University of Warwick	£260
W. Bahsoun	Loughborough	S. Vaienti	Universite d'Aix-Marseille	£700
G. Barrenechea	Strathclyde	F. Valentin, R. Araya	LNCC Brazil, Universidad de Concepción, Chile	£600
Y. Bazlov	Manchester	A. Berenstein	University of Oregon, USA	£700
M. Blyth	East Anglia	P. Trevelyan	Université Libre de Bruxelles	£300
I. Cheltsov	Edinburgh	C. Shramov	Steklov Mathematical Institute, Moscow	£700
C-H. Chu	QMUL	M.V. Velasco	Universidad de Granada, Spain	£650
M. Crochemore	King's College London	M. Kubica	Warsaw University	£680
R. Curtis	Birmingham	J. Hall	Michigan State University	£700
P.J. Davies	Strathclyde	H. Brunner	Memorial University of Newfoundland, Canada	£680
G. Garkusha	Swansea	I. Panin	Steklov's Mathematical Institute, St Petersburg	£620
C. Iliopoulos	King's College London	J. Simpson, E. Chang	Curtin University, Perth, Australia	£700
A. Jasra	Imperial College London	N. Whiteley	Bristol University	£230
J.R. Johnson	QMUL	G.O.H. Katona	Alfred Rényi Institute of Mathematics, Hungary	£600
O. King	Newcastle	G. Marino	Napoli	£700
V. Kisil	Leeds	O. Hutnik	Cinvestav del IPN, Mexico	£700
I. Kiss	Sussex	S. Peter	Eötvös Loránd University, Budapest	£525
N.J. Laustsen	Lancaster	T. Schlumprecht, A. Zsak	Texas A&M University; Cambridge	£300
A.E.M. Lewis	Leeds	C. Conidis	Waterloo, Canada	£600
S. Lind	Manchester	T. Phillips	Cardiff University	£290
O. Makarenkov	Imperial College London	J. Meiss	University of Colorado	£450
S. Malham	Heriot-Watt	R. Marangell	University of Warwick	£273
M. Mathieu	QUB	A.R. Sourour	University of Victoria, BC, Canada	£700
N. Mazza	Lancaster	S. Bouc	Université de Picardie	£700
A. Mijatovic	Warwick	M. Urusov	Ulm, Germany	£600
V. Moroz	Swansea	C. Muratov	New Jersey Institute of Technology	£700
E. Parau	East Anglia	P. Guyenne	University of Delaware	£600
S. Scott	King's College London	S. Rosenberg	Boston University	£700
D. Strauss	Leeds	F.K. Dashiell	Chapman University, California	£700
I. Todorov	QUB	M. Anoussis	University of the Aegean	£700
D. Turaev	Imperial College London	V. Rom-Kedar	Weizmann Institute of Science, Israel	£700
A. Turner	Lancaster	F. Viklund, A. Sola	Columbia University; Oklahoma State University	£700
M. van den Berg	Bristol	P. Gilkey	University of Oregon	£700
S. Volkov	Bristol	P. Tarrès	Institut de Mathématiques de Toulouse	£590
S. Wainer	Leeds	D.C. Ding	Nanjing University	£700

International Short Visits

Visitor	Institution	To Visit	Applicant	Grant
T. Aboiyar	Makurdi, Nigeria	Leicester	E. Georgoulis	£1,900
K. Babalola	Ilorin, Nigeria	York, University College Cork	B. Everitt	£350
A. Chechkin	Institute for Theoretical Physics NSC KIPT, Ukraine	QMUL	R. Klages	£1,840
M. Elloumi	University of Tunis El-Manar	King's College London	C. Iliopoulos	£2,000

Applicant	Institution	To Visit	Grant
R. MacKay	Warwick	J-P. Nguenang, University of Douala, Cameroon	£902

Call for Applications

Closing Date: 31 December 2011

Applications are invited for renewal of **Joint Research Groups (Scheme 3)**.

ALL renewal applications MUST be accompanied by a financial and academic report for the previous year's activities. Please note that full reports should always be submitted ('light touch' refers to the application procedure only).

Grant holders wishing to renew their application may use the Light Touch Application Form if

the original or last full renewal application was made in the last TWO years, and NONE of the following have changed:

- the grant holder,
- the supporters, and
- the amount requested

Grant holders MUST use the Full Renewal Application Form if

the original or last full renewal application was made THREE years ago, and/or ANY of the following have changed:

- the grant holder,
- the supporters or
- the amount requested

If a renewal application is unsuccessful, normally the grant will be terminated at the end of the calendar year. A supplementary grant will be available to cover actual expenditure for a meeting held during the autumn term. This will normally be the equivalent of the grant awarded for one meeting, e.g. **£350**, and will not usually exceed one third of the previous year's grant.

Call for Applications

Closing Date: 31 January 2012

Applications are invited for the following grants:

- Conferences and postgraduate research conferences held in the UK (Schemes 1 and 8)
- Celebrating new appointments (Scheme 1)
- Visitors to the UK (Scheme 2)
- Research in Pairs (Scheme 4)
- International short visits with the main focus on Africa (Scheme 5)
- Young British and Russian Mathematicians Scheme (see further details below)

For full details of these grant schemes, and to download application forms, visit the LMS website (www.lms.ac.uk/content/research-grants).

- Applications for renewal of Joint Research Groups (Scheme 3) must be received by **31 December 2011** and will be considered at a meeting in January.
- Applications for the above grant schemes which are received by **31 January 2012** will be considered at a meeting in February.
- Applications should be submitted well in advance of the date of the event for which funding is requested.
- Normally grants are not made for events which have already happened or where insufficient time has been allowed for processing of the application.

Queries regarding applications can be addressed to the Grants Administrators (see below) who will be pleased to discuss proposals informally with potential applicants and give advice on the submission of an application.

- Grants Administrators: Sylvia Daly and Elizabeth Fisher (tel: 020 7291 9971/3, email: grants@lms.ac.uk)

Young British and Russian Mathematicians Scheme

Visits to Russia

Applications are invited from young British postdoctoral mathematicians who wish to spend a few weeks in Russia giving a series of survey lectures on the work of their school.

The LMS is offering grants of **up to £500** to meet the travel costs, while the host should apply to the Russian Academy of Sciences for funding towards local expenses for accommodation and subsistence.

Applications to the LMS should include:

1. A brief academic case for the visit, including a description of your current research interests, and an outline of your planned work during the visit (no more than one side of A4).
2. A brief CV (no more than one side of A4).
3. A brief budget.
4. An invitation from the host in Russia, which must state explicitly that your accommodation and subsistence expenses will be met by them. This should include provisional dates for the visit.

Financial and academic reports will be required after the visit.

In exceptional circumstances, applications may be considered from strong research students who are close to finishing their doctorates. Applications should include a strong case and the student should obtain a letter of recommendation from his/her supervisor.

Visits to Britain

Under this Scheme, applications may be made by any mathematician in Britain wishing to host a visit by a young Russian postdoctoral mathematician who wishes to spend a few weeks in Britain giving a series of survey lectures on the work of their Russian seminar.

The LMS is offering grants to the host institution to meet the visitor's actual travel and accommodation costs of **up to £1,500**.

Applications should include the following:

1. Name and brief CV of the visitor.
2. A brief description of the course of lectures.
3. A letter or email of agreement from the head of the host department, including the proposed dates of the visit.

Financial and academic reports will be required after the visit.

Further details of the Scheme can be found on the LMS website: www.lms.ac.uk/content/international-grants#YBR.

Enquiries should be made to the Grants Administrators: Sylvia Daly and Elizabeth Fisher (tel: 020 7291 9971/3, email: grants@lms.ac.uk).

Grants News

We would like to draw your attention to the following:

Computer Science Small Grants (Scheme 7)

Funding for grants **up to £500** is available to support a visit for collaborative research at the interface of Mathematics and Computer Science either by the grant holder to another institution within the UK or abroad, or by a named mathematician from within the UK or abroad to the home base of the grant holder. The next deadline for applications is **31 January 2012** – please see the website for further details: www.lms.ac.uk/content/computer-science-small-grants-scheme-7.

Small Grants for Education

Funding for grants **up to £600** is available from the LMS Education Committee to stimulate interest and enable involvement in mathematics from Key Stage 1 (age 5+) to Postgraduate level and beyond. Anyone working/based in the UK is eligible to apply for a grant. If the applicant is not a member then the application must be countersigned by an LMS member or another suitable person such as a Head teacher or senior colleague. The next deadline for applications is **31 January 2012**. Please see the website for further details: www.lms.ac.uk/content/small-grants-education

Childcare Grants

The Society believes that all parents working in mathematics should be able to attend conferences and research meetings without being hindered by childcare costs. Institutions are expected to make provision for childcare costs and parents are encouraged to make enquiries. However, where this is not available, the Society administers a Childcare Supplementary Grants Scheme. Further details can be found on the LMS website: www.lms.ac.uk/content/childcare-supplementary-grants.

LMS POPULAR LECTURES DVDs

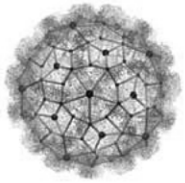
The LMS Popular Lectures present stimulating topics in mathematics and its applications to a broad audience. They are designed to be intelligible to a non-specialist audience, although A-levels are useful. The lecturers are always chosen for their mathematical distinction and their ability to communicate. There are two lectures and the event is held annually, given at two venues in the UK. The Popular Lectures are recorded each year for release on DVD. The DVDs contain extra material which includes, for example, copies of the graphics and suggestions for further reading.

Popular Lecture titles include:

BIG MONEY MATHEMATICS (*K. Binmore*)

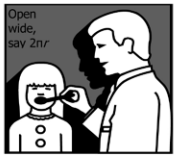
$$\sqrt{2\pi n}\left(\frac{n}{e}\right)^n = £$$

Can mathematics raise billions of pounds? Find out what happens when the mathematics of game theory is applied to economics.



KNOW YOUR ENEMY – VIRUSES UNDER THE MATHEMATICAL MICROSCOPE (*R. Twarock*)
Mathematics can help us understand the structure of viruses and the principles responsible for their formation. Can this knowledge be used to find their Achilles' heel and develop new strategies for anti-viral drug design?

A SPOONFUL OF MATHS HELPS THE MEDICINE GO DOWN (*H. Byrne*)
What role should mathematics play in the field of medicine? Could it be the new tonic that doctors need to cure our ills?



THE MUSIC OF THE PRIMES (*M. du Sautoy*)
A million dollars awaits the person who can unravel the mystery of the hidden music that explains the cacophony of the prime numbers.

TOY MODELS (*T. Tokieda*)
See how many toys that can be made in 10 minutes but, if played with imaginatively, can inspire research for 10 months and pose problems in mathematics and mechanics, some still unsolved.

To order these and many other titles, please visit the LMS website: www.lms.ac.uk/content/popular-lectures-dvds to download the latest DVD catalogue and order form.

DVD Prices (inc P&P):

- £12.50 each
- £10.00 each for two or more ordered

Christmas Offer: 20% off
(£10 for 1; £8 each for 2 or more ordered)

Quote: "Christmas Offer". Valid for orders received by 31 December 2011. Order by 14 December in time for Christmas.

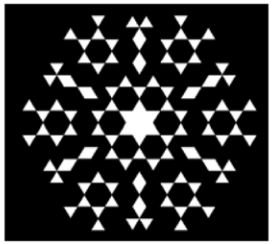
Please note any orders received after 14 December will be dispatched by 15 January due to the holiday season.

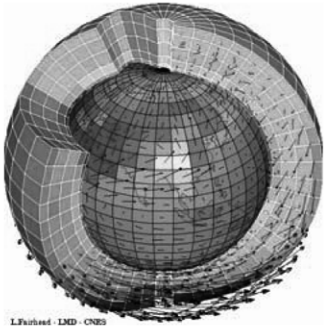
2011 Popular Lectures DVDs

Dr Colva Roney-Dougal
University of St Andrews

Symmetry, Chance & Determinism.

By playing some games with symmetries, we'll discover the surprising fact that choosing randomly can give the same answer (almost) every time!





Dr Hilary Weller
University of Reading

How Climate Models Work and Could They Be Better?

Hilary Weller will describe some of the physics behind how the real climate works, some of the mathematics involved in creating a computer model of the climate to make climate predictions and how climate data is gathered in order to test the models.

We will see that, although climate models are far from perfect, some predictions can be made with confidence.

MATHEMATICS POLICY ROUND-UP

November 2011

RESEARCH

Young mathematicians write to the Prime Minister
Over 300 young mathematical scientists sent a letter to the Prime Minister in October protesting against the EPSRC's restrictions on Fellowships, announced in July. The letter is available at http://tinyurl.com/6kt2vrs.

Responses to Select Committee Peer Review report
The Science and Technology Select Committee has received responses to the *Peer review in scientific publications* report published by the Committee on 28 July 2011. The response from the government and Research Councils UK is available at http://tinyurl.com/5syydzd. The LMS response to the original peer-review inquiry can be found at http://tinyurl.com/5rmho6n.

David Willetts MP gives Third Roberts Science Policy lecture
In his lecture Willetts covered areas including the *Strength of the research base*, *Government support for science*, *Impact*, *Peer review* and *Science careers*. A podcast and transcript of the lecture are available at http://tinyurl.com/5u5gzy4.

The UK is a world leader in science and research
According to a new report from BIS, *International Comparative Performance of the UK Research Base 2011*, the UK is a world leader in science and research. The report shows that UK research attracts more citations per pound spent in overall research and development than any other country. It has also found that the UK research base is highly mobile, internationally competitive and diverse. In terms of mathematics the report states among other things:

- "The UK has a lower share of articles published than the global average in mathematics, physical sciences and engineering, although the share has grown slightly in mathematics";
- "UK research strengths reveal some of the smaller disciplinary areas in which the UK has notable strengths relative to other countries, this includes topology."

The full report is available at http://tinyurl.com/6cguabq.

EPSRC Physical Sciences Town Meeting
A Physical Sciences Town Meeting was held in London on 26 September 2011 to communicate details of the EPSRC's Shaping Capability Strategy. A video of the meeting is available at http://tinyurl.com/642vf2j.

HIGHER EDUCATION

Higher education in STEM subjects inquiry launched
The House of Lords Science and Technology Sub-Committee has launched a new inquiry into how the UK builds the educational foundations it needs to face the challenges of the future. The inquiry will address higher education in Science, Technology, Engineering and Mathematics (STEM) subjects. The deadline for responses is **16 December 2011**. More information is available at http://tinyurl.com/6292rrm. The LMS is preparing a response.

Trends in higher education
Universities UK has published a report looking at *Patterns and trends in UK higher education* over the past decade, from 2000/01 to 2009/10.

A breakdown of student numbers by subject area studied for 2009/10, with comparisons against 2008/09 and 2003/04 shows that since 2003/04 student numbers across all subjects have increased by 13.3 per cent. Over the past seven years the mathematical sciences shows one of the biggest rises, with a 30 per cent increase. As well as looking at the trends in HE numbers, the report looks at patterns of institutional diversity. The full report is available at http://tinyurl.com/67dewng.

SCHOOLS AND COLLEGES

How should examinations for 15–19 year olds in England be run?
In September 2011 the Education Select Committee launched an inquiry 'to consider the benefits and drawbacks of having several awarding bodies for qualifications taken by 15–19 year olds and the extent to which the current system delivers the best and fairest educational outcomes for young people'. The deadline for written submissions was 7 November 2011. The LMS prepared a response and the Committee's findings will be available in due course.

Royal Academy of Engineering launches *Respected* report for education
A report looking at which qualifications are highly regarded by the science, technology, engineering and mathematics (STEM) community has been published by the Royal Academy of Engineering. The full report *Respected: Technical qualifications selected for use in University Technical Colleges* is available at www.raeng.org.uk/news/releases/pdf/691.pdf.

Improving science in colleges
Ofsted has conducted a survey of good practice in science in general further education and sixth-form colleges in England. The report 'identifies the factors that helped these colleges to maintain the high standard or improve the quality of their science provision and makes recommendations for further improvement'. The full report is available at www.ofsted.gov.uk/resources/improving-science-colleges. Mathematics is mentioned as part of the overall STEM programme.

Dr John Johnston
Mathematics Promotion Unit

RIGIDITY OF PERIODIC AND SYMMETRIC STRUCTURES

A Royal Society meeting on the *Rigidity of Periodic Structures in Nature and Engineering* will be held at the Kavli Royal Society International Centre from 23 to 24 February 2012. Rigidity and flexibility are the heart of the behaviour of designed and natural structures, machines and materials. Combining theories of symmetry and rigidity gives insights in all these fields. Periodic and repetitive structures give new challenges, where open mathematical questions have practical implications for engineers, material scientists and chemists; multidisciplinary combination of diverse approaches shows the way forward. The speakers are:

- Bob Connelly (Cornell University)
- Gérard Férey (Université de Versailles)
- Simon Guest (University of Cambridge)
- Stephen Hyde (Australian National University)
- Mike O'Keefe (Arizona State University)
- Stephen Power (University of Lancaster)
- Elissa Ross (York University, Canada)
- Bernd Schulze (York University, Canada)
- Hellmuth Stachel (Technische Universität Wien)
- Mike Thorpe (Arizona State University)
- Mike Treacy (Arizona State University)
- Nick Trianafyllidis (University of Michigan)
- Walter Whiteley (York University, Canada)
- Alphonse Zingoni (University of Cape Town)

Participation in the meeting is open to all. Further information can be obtained from the conference website at http://royalsociety.org/events/Rigidity-of-periodic-and-symmetric-structures, which includes the email address for registration, or from the organizers, Dr Simon Guest (sdg@eng.cam.ac.uk), Professor Patrick Fowler (P.W.Fowler@sheffield.ac.uk) and Professor Stephen Power (s.power@lancaster.ac.uk).

6TH EUROPEAN CONGRESS OF MATHEMATICS

Kraków, Poland, 2–7 July 2012

The Congress The *European Congress of Mathematics*, a quadrennial general mathematical meeting, is an important activity of the European Mathematical Society (EMS) which decides about the core of its scientific programme. The 6ECM is organized by the Polish Mathematical Society and the Jagiellonian University in Kraków.

Scientific programme There will be 10 plenary lectures, 34 invited lectures in parallel sections, approximately 20 mini-symposia as well as contributed poster sessions. Arrangements will be made for informal discussions, talks and small working groups.

Prizes 10 EMS Prizes for mathematicians not older than 35, the Felix Klein Prize in Application of Mathematics and the Otto Neugebauer Prize for the History of Mathematics will be awarded. The committees were appointed by the EMS. The winners will be announced at the opening of the 6ECM and they will deliver lectures during the 6ECM.

Proceedings The *6ECM Proceedings*, published by the EMS Publishing House, will be available at a special price for the registered participants. The registered participants will receive free access to the files of the proceedings papers.

6ECM
6 th European Congress of Mathematics
Kraków 2012

Satellite conferences Mathematicians are invited to organize satellite events (conferences, etc.) close to the dates of the 6ECM. There are already 12 satellite conferences that will be held before and after the Congress, in the Czech Republic, Estonia, Finland, Germany, Poland and Romania.

Grants and financial support In order to ensure broad participation and reduce economic barriers, a limited number of grants funded by the Foundation for Polish Science and the EMS will be offered, particularly for young mathematicians and for mathematicians from Central and Eastern Europe.

Exhibitions Space will be available for mathematical societies, publishers and other companies.

Registration fee Until **31 March 2012** the fee is PLN 1,050 (Polish Złoty) which currently is approximately €250; from 1 April 2012 it will increase to PLN 1,250. There is a reduced fee for EMS individual members (PLN 900) and students (PLN 600).

Social programme Social and cultural programmes, promoting informal contacts between participants and the rich cultural heritage of Kraków, will be important components of the Congress activities. A welcome reception and conference dinner are planned. There will be a special programme for accompanying persons.

Logistics The Congress will be held in the Auditorium Maximum of the Jagiellonian University, located close to the historic old city. Several rooms will be booked for participants for the period of the Congress in hotels and dormitories (of different standards) at convenient distance from the Congress venue. Reservations will start in February 2012 via the 6ECM website, www.6ecm.pl.

Important dates and deadlines

31 Dec 2011	announcement of the scientific programme
29 Feb 2012	application for the satellite events
1 Apr 2012	registration fee increases
30 Apr 2012	submission of posters

Register for the 6ECM at the website www.6ecm.pl, where you'll also find:

- names of the speakers
- call for nominations of candidates for prizes
- list of satellite events

and much more. You can also ask questions via email to 6ecm@6ecm.pl.

LMS INVITED LECTURER 2012

Professor Alexei Borodin (MIT)

Determinantal point processes and representation theory

26–30 March 2012
University of Glasgow

Alexei Borodin will give a ten-lecture minicourse, at a level suitable for graduate students, on *Determinantal point processes and representation theory.* The lectures will explore the interactions between probability theory and algebra, which is a new fast-developing area.

There will also be supplementary lectures by:

- **Neil O'Connell** (Warwick)
- **Patrik Ferrari** (Bonn)

Local B&B accommodation will be available.

Limited financial support is available with preference given to UK research students. Please contact the organisers for further details (LMSlectures2012@gmail.com).

For further details on the 2012 Invited Lectures please visit www.maths.gla.ac.uk/~mf/LMSLectures2012/index.htm.

Institute of mathematics & its applications

LONDON MATHEMATICAL SOCIETY

Nominations are invited for the 2012 David Crighton Medal

The David Crighton Medal was established by the Councils of the Institute of Mathematics and its Applications (IMA) and the London Mathematical Society (LMS) in 2002 to pay tribute to the memory of Professor David George Crighton FRS.

The medal is awarded every three years to an eminent mathematician for services both to mathematics and to the mathematical community. The medal winner is normally presented with the award at a joint meeting of the IMA and LMS, and will also be invited to give a lecture.

Previous winners of the Medal are Professor Keith Moffatt, FRS (2009), Sir Christopher Zeeman, FRS (2006) and Professor Sir John Ball, FRS (2003).

Nominations can be made using the form available on both Societies' websites (e.g. **www.lms.ac.uk/content/ima-lms-prizes**) or from the Secretary to the David Crighton Committee (**prizes@lms.ac.uk**). Nominees should normally be resident in the mathematical community represented by the two organisations on 1 January of the year of the award and nominations must be received by **28 February 2012**.

MATHEMATICS TODAY

British mathematics has a stunning history, spanning at least 400 years. To understand the motion of the planets, Isaac Newton developed the mathematical tools that are still used to describe the motion of almost anything. In the 1860s James Clerk Maxwell wrote down the relativistic equations of light and radio waves, anticipating aspects of Einstein's theory by twenty years. R.A. Fisher developed the mathematical theory of statistics in its modern form almost single-handedly in the 1920s whilst working at the Rothamsted Experimental Station; and Alan Turing used mathematics to decode the German Enigma machines in the 1940s, developing the first computers in the process. In 1994, more than three hundred and fifty years after the problem was first posed, Andrew Wiles proved Fermat's Last Theorem; Wiles will return from the US to a post at Oxford later this year.

To assess the state of current mathematical science, the Engineering and Physical Sciences Research Council (EPSRC) commissions regular reports from international experts. The *International Review of Mathematical Sciences 2010* (IRMS 2010, [**1**]), was published this Easter, the first report since 2004. Its conclusion is that 'UK mathematical sciences research is world-leading in some fields, outstanding in many others and strong overall'. The Executive Summary (*p*. iv) adds:

> *"Two major factors that contribute to the present excellence of the UK academic mathematical sciences enterprise are its diversity – in area, group size and size of institution – and its geographically distributed nature."*

The report goes on to examine both the activity and the processes involved in mathematical research in the UK. Its publication provides an excellent opportunity for the UK mathematics community to reflect on recent achievements and frame future prospects.

Publication of the IRMS report coincides with far-reaching and controversial changes in research funding policy signalled by the EPSRC's 'Shaping Capability' agenda [**2**]. The Research Council intends to take a more pro-active role in commissioning and sponsoring research, identifying research areas for growth and special support, rather than simply supporting excellence as advised by academic and industrial experts. In what follows we shall try to explain how and why the mathematical sciences must exercise central roles in the culture and the economy of any successful modern society; and we shall also aim to show why EPSRC's current strategy risks making these roles unsustainable for UK mathematical science.

It is hard to overstate the importance and the ubiquity of mathematics. The IRMS 2010 expresses it well (again from the Executive Summary):

SCIENCE IN PARLIAMENT

The mathematics community was given the opportunity to contribute to the Autumn 2011 issue of *Science in Parliament* (vol. 68 no. 4), the journal of the Parliamentary and Scientific Committee. This is a prestigious publication, which has two stated objectives:

- 'to inform the scientific and industrial communities of activities within parliament of a scientific nature and of the progress of relevant legislation'; and
- 'to keep Members of Parliament abreast of scientific issues'.

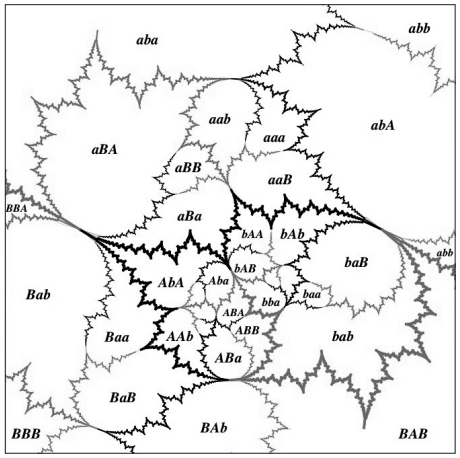
The adjacent article has been reproduced with kind permission of the Parliamentary and Scientific Committee and the authors. It looks at the special history of mathematics and its major impact on our lives, and is available to download at www.vmine.net/scienceinparliament/sip68-4-14.pdf.

"the mathematical sciences provide a universal language for expressing abstractions in science, engineering, industry and medicine; mathematical ideas, even the most theoretical, can be useful or enlightening in unexpected ways, sometimes several decades after their appearance; the mathematical sciences play a central role in solving problems from every imaginable application domain; and, because of the unity of the mathematical sciences, advances in every sub-area enrich the entire field."

However, mathematical science is also a hugely important discipline in its own right, with its own culture and intellectual imperatives, its own history over millennia, and its own 'Grand Challenges'. It is important to see mathematics in its entirety and not be distracted by the crude and misleading distinction between theory and applications, often expressed as 'pure' versus 'applied' mathematics.

Misled by its daily usefulness, we might see mathematical science as a stagnant well of techniques from which one can ladle out exactly what is needed to deal with a given problem. This is far from the truth. The "right" mathematics may be languishing in obscurity, having been developed many years earlier; or it may be in a field with no apparent connection with the matter at hand; or it may well not yet have been discovered.

Many examples can be given of each of these cases. For example, the medical imaging techniques used every day in every hospital in the land depend crucially on abstract mathematical analysis of the early 20th century; and the "matrix formulation of quantum mechanics", developed in the late 1920s, hinged on the then very obscure – but now school-level – matrix algebra, studied by English algebraists 60 years earlier. Of course quantum mechanics itself was in the 1920s regarded as completely useless, but now underpins our digital universe. A problem we still do not know how to approach is that of extracting the important



information hidden in huge data sets. This is one of the key challenges for genomic biology, and statisticians are currently making important advances in developing new methodology to address it.

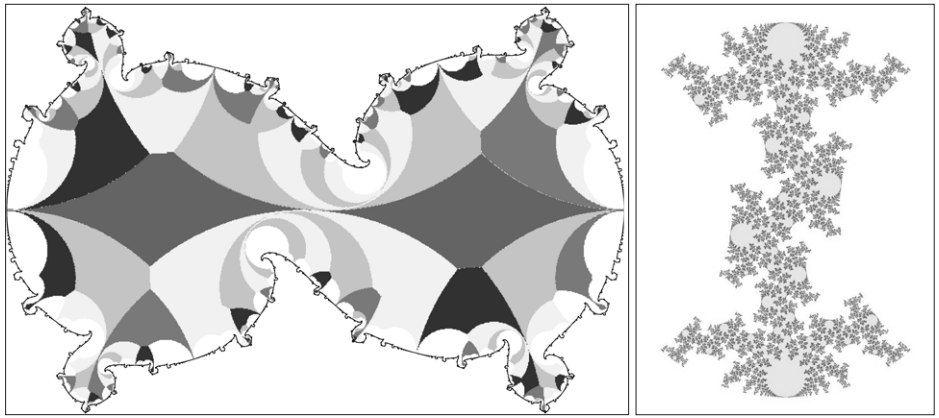
The well-and-ladle metaphor is grossly misleading in a second way: it wrongly suggests that those working on applications don't themselves produce fundamental mathematics. In fact the reverse is the case. Newton's discovery of the calculus is of course the first and greatest of many British examples. This age-old interchange between mathematical science and physics continues undiminished today: stemming from the pioneering work of Sir Michael Atiyah and his students, the UK has been a world leader for 50 years in the convergence of parts of physics with the 'purest' reaches of algebra, geometry and topology.

Mathematics doesn't just solve problems, it provides insights which can lead to more far-reaching advances. In the 1990s Frank Kelly (University of Cambridge) worked on BT's new routing architecture where a major issue is how to deal with blockages in the network. The natural 'technological' solution is to have full knowledge of the state of the system and compute the most efficient route from the blocked point. Kelly showed that the far simpler and more robust method of sending the call to a nearby node at random and then taking the standard route from there was almost as efficient, far cheaper to implement, and far less likely to malfunction. This insight, that a less sophisticated, simple solution can be almost as good and far cheaper than a technically perfect solution, is now a recognised design feature of networks.

The intricate inter-dependence of fundamental mathematical science and application makes it very hard to steer mathematical research in any meaningful way. This doesn't mean that we shouldn't try, but it does suggest that the best compass to use may be one which seeks out the highest quality and the most promising directions, in each particular field. Mathematicians and statisticians should continue to put huge efforts into seeking solutions to society's challenges, but the health of the core discipline is a vital feature of a country's mathematical research framework.

It could be argued that given the severity of the current economic crisis we should leave fundamental research to other countries and focus on the applications. This is to misunderstand the nature of mathematical research: core and applied mathematics are inextricably interlinked and, as we've tried to show, to spot the right mathematics for a given application requires immersion in the well and can't simply be done by wielding a ladle from above. Moreover, it often happens that deep understanding of the mathematical science actually generates the application. A famous example is the PageRank algorithm at the heart of Google, which relies on the same matrix algebra that was crucial for quantum mechanics.

How do people actually do research in mathematics? The answer, typically, is: by reading a bit, perhaps talking to colleagues and students (both down the corridor and across the planet), and by thinking a lot. Consequently, the working research mathematician's requirements are relatively few – good internet access, a quiet and warm place to work, and plenty of time and coffee! Except in some cases involving large interdisciplinary activity, what she or he *doesn't* usually need is a big team working



(Above, and opposite) With minimal input, these intricately beautiful computer-generated fractal graphics are made by repeating simple geometrical operations many times. Behind them lie deep mathematical discoveries of recent years. Reproduced from [**10**] with permission.

on the same problems in the same place, or expensive equipment. These factors make it easy to achieve the diversity and geographic distribution highlighted as virtues by the IRMS 2010. They also ensure that UK mathematical scientists are well positioned, in terms both of geography and subject coverage, for the absolutely crucial task of teaching undergraduate and postgraduate students.

In both teaching and research UK mathematics is a large activity: 1,129 international-level mathematical scientists (FTE) were submitted to the last research assessment exercise compared with 729 in physics and 957 in chemistry [**3**]. The dual funding (Funding Council/RCUK) support for UK universities means that research and teaching are linked, so that students taking degrees in mathematical science have the opportunity to see the subject as the living, developing discipline that it is. And it's an opportunity which more and more students are taking: there were 5,475 graduating students in mathematical science in the UK in 2007–8, almost as many as chemistry (2,965) and physics (2,765) combined. The figure for graduate mathematicians has been steadily rising for over a decade now: in 2000 it was 3,500 [**4**].

Mathematics graduates are employed in banking, medicine, pharmaceuticals, manufacturing, communications and other advanced technology, teaching, government departments, actuarial and accountancy as well as going into business for themselves. Mathematics is rightly seen as a challenging degree by employers and valued for its transferable skills; indeed postgraduate mathematical scientists have the highest average starting salary among all UK holders of postgraduate degrees [**5**]. This crucial contribution to the country's economy is only possible by virtue of the wide distribution of research excellence which ensures that mathematics research and teaching are accessible throughout the country.

So much for the scale of the enterprise, but what about diversity and quality? Given the size of the mathematics research community it is not surprising that most areas of the discipline are represented within the UK. British-based mathematical scientists are pioneering world-class work in fields as diverse as models of cancer growth and properties of sequences of prime numbers. They are involved in applications ranging from the analysis of option pricing to the assessment of medical procedures. And their excellence is recognised up to the very highest level: six UK mathematicians hold Fields Medals [**6**]. This is officially known as the International Medal for Outstanding Discoveries in Mathematics, but unofficially as the 'Nobel Prize for mathematics'. Two or three of these are awarded once every four years, for work done before the age of forty.

British mathematical science wins financial backing not only from the HE Funding Councils and from the Research Councils, but from European agencies, from charities, from government and industry, and from many outside bodies. To give just one recent and very notable example: the Oxford Centre for Collaborative Applied Mathematics (OCCAM, [**7**]) has been created with £20m backing from the King Abdullah University of Science and Technology (Saudi Arabia).

Inevitably there is room for improvement. The IRMS 2010 criticises the UK for the poor representation of women in mathematics, and also points out that the brevity of UK doctoral training compared with mainland Europe and the US can put young UK mathematicians at a disadvantage compared to their international peers. Both these are points the community and the universities are addressing, but, particularly in the case of women in mathematics, there is some way to go.

Despite the best efforts of people such as Marcus du Sautoy and Ian Stewart, we could do better in telling the public about the excitement and applicability of mathematics sites such as the excellent Mathematics Matters [**8**] of the Institute of Mathematics and its Applications point the way here.

Although mathematics is relatively cheap compared with experimental science, 'cheap' does not mean 'free' – money is badly needed to maintain and widen the pipeline for fresh talent, from PhD training through to postdoctoral fellowships and beyond. Research grant support for established mathematical scientists gives them essential opportunities to interact on a global stage with their peers, and provides vital periods of uninterrupted time for research.

A crucial and more subtle point about research council support is often missed – namely, there are unintended negative consequences of low and reducing levels of funding, beyond the straightforward loss of support for current research. University administrations, under pressure to maximise external funding, are increasingly reluctant to make new appointments in fields where research council support is low, so that, over time, the geographic and subject diversity highlighted above will be threatened.

We share the widespread fear that the future of UK mathematical sciences is under threat. The research grant commitment of the EPSRC Mathematics Programme has been in decline since 2007–8, at a time when funding for other disciplines in EPSRC's portfolio was still increasing. At a modest £12m, it was the same in cash terms in 2009–10 as it had been in 2003–4. Over this same period the total EPSRC research grant commitment increased from £378m to £459m, the latter figure including £88m for physical sciences and £72m for ICT [**9**]. It is in this already very challenging landscape that the EPSRC is now rushing through its ill-considered 'Shaping Capability' agenda.

This agenda is being implemented before the mathematics community has been properly consulted. It places strategic decisions in the hands of administrators, with priorities such as the centralisation of research that do not necessarily fit the mathematics landscape. There is a real danger that the geographically distributed excellence in UK mathematical science, developed over many years with the support of HEFCE and the research councils, is about to be seriously diminished.

Acknowledgements. We are grateful to colleagues on the Council for Mathematical Sciences for comments and suggestions that have been incorporated into this article.

Ken Brown, University of Glasgow
LMS Vice-President
Paul Glendinning, University of Manchester
IMA Vice-President

References and notes

1. 'International Review of Mathematical Sciences 5–10 December 2010', available at www.epsrc.ac.uk/newsevents/pubs/corporate/intrevs/2010maths.
2. Details of the EPSRC Shaping Capability Policy are at www.epsrc.ac.uk/plans/implementingdeliveryplan/goals/shapingcapability. The Council of Mathematical Sciences (CMS) responses are at www.cms.ac.uk/submissions.html.
3. Figures were obtained by multiplying the percentage of outputs in quality bands 3* and 4* by the number of academic staff in each RAE submission, and summing over all submissions.
4. Figures from HESA; see www.iop.org.
5. Adrian Smith *et al.*, 'One Step Beyond: Making the most of postgraduate education' (report, March 2010), p. 94.
6. Atiyah, Baker, Borcherds (based in the US), Donaldson, Gowers and Roth.
7. See www.maths.ox.ac.uk/groups/occam.
8. See www.ima.org.uk/i_love_maths/mathematics_matters.cfm.
9. Taken from Table 3 of 'CMS submission to House of Commons Select Committee inquiry on the Spending Review 2010', available at www.cms.ac.uk/files/Submissions/article_4e92ed3406d890.06887894.pdf. Assembled from tables in EPSRC Annual Reports.
10. D. Mumford, C. Series and D. Wright, *Indra's Pearls: The Vision of Felix Klein* (Cambridge University Press, Cambridge, 2002).

BRITISH MATHEMATICAL COLLOQUIUM 2012

16–19 April 2012, University of Kent, Canterbury

The 2012 *BMC* will include a celebration of the centenary of the birth of Alan Turing. Dr Andrew Hodges will give a public lecture on Turing's life and work and Professor Solomon Feferman will give a plenary lecture on mathematical aspects of Turing's work.

Plenary speakers

- Christine Bessenrodt (Hannover)
- Solomon Feferman (Stanford)
- Andrew Hodges (Oxford)
- Martin Lorenz (Temple University)
- Idun Reiten (Trondheim)
- Christiane Tretter (Bern)

Morning speakers will include

- Ken Brown (Glasgow)
- Rachel Camina (Cambridge)
- Cornelia Druţu (Oxford)
- Des Evans (Cardiff)
- Leonid Parnovski (UCL)
- Sarah Rees (Newcastle)

Research workshops

- Turing's Legacy
- Algebraic Transformation Groups
- Mathematical Physics
- Operator Theory
- Noncommutative Geometry
- Number Theory and Algebraic Geometry

For more information visit the website at www.kent.ac.uk/IMS/events/160412.html.

BRITISH APPLIED MATHEMATICS COLLOQUIUM 2012

27–29 March 2012, University College London

The Mathematics Department at University College London will host the *British Applied Mathematics Colloquium* (BAMC 2012) from 27 to 29 March 2012. It is the first time it will take place at UCL since 1972. BAMC is one of the main annual applied mathematics meetings in the UK. The organisers expect about 300 participants including faculty members, scientists and graduate students. Contributed talks will cover a wide range of topics in applied mathematics. They will be given in parallel sessions by senior and junior researchers. Each talk will be followed by a discussion. In addition there will be plenary lectures and mini-symposia.

The currently confirmed plenary speakers are:

- Oliver Buhler (New York University), Lighthill Lecture
- Darren Crowdy (Imperial College London)
- Mark Peletier (Eindhoven University of Technology)
- Yuriko Renardy (Virginia Tech), Stewartson Lecture

The currently planned mini symposia include:

- Financial mathematics
- Free surface flows
- General relativity
- Geophysical fluid mechanics
- Mathematical ecology
- Medical applications
- Numerical analysis
- Quantum dynamics
- Quantum information
- Slamming problems
- Social modelling

For further information email bamc@math.ucl.ac.uk or visit the website at www.ucl.ac.uk/mathematics/BAMC-2012.

Institute of mathematics & its applications

LONDON MATHEMATICAL SOCIETY

The 2012 Christopher Zeeman Lecture

Professor John Barrow FRS

Wednesday 21 March 2012 at 6.00 pm followed by a reception

at The Royal Society, Carlton House Terrace, London, SW1

Maths, Sport, and the Olympics

Abstract We will reveal some of the many ways in which simple mathematics helps us understand and improve sporting performance. Running, throwing, cycling, jumping, and weightlifting are among the examples we will take a look at from a new perspective. Along the way we will also see how Usain Bolt can break his world 100m record and investigate some odd scoring systems.

Before the lecture, Professor John Barrow will be presented with the Christopher Zeeman award. This medal is awarded triennially to recognize and reward the contributions of mathematicians involved in promoting mathematics to the public, with a view to encouraging others by demonstrating that such activities are valued as part of the role and responsibilities of a mathematician. It is jointly awarded by the Institute of Mathematics and its Applications and the London Mathematical Society.

Admission

To the lecture is by ticket only.

For tickets please contact Mrs Lynn Webster at the IMA (email lynn.webster@ima.org.uk or Catherine Richards House, 16 Nelson Street, Southend-on-Sea, SS1 1EF) by 28 February 2012. Tickets are free of charge and will be allocated on a first come, first served basis.

VISIT OF V. ROTHOS

Dr Vassilis Rothos (Aristotle University of Thessaloniki) will visit the UK from 18 to 30 January 2012. During his visit he will be based at the University of Nottingham. The focus of the research during this visit will be on study of travelling lattice solitary waves in discrete systems using dynamical system analysis. He will give lectures at:

- Loughborough, 16 January: *Shilnikov chaos in parametrically-driven coupled nonlinear lattices: Application in two coupled rf-SQUIDs*
- Imperial College London (Dynamical Systems Seminar/Applied Maths), 18 January: *Traveling waves in nonlocal lattice equations*
- Surrey (Mathematics), 20 January: *Stationary and traveling waves in lattices with saturable nonlinearities*

For more information contact Hadi Susanto (hadi.susanto@nottingham.ac.uk). The visit is supported by an LMS Scheme 2 grant.

VISIT OF P. KOSZMIDER

Professor Piotr Koszmider (Institute of Mathematics, Polish Academy of Sciences) will visit the UK from 29 January to 14 February 2012. He is an expert in the application of set-theoretic methods in Banach space theory; he is particularly known for his constructions of compact Hausdorff spaces with the property that the corresponding Banach spaces of continuous functions acting on them admit only 'few' operators in various specific ways. During his visit Professor Koszmider will lecture at the following places:

- University of Leeds, Tuesday 31 January; contact Dr Matt Daws (mdaws@maths.leeds.ac.uk)
- Lancaster University, Wednesday 1 February; contact Dr Niels Laustsen (n.laustsen@lancaster.ac.uk)
- University of Cambridge, Monday 13 February; contact Dr András Zsák (a.zsak@dpmms.cam.ac.uk)

Professor Koszmider will be based at Lancaster University during his stay, hosted by Dr Niels Laustsen. The visit is supported by an LMS Scheme 2 grant.

VISIT OF H. LONG

Professor Hongwei Long (Florida Atlantic University) is visiting the UK from 1 to 23 December 2011. Professor Long's research interests include Stochastic Analysis, in particular filtering methods for stochastic differential equations (both ordinary and partial). He will give the following talk *Nadaraya–Watson estimator for stochastic processes driven by stable Lévy motions* on:

- Thursday 8 December at 3 pm, Probability Seminar, Mathematics Department, School of Physical Sciences, Swansea University
- Friday 16 December at 3 pm, Mathematics Institute, University of Warwick
- Monday 19 December at 3.15 pm, Mathematical Finance and Stochastic Analysis Seminar, Room G/013, Department of Mathematics, University of York

For further information contact Zdzislaw Brzezniak (zdzislaw.brzezniak@york.ac.uk). The visit is supported by an LMS Scheme 2 grant.

CONFERENCE FACILITIES

De Morgan House offers 40% discount on room hire to all Mathematical charities and 20% to all not-for-profit organisations. Support the LMS by booking the next London event at De Morgan House.

Call us now on 020 7927 0800 or email roombookings@demorganhouse.co.uk to check availability, receive a quote or arrange a viewing of the venue.

ADDITIVE COMBINATORICS

Additive Combinatorics in Paris 2012 will be held at the Institut Henri Poincaré in Paris from 9 to 13 July 2012. The conference will be dedicated to the memory of Yahya ould Hamidoune, who passed away earlier this year. As such, the scope of the conference encompasses topics in additive and combinatorial number theory, additive group theory, graph theory and probabilistic combinatorics as well as adjacent fields. The following keynote speakers have confirmed their attendance:

- Noga Alon (Tel Aviv University)
- Emmanuel Breuillard (Université Paris-Sud, Orsay)
- Alfred Geroldinger (Universität Graz)
- Tim Gowers (University of Cambridge)
- Ben Green (University of Cambridge)
- Melvyn Nathanson (CUNY/Lehman College)
- Oriol Serra (Universitat Politècnica de Catalunya)
- Benny Sudakov (UCLA)
- Tamar Ziegler (Technion)

In addition, there will be shorter lectures. For further information visit the website at http://caparis2012.wordpress.com.

HIGHER ORDER PROBLEMS IN GEOMETRIC ANALYSIS

A workshop on *Higher Order Problems in Geometric Analysis* will take place at the University of Bath from 5 to 8 June 2012. The aim of this workshop is to bring together experts in geometric analysis and foster interaction with researchers in neighbouring fields, such as differential geometry, numerical analysis, or applied mathematics. The focus is on problems giving rise to partial differential equations of higher order. Speakers include:

- John Barrett (Imperial College London)
- Anna Dall'Acqua (University of Magdeburg)
- Klaus Deckelnick (University of Magdeburg)
- Andreas Gastel (University of Duisburg-Essen)
- Udo Hertrich-Jeromin (University of Bath)
- Ernst Kuwert (University of Freiburg)
- Tobias Lamm (University of Frankfurt)
- Andrea Malchiodi (SISSA, Trieste)
- Jan Metzger (University of Potsdam)
- Tristan Rivière (ETH Zürich)
- Frédéric Robert (Henri Poincaré University, Nancy)
- Melanie Rupflin (Albert Einstein Institute, Potsdam)
- Friedemann Schuricht (TU Dresden)
- Michael Struwe (ETH Zürich)
- Paweł Strzelecki (University of Warsaw)

The programme will start on Tuesday afternoon (5 June) and end on Friday afternoon (8 June). For further information contact the organisers Peter Hornung, Roger Moser and Hartmut Schwetlick (geometric-analysis@bath.ac.uk) or visit the website at http://people.bath.ac.uk/rm257/geometric_analysis. The event is supported by the EPSRC.

CELEBRATION OF THE 70TH BIRTHDAY OF ELMER REES

The Heilbronn Institute for Mathematical Sciences, University of Bristol, is planning to hold a short conference to celebrate the 70th birthday of Elmer Rees, to honour his academic achievements and to acknowledge his success as the first Director of the Institute. The conference will take place at the University of Bristol from 20 to 21 April 2012. Confirmed speakers are:

- Sir Michael Atiyah (University of Edinburgh)
- Sir John Ball (University of Oxford)
- Victor Buchstaber (Steklov Mathematical Institute, Russian Academy of Sciences)
- John Jones (University of Warwick)
- Angus Macintyre (Queen Mary, University of London)
- Andrew Ranicki (University of Edinburgh)

There will be four lectures on Friday followed by a dinner in the evening. On the Saturday morning there will be lectures with the conference ending with lunch. All lectures will be about one hour and will be of general interest. There is no registration fee but to enable estimation of numbers, intending participants are requested to inform Claire Barr (claire.barr@bristol.ac.uk).

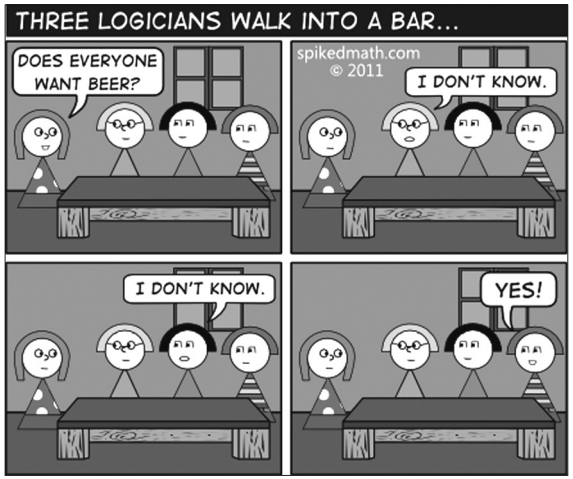
Dinner on the Friday evening will be at The Royal West of England Academy and there is a charge of £25 per person for attendees and guests. Further information and registration forms are available at www.maths.bris.ac.uk/events/meetings/meeting/index.php?meeting_id=76. The organiser is Nelson Stephens.

HEILBRONN QUANTUM ALGORITHMS DAY

The 2nd *Heilbronn Quantum Algorithms Day* will take place at the University of Bristol on 1 February 2012. Following on from the success of last year's event, the aim of this colloquium is to showcase recent research in quantum algorithms. The day will consist of a number of talks from invited speakers who include:

- Scott Aaronson (MIT)
- Matty Hoban (Oxford)
- Ashley Montanaro (Cambridge)
- Martin Roetteler (NEC Labs, Princeton)
- Miklos Santha (LIAFA, Paris)

There is no conference fee; however registration is mandatory and intending participants are requested to email quantum-algorithms-2012@bristol.ac.uk. The deadline for registration is **31 January 2012**. The organisers may be able to offer limited travel support to students who are unable to find funding from their home institutions. The organisers are Steve Brierley, Noah Linden and Oliver Gray. Further information is available at www.maths.bris.ac.uk/~maowg/q-alg-2012/q-alg-2012.html.



CULTURE OF BEING A MATHEMATICIAN

Tony Mann (University of Greenwich) and Chris Good (University of Birmingham) are working on a project to produce teaching materials on "the culture of being a mathematician". The project is supported by the Mathematical Sciences HE Curriculum Innovation Project as part of the National HE STEM Programme, acting on a recommendation from the HE Mathematics Curriculum Summit (*LMS Newsletter* 401, March 2011, p. 9). We would like to interview a small number of mathematicians on this subject, with a view to making the results available as a teaching resource. If you might be interested in taking part, please contact Tony Mann (A.Mann@gre.ac.uk) for more information.

NEURODYNAMICS

A workshop on heterogeneity, noise, delays, and plasticity in neural systems will take place in Edinburgh from 5 to 7 March 2012. Although mathematical work on Neurodynamics has increased in recent years, the study of heterogeneity, noise, delays, and plasticity needs much further attention. A firmer mathematical framework for treating dynamical systems with these attributes will pave the way for a more comprehensive understanding of the dynamic states of biological neural networks, and their role in facilitating natural computation. This three-day conference will bring together experts in these key areas to seed a new phase of theoretical work to develop those pieces of mathematical theory which are critical for future realistic modelling studies of the brain.

The meeting will consist of invited speakers and registered participants, though will be limited to 100 people. The schedule will allow for a number of poster presentations. The invited speakers are:

- Paul Bressloff (University of Utah)
- David Cai (Courant Institute of Mathematical Science, New York University)
- Dmitri Chklovskii (Howard Hughes Medical Institute, Janelia Farm)
- Claudia Clopath (Université Paris Descartes)
- Carina Curto (University of Nebraska-Lincoln)
- Ila Fiete (University of Texas at Austin)
- Toni Guillamon (Universitat Politècnica de Catalunya)
- Boris Gutkin (École Normale Supérieure)
- Rachel Kuske (University of British Columbia)
- Khashayar Pakdaman (Université Paris Diderot/CNRS)
- Stefan Rotter (University of Freiburg)
- Nicholas Swindale (University of British Columbia)
- Jonathan Touboul (INRIA/ENS Paris)
- Martin Wechselberger (University of Sydney)
- Fred Wolf (Max Planck Institute for Dynamics and Self-Organisation)

Registration is now open, closing on **6 January 2012**. The registration fee for the conference is £100. This event is sponsored by the EPSRC in association with the UK Mathematical Neuroscience Network (http://mathneuronet.org.uk). The scientific organizers are Professor Stephen Coombes (Nottingham) and Dr Yulia Timofeeva (Warwick).

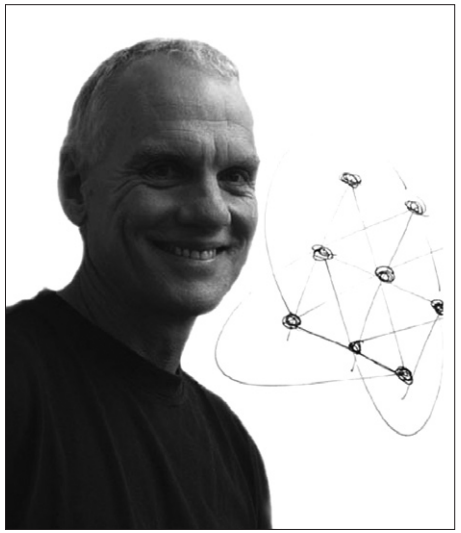
A *Tutorial Day*, covering key concepts in heterogeneity, noise, delays, and plasticity in neural systems, for PhD students and post-docs, will take place on 4 March prior to the meeting. Some financial assistance is available to assist graduate students who attend both the training workshop and the conference. The *Tutorial Day* organiser is Dr Mark van Rossum (Edinburgh).

For further details and how to register visit the website at http://icms.org.uk/workshops/neuro2012. Enquiries should be addressed to Audrey Brown (audrey.brown@icms.org.uk).

FIRST AITKEN LECTURER VISITS THE UK

In 2009, the London Mathematical Society and the New Zealand Mathematical Society agreed to set up a new lectureship named after Professor A. Aitken, one of New Zealand's great mathematicians.

The Aitken Lectureship takes place every two years (in odd-numbered years) when a mathematician from New Zealand is invited by both Societies to give lectures at different universities around the UK. Professor Geoff Whittle is the first holder of the Aitken Lectureship and he visited the UK in October to give a series of talks at the universities of St Andrews, Manchester, Cambridge, Oxford and QMUL.



Geoff Whittle (Aitken Lecturer)

Whittle is professor in the School of Mathematics, Statistics and Operations Research at the Victoria University of Wellington, New Zealand and a Fellow of the Royal Society of New Zealand. After graduating, Whittle began his career teaching in high school but soon returned to the University of Tasmania to study for his PhD and he has now been an academic mathematician for over 20 years. During his career Whittle has developed an interest in matroids. As he says, "during the late 1980s and early 1990s matroid theory was stagnating to some extent but during the 1990s I started to make significant progress on some long-standing problems. This led to a collaboration with Jim Geelan and Bert Gerards, with the recent work on the so-called Matroid Minors project being the most significant achievement".

Whittle is no stranger to the UK, having visited on many occasions and frequently worked with 'the inspirational' Dominic Welsh at Oxford. During his visit as Aitken Lecturer, Whittle gave two presentations entitled *Well-quasi-ordering binary matroids* and *Matroid representation over infinite fields*. The lectures were well attended, with a significant number of graduate students. Whittle was very enthusiastic about his visit to the UK. "The lectureship is a good arrangement and provides a fantastic opportunity for mathematicians to interact and learn from each other. I hadn't ventured north of Cambridge on my previous visits to the UK and the opportunity afforded me by the Aitken Lectureship has certainly been an enriching experience."

John Johnston
Mathematics Promotion Officer

WAVELETS AND MATLAB

A workshop on *Wavelet Analysis with MATLAB* will take place at Northumbria University from 19 to 21 December 2011. The aim of this workshop is to introduce wavelets as a tool for data analysis for a number of applications such as signal and image processing, communication systems, engineering, mathematics, computing, physics, biology medicine and finance. The workshop will cover the mathematical background of wavelet analysis and will introduce examples of 1D and 2D discrete and continuous wavelet transforms with applications.

The introduction to *Wavelet Analysis with MATLAB* will be on Tuesday 20 December 2011 from 10.00 to 17.00. The workshop will be presented as a mixture of lectures and laboratory sessions for approximately six hours per day. The laboratory sessions will require the participants to have a working knowledge of MATLAB.

Advanced sessions for those already familiar with Wavelet will be held on Wednesday 21 December 2011 from 10.00 to 17.00.

For participants not familiar with MATLAB, there will be a half-day course on the MATLAB on Monday 19 December between 14.00 and 17.00.

Participants with knowledge of MATLAB may wish to attend the Tuesday and Wednesday sessions only.

Registration deadline is **10 December 2011**. The registration fee for the entire workshop is £300, the two-day workshop is £250 (Wavelet basics and advanced) and for a single-day workshop £150 (Wavelet basics or advanced). The registration fee covers handouts for the workshop, use of MATLAB toolboxes, lunches and refreshments.

For further information visit the website at http://group28.northumbria.ac.uk or contact Dr Sujan Rajbhandari (tel: 0191 227 3901, email: sujan.rajbhandari@northumbria.ac.uk).

REVIEWS

On Gauss and Cows

Carl Friedrich Gauß: Biographie und Documente by Hans Wußing, 2011, EAGLE 051 Leipzig, 279 pp, €26.50, ISBN 978-3-937219-51-6.

This book first appeared in 1974 in a series of popular short biographies of major scientists published by the Leipzig house Teubner. It consisted of ten chapters that ran efficiently through the main features of the life and especially the work of its subject, and ended with a timeline and a bibliography, mostly of historical literature. It was reprinted four times, to 1989; but this edition is substantially different. The chapters read more or less as before, but the text contains far more illustrations, especially likenesses of Gauss and others, and title pages of some publications and manuscripts.

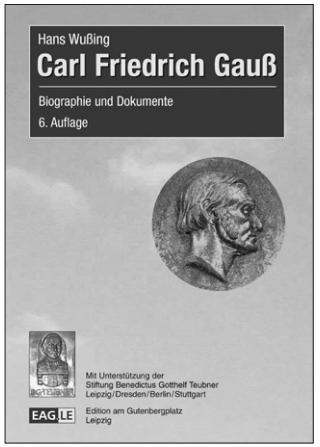
The first main change is the addition of 25 short 'documents' concerning 'Gauss in his intellectual and private circumstances'. The author, often quoting contemporaries or historians, writes several of them; the rest are passages photoreproduced from historical writings, ending with one by the author.

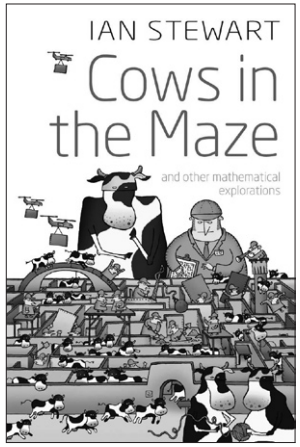
The second change is a further 25 documents on contacts between Gauss and Teubner, prepared in part to celebrate in 2011 the bicentenary of the house. Although they did not publish Gauss's own books, they dominated the publication of Gauss scholarship, which began soon after his death in 1855. Gauss's compatriots produced a fine edition of his *Werke* in 12 large volumes between 1863 and 1933, including many manuscripts as well as his publications (which are far more numerous than is suggested by his famous conceit '*pauca sed matura*'). Large supplements to volumes 10 and 11 constituted (some reprints of) articles and monographs on aspects of his work that were produced in a project directed by Felix Klein. In addition, there have been editions of the main (and massive) correspondences with major colleagues, especially with astronomers. Some of these texts came out from another Leipzig house, Engelmann, including several Gauss items in their important series of source books 'Ostwalds Klassiker', as is duly noted in 20 pages of reproduced title pages of 'Leipzig reference books'. Since 1962 the *Gauss Gesellschaft* has published a useful series of slim *Mitteilungen*. All of this distinguished historical scholarship is at least noted bibliographically in this sequence of 25, much of which is little known to those Gauss enthusiasts who do not read the language; again some short passages from historical texts are photo reproduced.

This half-century of additions more than doubles the length of the book; while the order somewhat resembles a random walk, much useful information on Gauss is made available. The book ends with illustrations of Gauss, especially in stamps (where the author draws upon his own splendid collection for sciences and scientists), banknotes, coins, medals in Gauss's honour, and statues, and the lifeline. One hopes that someone will be inspired to draw upon all these resources and produce or edit the definitive Big-Book(s) biography that Gauss deserves.

The preface of this book is dated February 2011; as is noted on the next page, Wussing died in April after a long fight against cancer. A leader of the history of science in the German Democratic Republic for decades, he was also a major figure in the history of mathematics, receiving the May Medal in 1997 for his services to the field. He was also a substantial author in the popularisation of science and especially mathematics; for example, this book was one of several that he contributed to Teubner's series.

I. Grattan-Guinness
Middlesex University





Cows in the Maze and other mathematical explorations by Ian Stewart, 2010, Oxford University Press, 320 pp, £8.99, ISBN 978-0-19-956207-7.

Cows in the Maze is a collection of 21 articles from the author's Mathematical Recreations column in *Scientific American* magazine. As one might expect, they are pitched at the intelligent, but not necessarily mathematically educated, reader.

The articles cover a variety of topics, most of them well within the traditional scope of "recreational mathematics", but none the worse for that. The stock-in-trade of the genre (from knots to knight's tours, and magic squares to tilings) is all present, but the exposition here is outstanding, and in many cases the author finds a new slant to interest even those familiar with the basic ideas. For example, while the counterintuitive consequences of Bayes' theorem have been covered many times before, the presentation here features a fascinating discussion of its implications in the legal world, with well-researched reference to real-life cases.

Three articles in the middle of the book make a detour into theoretical physics, forming a short(ish) story in which the characters discuss the possibility of time travel in a relativistic universe.

A number of the other articles also take the form of dialogues or short stories. One can see how this would draw in the casual reader of a non-specialist publication, but the willing purchaser of an entire volume on mathematics can probably do without this kind of insulation from the subject matter, and might prefer to see things presented in a more straightforward way.

The only topic to leave me completely cold was that referred to by the title: an extraordinarily complicated self-referential "logic maze". For me, elegant and simply stated mathematical problems naturally cry out for attention, while more technical ones have to earn their crust by virtue of some external importance. This seems to be a problem crafted for the specific purpose of being convoluted and difficult to understand, and I couldn't summon up the enthusiasm necessary to get to grips with it. That said, the prominence given to it suggests that the author feels it is a strong selling point of the book, so perhaps I am missing the point and everyone else will love it!

While the articles themselves are outstanding, the volume as a whole is perhaps not quite the sum of its parts. Each article is simply presented, with minimal editing, as a chapter. The only significant additions to each are a brief discussion of feedback received by the author after publication and a list of websites for further reading. A general lack of progress or development between chapters inevitably makes the book feel disconnected, and a little unsatisfying to read from cover to cover. On the other hand, the format (the only edition available seems to be a paperback with black and white illustrations) does not naturally make it the kind of book one would treasure and dip into from time to time, or keep out on a coffee table.

In summary, the articles collected are undoubtedly a masterclass in mathematical writing for the casual, non-specialist reader, but I am not persuaded that simply collecting them in a paperback volume does them justice.

Mark Kambites
University of Manchester

CALENDAR OF EVENTS

This calendar lists Society meetings and other mathematical events. Further information may be obtained from the appropriate LMS *Newsletter* whose number is given in brackets. A fuller list of meetings and events is given on the Society's website (www.lms.ac.uk/newsletter/calendar.html).

Please send updates and corrections to calendar@lms.ac.uk.

DECEMBER 2011

5-9 Mathematical Models of Cognitive Architectures Workshop, CIRM, Marseille (406)
11 *Everything and Nothing* Performance, Bob Kayley Theatre, Reading (408)
12 Profinite Completions of Groups Meeting, Imperial College London (408)
12-16 Inverse Problems in Science and Engineering INI Workshop, Cambridge (401)
13 *David and Goliath*, Gresham College Lecture, Museum of London (409)
16-17 LMS Prospects in Mathematics Meeting, Bristol
19-21 Wavelet Analysis with MATLAB Workshop, Northumbria (409)

JANUARY 2012

4-6 British Postgraduate Model Theory Conference, Oxford (409)
4-8 String Theory, Geometry, and Mathematical Physics UK–Japan Winter School, Oxford (407)
8-11 Free Boundary Problems in Fluid Mechanics Meeting, Nottingham (406)
17 *Citius, Altius, Fortius*, Gresham College Lecture, Museum of London (409)
31-2 Feb Cryptographic Theory INI Workshop, Cambridge (404)

FEBRUARY 2012

1 Heilbronn Quantum Algorithms Day, Bristol (409)
13-17 Symmetries of Discrete Objects Conference, Queenstown, New Zealand (406)
21 *Let's Twist Again*, Gresham College Lecture, Museum of London (409)
23-24 Rigidity of Periodic and Symmetric Structures Meeting, Kavli Royal Society International Centre, Newport Pagnell (409)
24 LMS Meeting and Mary Cartwright Lecture, London (409)

MARCH 2012

4 Neurodynamics Workshop Tutorial Day, Edinburgh (409)
5-7 Neurodynamics Workshop, Edinburgh (409)
14 Combinatorics Meeting, Oxford
14-16 Pattern Formation: The Inspiration of Alan Turing INI Satellite Meeting, Oxford (408)
15-17 The Big Bang Science and Engineering Fair, NEC Birmingham (407)
21 Zeeman Medal 2011 Award Ceremony, The Royal Society, London (409)
21-22 Young Functional Analysts' Workshop, Oxford
26-30 LMS Invited Lectures, Alexei Borodin, Glasgow (409)
27 *On the Waterfront*, Gresham College Lecture, Museum of London (409)
27-29 BAMC 2012, University College London (409)

APRIL 2012

2-3 Biological Flow Conference, Cambridge
2-4 Young Researchers in Mathematics Conference, Bristol
2-5 British Colloquium for Theoretical Computer Science, Manchester
10-13 Formal and Computational Cryptographic Proofs INI Workshop, Cambridge (408)
16-19 BMC 2012, University of Kent, Canterbury (409)
16-20 Noncommutative Geometry INI–WIMCS Meeting, Cardiff
17-19 Frontiers of Nevanlinna Theory 3: Applications of Nevanlinna Theory to Differential and Functional Equations, University College London (401)
20-21 Elmer Rees' 70th Birthday Celebration Conference, Bristol (409)
24 *Final Score*, Gresham College Lecture, Museum of London (409)

MAY 2012

19 LMS Poincaré Meeting, London
28-1 Jun Boundary Value Problems for Linear Elliptic and Integrable PDEs: Theory and Computation ICMS Workshop, Edinburgh (405)
28-1 Jun Infinite Ergodic Theory Workshop, Surrey

JUNE 2012

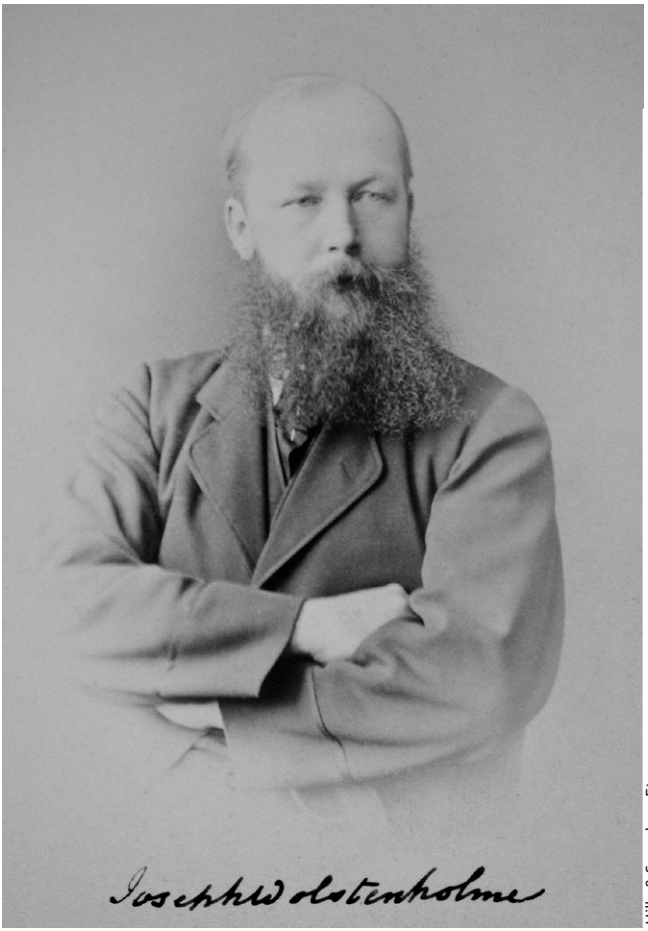
2-3 Numerical Linear Algebra, Control Theory and Data Assimilation Conference, Reading
5-8 Higher Order Problems in Geometric Analysis Workshop, Bath (409)
6 LMS Northern Regional Meeting, Northumbria University, Newcastle
11-12 Numerical Analysis of Stochastic Partial Differential Equations, Warwick
12-15 The Incomputable Workshop, Chicheley Hall, North Buckinghamshire (407)
12-15 Chaotic Modeling and Simulation International Conference, Athens, Greece
18-20 Frontiers of Nevanlinna Theory 4: Nevanlinna Theory and Number Theory, University College London (401)
18-23 Turing Centenary Conference, Cambridge (407)
29 LMS Meeting and Hardy Lecture, London

JULY 2012

2-7 6th European Congress of Mathematics, Kraków, Poland (409)
9-13 Additive Combinatorics in Paris 2012 Conference, Paris, France (409)

J. WOLSTENHOLME

LMS member 1871-1885, 1887-1891



Hills & Saunders, Eton

Rev Joseph Wolstenholme, MA, FCPS
Fellow, Christ's College, Cambridge
Professor of Mathematics, Royal Indian Engineering College