## Society Meetings and Events

## 2014

Friday
14 November
LMS AGM
Naylor Lecture
London
page 7
Wednesday
17 December
SW \& South Wales
Regional Meeting
Plymouth
page 27
2015
Friday 16 January 150th Anniversary Launch, London
page 9
Friday 27 February Mary Cartwright
Lecture, London
16-20 March 2015
LMS Invited Lectures
Durham
page 16
Wednesday 1 April 150th Anniversary Celebrations at the BMC-BAMC 2015 Cambridge page 8

## NEWSLETTER ONLINE:

newsletter.Ims.ac.uk

## ELECTIONS TO COUNCIL AND NOMINATING COMMITTEE 2014

Members should now have received a communication from the Electoral Reform Society (ERS) for both e-voting and paper ballot. For online voting, members may cast a vote by going to www. votebyinternet.com/LMS2014 and using the two part security code on the email sent by the ERS and also on their ballot paper.
All members are asked to look out for communication from the ERS. We hope that as many members as possible will cast their vote. If you have not received ballot material, please contact duncan.turton@lms.ac.uk, confirming the address (post or email) to which you would like material sent.
With respect to the election itself, there are ten candidates proposed for six vacancies for Member-atLarge. One candidate has been nominated for the role of Mem-ber-at-Large (Librarian). Four candidates have been proposed for two vacancies in the membership of Nominating Committee. The slates and candidate biographies
for the election can be found on the LMS website at www.Ims. ac.uk/about/council//ms-elections.
For both electronic and postal voting the deadline for receipt of votes is Thursday 6 November. Members may still cast a vote in person at the AGM, although an in-person vote must be cast via a paper ballot.
Members may like to note that an LMS Election blog, moderated by the Scrutineers, can be found at http://discussions.Ims. ac.uk/elections2014.

## Future Elections

Members are invited to make suggestions for nominees for future election to Council. These should be addressed to the Nominating Committee (nominations@ Ims.ac.uk). Members may also make direct nominations: details will be published in the April 2014 Newsletter or are available from Duncan Turton at the LMS (duncan.turton@Ims.ac.uk).

Fiona Nixon
Executive Secretary

## LMS TWITTER FEED LAUNCHED

The LMS is pleased to follow us on Twitter to receive announce the launch of its regular updates about the new Twitter feed @LondMath Soc. We invite our members to
society, and UK mathematics in general.

## Contents

## No. 441 November 2014



150th Anniversary Events
BMC-BAMC 2015 - LMS 150th
Anniversary Celebration Day. $\qquad$
Launch of the 150th
Anniversary Celebrations. .. 9
Calendar of Events ..... 35
LMS ItemsAnnual General Meeting.3
Annual LMS Subscription 2014-15 ..... 4
A Review of the Newsletter ..... 3
Elections to Council andNominating Committee 20141
Open House Success Continues ..... 3
LMS Invited Lectures 2016 - Call for Proposals ..... 16
LMS Hardy Fellowship Lecture Tour 2016 ..... 14
LMS Prizes 2015 - Call for Nominations. ..... 11
LMS Twitter Feed Launched ..... 1
Society Conference Grants ..... 17
LMS Meetings
Annual General Meeting 2014 ..... 7
Northern Regional Meeting 2015 ..... 10
SW \& South West Regional Meeting. ..... 27
Meetings
Integrable Day ..... 29
INI Random Planar Structures Workshop ..... 29
News
European News ..... 20
Mathematics Policy Round-up ..... 5
The Man Who Knew Infinity ..... 12
Obituary
Mullender, Pieter ..... 30
Reports
British Science Festival ..... 23
Knowledge Transfer Reports. ..... 13
Lancaster University 50th Anniversary.. ..... 22
Valediction to Jeremy Gray ..... 21
Reviews
Basic Gambling Mathematics ..... 31
Experiencing Mathematics ..... 33
How to Study for a Maths Degree ..... 30
Scholarship
Cecil King Travel Scholarship ..... 26

# ANNUAL GENERAL MEETING 

The Annual General Meeting of the London Mathematical Society will be held at 3.00 pm on Friday 14 November 2014 in the Jeffrey Hall at the Institute of Education, 20 Bedford Way, London, WC1H 0AL.
The business shall be:

1. Elections to Council and Nominating Committee
2. Review of Society Activities 2013-14
3. Report of the Treasurer
4. Resolutions
a. Adoption of the Trustees' Report 2013-14
b. Appointment of the Auditors
5. Presentation of Certificates to the 2014

LMS Prize Winners
It is hoped that as many members as possible will be able to attend. The Annual General Meeting will be followed by a Society Meeting (see page 7).

Fiona Nixon
Executive Secretary

## A REVIEW OF THE NEWSLETTER

Council is firmly of the view that a Newsletter is critically important for the Society, but that its form is overdue for a review. One might imagine changes in various ways, such as its size, frequency, and style. Comparisons are often made with the Newsletter of the European Mathematical Society, for example. We would like to assemble a small group of
people to start thinking about this, as well as some names of people who might be interested in working on a new Newsletter. If you would like to be considered for membership of our working group, or if you would like to suggest somebody else who might be interested, please write to Stephen Huggett at general.secretary@lms.ac.uk.

## OPEN HOUSE SUCCESS CONTINUES

Over three hundred people once again visited De Morgan House on Sunday 21 September 2014 as part of the annual London Open House event. Since first participating in Open House four years ago nearly 1,500 people have visited De Morgan House, learning about the Society and mathematics more
generally.
At this year's event visitors were given a short tour of selected rooms in the building by LMS staff and Open House volunteers. As well as discussing the architectural features of De Morgan House and its place in the history of Bloomsbury, the event is an op-

| Editorial team <br> http://newsletter.Ims.ac.uk |  |
| :--- | :--- |
| Editorial office | www.Ims.ac.uk/newsletter/ |
| London Mathematical Society, | ratecard.html |
| De Morgan House, 57-58 Russell | General Editor |
| Square, London WC1B 4HS | Mr A.J.S. Mann |
| (t: 020 7637 3686; | (a.mann@gre.ac.uk) |
| f: 0207323 3655) | Reviews Editor |
| Events calendar | Professor D. Singerman |
| Updates and corrections to | (d.singerman@soton.ac.uk) |
| calendar@lms.ac.uk | Administrative Editor |
| Articles | S.M. Oakes |
| Send articles to | (newsletter@Ims.ac.uk) |
| newsletter@lms.ac.uk | Typeset by the LMS at De |
| Advertising | Morgan House; printed by |
| For rates and guidelines see | Holbrooks Printers Ltd. |

Editorial team
http://newsletter.Ims.ac.uk

London Mathematical Society, De Morgan House, 57-58 Russel Square, London WC1B 4HS
(t. 02076373686

Events calendar
Updates and corrections to calendar@lms.ac.uk
Articles
Send articles to

Advertising
For rates and guidelines see
www.Ims.ac.uk/newsletter/ .htm
General Editor
Mr A.J.S. Mann

Reviews Editor
Professor D. Singerman german@soton.ac.uk)
S.M. Oakes
(newsletter@lms.ac.uk)

Morgan House; printed by Holbrooks Printers Ltd.

# Publication dates and deadlines 

Published monthly, except August. Items and advertisements by the first day of the month prior to publication, or the closest preceding working day. Notices and advertisements are not accepted for events that occur in the first week of the publication month. News items and notices in the Newsletter may be freely used elsewhere unless otherwise stated, although attribution is requested when reproducing whole articles. Contributions to the Newsletter are made under a non-exclusive licence; please contact the author or photographer for the rights to reproduce. The LMS cannot accept responsibility for the accuracy of information in the Newsletter. Views expressed do not necessarily represent the views or policy of the London Mathematical Society.
Charity registration number: 252660.
portunity to publicise LMS activities. On this occasion visitors had the opportunity to view the Mathematics in World War 1 exhibition, which was very well received. Visitors also heard about the Philippa Fawcett book collection from volunteers who were catalogu-
ing the collection.
Open House is an ideal opportunity to inform the public about the Society's 150th Anniversary (www.Ims.ac.uk/2015) and we intend to have a wide range of information and exhibitions at next year's event.

## ANNUAL LMS SUBSCRIPTION 2014-15

Members are reminded that their annual subscription, including payment for publications, for the period November 2014-October 2015 is due on 1 November 2014.

## Membership Subscription Rates

The annual subscription to the London Mathematical Society for 2014-15 is:

| Ordinary membership | $£ 66.00$ |
| :--- | :--- |
| Concessions on ordinary membership: | $£ 33.00$ |
| Reciprocity | $£ 16.00$ |
| Career break or part-time working | $£ 16.00$ |
| Associate membership |  |

LMS Journal Prices
The prices of the Society's periodicals for 2015 are:

|  | Print only | Online only | Print \& online |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| Bulletin | N/A | Free | $£ 81.00$ |  |  |
| Journal | N/A | Free | $£ 145.00$ |  |  |
| Proceedings | N/A | Free | $£ 155.00$ | North America |  |
|  | $£$ |  |  |  |  |
| Nonlinearity | N/A | Free | $£ 200.00$ |  |  |
| JCM (electronic) | Free |  |  |  |  |

We would like to draw members' attention to the following changes regarding the Society's journals:

1. Council has agreed the Society will no longer offer print-only copies of Nonlinearity to members from 1 January 2015.
2. Council has agreed the Society will offer free electronic access to Nonlinearity to members for personal use from 1 January 2015. To receive free electronic access for personal use, please note this on your subscription form when returning it to the Membership Department. Please note that for online journal subscriptions it is essential that members provide the Society with an up-to-date email address as the email address will be passed to the Institute of Physics who will send further details to subscribers.
3. Council has agreed the Society will continue to offer the "Print \& online" option for Nonlinearity to members from 1 January 2015.

## Subscription Rates for the EMS and JEMS via the LMS.

Members also have the option to pay their European Mathematical Society subscription via the LMS and subscribe to the Journal of the EMS:

| EMS subscription (via the LMS) | $£ 22.00$ |
| :--- | :--- |
| JEMS subscription (via the LMS) | $£ 120.00$ |

## Renewal and Payment

A subscription form has been sent by email or post to all members to complete and return with payment. Members are advised to use the subscription form to update the Society with their contact details.
If you have not received your subscription form, please contact Membership (membership@ Ims.ac.uk; 0207291 9973).
The Society encourages payment by direct debit. If you do not already pay by this method and would like to set up a direct debit (this requires a UK bank account), please visit the LMS website to download the direct debit mandate form: www.lms.ac.uk/sites/default/files/Mem bership/Direct\%20Debit\%20Form.pdf.
The Society also accepts payment by cheque or credit/debit card.
Please note that subscriptions become due on 1 November 2014 and payment should be received by 1 December 2014.

Elizabeth Fisher<br>Membership \& Activities Officer

## MATHEMATICS POLICY ROUND-UP

## October 2014

## HIGHER EDUCATION

## Statistics of higher education

HEFCE has published interactive data on the trends in employment of staff in the higher education sector for the ten years, 2003-04 to 2012-13. 2012-13 is the first year in which detailed information on job types is available. The type of work staff undertake in English higher education institutions falls into two main categories:

- academic roles, such as professors and research assistants; and
- professional and support roles, such as managers and directors.
More information is available at http://tinyurl. com/psoxqd6.


## SCHOOLS AND COLLEGES

## Mathematics Teacher Training Scholarships

The Institute of Mathematics and its Applications (IMA), LMS and the Royal Statistical Society
(RSS), Mathematics in Education and Industry (MEI) and The Mathematical Association (MA) are delighted to be able to continue working together to deliver Mathematics Teacher Training Scholarships for a third year.
The recent Vision for Science and Mathematics report produced by the Royal Society argues that 'Inspirational teaching begins with teachers who know and love their subject'. Mathematics Scholars have excellent subject knowledge as well as the potential to inspire their pupils and be inspired by the opportunities offered by the Scholarship scheme and by their initial teacher training.
Up to 250 scholarships will be available, worth $£ 25,000$ each. Candidates are expected to have a strong academic background (First, 2.1 or post graduate degree, high levels of mathematical knowledge and a desire to share their passion and love for maths. Candidates with a 2:2 may also be eligible if they bring significant additional experience).

As well as $£ 25,000$, Scholars will become part of a supportive community, be offered 2 years free membership of the IMA, LMS, RSS, MEI and MA with associated benefits. We are looking for applicants with the potential to become inspirational teachers and the future leaders in education. More information is available at tinyurl.com/oannnab.

## Subject consultations

The LMS has responded to recent consultations - Developing new GCSE, A-level and AS qualifications for first teaching in 2016 (OFQUAL) and Reformed GCSE and A-level subject content (DfE). The responses are available on the LMS website at www.Ims.ac.uk/policy/reports-and-policy-submissions.

## Setting Standards for new GCSEs 2017

Exams regulator Ofqual has confirmed how grading will work when new GCSEs are awarded for the first time.
New GCSEs in English language, English literature and mathematics will be taught in schools in England from September 2015, with students getting their results in August 2017.
The new GCSEs will be graded 1 to 9 , with 9 being the top grade. Ofqual has consulted on proposals for how standards should be set for them, and how the grading scale should work.
More information is available at tinyurl.com/ nja8hol.

## King's College London Mathematics School Opens

King's College London Mathematics School has been officially opened by Nicky Morgan MP, Secretary of State for Education.
Through its curriculum and its outreach activities, the School will increase the number of well-trained young mathematicians going on to study Mathematics, Physics, Computer Science and Engineering. It will also provide access to high quality teaching at sixth form level and has already been running an extensive GCSE enrichment programme involving over 250 students which aims to increase mathematical understanding and improve take up of both Mathematics and Further Mathematics A-levels.

More information is available at www.kcl. ac.uk/mathsschool/Home.aspx.

## Review of vocational education: the Wolf report

The report, originally published in 2001, has been updated. The review considers how vocational education for 14 - to 19 -year-olds can be improved in order to promote successful progression into the labour market and into higher level education and training routes. It provides practical recommendations to help inform future policy direction, taking into account current financial constraints. More information on the updated report is available at http://tinyurl.com/luevgox.

## OTHER

## Research with young people

The Department for Business, Innovation and Skills has published a research report - Research and analysis: Science, technology, engineering and maths: research with young people. The research looks at the attitudes, motivations and mindsets of young people and how these affect the decisions they make on subject and career choice. In particular this is in relation to science, technology, engineering and mathematics (STEM). The report covers:

- attitudes and mindsets that define today's generation of 14 to 17 year olds across England;
- what young people want from work;
- when key decisions are made and identifies the key influencers;
- how STEM is perceived by young people, parents and teachers; and
- how STEM is talked about on social media The full report is available at tinyurl.com/ qa9kaal.


## Literacy and numeracy in England

On UN International Literacy Day in September, the Business, Innovation and Skills (BIS) Select Committee published a report recommending the government launch a high-profile campaign to tackle the alarmingly low levels of adult literacy and numeracy in England. The report is available at tinyurl.com/ozzll8c.

Dr John Johnston
Joint Promotion of Mathematics

MATHEMATICAL SOCIETY

ANNUAL GENERAL MEETING<br>14 November 2014<br>$3.00-6.00 \mathrm{pm}$<br>Jeffrey Hall, Institute of Education<br>(20 Bedford Way, London WC1H 0AL. Nearest tube: Russell Square)

## PROGRAMME

## Annual General Meeting

The meeting will include the presentation of certificates to the LMS Prize-winners in 2014.

## E. Brian Davies (King's College London)

## Non-self-adjoint spectral problems

Abstract: Non-self-adjoint spectral theory is not yet a coherent subject, in the sense that there is no analogue of the spectral theorem for self-adjoint operators that can act as a basis for further research. The very high instability of eigenvalues under small perturbations often affects the analysis of particular models. The number of examples understood is expanding rapidly and will continue to do so into the foreseeable future.
We describe joint work with Michael Levitin on the $N \rightarrow \infty$ asymptotic spectral behaviour of a particular family of large non-self-adjoint matrices $A c, N$ associated with a self-adjoint linear pencil. Crucial insights were obtained by numerical experiments, even though the final analysis does not use rely on numerics. The problem is a matrix analogue of an indefinite self-adjoint linear pencil that concerns a Dirac operator with an indefinite potential. In some sense it is the simplest matrix example of its type, but its behaviour is still far more complex than one might expect. The eigenvalues of the matrix $A c, N$ converge to the real axis as $N \rightarrow \infty$, but the details of the convergence depend strongly on the choice of the real parameter C , in a way that presently defies understanding, even at a numerical level.

## Tea/Coffee

## Announcement of Election Results

Nick Trefethen (Oxford)

## Naylor Lecture: Mathematics of the Faraday Cage

Abstract: Everybody has heard of the Faraday cage effect, in which a wire mesh does a good job of blocking electric fields. Surely the mathematics of such a famous and useful phenomenon has been long ago worked out and written up in the textbooks?
It seems to be not so. One reason may be that that the effect is not as simple as one might expect: it depends on the wires having finite radius. Nor is it as strong as one might imagine: the shielding improves only linearly as the mesh spacing decreases. Mathematically, the subject is an appealing case study in the behaviour of harmonic functions, with links to Brownian motion and diffusion processes. Physically, Faraday cage shielding can be regarded as a process of electrostatic induction by a surface of limited capacitance. The talk will present results developed jointly with Jon Chapman and Dave Hewett.
The meeting will be followed by a reception at De Morgan House, Russell Square, and the Society's Annual Dinner at the Montague Hotel, 15 Montague Street, London WC1B 5BJ. The cost to attend the dinner will be $£ 53$ per person. Those wishing to attend the dinner should contact Carol Chessis (AnnualDinner_RSVP@Ims.ac.uk) by Monday 3 November.
For further details about the AGM contact Elizabeth Fisher (Imsmeetings@Ims.ac.uk).

## 漛图 UNIVERSITY OF CAMBRIDGE

## 150TH ANNIVERSARY CELEBRATIONS AT THE BMC-BAMC 2015 <br> 1 April 2015, University of Cambridge

## Programme

Robert Calderbank (Duke)
Andrew Wiles (Oxford)
Afternoon Workshop Sessions
Reception
Conference Dinner

To mark the 150th anniversary, there will be an LMS celebratory day as part of the joint BMC-BAMC in Cambridge, which will run from 30 March to 2 April 2015. The day will include plenary lectures by Robert Calderbank and Andrew Wiles and workshop sessions including some of the LMS Scheme 3 Research Groups.

These lectures are aimed at a general mathematical audience. All registered BMC-BAMC conference participants, whether LMS members or not, are most welcome to attend these events.

Registration for the joint BMC-BAMC will open on 1 December 2014. Early bird registration closes on 7 February 2015. If you are interested in attending the joint BMC-BAMC, please complete the preregistration form (http://www.bmc-bamc.org.uk/preregistration).

## $150^{\mathrm{TH}}$ ANNIVERSARY

The London Mathematical Society is delighted to announce the Launch
of its $150^{\text {th }}$ Anniversary Celebrations

## MATHEMATICS: UNLOCKING WORLDS

With a programme of prestigious speakers including:

Professor Terry Lyons, President of the LMS
Steve Thompson, Playwright and Screenwriter
Professor Robert Calderbank, Duke University
Professor Nigel Hitchin, University of Oxford
James Reid, Head of Visual Effects at Milk Visual Effects
Robert Pieké, Research Lead at Moving Picture Company
Professor Andrew Blake, Head of Microsoft Research, Cambridge
Professor Dame Frances Kirwan, University of Oxford

With link presenter Maggie Philbin, Television Presenter

Friday 16th January 2015
2.00 pm to 6.30 pm

Goldsmiths' Hall

This event will be live-streamed from www.lms.ac.uk/2015/launch

| LMS | ANNIVERSARY RN REGIONAL MEETING |
| :---: | :---: |
| Departmen | ics and Statistics, Lancaster University |
|  | 7 April 2015 |
| 2.00 pm | Opening of the meeting |
|  | Peter Neumann (Oxford) |
| 3.00 pm | Dennis Sullivan (SUNY, Stony Brook) |
| 4.00 pm | Tea/Coffee |
| 4.30 pm | leke Moerdijk |
|  | (Radboud University Nijmegen/ Sheffield) |
| 6.00 pm | Reception and Dinner |

These lectures are aimed at a general mathematical audience. All interested, whether LMS members or not, are most welcome to attend this event.

For further details and to register and to reserve a place at the dinner, visit the website at www.lancaster.ac.uk/maths/research/homotopical/.
The cost of the dinner will be approximately $£ 30$, including drinks.
The meeting forms part of a workshop on Homotopical Algebra and Geometry from 7-11 April 2015. The speakers at the workshop include: D.-C. Cisinski, V. Ginzburg, M. Gross, I. Grojnowski, V. Hinich, D. Joyce, A. King and M. Livernet. For further details visit the website above or contact the organiser (j.grabowski@lancaster.ac.uk).

There are funds available to contribute in part to the expenses of members of the Society or research students to attend the meeting and workshop. Requests for support, including an estimate of expenses, may be addressed to the organisers.

## 150TH ANNIVERSARY LMS PRIZES 2015 <br> Call for Nominations

The London Mathematical Society welcomes nominations for the 2015 prizes, to recognise and celebrate achievements in and contributions to mathematics.
In 2015, the LMS Council expects to award:

- The Polya Prize - in recognition of outstanding creativity in, imaginative exposition of, or distinguished contribution to, mathematics within the United Kingdom.
- The Shephard Prize - awarded for the first time in 2015. For making a contribution to mathematics with a strong intuitive component which can be explained to those with little or no knowledge of university mathematics, though the work itself may involve more advanced ideas.
- The Senior Whitehead Prize - for work in, influence on or service to mathematics, or recognition of lecturing gifts in the field of mathematics.
- The Naylor Prize and Lectureship - for work in, and influence on, and contributions to applied mathematics and/or the applications of mathematics, and lecturing gifts.
- The Berwick Prize - in recognition of an outstanding piece of mathematical research actually published by the Society during the eight years ending on 31 December 2014.
- The Whitehead Prizes - for work in and influence on mathematics.
- The Anne Bennett Prize - awarded for the first time in 2015. For work in and influence on mathematics, particularly acting as an inspiration for women mathematicians.
- The Hirst Prize for the History of Mathematics - awarded to mark the LMS 150th Anniversary - for contributions to the study of the history of mathematics. The prize will be awarded in recognition of original and innovative work in the history of mathematics, which may be in any medium.
- The Prize for Communication of Mathematics - awarded to mark the LMS 150th Anniversary - for the award of the prize are communication of mathematics and excellence in communication. The communication of ideas may be in any medium and the audiences involved may be of any age-group.
For further information and nomination forms, please visit the LMS website (www.Ims. ac.uk/content/nominations-Ims-prizes) or contact Duncan Turton, Secretary to the Prizes Committee at the Society (tel: 0207927 0801, email: prizes@lms.ac.uk).
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.

[^0]
## THE MAN WHO KNEW INFINITY

## Notes from Production

Production began early in August 2014 on The Man Who Knew Infinity, a film based on the book by Robert Kanigel about the life of world-renowned mathematician Ramanujin. The film focuses on the bond that developed between Trinity College Fellow G.H. Hardy (played by Jeremy Irons) and the young Ramanujin (played by Dev Patel).
The story begins with Ramanujin's early life as he developed his inspirational mathematics potential and was invited by Hardy to study at Cambridge. It was a difficult decision for the young man, to leave his young bride and his Braham culture behind. Cambridge at that time was a cold and harsh place for the young man who struggled not just in his studies but with the racism and condescension from the other Dons in the faculty.
The film has been written and directed by Matt Brown who brought in Ken Ono, the Asa Griggs Candler Professor from Emory University in Atlanta, an American mathematician who specializes in number theory, especially in integer partitions, modular forms, and the fields of interest to


Jeremy Irons as G.H. Hardy
Ramanujan. Ken assisted the director with some of the dialogue in the film to make sure the two lead characters spoke in real 'mathematics!' He also taught Jeremy Irons and Dev Patel how to write formulas on blackboards in preparation for their on-screen scenes.
Ken had his own personal connection to Ramanujin. Ken's father was also a mathematician and had responded to an appeal to help fund a statue to commemorate Ramanujin in his hometown in India. Some time later, Ken was still a teenager, a flimsy airmail envelope covered in Indian stamps arrived at their house. It was a personal letter from Ramanujin's widow, Janika, to thank him for the donation.
For the first time in its history, Trinity College at Cambridge
allowed the film crew inside it's grounds to shoot several scenes. One included a shot where Dev Patel as Ramanujin is introduced to the iconic punting races but is unkindly pushed into the River Cam by another student. This was covered by local paparazzi and made the press in India as 'Dev Patel accidently ends in the river as he slipped and fell during filming!' It was a real honour for the film crew to work inside Trinity and the quads were filled with extras dressed as professors. When the real 'dinner bell' rang promptly at 7.30 pm each evening it was sometimes difficult to tell the extras from the real professors who call Trinity home.
There were other poignant scenes as the
film is set from 1912 to 1916 when the first world war was debated and fought. As Britain started to commemorate the start of the war and remember the dreadful carnage that ensued, our actors were creating scenes where opinions were aired as to the actions that would soon be taken in reality. One day, as his character G.H. Hardy, Jeremy Irons was reading a prop newspaper with the headline 'Archduke Shot' almost one hundred years to the day from the actual event.

The Man Who Knew Infinity should be in theatres towards the end of 2015.

Pamela Godfrey
Executive Producer

# KNOWLEDGE TRANSFER REPORTS PUBLISHED 

## Quantitative Verification Problem Solving for the 21st Century

The LMS-Smith Institute Knowledge Transfer Reports are an initiative coordinated jointly by the Smith Institute and the Computer Science Committee of the LMS. Two new reports have been published.
The first new report, written by Gethin Norman and David Parker is on Quantitative Verification. Quantitative verification is a technique for analysing quantitative aspects of a system's design, such as timeliness, reliability or performance. The report explains the basics of quantitative verification, highlights a variety of successful applications of the methods and seeks to spur further advances in the field.
The second report, co-authored by Clark Barrett, Daniel Kroening and Tom Melham is titled Problem Solving for the 21st Century and focuses on Satisfiability Modulo Theories (SMT). SMT is a computerised method for finding solutions to business and industrial problems expressed mathematically by systems of constraints. The report explains the background to SMT technology and presents areas where it has been successfully applied. The report also sets out the potential for the widespread
application of the technology.
The Computer Science Committee hopes that members with an interest in the interface of computer science and mathematics will look at both of the papers, and pass them to others with an interest in the technology.
The reports are produced as the third and fourth in an occasional series, each one addressing an area where mathematics and computing have come together to provide high-impact significant new capability, ready for mainstream industrial uptake. The papers also list active researchers and practitioner groups in the technical areas covered. The full series, including the two latest reports can be seen at www.Ims.ac.uk/ about/committees/knowledge-transfer-papers.
The reports are written by senior researchers in each area, for a mixed audience in business and government. The Computer Science Committee looks forward to developing the series of reports, producing more papers for publication in the near future.

Artur Czumaj
Chair, Computer Science Committee

# LMS HARDY FELLOWSHIP LECTURE TOUR 2016 Nominations Sought 

The Society is seeking nominations for a Hardy Lecture Tour in 2016.
The Hardy Fellow visits the UK for a period of about two weeks, and gives the Hardy Lecture at a Society meeting, normally held in London in early July. The Hardy Fellow will also give at least six other lectures, on different topics, at other venues in the UK.
The schedule is decided by the Programme Secretary in consultation with the Hardy Fellow, and will be designed to allow as many UK mathematicians as possible to benefit from the Hardy Fellow's presence in the UK.
The holder of the Hardy Fellowship shall be a mathematician who has not been normally resident in the United Kingdom of Great Britain and Northern Ireland for a period of at least five years, at the time of the award. Grounds for the award of the Fellowship include:

- the achievements of the Hardy Fellow, including work in, influence on, and general service to mathematics; lecturing gifts; and breadth of mathematical interests;
- the overall benefit the UK mathematical community might derive from the visit;
- the possibility of bringing to the UK a mathematician who might otherwise visit rarely or never.
The Hardy Fellowship is not restricted to mathematicians working in any specific area of mathematics. Previous lecturers include: 2014 Percy Deift (NYU), 2012 Etienne Ghys (Lyon), 2010 Hiraku Nakajima (Kyoto), 2008 Shmuel Weinberger (Chicago and Hebrew University).
In 2015, the Society will host Nalini Joshi (University of Sydney) as the Special Hardy Lecturer and she will visit the UK (and Scotland) during the Society's 150th Anniversary year.
The London Mathematical Society will fund:
- the honorarium - $£ 2,000$ paid directly to the Hardy Fellow/Hardy Lecturer
- travel expenses (including travel to/from the UK and within the UK) up to $£ 2,500$
- accommodation expenses up to $£ 1,500$
- a contribution to the host department to hold a dinner for the Hardy Fellow/Hardy Lecturer up to $£ 100$ per institution
The host department(s) will be expected to provide office accommodation and the academic support normally offered to a distinguished visitor.
Nominations must have the support of the host department(s), and should be sent by the Head of Department to the Programme Secretary (Imsmeetings@lms.ac.uk). The closing date for proposals is 31 January 2015.
For further details and guidance on how to submit a nomination, please visit the Society's website: www.Ims.ac.uk/events/lectures/hardy-lectureship.


# ए $\square$ WWWboristolac.uk <br> <br> Heilbronn Research Fellow 

 <br> <br> Heilbronn Research Fellow}

£35,256-£39,685<br>Job number: ACAD101083<br>School of Mathematics - Fixed term contract staff - Full time

The School of Mathematics invites applications for one or more Research Fellowships in association with the Heilbronn Institute for Mathematical Research. You will divide your time equally between your own research and the research programme of the Heilbronn Institute. Fellows are likely to be working in Bristol during the fellowship, though may have the opportunity to work in London.
Research areas of interest include but are not restricted to Number Theory and Algebraic Geometry, Algebra, Combinatorics, Probability, Quantum Information, Computation Statistics and Data Science.
Due to the nature of the Heilbronn Institute's work, you must satisfy vetting before appointment. UK resident UK nationals will normally be able to meet this condition: other potential applicants should consult the Associate Director (see below) about their eligibility before applying. You may become a member of the USS pension scheme. Research expenses of at least $£ 2,000$ per annum will also be available.
There is a salary supplement of $£ 3.5 \mathrm{~K}$ pa, in recognition of the distinctive nature of these Fellowships. Payment of this supplement is conditional on a finished thesis having been
accepted in final form, because we expect Heilbronn Fellows to hold PhDs before working at the Heilbronn Institute.
The Fellowships will be for three years, with a preferred start date in October 2015, though another date may be possible by agreement.
The School of Mathematics is a supporter of the LMS Good Practice Scheme aiming at advancing women's careers in mathematics and we therefore particularly welcome applications from women for this post. http://www.maths.bris.ac.uk/admin/life/women/ Applications should include a statement of proposed research (not more than one side of A4).
Candidates should ask three referees to send references by the closing date to:
Ms Chrystal Cherniwchan, Heilbronn Manager, School of Mathematics, University of Bristol, Bristol, BS8 1TW, UK Tel. (+44) 01173315260 Email: Heilbronn-coordinator@bristol.ac.uk (It is a candidate's own responsibility to ensure that the reference letters are received by the closing date. These letters may be sent by email.
Enquiries about the fellowships may be addressed to the Associate Director, Dr Oliver Johnson, School of Mathematics, telephone (+44)(0) 117928 8632, email: assoc-director-himr@ bristol.ac.uk
To apply please visit our web site at www.bris.ac.uk/jobs, enter the vacancy number into the job search and follow the link to the on line application process.
Closing date for applications is 27 November 2014.
The University of Bristol is committed to equality and we value the diversity of our staff and students.

## LONDON <br> MATHEMATICAL SOCIETY

## LMS INVITED LECTURE SERIES 2016 Call for proposals

Proposals for the Invited Lecture Series 2016 are now being sought. Proposers are invited to suggest a topic and Lecturer for the lecture series, which they should be prepared to organise at their own institution or a suitable conference centre within the UK.
The annual LMS Invited Lecturers scheme aims to bring a distinguished overseas mathematician to the United Kingdom to present a small course of about ten lectures held over five days (Monday-Friday). Each course of Invited Lectures is on a major field of current mathematical research, and is instructional in nature, being directed both at graduate students beginning research and at established mathematicians who wish to learn about a field outside their own research specialism.

The format of annual Invited Lectures series is:

- meetings at which a single speaker gives a course of about ten expository lectures, examining some subject in depth;
- held over a five day period (Monday to Friday) during a University vacation;
- the meetings are residential and open to all interested. It is intended that the texts of the lectures given in the series shall be published.
- In addition to full expenses, the lecturer is offered a fee for giving the course.
- A grant is given to the host department to support attendance at the lectures.

Enquiries about the Invited Lectures should be directed to the Programme Secretary at the Society (Imsmeetings@lms.ac.uk). The deadline for the submission of proposals is 6 February 2015.

For more information about the scheme and how to submit a proposal, please visit: www.Ims.ac.uk/events/lectures/invited-lecturer-proposals.
The Invited Lecturer for 2015 is Professor Michael Shapiro (Michigan State University), who will visit Durham from 16-20 March 2015 to give a series of lectures on Cluster algebras and integrable systems.

Recent previous lecturers have been:
2014 J. Väänänen (University of Helsinki and University of Amsterdam) Games, trees and models, Foundations of mathematics and second order logic and The mathematical theory of dependence and independence.
2013 F. Bogomolov (NYU) Birational geometry and Galois groups
2012 A. Borodin (MIT) Determinantal point processes and representation theory
2011 E. Candes (Stanford) Compressed sensing
2010 M. Bramson (University of Minnesota) Stability of queuing networks
2009 A.D. Ionescu (University of Wisconsin-Madison) Black holes in vacuum: examples \& uniqueness properties

## SOCIETY CONFERENCE GRANTS

The Society is pleased to report that in 2013-14 awards totalling $£ 241,477$ were made in the support of mathematics conferences. Funds are granted to the organisers of conferences to be held in the United Kingdom, and may be used to cover the expenses of principal speakers, and to provide support for research students and
for participants from Scheme 5 or former Soviet Union countries.
For Postgraduate Research Conferences funds are granted to support speakers and participants. Applicants wishing to apply for funding for a conference will find further details on the Society's website at www.Ims.ac.uk/content/research-grants.

Conference grants awarded during 2013-14

| Conference | Dates, Place | Applicant | Grant |
| :---: | :---: | :---: | :---: |
| Algebraic Methods in Theory of Differential and Difference Equations | $\begin{aligned} & \text { 6-7 Dec } 2013 \\ & \text { Kent } \end{aligned}$ | J.P. Wang | £4,130 |
| London Stringology Day \& London Algorithmic Workshop 2014 (LSD \& LAW) | 6-7 Feb 2014 | S. Pissis | £600 |
| Recent Trends in Nonlinear PDE and Calculus of Variations | 12-14 Feb 2014 Reading | N. Katzourakis | £600 |
| Recent Advances in Operator-Related Function Theory | Feb 2014 Kent | O. Constantin | $£ 520$ |
| Aspects of Random Walks | 31 Mar - 3 Apr 2014 Durham | A. Wade | £598 |
| Smart Energy Research Conference | 3-4 Apr 2014 Open University | B. Mestel | £950 |
| 18th UK Meeting on Integrable Models, Conformal Field Theory and Related Topics (ICFT2014) | 11-12 Apr 2014 Glasgow | C. Korff | £1,100 |
| The Mathematics of Brain Dynamics | 8 Apr 2014 Birmingham | R. Nicks | £3,020 |
| Middle European Co-operation in Statistical Mechanics (MECO) | 8-14 Apr 2014 Coventry | R. Kenna | £7,000 |
| Kent Spectral Theory Meeting | 14-17 Apr 2014 Kent | I. Wood | £7,000 |
| BAMC 2014 | 28-30 Apr 2014 Cardiff | T.N. Phillips | £5,000 |
| Geometric Analysis | 9 May 2014 King's College London | G. Tinaglia | £2,000 |
| Two Linked One-Day Colloquia in Combinatorics | 14-15 May 2014 QMUL | J. Skokan | £3,800 |
| New and Old Perspectives on Spectral Analysis: A Celebration of the Life and Work of W.N. Everitt | 15-17 May 2014 Cardiff | W.D. Evans | £6,500 |
| Wales Mathematics Colloquium 2014 | 19-21 May 2014 Newtown, Powys | D.H. Smith | £1,965 |
| UK National Conference on Geophysical, Astrophysical and Industrial Magnetohydrodynamics | 22-23 May 2014 Exeter | K. Zhang | £2,600 |
| Mathematics of String Theory (MOST) | 2-3 Jun 2014 <br> King's College London | S. Schafer-Nameki | £4,400 |
| One-Day Meeting in Combinatorics | 5 Jun 2014 Oxford | A. Scott | £2,350 |
| Rings of Differential and Integral Operators | 5 Jun 2014 Plymouth | D. Robertz | £600 |

## LMS NEWSLETTER http://newsletter.Ims.ac.uk

| Belfast Harmonic Analysis Day | $\begin{aligned} & 5 \text { Jun } 2014 \\ & \text { QUB } \end{aligned}$ | Y-F Lin | $£ 590$ |
| :---: | :---: | :---: | :---: |
| Workshop and School on Random Interacting Systems | $\begin{aligned} & 23-27 \text { Jun } 2014 \\ & \text { Bath } \end{aligned}$ | A.O. Stauffer | £6,000 |
| Mathematical Modelling of Biological and Cultural Evolution | 10 June 2014 City University | A. Kandler | £600 |
| Filtering High Dimensional Complex Systems | 30 Jun - 2 Jul 2014 Warwick | A.M. Stuart | £6,000 |
| 17th Galway Topology Colloquium | 30 Jun - 2 Jul 2014 Birmingham | C. Good | £2,710 |
| Category Theory 2014 | 29 Jun - 5 Jul 2014 Cambridge | J. Goedecke | £6,000 |
| Inner and Outer Model Theory | 6-7 Jul 2014 Bristol | P. Welch | £1,915 |
| Symmetry In Graphs, Maps and Polytopes (SIGMAP) | 7-11 Jul 2014 West Malvern | J. Siran | £3,840 |
| Bianchi and Siegel Modular Forms | 14-16 Jul 2014 Sheffield | T. Berger | £3,000 |
| Representations of Symmetric Groups, Hecke Algebras and Klr Algebras | 14-16 Jul 2014 Birmingham | A. Evseev | £4,430 |
| Projection and Slicing Theorems in Fractal Geometry | 17-18 Jul 2014 Bristol | T. Jordan | £4,000 |
| Recent Advances in Orthogonal Polynomials and its Interactions with Integrable Systems | Jul 2014 Kent | A.F.S. Loureiro | £600 |
| Contact Geometry in Dimension Three and Higher | 28 Jul- 1 Aug 2014 <br> University College London | C. Wendl | £6,000 |
| Limit Theorems, Probability Approximations and Related Areas | 1 Sep 2014 Heriot-Watt | F. Daly | £600 |
| One Day Function Theory Meeting | 1 Sep 2014 DMH, London | D. Sixsmith | £1,815 |
| Dislocations: The Legacy of Alan Head | 1-2 Sept 2014 Oxford | S. Fitzgerald | £1,422 |
| Algebra, Combinatorics, Dynamics and Applications | $\begin{aligned} & 1-4 \text { Sep } 2014 \\ & \text { QUB } \end{aligned}$ | N. lyudu | £5,200 |
| Stable Homotopy Theory: Structured Ring Spectra and their Invariants | $3-5 \text { Sep } 2014$ Manchester | N. Ray | £6,000 |
| Jordan Geometric Analysis and Applications | $\begin{aligned} & \text { 3-5 Sep } 2014 \\ & \text { QMUL } \end{aligned}$ | C. Chu | £4,000 |
| British Logic Colloquium 2014 | $\begin{aligned} & \text { 2-5 Sep } 2014 \\ & \text { Central Lancashire } \end{aligned}$ | D. Penazzi | £4,910 |
| C*-Algebras, Classification and Dynamics | 1-5 Sep 2014 Glasgow | J. Zacharias | £7,000 |
| 29th British Topology Meeting | 8-10 Sep 2014 Southampton | S. Theriault | £5,000 |
| Recent Advances in Discontinuous Galerkin Methods | 11-12 Sep 2014 Reading | A. Chernov | £1,800 |
| Introductory School on Derived Categories and their Applications | $\text { 8- } 12 \text { Sep } 2014$ <br> Warwick | M. Reid | £7,000 |
| Generalized Functions (GF2014) | 8-12 Sep 2014 Southampton | J. Vickers | £4,500 |
| Valediction to Jeremy Gray | 11-12 Sep 2014 Milton Keynes | R. Brignall | £2,000 |


| AdditiveCombinatorics@Bristol | $18 \text { Sep } 2014$ Bristol | J. Wolf | £600 |
| :---: | :---: | :---: | :---: |
| UK 'Easter' Probability Meeting 2014: From Microscopic Randomness to Macroscopic Phenomena | $\text { 15-19 Sep } 2014$ Imperial College London | A. Mijatovic | £5,000 |
| Analytic Number Theory Workshop | $\text { 17-19 Sep } 2014$ Cardiff | M. Lettington | £4,330 |
| British Algebraic Geometry Meeting (BrAG) | 22-24 Sep 2014 Warwick | D. Maclagan | £6,000 |
| Integrable Systems in Newcastle | $\text { 3-4 Oct } 14$ <br> Northumbria | B. Huard | £2,040 |
| Continued Fractions and Geometry of Lattices | 8 Oct 2014 <br> Liverpool | O. Karpenkov | £600 |
| Brian Hartley Memorial Day | $8 \text { Oct } 2014$ Manchester | R. Stohr | £1,830 |
| An Afternoon in Low-Dimensions | 10 Oct 2014 Glasgow | L. Watson | £600 |
| Maxwell Institute Graduate School on Evolution Equations | $\text { 8-10 Oct } 2014$ Edinburgh | H. Gimperlein | £1,170 |
| Cluster Algebras and Preprojective Algebras Workshop | $\begin{aligned} & \text { 17-18 Oct } 2014 \\ & \text { Cardiff } \end{aligned}$ | M. Pugh | £5,000 |
| Complex Geometry and Symplectic Topology | 3 Nov 2014 Warwick | W. Zhang | £600 |
| Multiscale PDE Systems of Fluid Models and Applications in Geophysics | $31 \text { Oct } 2014$ <br> Surrey | B. Cheng | £577 |
| X Brunel-Bielefeld Workshop on Random Matrix Theory and Its Applications | $\text { 12-13 Dec } 2014$ <br> Brunel University | D. Savin | £4,970 |
| UK-Japan Winter School: 'Topology and Integrability' | $\begin{aligned} & \text { 5- } 8 \text { Jan } 2015 \\ & \text { Loughborough } \end{aligned}$ | E. Ferapontov | £4,110 |
| Winter School on Bruhat-Tits Buildings | $\text { 6-9 Jan } 2015$ <br> Imperial College London | J. Schillewaert | £5,500 |
| Elliptic Curves, Modular Forms and Iwasawa Theory | $\text { 25-27 Mar } 2015$ <br> Cambridge | T. Dokchitser | £5,000 |
| Simple Groups, Representations and Related Topics | 13-15 Jul 2015 Cambridge | T. Burness | £6,000 |
| 68th British Mathematical Colloquium 2016 | $\begin{aligned} & \text { 21-24 Apr } 2016 \\ & \text { Bristol } \end{aligned}$ | T. Dokchitser | £12,500 |

Postgraduate Research Conference grants awarded during 2013-14

| Conference | Dates, Place | Applicant/Organiser | Grant |
| :--- | :--- | :--- | :--- |
| Young Functional Analysts' <br> Workshop | $23-25$ Apr 2014 <br> Lancaster | Applicant: H.G. Dales <br> Organiser: M. Gnacik | $£ 3,988$ |
| Research Students' Conference in <br> Probability and Statistics | 28 Apr - 1 May 2014 <br> Nottingham | Applicant: H. Le <br> Organisers: H. Pettitt, <br> I. Perez | $£ 3,690$ |
| Young Researchers in Mathemat- <br> ics (YRM) | 30 Jun - 3 Jul 2014 <br> Warwick | Applicant: J. Robinson <br> Organser: F. Bouyer | $£ 4,000$ |
| 16th Postgraduate Group Theory <br> Conference | $24-27$ Jun 2014 <br> Birmingham | Applicant: C. Parker <br> Organiser: A. Paolini | $£ 4,000$ |
| Kent Algebra Day Postgraduate | $21-24$ Jul 2014 <br> Kent | Applicant: S. Launois <br> Organisers: A. Kitchin, <br> C. Lecoutre | $£ 3,707$ |
| British Postgraduate Model <br> Theory Conference | Applicant: J. Pila <br> O-9 Jan 2015 <br> Oxford | Efem, L. Haykazyanyan, U. <br> B. Rigler, F. Sladek | $£ 4,000$ |

## EUROPEAN NEWS

The following items are from EMS e-News 12 (Sept 2014) www.euro-math-soc.eu/.

## ECM Proceedings 1992-2008

The Proceedings of the first five European Congress of Mathematics meetings, which took place respectively in Paris (1992), Budapest (1996), Barcelona (2000), Stockholm (2004) and Amsterdam (2008), are now freely available online at www. euro-math-soc.eu/ECM/.

## EMS Distinguished Speakers

Vera Serganova (UC Berkeley) will be an EMS Distinguished Speaker at the Aspects of Lie Theory Conference to be held in the INdAM (Rome) from 7 to 10 January 2105. For further information visit the website at www1.mat.uniroma1.it/people/bravi/ indam2015.html.
Sylvia Serfaty (Université Paris 6) will be an EMS Distinguished Speaker at the joint AMS-EMS-SMP Meeting in Porto from 11 to 14 June 2015. For further information visit the website at http://aep-math2015. spm.pt.

## Special stamp issue

In the framework of the International Year of Crystallography, declared by the UN, the Portuguese postal service, CTT, has released five stamps and a souvenir sheet illustrating the interplay between crystallography and mathematics, geology, physics, chemistry and biology. For this issue the CTT had the collaboration of several Portuguese scientific societies, including the Portuguese Mathematical Society. Stamps can be ordered at tinyurl. com/lvlz4o3.

## New journal

SMAI-JCM is a newly launched journal of the Société de Mathématiques Appliquées et Industrielles (SMAI), France, that publishes high quality research articles on design and analysis of algorithms for
computing the numerical solution of mathematical problems arising in applications. This is an online and free access journal in the framework of the CEDRAM initiative. For further details visit the website at https://ojs.math.cnrs.fr/index.php/SMAIJCM.

## Jobs in industry

The association EU-MATHS-IN (promoted by the EMS and ECMI) has launched a new service: a website for advertising jobs for mathematicians in companies or institutions working on industrial contracts. Job announcements can be found or deposited at the address www.eu-maths-in.eu/jobs.
[Source: IMU-Net 66: July 2014 www.mathunion. org/imu-net]

## EMS Newsletter



The September 2014 issue of the Newsletter is available online at tinyurl.com/ jw5gyc5.
As every year, the September issue focusses on the Abel Prize, with the interview of the 2014 laureate Yacov Sinai by M. Raussen and C. Skau, the speech in his honour given by the President of the European Research Council (ERC) J.-P. Bourguignon, as well as an article on Mathematical Billiards and Chaos by Domokos Szász who gave the Science Lecture at the Norway Academy.
Other articles in this issue include: Opportunities and Challenges in Electronic Publication by J. Rákosník and O. Teschke, The Support Given by the European Research Council to Mathematical Research by J.-P. Bourguignon and Around $A B C$ by P. Mihailescu.

David Chillingworth LMS/EMS Correspondent

## VALEDICTION TO JEREMY GRAY

## Report

The conference to mark Jeremy Gray's contributions to the history of mathematics and his retirement took place from 11 to 12 September 2014 at the Parkside Hotel in Milton Keynes. Forty three people gathered to hear 10 talks over the two days, given by invited speakers who comprised Jeremy's long-term friends, collaborators, former PhD students, and Jeremy himself. The talks covered a variety of topics in the history of mathematics, ranging from the roles mathematicians have played in Italian politics, through the mathematics of medieval China and studies in the personal manuscripts of Isaac Newton, to thoughts on what the history of mathematics can teach to other areas of historical study. The concentration of distinguished academics ensured that every talk inspired lively discussions afterwards.
On Thursday 11 September we heard talks from Snezana Lawrence (Bath Spa) on History of Mathematics lessons for Mathematics Education and Umberto Botazzini (Milan) on Mathematics and politics: the Italian case before lunch, and Karine Chemla (Paris) Measuring the circle on the sea-mirror, Leo Corry (Tel Aviv) The interaction between arithmetic and geometry in the


Jeremy Gray (Open University) Klein's Galois Theory: underneath the icosahedron

Euclidean tradition: a longue durée issue in the historiography of mathematics (if there ever was one) and Niccolň Guicciardini (Bergamo) On Newton's mathematical manuscripts: disciplinary boundaries, writing practices, and styles in the afternoon. The conference dinner, held in the pub across the road from the hotel, provided further opportunity for lively discussions through the evening.
On Friday 12 September, the talks before lunch were given by Erhard Scholz (Wuppertal) whose talk was entitled Localizing the geometry of special relativity: Why Cartan and Weyl posed their new 'problem of space' differently, Moritz Epple (Frankfurt) on Another look at mathematical modernism: Felix Hausdorff on dimension and Jesper Lützen (Copenhagen) about Geometry, forces and models. The final session after lunch began with a short encomium from the Depart- ment of Mathematics and Statistics by Phil Rippon (OU), before June Barrow-Green (OU) read the many warm wishes to Jeremy from those who couldn't make it to the meeting. The meeting closed with two final talks: the first from June Barrow-Green (OU) about GD Birkhoff and Poincaré's 'Last Geometric Theorem', and the second given by Jeremy Gray himself, in a talk entitled Klein's Galois Theory: underneath the icosahedron.
Needless to say, the talks were frequently embellished by numerous stories and photographs of Jeremy throughout his career. The meeting was a fitting tribute to Jeremy, although of course nobody believes that his retirement will cause any reduction in his rate of output! Thanks to the London Mathematical Society, the British Society for the History of Mathematics and the International Commission on the History of Mathematics for financial support for this meeting.

Robert Brignall
The Open University

## LANCASTER UNIVERSITY 50TH ANNIVERSARY

This year, Lancaster University celebrates the 50th anniversary of its foundation in 1964. To honour this occasion, the Department of Mathematics and Statistics organised two special 'anniversary lectures' on Friday 26 September 2014.
The first lecture was given by Professor E. Brian Davies, FRS, of King's College, London. Brian was the President of the LMS from 2007 to 2009; he is the author of many papers and seven books. His talk, based on a joint paper with Michael Levitin, was devoted to an easily stated question: what are the eigenvalues of a specific, elementary, non-self-adjoint $n \times n$ matrix (with $n$ large)? The answer, however, is not easily found. Elementary estimates give some rough bounds, and impressive numerical calculations, shown on attractive slides, lead to conjectures on other bounds. The latter have been verified in some cases, using surprisingly advanced mathematics. Brian illustrated beautifully the elusive nature of this approach by showing a short video indicating how the eigenvalue distribution varies with n . We are far from a secure theory
that explains the numerical phenomena, even in this specific example. But the audience was surely convinced that the conjectures of Davies and Levitin must be true, even if nobody could prove them.
The second lecture was given by Professor W. Hugh Woodin. Hugh now holds a joint position in the Departments of Mathematics and of Philosophy at Harvard University; he was previously Professor at the University of California, Berkeley, from 1989 to 2014. He is surely one of the leaders in our era in the quest to understand the fundamental nature of sets and the real numbers, taking forward the journey of Gödel and Tarski into the far reaches of higher cardinals. His lecture (almost) also marked the 50th anniversary of Gödel's Incompleteness Theorem. By 1964, we knew that CH is independent of the axioms ZFC of set theory; now we know that very many statements, including many in 'main-stream' mathematics, are independent. How satisfactory is this? Could (necessarily detailed) examination of higher cardinals lead to a further compelling axiom that 'resolves' CH and other questions? Is 'ultra-L' such an axiom? These were very challenging ideas, very clearly articulated.
The two lectures kept a large audience engrossed for the afternoon; we are very grateful to the speakers.
More information and additional pictures from the event are available on the department's website at www. lancaster.ac.uk/maths/ about-us/history/50th-anniversary-special-lec tures.
H. Garth Dales Lancaster University


Hugh Woodin and Brian Davies

## THE BRITISH SCIENCE FESTIVAL

## Report

This has been an exceptionally good year for mathematical sciences at the British Science Festival held at the University of Birmingham from 6 to 11 September 2014. There were nine events directly connected with presenting aspects of "maths" to a general audience, and advertised in the flyer produced by the Mathematical Sciences Section of the Festival. These included two of the Award Lectures, one on mathematical models of the sun and the other on models of animal behaviour. This year's "Maths President", Peter McOwan, professor of computer science at QMUL, took part in two of the events, and his Presidential Lecture was followed by a wine and food reception generously sponsored by the Operational Research Society. The wide reach of mathematics, from the purest conjectures in number theory to the most applied uses in physics, robotics and data processing, were a strong feature of the programme. There was even a talk by Simon Singh on the mathematics of the Simpsons! Here I will try to convey the flavour of the nine "maths events". We were very lucky to have Matt Parker and Katie Steckles available to introduce and wind up each event in exuberant style - this gives an excellent cohesion to the "maths programme"
of the Festival. Each event attracted between 100 and 200 people; in fact I have never before seen maths events so uniformly wellattended at these annual Festivals. Much tweeting went on during and after the talks, and the feedback from audiences was very positive. I think the Festival was a good advertisement for mathematics in all its huge diversity.
From Dürer to Sudoku, organized in association with the British Society


Matt Parker for the History of Mathematics, took its theme from the engraving Melencolia I, celebrating its 500th birthday this year. The engraving contains features of geometrical interest, notably a perspective drawing of a solid, and John Sharp took the audience through a brief history of perspective and then demolished several attempts to identify the actual solid in the engraving, promising that he was working on the correct solution. Robin Wilson followed with a history of Latin squares and magic squares (there is a famous one in the engraving), and Peter McOwan concluded the session with his customary panache, showing the audience some mathematical magic - magic tricks that are


Robin Wilson

## LMS NEWSLETTER

## http://newsletter.Ims.ac.uk

"doomed to succeed" because of their underly ing mathematical structure.
Lisa Collins from the University of Lincoln works with a wide range of animal species as well as maths and she gave the Darwin Award lecture What can maths tell us about what an animal is feeling? She talked about gathering large amounts of data on animal behaviour and analysing it by means of fractals for long-term behaviour and Markov chains for the short term. Knowing how to recognize sequences of behaviour indicating high stress can help to reduce outbreaks of aggression which seriously reduce the welfare of other animals.
David Hand from Imperial College gave a talk based on his recent book The Improbability Principle, the key message of which is that extremely improbable events are commonplace: one of his five principles is that "With a truly large number of opportunities any outrageous thing is likely to happen". He explained all five principles, such as "Choosing after the Event" (how ever do companies produce jars of whole walnuts when most walnuts shatter when cracked?); and "Something Must Happen" (a consortium bought, or attempted to buy, all seven million tickets for a lottery where the payout would exceed the outlay). The most painful example he showed was a video of an unfortunate person being struck by lightning twice within a few seconds, but fortunately able to struggle to his feet after each strike.
lain Bethune from the University of Edinburgh talked about distributed "volunteer computing": thousands people lending their computers' processing time to the collective solution of outstand-
ing problems in number theory. He took his audience through the Lucas-Lehmer test for the primality of Mersenne numbers $2^{p}-1$; including worksheets taking small values of $p=7,11,13$ which were passed round the audience for completion. This exercise illustrated very well two of the difficulties of "volunteer computing": the results may not be correct and some people may never return their results! But the title of his talk Seventeen or Bust referred to the Sierpiński conjecture: of all the numbers $k$ such that $k 2^{n}+$ $1, n=1,2,3, \ldots$, is never prime, the smallest $k$ is equal to 78557. In 2002 there were 17 potential smaller candidates for $k$ but this list is now down to six. lain did warn potential volunteers that their computer, running $24 / 7$, might get hot... but there is a chance of glory: all prime number related records in the last 17 years have been achieved through volunteer computing.
Gina Rippon from Aston University asked Where Have All the Girl Scientists Gone? under the general heading Sex, Maths and the Brain. She made it clear that serious research into male/ female brains faces many obstacles, not least the seemingly wilful incomprehension and misrepresentation typical of the popular press. She dismissed a recent claim that we should give up


Part of the Presidential Session audience
encouraging girls to do science and presented the good news that brain plasticity-the ability to develop areas of the brain in response to new stimuli and training-persists through life in both sexes, and that given the right environment men and women equally can excel at the kind of reasoning required of mathematics and science, as witness the recent Fields medallist Maryam Mirzakhani.
Peter McOwan from QMUL in his Presidential Lecture When Fridges Attack: Big Data Meets Intelligent Machines talked about benefits and dangers of the Internet of Things and in particular the possibility of social interaction with robotic devices. In a chess club for young children in Lisbon the "opponent" is not an anonymous computer program but a robot cat which has empathy with the children and consoles them when they make a wrong move! But a driverless car might be hacked to take the owner to a place he definitely did not want to go and, as the title pointed out, a smart fridge has been hacked to send out spam emails. A highlight of the event was a demonstration by Louis McCallum, also from QMUL, of Mortimer the Musical Robot, which (who?) attemp-


Gina Rippon ted to produce a drum accompaniment to a tune played on a keyboard by a brave young volunteer from the audience.
Max Little from Aston U n i ver sity and MIT talked about providing clinicians with accurate and detailed data about their patients by means of a Pocket Doctor.


Katie Steckles presenting the Rosalind Franklin Award Lecture certificate to Ineke De Moortel

This might be as simple as a smartphone, or recording and transmitting data from your body which the clinician can use to diagnose certain conditions such as Parkinson's disease with a very high accuracy. The device can also be used to engage people in clinical trials (at present $30 \%$ of all clinical trials attract no volunteers at all) because of the great reduction in timewasting inconvenience afforded by a pocket (or wrist) device. Of course numerous ethical, legal, practical and medical issues were raised, and during and after the lecture these were the subject of lively discussion.
The event Life Saving Mathematics presented by Thomas Woolley, Helen Byrne and Gary Mirams (all from Oxford) focused on demonstrating how mathematics is being used at the very cutting edge of biology and medicine, in such fields as stem cell motility, cancer tumour growth and heart arrhythmias. Overall, the theme that ran through the three talks was that applied mathematics does not have to be hugely complicated in order to have a big influence.
In her Rosalind Franklin Award Lecture, Our Dynamical Sun: a 21st Century View, Ineke De Moortel (St Andrews) was bold enough to include the equations of magnetohydrody-
namics (MHD), as well as many striking animations and video sequences, when discussing the magnetic fields of the Sun and their relationship to sunspots, solar flares (one occurred the day before her talk), coronal mass ejections and the "coronal heating problem": why is the corona so much hotter than the surface of the Sun? She, like several of the speakers, emphasized the key role of serious mathematics in the investigation of physical and other phenomena. She described the disruptive effects of solar flares, from their effects on electricity supplies on Earth to the danger they pose to residents at the International Space Station and possible travellers to other planets.
During the Family Weekend, Katie Steckles ran three very popular Think Maths workshops on
fractals, explaining the ideas and helping participants to make a tetrix, 3-dimensional analogue of the Sierpiński triangle, from 64 tetrahedra. Finally the programme for schools had several maths events, including Modular Arithmetic by Joe Watkins (Kent) and Maths Saves Lives by Louise Allison (OR Society), Noel-Ann Bradshaw (Greenwich), Julie Vile (Cardiff) and Waleed Backler (Greenwich); Codes and Codebreaking by Corneliu Hoffman, Designing and Making a Calculator by David Leppinen, Using Maths to Survive the Zombie Apocalypse by Sara Jabbari and Using Maths to Win at Gameshows by Simon Goodwin (the last four all from Birmingham). Peter Giblin
Chair of the Mathematical Sciences Section of the Festival

## LONDON

MATHEMATICAL
SOCIETY

## 150TH ANNIVERSARY CECIL KING TRAVEL SCHOLARSHIP

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 must be nationals of the UK or the Republic of Ireland, either registered for or having completed a doctoral degree within 12 months of the closing date.
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@ Ims.ac.uk. The closing date for applications is Friday 6 March 2015. 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.


We are seeking candidates for 16 fully funded PhD positions, as part of the 2015 cohort of the EPSRC Centre for Doctoral Training (CDT) in the Mathematics of Planet Earth (MPE), jointly run by Imperial College London and the University of Reading. Successful applicants will have (or expect to receive) a first class honours degree in Mathematics, Statistics, Physics or closely related subject. All applications will be considered jointly by the partner universities.

The centre offers an innovative four year PhD in programme in Mathematics and its applications to weather, oceans and climate science. The first year takes the form of an MRes (Masters by Research) course, leading to a jointly awarded degree from Imperial College London and the University of Reading. The following 3 years focus on the PhD project, and lead to the award of a PhD from either Imperial or Reading. Places on the CDT offer full funding (fees plus tax-free stipend). Whilst most places are available only to UK and EU students, there is limited funding for international students.

Successful candidates will choose, by the end of the first year, the particular area of research that suits their individual taste and talents from the broad areas of Analysis, Statistics, Probability, Fluid Mechanics, Dynamical Systems, Numerical Analysis, Scientific Computing, and will work on PhD projects. All projects will have relevance and applicability to research in weather, oceans and climate, and some of them will be in collaboration with a weather or climate forecasting centre or other industrial partner. Prior knowledge of environmental science is not a requirement.

The MPE CDT students will graduate with substantial, interdisciplinary experience in developing and applying mathematical techniques to challenging and urgent problems. They will acquire teamwork, communication, management and leadership skills through our close cooperation with our external partners from research institutions and industry. Integrated in the programme are a number of bespoke training activities and professional development opportunities.

Further details on the programme and the application procedure can be obtained at wWw.mpecolt.org

## www.mpecdt.org

 Research Council London
## INTEGRABLE DAY AT LOUGHBOROUGH

A half-day workshop on Geometric Structures and Integrability will be held at Loughborough University on 28 November 2014 in Room KG107 from 1.30 pm . The speakers are:

- David Calderbank (Bath)

Affine buildings and discrete integrable geometry

- Boris Doubrov (Minsk) Fundamental invariants for systems of ODEs of higher order
- Maciej Dunajski (Cambridge)

How to recognise a conformally Einstein metric?

- Boris Kruglikov (Tromso) Symmetric integrable deformations of dispersionless PDEs
The meeting is part of a collaborative workshop series on Classical and Quantum Integrability, supported by an LMS Scheme 3 grant, involving Edinburgh, Glasgow, Leeds and Loughborough Universities. Funds may be available to support the attendance of research students. Enquiries should be addressed to the organiser: A.P.Veselov@ lboro.ac.uk. For further information visit the website at http://tinyurl.com/mtyxmzu.

Isaac Newton Institute<br>for Mathematical Sciences

# RANDOM PLANAR STRUCTURES <br> 20-24 April 2015 <br> in association with the Newton Institute programme Random Geometry 

12 January - 3 July 2015
Organisers: Itai Benjamini (Weizmann Institute of Science), Nathanael Berestycki (University of Cambridge), Jean Francois Le Gall (Université Paris-Sud 11), Scott Sheffield (Massachusetts Institute of Technology).

Background: The goal of this workshop will be to highlight recent progress and outstanding problems concerning our understanding of the geometry of random planar structures, both discrete and continuous. Part of the workshop will focus on random planar maps, a topic at the intersection of probability, combinatorics, and statistical physics. Random planar maps form a basic building block for Liouville quantum gravity, and are thought to be related to the exponential of the Gaussian Free Field and other conformally invariant scaling limits. A major recent progress is the proof by Miermont and by Le Gall, simultaneously, that a uniform random $p$-angulation (for $p=3$ and $p \geq 4$ even) converges as a metric space, after rescaling, to the Brownian map. Other parts of the workshop will detail progress on two-dimensional models of statistical physics such as percolation, the self-avoiding walk, and dimer models.

Closing date of the receipt of applications is 1 February 2015.
Further information and application forms are available from the website:

OBITUARY<br>PIETER MULLENDER



Professor Pieter Mullender, who was elected a member of the London Mathematical Society on 18 November 1944, died on 31 July 2014, aged 97.
Marinus Kaashoek writes: Pieter Mullender (Piet for his colleagues and friends) studied mathematics and did his PhD at the Vrije Universiteit (VU) in Amsterdam. He prepared his thesis under supervision of the number theorist Jurjen F. Koksma during World War Two. His first publication appeared in 1944, and he defended his thesis just a few months after the German occupation of the Netherlands had ended. Geometry of numbers and complex function theory became
as a lecturer at his Alma Mater. The two years before he worked in Cambridge UK (St John's College) as a postdoctoral student in the group of L.J. Mordell. His thesis had been in Dutch, and under Mordell's supervision he wrote a second one in English. The Cambridge years made him an LMS supporter; he read the LMS Newsletter
into his nineties.
In 1952 followed Piet's promotion to full professor at the VU. During the stormy years 1964-1973 he was the Director of the Mathematics Department at the VU. In those years, under his guidance, the department developed from a small institute with a few professors and a limited research program into a modern department covering a broad spectrum of research areas in pure and applied mathematics, with a staff of almost 50 persons. He arranged the first appointments in computer science at the VU. Stormy years also because in this period a wave of democratization flooded across the Dutch universities. Time for research was limited, and Piet had to solve organizational problems instead of mathematical ones which he did with success. Piet was a great lecturer, highly appreciated and admired by the students. For the new mathematics professors appointed at the VU during his time as director - I was one of them - he was a generous governor, leaving a lot of freedom to new appointees, mathematically as well otherwise.
His wife Fina, also a VU educated mathematician, passed away in 2013. During his last year Piet suffered from aphasia but remained cheerful and full of stories. He is gratefully remembered by his students and former colleagues.

## REVIEWS

HOW TO STUDY FOR A MATHS DEGREE by Lara Alcock, Oxford University Press, 2012, pp 288, £13.99, ISBN 978-0-19-966132-9.


This book is written in a very modern and informal way which will suit younger generations who are used to modern ways of communication through blogs and Facebook. The book is written in a way that is mostly based on personal experience and not on scientifically tested and proven methods. However, its modern "how to" approach can be very popular amongst current
students
It is divided into two parts; "Mathematics" and "Study skills". The first part is actually study skills or the skills that mathematicians should have when studying any specific mathematical content. But, do not expect to learn any specific mathematical topics from it, that isn't the aim of the book. A useful topic that is covered in the first section is that students should learn the art of communicating their mathematics to others, and to themselves for revision purposes. Another important topic is a chapter covering proofs. Many students complain about the "proofs" in our teaching and Chapter 5 shines light onto the different types and the importance of under-
standing proofs.
Each chapter is rounded off with bullet point summaries and future reading, which will encourage readers to explore the main ideas of the text in more detail.
In places I have found the book to be a bit repetitive and slow going, but again, this might suit some students especially those who love mathematics but sometimes struggle with understanding major concepts like "abstract objects" and "proofs". Students' experience with these concepts is limited during previous education, and this "real mathematics" might come as a shock to them. The book explains them in a gentle way, in contrast to many lecturers "brief" and "you should know this" approach.
The second part is not really a collection of study skills, it is more a collection of advices and tips on understanding university life: how to write
up lecture notes, how to ask for help, who can support you in your studying, what the lecturers/ professors are like?.. This is advice that lecturers repeatedly tell students about: time management, revision plans, etc...so it is nice to have it summarised in a book like this.
I would recommend this book to all students who are starting their studies of Mathematics as a major, but also to those who are still in school and thinking about their choice of University subjects. It is a useful, small book, which could easily be read on the bus to/from University, in breaks between the lectures, or in your spare time. Each section is self-contained and rounded and you can jump from topic to topic, especially with the second part of the book. After that it should be kept on the shelf for reference when needed.

Zuzana Hucki
Nottingham Trent University

BASIC GAMBLING MATHEMATICS: THE NUMBERS BEHIND THE NEON by Mark Bellman, CRC Press, 2014, 284 pages, £38.99, US\$59.95, ISBN 978-1-4822-0893-1.


Often, a good mathematical model for roulette, dice, or cards, or for gambles such as lotteries or keno, identifies some number $N$ of distinct equally likely outcomes. The winning chances, and the size of any house advantage, then follow via accurate counting. This book examines a vast array of gambles that are found in legal (and illegal) betting establishments, almost entirely focussed on the USA. It assumes a very limited background in mathematics - for example, it labels the standard formulae for choosing $r$ objects from a set of $n$ objects as "advanced counting arguments".
Although the book begins with a general account of the ideas of probability as they pertain to random experiments with equally likely outcomes, it is not intended as a textbook for the broader subject. Rather, it offers advice, backed up by detailed calculations, on standard gambles found in casinos, and on the variations
used to spice up these games. Most of these "extras" turn out to have a far larger house advantage, but in their zeal to hook in potential customers, casinos may offer bets that favour the punter, or even free bets. Savvy readers can discover here how best to exploit these baits.
Each of the seven chapters ends with a collection of exercises, with answers given for half of them. Useful tables list the basic data for a variety of games - the outcome probabilities, the payoff odds, optimal play, and the house advantage. Blackjack, with its myriad variations on the basic rules, has its own chapter, with advice on how to assess the house advantage according to the precise game on offer. The final chapter runs through a plethora of general betting strategies that have been suggested, and explains their deficiencies patiently.
When you are contemplating a bet, do notice whether the payoff odds are quoted as " 5 to 1 " or " 5 for 1 ", the latter being a sneaky way of making odds of 4 to 1 look better. Reading this book would be time well spent for anyone contemplating a vacation in Las Vegas.

John Haigh
University of Sussex

## American Mathematical Society



## ARNOLD

Swimming Against the Tide
Edited by Boris A. Khesin, University of Toronto \&
Serge L. Tabachnikov, ICERM, Brown University and
Penndylvania State University
Vladimir Arnold, an eminent mathematician of our time, is known both for his mathematical results, which are many and prominent, and for his strong opinions, often expressed in an uncompromising and provoking manner. His dictum that "Mathematics is a part of physics where experiments are cheap" is well known.
This book consists of two parts: selected articles by and an interview with Vladimir Arnold, and a collection of articles about him written by his friends, colleagues, and students. The book is generously illustrated by a large collection of photographs, some never before published. The book presents many a facet of this extraordinary mathematician and man, from his mathematical discoveries to his daredevil outdoor adventures.
Nov 2014 173pp 9781470416997 Paperback $£ 22.50$

## THE POINCARÉ CONJECTURE

Edited by James Carlson, Clay Mathematics Institute
The conference to celebrate the resolution of the Poincaré conjecture, which is one of the Clay Mathematics Institute's seven Millennuium Prize Problems, was held at the Institut Henri Poincaré in Paris. Several leading mathematicians gave lectures providing an overview of the conjecture - its history, its influence on the development of mathematics, and, finally, its proof.
This volume contains papers based on the lectures at that conference. Taken together, they form an extraordinary record of the work that went into the solution of one of the great problems of mathematics.
A co-publication of the AMS and Clay Mathematics Institute
Clay Mathematics Proceedings, Vol. 19
Nov 2014 181pp 9780821898659 Paperback $£ 53.50$

To order AMS titles visit www.eurospanbookstore.com/ams

EXPERIENCING MATHEMATICS: WHAT DO WE DO, WHEN WE DO MATHEMATICS? by Reuben Hersh, American Mathematical Society, 2014, pp 291, pb £30.50, US\$39.00, ISBN-13: 978-0-8218-9420-0.

This book is a collection of 30 articles and essays on the philosophy of mathematics written by the author (some in collaboration with Philip J. Davis) between 1981 and 2013. The articles are preceded by a manifesto, a self-introduction and a chronology which put the choice of articles in perspective and succinctly summarises Hersh's lifetime thinking about the nature and purpose of mathematics.
Hersh was born in New York in 1927 to Polish and Ukrainian immigrants, and studied English Literature at Harvard. He worked at the Scientific American for a few years, then as machinist until 1956, when an accident at work in which he lost half his right thumb prompted him to a life changing decision: going back to university and study maths. He started as an undergraduate in 1957 at New York University, and received a PhD under the supervision of Peter Lax in 1962. After two years at Stanford (where he met and co-wrote an article in the Scientific American with Paul Cohen about the undecidability of the Continuum Hypothesis), he took a permanent job at the University of New Mexico, where he taught from 1964 to 2011. Reuben Hersh has worked on partial differential equations, random evolutions, probability and linear operator equations, but he is best known for his writings on the nature and practice of mathematics. In 1983 he and co-author Philip J. Davis won the National Book Award in Science for

their book The Mathematical Experience.
Hersh writes from the point of view of a working mathematician rather than a philosopher of mathematics, and indeed his starting point is 'Mathematics is that what mathematicians do'. Thus he concerns himself with the meaning and purpose of mathematics as a human activity, but his reasoning has far reaching consequences for the very nature of mathematics and mathematical reality. Hersh's main conclusion is not only that mathematics can be seen as a human activity, but rather that it is fundamentally a human activity
thinking not only clarifies and demystifies what mathematicians do for the outsider, but also for the working mathematician, to who is forced to reflect on the mathematical experience and to confront established dogma about what mathematics is about. (Indeed, a stereotypical 'ivory tower' mathematician might feel a 'philosophical slap on the face' by reading some of Hersh's conclusions.)
Hersh does not shy away from the most fundamental questions, such as the foundations of mathematics, the nature of mathematical objects, what a mathemati-
cal proof is, and even gives a complete definition of mathematics. (I am afraid that you will have to read either this book or some of the articles in it to find out Hersh's answers.)
If you are familiar with Hersh's previous work, or have read about the philosophy of mathematics, this book may not be as revealing as for someone (like this reviewer) who had not given much serious thought or reading to such fundamental questions. And I must admit that I found the author's arguments powerful and compelling, and conveyed with great clarity and concision.
The articles are divided into three groups: The first group forms the core of the book where Hersh's philosophical thinking is discussed; the second part is a somehow more tangential collection of articles; and the third part is a selection of six book reviews by Hersh. The second and third part are somehow less relevant to the main theme of the book, and perhaps one can
see them as 'bonus material' collected from the author's extensive writings.
It is refreshing to occasionally step back and talk about mathematics rather than doing it, and this book provides solid rhetorical ammunition, particularly against the dogmatic mathematician in your department. I can also recommend this book for the right reasons, particularly to the working mathematician who ever wondered about the nature or foundations of mathematics alternative to the Plato-nism-Formalism duality.

I conclude with a quote from the book "... mathematics is a humanistic study. It is one of the humanities", which made me temporarily less unhappy with the decision of my university to merge Mathematics with the Faculty of Social and Human Sciences (although I doubt Reuben Hersh's humanist view had anything to do with it).

Ruben Sanchez-Garcia
University of Southampton


## 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 is given on the Society's website (www.Ims.ac.uk/ content/calendar). Please send updates and corrections to calendar@Ims.ac.uk.

## NOVEMBER 2014

3 Complex Geometry and Symplectic Topology Meeting, Warwick (440) 14 LMS AGM, London (441)
22 Early Career Mathematicians' Autumn IMA Conference, Queen Mary University London (438)
26-28 Engineering and Control of Natural and Synthetic Microbial Communities, INI Workshop, Cambridge (439) 28 Geometric Structures and Integrability Workshop, Loughborough (441)

## DECEMBER 2014

8-10 Applications of Game Theory IMA Conference, Oxford (438)
12-13 Random Matrix Theory Workshop, Brunel University (440)
15-17 Maths in Signal Processing IMA Conference, Birmingham (438)
15-19 Regulating Systemic Risk: Insights from Mathematical Modelling, INI Workshop, Cambridge (440)
16-17 Mathematical Challenges of Big Data IMA, Woburn House, London (438)
17 LMS SW \& South Wales Regional Meeting, Plymouth (441)
18 Combinatorics Workshop, Plymouth (441)
19 Differential Algebra Workshop, Plymouth (441)

## JANUARY 2015

5-8 Topology and Integrability, UK-Japan Winter School, Loughborough (440) 5-16 Periodic, Almost-Periodic, and Random Operators Introductory School, INI,

## Cambridge (439)

6-9 Bruhat-Tits Buildings Winter Meeting, Imperial College London (439)
9 Research in Mathematics and its
Applications IMA Conference, Bath (438)
12-23 Random Geometry Instructional Workshop for Younger Researchers, INI, Cambridge (439)
16 150th Anniversary Launch, London (441) 26-30 Conformally Invariant Scaling Limits, INI Workshop, Cambridge (439)

## FEBRUARY 2015

4-8 CERME 9, Prague (439)
27 Mary Cartwright Lecture, London

## MARCH 2015

9-13 Stochastic Systems Simulation and Control ICMS Workshop, Edinburgh (440)
16-20 LMS Invited Lectures, Professor Michael Shapiro (Michigan State University) Cluster algebras and integrable systems, Durham (441)
19 Mathematics 2015 IMA Conference, Mary Ward House, London (438)
23-27 Galerkin Methods with Applications in Weather and Climate Forecasting ICMS Workshop, Edinburgh (440)
30-31 Flood Risk Assessment IMA Conference, Swansea (438)
30-2 Apr Joint Meeting of the BMC and BAMC, Cambridge (438)

[^1]
## LMS-FUNDED MEETING

## Valediction to Jeremy Gray

held at Milton Keynes from 11 to 12 September 2014
(report on page 21)


June Barrow-Green (Open University)
GD Birkhoff and Poincaré's 'Last Geometric Theorem'


Erhard Scholz (Wuppertal)
Localizing' the geometry of special relativity: Why Cartan and Weyl posed their new 'problem of space' differently


Leo Corry (Tel Aviv)
The interaction between arithmetic and geometry in the Euclidean tradition: a longue durée issue in the historiography of mathematics (if there ever was one)


Umberto Bottazzini (Milan)
Mathematics and politics: the Italian case


[^0]:    Closing date for nominations
    Monday 20 January 2015

[^1]:    APRIL 2015
    1 BMC-BAMC 2015 - LMS 150th Anniversary Celebration Day, Cambridge (441)
    7 LMS Northern Regional Meeting, Lancaster (441)
    7-11 Homotopical Algebra and Geometry workshop, Lancaster (441)
    13-17 Mathematics for Health and Disease ICMS Workshop, Edinburgh (440)
    20 Mathematical Education of Engineers IMA Conference, Loughborough (438) 20-24 Gradient Flows: From Theory to Application ICMS Workshop, Edinburgh (440)

    20-24 Random Planar Structures INI Workshop, Cambridge (441)

