LONDON MATHEMATICAL SOCIETY
150 YEARS

JOINT ANNIVERSARY WEEKEND
Report

Pavel Exner, President of the European Mathematical Society and Terry Lyons, President of the London Mathematical Society

The weekend 18 to 20 September 2015 saw mathematicians from around the world congregate at the University of Birmingham, UK, for a conference in celebration of two birthdays: the 150th of the venerable London Mathematical Society (LMS), and the 25th of the relatively youthful European Mathematical Society.

Under the watch of the Joseph Chamber-lain Memorial Clock-tower (or 'Old Joe', the world's tallest free-standing clock-tower), participants divided between parallel sessions on the themes of Algebra, Combinatorics, and Analysis, and reunited for plenary talks from some of mathematics' current leading lights.

After warm greetings from Terry Lyons and Pavel Exner, the two societies' respective

SOCIETY MEETINGS AND EVENTS

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Presidents, and from Andrew Schofield, Head of Birmingham University's College of Engineering and Physical Sciences, the meeting got underway with a plenary talk from Noga Alon (Tel Aviv and Princeton), on the subject of *Graphs, vectors and integers*. His focus was Cayley Sum Graphs of finite Abelian groups, and the role they play in subjects from Graph Theory to Information Theory. Aner Shalev (Jerusalem) later delivered the day's second plenary talk, on *Groups in interaction*, discussing several instances of interplay between group theory and other subjects, including probability theory, algebraic geometry, and number theory.

Away from the lecture theatres, mathematicians were spotted enjoying Balti curry (a famous Birmingham creation, along with the postage stamp and the pneumatic tyre) and enjoying the outstanding collection of paintings at the Barber Institute of Fine Arts, next door to the School of Mathematics.

Stefanie Petermichl (Toulouse) delivered the first plenary lecture of Saturday 19 September, on *Optimal control of second order Riesz transforms on multiply-connected Lie groups*, discussing progress on controlling the norms of certain classical operators on groups. She was followed by Béla Bollobás (Cambridge and Memphis)

speaking on *Percolation and random cellular automata*. He paused during his talk to pay tribute to two friends who had recently passed away: Ian Cassels, Head of Mathematics during his PhD at Cambridge, and Bollobás's own graduate student Charles Read (Leeds). The day's final plenary lecture was from Timothy Gowers on the subject of *Interleaved products in highly non-Abelian groups*, an algebraic problem motivated by a question in cryptography.

The conference dinner took place on Saturday evening in Birmingham University Staff House, where delicious food was consumed, and many glasses were raised in cheerful celebration of the two societies' birthdays.

Rounding off the meeting on the Sunday was Keith Ball (Warwick), with an entertaining plenary talk exploring *The probabilistic character of high-dimensional objects*. Then with hearty thanks to the organisers, Chris Parker, Anton Evseev, Maria Carmen Reguera and Andrew Treglown, and with congratulations to Elisa Covato (Bristol) and Robert Hancock (Birmingham), winners of the graduate student poster competition, an excellent celebratory weekend drew to a close.

Richard Elwes
University of Leeds

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EDINBURGH
MATHEMATICAL
SOCIETY

LONDON
MATHEMATICAL
SOCIETY
150 YEARS

LMS 150th Anniversary

London Mathematical Society & Edinburgh Mathematical Society Joint Meeting 2015

ICMS Edinburgh, 10-11 December 2015

Programme

Thursday:	10:00 - 10:30	Coffee & Registration
	10:30 - 11:30	Opening of the Joint Society meeting: Eva Tardos, Cornell
	11:45 - 12:45	Jarek Brodzki, Southampton
	Lunch	
	14:00 - 15:00	Ilias Diakonikolas, Edinburgh
	15:15 - 16:15	Marian Scott, Glasgow
	16:15 - 16:45	Coffee
	16:45 - 17:45	Igor Rivin, St. Andrews
Friday:	10:00 - 10:30	Coffee & Registration
	10:30 - 11:30	Ronald Coifman, Yale
	11:45 - 12:45	Colin McDiarmid, Oxford
	Lunch	
	14:00 - 15:00	Coralia Cartis, Oxford
	15:15 - 16:15	Sofia Olhede, UCL
	16:15 - 16:45	Coffee

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

For further details and to register and to reserve a place at the dinner, please visit http://129.215.255.70/workshop.php?id=391 or contact Jane Walker (jane.walker@icms. org.uk). The cost of the dinner will be approximately £24.00, including drinks.

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

1865 - 2015

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REVIEW OF THE LMS NEWSLETTER

As members may already know, the LMS is currently holding a review of the *LMS Newsletter*, looking closely at both its content and its design, with a view to making it as valuable a resource as possible to both LMS members and the wider mathematical community. A Newsletter Review Group has been set up and, after holding discussions on the current *LMS Newsletter* and looking at similar publications by other UK and international societies and organisations, an initial proposal was made to adopt a design similar to the *Gazette* (the newsletter of the French Mathematical Society).

In particular, the Group liked the use of white space in that publication, which it was thought gave it a clean and uncluttered appearance.

We would now like to get the opinions of LMS Representatives and members on both the current *LMS Newsletter* (design and content) and the proposed new design. We have asked all Representatives to complete a survey of seven questions, and have sent copies of the *Gazette* and the *EMS Newsletter* to each Representative for comparison purposes. Please contact your Representative if you would like to give your opinion.

LMS COUNCIL DIARY

16 October 2015
A personal view

An important task for Council at its October meeting is, as part of the process of winding up the financial year which ended in August, to consider the draft Trustees' Report and the Annual Accounts. They are then presented to the Annual General Meeting in November. In the absence of Treasurer Rob Curtis, who is recovering from an operation, Vice-President John Greenlees presented, and Council approved, the report and the accounts, subject to some minor corrections in the former. He also introduced a comparison of the 2014–15 budget with the actual outcome. Noteworthy were underspends on Programme Committee grants, Short Courses and employment costs, and increased Publications income.

Publications Secretary John Hunton presented to Council a proposal from the Publications Committee concerning the LMS *Journal of Computation and Mathematics (JCM)*, which had not been performing well, refocusing it on its strongest areas and moving to a Gold Open Access publishing model with a modest Author Publication Charge. After a lengthy debate on all of the issues involved, as detailed in an accompanying paper, it was decided that it was in the best interests of the Society that the JCM should instead be closed.

General Secretary Stephen Huggett reported on the work of the newly formed Newsletter Review Group. The Newsletter has doubled in size since its format and structure was last looked at, while much of what is included is duplicated on the website and in mailings. The group had looked at several similar publications and were particularly impressed with the current design of the *Gazette des Mathématiciens of the Société Mathématique de France*; the latest issue is at http://smf.emath.fr/files/146-bd.pdf. The group's next step would be to send a short questionnaire to departmental representatives. Issues to consider would be the frequency of publication, and the editorial structure. It was hoped that a relaunched Newsletter could appear in about a year's time.

Vice-President Ken Brown reported on the work of the Research Policy Committee. The CMS report *The Mathematical Sciences People Pipeline* had now been published and would be launched at the House of Commons in January. He had attended a meeting of EPSRC's mathematics Strategic Advisory Team (SAT). Amidst considerable anxiety about the effects of the Government's forthcoming Comprehensive Spending Review on research spending, all the

SATs were to meet again in November.

Obviously the Diary can only report a fraction of what happens at Council. There is, inevitably, a significant amount of routine business. Routine it may be, but it is still important. For example, this meeting approved proposals for filling vacancies on some of the Society's many committees. It is one of General Secretary Stephen Huggett's duties to bring such proposals to Council, after, of course, consulting widely.

Francis Clarke

LMS RESEARCH WORKSHOPS 2016

Applications for Future Research Workshops

The LMS Research Meetings Committee considers requests for either full or partial support (for travel and subsistence of participants, and reasonable associated costs) in the range £1,000 - £10,000. The maximum award is £10,000, but a typical award is in the range of £3,000 - £5,000. Applications for partial support of workshops with other sources of support will be considered.

Applications can be made at any time but should normally be submitted at least 12 months before the proposed workshop. All proposals are refereed, and support will only be offered if it felt that the benefits to UK mathematics are likely to be significant.

Applications should be made via email to the Chair of the Research Meetings Committee, Professor Beatrice Pelloni (RMC.Chair@lms. ac.uk), at any time. There is no application form. Proposals in PDF or Word format should contain:

- a description of the research area
- the aims and format of the workshop
- a list of participants and a budget
- details of proposed location and timing

Applicants may consult Professor Beatrice Pelloni (RMC.Chair@lms.ac.uk) informally about their proposed workshop before making an application.

LMS Research Workshops 2015

In 2015, the LMS Research Meetings Committee supported the following Research Workshops:
- *Edge days: del Pezzo surfaces;* Edinburgh
- *Gluing techniques in complex geometry;* Bath
- *Hopf-Galois theory and Galois module structure;* Exeter
- *London-Paris Bachelier mathematical finance workshop;* King's College London
- *Quantum groups and quantum information theory;* Herstmonceux Castle, East Sussex.

LMS TRAVEL GRANTS: 7ECM 2016

The London Mathematical Society has set aside funds to be used for making grants to support the attendance of UK-based mathematicians at the Seventh European Congress of Mathematics, Berlin from 18 to 22 July 2016 (www.7ecm.de).

The Society would particularly like to support those mathematicians at an early stage in their career, including postdocs. You do not need to be an LMS member to apply.

To apply, download an application from the LMS website (www.lms.ac.uk/content/7ecm-2016-lms-travel-grants) or contact Elizabeth Fisher (lmsmeetings@lms.ac.uk, tel. 020 7291 9973). The completed application form should be returned by post to:

LMS Travel Grants for 7ECM 2016
London Mathematical Society
De Morgan House
57-58 Russell Square
London WC1B 4HS

Applications should be submitted by **5 February 2016** and applicants will be informed of the outcome by early March.

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SPITALFIELDS DAY
Call for proposals

The London Mathematical Society is pleased to offer grants of **up to £1,000** towards the cost of a Spitalfields Day.

A Spitalfields Day is a one-day event at which selected participants, often eminent experts form overseas, give survey lectures or talks, which are accessible to a general mathematical audience. The Spitalfields Day is often associated with a long-term symposium and speakers will generally give lectures on topics of the symposium.

The name honours the Society's predecessor, the Spitalfields Mathematical Society, which flourished from 1717 to 1845, and Spitalfields Days have been held each year since 1987.

The grant of £1,000 is intended to cover actual supplementary costs for the event, e.g. subsidising the cost for a lunch for participants, and for small travel grants of £50 to enable LMS members and research students to attend the event.

If you are interested in organising a Spitalfields Day, please write to the Society (grants@lms.ac.uk). The format need not be precisely as described, but should be in a similar spirit.

The next deadline for proposals is **31 January 2016**. (Subsequent deadlines are 15 May and 15 September 2016. Please note the Society cannot fund events retrospectively so applicants are advised to apply well in advance of the event).

MATHEMATICS POLICY ROUND-UP
November 2015

HIGHER EDUCATION

HEFCE highly respected by stakeholders
An independent survey has found that HEFCE is considered by its stakeholders to be highly respected, trusted and approachable. There is widespread and increased recognition of HEFCE's role as a broker between government and the higher education sector, and 94 per cent of respondents believe that HEFCE implements government policy effectively. The full stakeholder survey is available at http://tinyurl.com/ngrkr3l.

Relevance of Core Maths to higher education
Nick Gibb, Minister of State for Schools (DfE) and Jo Johnson, Minister of State for Universities and Science (BIS) have written a letter (http://tinyurl.com/q3rhqt9) to provide information on the new Core Maths qualifications, which have been introduced for 16 year olds. Universities will begin to see an increasing number of applicants with these qualifications from 2016 and the information provided is to help raise awareness of Core Maths.

Core Maths qualifications are a suite of new Level 3 qualifications for students in post-16 education. Core Maths courses are aimed at students who have passed GCSE mathematics at grade C or above but who are not taking AS or A-level mathematics. The qualifications aim to help students retain, deepen and extend their mathematical skills and understanding through the use of meaningful and relevant problems, preparing young people for university, employment and life.

Core Maths is suitable for a wide range of students progressing to education courses with distinct mathematical or statistical elements such as psychology, geography, business and management, sociology, health sciences, biology, education and IT.

The links may help those in universities to become aware of the skills and knowledge that students with this qualification will bring to their higher education. The govern-

ment's aim is that by 2020 the vast majority of students will continue to study some form of mathematics as part of their post 16 education, so that the number of students taking Core Maths is expected to grow steadily over the next few years.'

In addition to the Ministerial letter, more details on Core Maths and its relevance to higher education are also available in a briefing paper by Professor Paul Glaister, University of Reading (http://tinyurl.com/pxmxsvf).

Professor Glaister is available to give institution-wide briefings on Core Maths to senior staff and staff responsible for admissions in universities. All universities are encouraged to take up this opportunity to find out more about Core Maths, its relevance to higher education, and to discuss any aspects of Core Maths (p.glaister@reading.ac.uk).

Further queries about Core Maths can be directed to the Department for Education at core.maths@education.gsi.gov.uk. More information about Core Maths is available at www.core-maths.org.

SCHOOLS AND COLLEGES

Increased teaching bursaries and scholarships

To help attract graduates with the potential to be exceptional teachers in the core EBacc subjects, the government has published details of the increased tax-free bursaries and scholarships available for the academic year 2016 to 2017. These include:

- £30,000 tax free for graduates with a first class degree who are training to teach physics, an increase from £25,000 in 2015 to 2016 - trainees in physics with a 2:1 will continue to receive a £25,000 bursary, and trainees with a 2:2 will also now receive £25,000, up from £15,000 last year
- increased bursaries of up to £25,000 in other EBacc subjects including maths, biology, chemistry, computing, languages and geography
- continuing the increased funding available to schools offering School Direct (salaried) places in maths and physics to

boost starting salaries in these subjects - trainees can earn over £21,000 nationally and £25,000 in inner London
- a further 700 tax-free scholarships worth up to £30,000 for physics and £25,000 for maths, chemistry and computing trainees, delivered in partnership with the professional bodies for these subjects.

More information is available at http://tinyurl.com/nbfbedz. More information on Mathematics Teacher Training Scholarships is available at www.ima.org.uk.

Education in Scotland

The Royal Society's Vision report, published in June 2014, outlines the requirements for high performing science and mathematics education in the UK over the next 20 years. The report advocates an evolutionary approach to support the teaching of science and mathematics, and to encourage an environment that promotes innovation. The full report can be accessed here: https://royalsociety.org/education/policy/vision/.

The Royal Society of Edinburgh (RSE) and the Royal Society held a joint Chatham House roundtable discussion at the RSE on 20 May 2015 to explore the Vision report in the context of developments in Scotland. The Advice Paper from that meeting is now available at http://tinyurl.com/qab9fb7

OTHER

Science Budget Inquiry

Jo Johnson MP, Minister of State for Universities and Science, Department for Business, Innovation and Skills, and Gareth Davies, Director General, Knowledge and Innovation, Department for Business, Innovation and Skills, gave evidence to the House of Commons Select Committee for Science and technology. The transcript of the evidence is available at http://tinyurl.com/oxoge29.

The science budget was also debated in Westminster Hall on the 21 October. The transcript is available at http://tinyurl.com/ppcr8ow.

Dr John Johnston
Joint Promotion of Mathematics

THE 150TH ANNIVERSARY LOCAL HEROES PROGRAMME

A Retrospective

The UK has produced scores of eminent mathematicians and their origins can be traced to every corner of the country, from the City of London to the Highlands of Scotland.

With this in mind the Society decided to offer museums around the UK the opportunity to apply for a grant of up to £4000, to help them produce and curate an exhibition celebrating a local, historical mathematician.

These Local Heroes Exhibitions became an integral part of the Society's 150th Anniversary Celebrations in 2015, because at its heart was the notion that 'mathematics is everywhere and for everyone' – one of the anniversary's three key messages.

The programme's objective was to highlight and celebrate the achievements of historic, UK mathematicians while at the same time placing them within the contexts of the communities that supported them. Doing so, the Society felt, would widen participation in the anniversary celebrations and present mathematics to new audiences in an engaging and accessible way.

Subsequently, the Society cast a wide net and
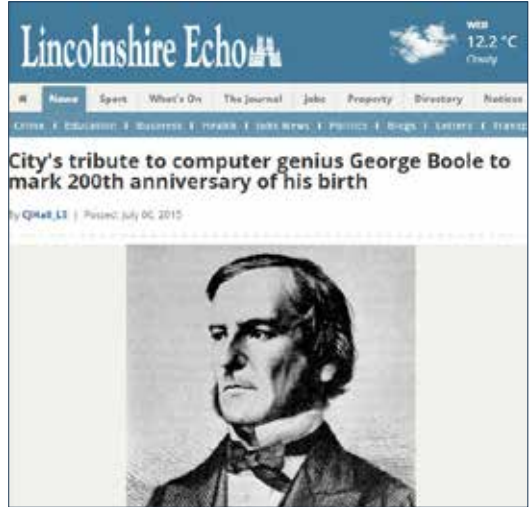
Lincolnshire Echo article

accepted five applications from Carrickfergus Museum & Civic Centre; Dundee University Museums; a joint application from Lincoln University Museums and Lincoln Cathedral; London Council; and Tenby Museum and Art Gallery. The Local Heroes nominated by the grantees were, respectively, Robert Adrain, D'Arcy Thompson, George Boole, Sydney Chapman and Robert Recorde.

The programme began in July with Lincoln University Museum and Lincoln Cathedral's joint exhibition **The Life and Legacy of George Boole**. Their displays included a large timeline of the Lincoln-born mathematician's life as well as an impressive archive of his correspondence, academic work and personal items.

Running from 13 July to 3 November, the exhibition also coincided with the bicentenary of Boole's birth, making it perfectly placed to benefit from the groundswell of public interest in him this year. That public interest was reflected in the success with which the

team at Lincoln managed to promote the exhibition on social media and to the local press. It also contributed to the huge demand the organisers saw for their public lectures, particularly at the Cathedral.

Professor Terry Lyons, President of the London Mathematical Society, commented: "Boole's contribution, and thus Lincoln's contribution, to mathematical sciences was a profoundly enabling one. It opens the way to

change probabilities as new evidence arrives. The techniques underpin so many things. It is great that Lincoln and the London Mathematical Society worked together to bring attention to his contributions."

Special thanks are due to the exhibition organisers Claire Arrand and Ian Snowley, as well as Professor Alexandre Borovik for attending the official opening of the exhibition on 16 July as an LMS representative.

The second LMS Local Heroes Exhibition to open was **Nature's Equations: D'Arcy Thompson and the Beauty of Mathematics** at Dundee University Museum's Science Centre

Meet the Mathematicians event at Dundee

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from 22 August to 25 October.

The exhibition's close connection with the University of Dundee's mathematics department proved fruitful as the organisers were able to enhance their displays with public talks and hands-on demonstrations of how Thompson's pioneering work is being taken forward by current members of the department.

This includes the research of Dr Fordyce Davidson, head of the department, who said, "Mathematics is a truly beautiful subject. As D'Arcy Thompson realised, what makes it all the more breathtaking is that this beauty can also help us understand and solve some of the most complex problems faced by humankind. I am very privileged to be able to work at the exciting interface of mathematics and the living world."

University museum curator Matthew Jarron added, "We're delighted to have this opportunity to reveal the influence that D'Arcy Thompson has in science today, and to showcase the fascinating work being done by current mathematics researchers at the university, helping to understand such diverse topics as cell development, cancer growth and the movement of birds."

A highlight of 'Nature's Equations' was a 'Meet the Mathematicians'

event organised in collaboration with the Dundee mathematics department, which presented an opportunity for visitors to pick the brains of researchers at the forefront of the field of biomathematics and consequently gain a unique insight into the life and work of Thompson himself.

The Society would like to thank the curator Matthew Jarron and his team, as well as the Dundee mathematics department for their contributions.

The third exhibition to open was 'Robert Recorde: All Angles Covered' at Tenby Museum and Art Gallery, which ran from 7 September to 25 October.

Tenby Museum's celebrations of Recorde included a series of bilingual, interpretive panels, art works and mathematical artefacts. The exhibition was accompanied by a series of lectures by experts in their fields, events with schools and a bilingual, one-man show aimed at introducing children to the history of mathematics.

The exhibition also saw broad media interest: the BBC ran an online article about it on 16 September and BBC Radio dedicated 10 minutes to it on Good Evening Wales on 9 September. The exhibition was also covered by WalesOnline and the Western Telegraph. In all four instances the Society was mentioned as
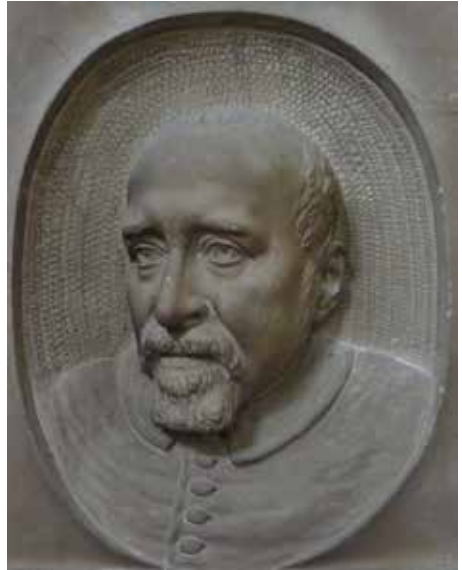
Robert Recorde

the principal supporter.

Professor Terry Lyons said of the Tenby exhibit, "Robert Record was, through his introduction of effective notation, one the influential leaders who helped to transition Britain from the medieval to a modern approach to arithmetic using zero and decimal notation. His contribution to computation was a fundamental one."

Tenby Museum and Art Gallery's Collections Manager, Mark Lewis, said, "This is such an exciting adventure and we are so pleased to be involved in this national event of celebration. The support of the London Mathematical Society, both financially and in an advisory capacity, has been invaluable and we hope that people get to learn a great deal more about his fascinating Tenby man who has had such influence on our every-day lives."

Thanks are owed to the

organiser Mark Lewis and his team, as well as to Dr Francis Clarke for attending the launch event as an LMS representative.

The fourth exhibition to open was **Sydney Chapman: Kensington Local Hero** at Kensington Central Library between 3 to 25 October. The displays formed part of London Council's annual Celebration of Science, which provided an ideal platform for exhibiting the life and work of one of the Society's past presidents and one the borough's most influential historical mathematicians.

In this instance the Society acted as the curator and the Council as the principal funder, which proved to be an excellent partnership. The LMS Librarian, Professor June Barrow-Green, provided particular support throughout the project, visiting academic archives across the capital to source images and written works by Chapman during his time as Head of Department at Imperial College.

Mary Enright, Tri-borough Reference, Information and Archives Manager at London Council, said, "We were delighted at Kensington & Chelsea Libraries to get to work with the London Mathematical Society, and collaborate on this display of Sydney Chapman's life and work. It was really a win-win arrangement for us both – customers at Kensington Central Library got the chance to learn something about a very personable mathematician whose work 70 years ago is still highly relevant and interesting today, and the LMS

had the opportunity to reach new audiences, spread the word about the Society's role today, and get mathematics onto the horizon of ordinary members of the public. We'd be more than happy to work with the Society again."

Thanks in this instance go to LMS President Professor Terry Lyons, LMS Librarian Professor June Barrow-Green, Kensington Councillor Warwick Lightfoot, Mairi Walker and Mary Enright.

The last exhibition to open was **Robert Adrain: United Irishman, Leading Mathematician, Vice Provost** at Carrickfergus Museum, which ran from 5 to 26 October.

A direct descendent of Adrian, Stiofán Ó Direáin, gave a fascinating talk on his ancestor's life and work at the opening on 30 September. Carrickfergus Museum was also heavily involved with local schools, attracting over 180 children to their 'Maths in Action' day and many more to their Carrickfergus Maths Trail.

Shirin Murphy, Collections Access Officer at Carrickfergus Museum & Civic Centre, said '"This has been such a great experience for us. It was a brilliant opportunity for us to highlight the story of our own local hero Robert Adrain who also took part in one of Ireland's most significant historical events, the 1798 Irish Rebellion. All our local post primaries participated in our schools event and the feedback we received was excellent. We are indebted to the London Mathematical Society for their support of our project and we look forward to exploring ideas to build on this success."

Thanks to Shirin Murphy, Collections Access Officer at Carrickfergus Museum & Civic Centre and to Dr Martin Mathieu for attending the opening on behalf of the LMS on 30 September. Thanks also to the School of Computing and Mathematics at Ulster University for their support of the Maths in Action day.

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Loughborough University

LONDON MATHEMATICAL SOCIETY
150 YEARS

LMS 150th Anniversary
LMS Prospects in Mathematics
A Symposium for Potential Research Students in Mathematics

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Department of Mathematical Sciences, Loughborough University
15-16 December 2015

Are you considering applying for PhD study in mathematics for entry in 2016?
If the answer is yes, this meeting is for you!

List of speakers

Stephen Coombes (Nottingham)   Diane Maclagan (Warwick)
Martin Huxley (Cardiff)   Paul Milewski (Bath)
Natalia Janson (Loughborough)   Konstanze Rietsch (KCL)
Daniela Kuhn (Birmingham)   Anna Taormina (Durham)
Tanniemola Liverpool (Bristol)   Richard Thomas (Imperial)

How to participate

Funding is available - register at the conference webpage:
http://homepages.lboro.ac.uk/~maap/LMS/

Organisation and Support

The event is sponsored by the London Mathematical Society and supported by the
Department of Mathematical Sciences, Loughborough University.

The local organisers are Karima Khusnutdinova, Marta Mazzocco, and Artie Prendergast-
Smith. For more information email a.prendergast-smith@lboro.ac.uk.

Background image: "Loughborough Carillon" - Chris J Dixon (Creative Commons)

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LMS-CMI RESEARCH SCHOOLS
CALL FOR PROPOSALS

The London Mathematical Society and Clay Mathematics Institute invite proposals for Research Schools to be held in the UK in 2017.

Up to £31,000 is available per Research School which provides training for young researchers in a core area of mathematics. The new series of courses builds on the short courses, previously supported by the Society and EPSRC, and aims at the highest international standing by allowing for support of both international lecturers and participants. The Research Schools are also supported by the Heilbronn Institute for Mathematical Research.

Prospective organisers should send an outline proposal to Elizabeth Fisher (Research.Schools@lms.ac.uk) by **31 January 2016**.

Outline proposals should discuss:

• The general mathematical area of the proposed Research School and its importance.
• The aims of the Research School, its appropriateness to the Research School programme and the likely level of demand for the Research School.
• The names and affiliations of the lecturers, titles of their courses and brief syllabuses.
• The provision for tutorial support.

Outline proposals should be no more than two A4 sides in length.

For further details about the Research Schools, please visit the Society's website: www.lms.ac.uk/events/lms-cmi-research-schools.

A list of previously supported Research Schools and Short Courses can be found at: www.lms.ac.uk/events/past-research-schools-and-short-courses

Before submitting: Organisers are welcome to discuss informally their ideas with the Chair of the Research Meetings Committee, Professor Beatrice Pelloni (RMC.Chair@lms.ac.uk).

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LMS 150TH ANNIVERSARY
DEPARTMENTAL CELEBRATIONS

These events are part of a series of receptions being hosted across the UK by mathematics departments, celebrating the 150th Anniversary of the LMS.

QUEEN MARY UNIVERSITY OF LONDON

The School of Mathematical Sciences at Queen Mary University of London held a reception to celebrate the LMS 150th anniversary on the 5 October 2015. The event started with a short speech by Professor Rob Wilson, who as LMS representative outlined the unique role the LMS played through its history in promotion of Mathematics in Britain and beyond, and stressed the importance of supporting the Society and upholding its values. The event was well-attended by School members, both past and present, who raised their glasses to the continued health and prosperity of the LMS.

The reception was followed by the School Colloquium, with the speaker Professor Misha Sodin (Tel Aviv University) delivering a talk on *Topology of zero sets of smooth random functions*.

BIRMINGHAM UNIVERSITY

The LMS-EMS Mathematical Weekend conference was held in Birmingham from 18 to 20 September 2015. This incorporated a wine reception on the first day of the event to which all staff members and postgraduate students in the School of Mathematics were invited to join the conference participants in their celebration of the 150th year of the London Mathematical Society and the 25th year of the European Mathematical Society. More than 180 mathemati-

cians raised cheerfully the toast 'To the continued health of UK mathematics and the London Mathematical Society' and then continued to wish also further success to the European Mathematical Society.

UNIVERSITY OF SHEFFIELD

The LMS 150th birthday celebrations at the School of Mathematics and Statistics was held on 28 October 2015. We had a party in our common room which followed a stimulating LMS/NZ Aitken lecture by Stephen Galbraith (Auckland) on *Linear Algebra with Errors, Coding Theory, Cryptography and Fourier Analysis on Finite Groups*. The centrepiece of the celebration was a wonderful cake bearing the LMS logo which was baked by Alison Parton, a PhD student. Tom Bridgeland FRS gave a toast to the LMS in which he spoke about the Society's founding by Arthur Ranyard and George de Morgan in 1865, and its wonderful history of support for UK mathematics. Long may this continue!

LONDON
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LMS 150TH ANNIVERSARY
POSTDOCTORAL MOBILITY GRANTS
2016-17 AWARDS

The London Mathematical Society will award grants of up to £7,200 plus a travel allowance to mathematicians of excellent promise. The purpose of the grants is to support a period of study and research in mathematics between three and six months in the academic year 2016-17 at one or more institutions other than the holder's home institution (the holder's home institution may be included for applicants with circumstances that make moving impractical, please visit the website for the full guidelines). They are intended to support promising researchers during the transitional period between having submitted their thesis and the start of their first post-doctoral employment.

The value of the grant will be calculated at £1,200 per month plus a travel allowance.

At the time of the closing date applicants have to be UK residents. Successful candidates must have submitted their thesis within twelve months before the start of their grant period. Grant holders are allowed to teach up to three hours a week. Otherwise they are expected to spend their working time on study and research.

**Please read the full guidelines before applying, these are available on the website:
lms.ac.uk/grants/postdoc-mobility-grants**

Candidates are asked to provide with their application:

- **a completed application form**
- a **cover letter**;
- a **CV** including a list of publications (maximal two A4 pages);
- a **research proposal** including a rationale for the choice of institution(s) to be visited (maximal three A4 pages);
- at least **two letters of reference**, which applicants should request that referees email directly to the LMS (to the email address below) by the closing date;
- and **letter(s) of support** from the host(s) at the institution(s) where the proposed visit will take place; it is expected that host institutions provide the grant holder with office space and access to computing and library facilities.

These grants have been established by the LMS to mark its 150th Anniversary.

Applications should be sent by Thursday 31 March 2016 by email to: pmg@lms.ac.uk

Queries should be referred to Katy Henderson:
pmg@lms.ac.uk
Tel.: +44 (0)20 7927 0809

Applicants will be notified of the outcome of their application in late May 2016.

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LONDON
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LONDON MATHEMATICAL SOCIETY
UNDERGRADUATE RESEARCH BURSARIES IN MATHEMATICS
2016

Nature of Awards
The purpose of the awards is to give experience of research to undergraduates with research potential and to encourage them to consider a career in scientific research.
The awards provide support for the student at a rate of £180 per week (or £190 per week in London), for a period of between 6 and 8 weeks.

The closing date for receipt of applications is 5pm Thursday 4 February 2016.

Eligibility
- Students may only take up the award during the summer vacation between the **intermediate years (i.e. 2/3, 2/4 or 3/4)** of their undergraduate degree. Students in the final year of their degree intending to undertake a **taught Masters** degree immediately following their undergraduate degree may apply. Applications on behalf of first-year undergraduates will not be considered.
- Researchers in Mathematics at universities and research institutions within the UK are eligible to apply. Interdisciplinary projects will be considered providing the project has significant mathematical content.
- **Postdoctoral researchers** and **new lecturers**, early in their careers are also encouraged to apply, and should note this on the application form.
- Only **one** application should be submitted by a supervisor.
- Departments are asked to provide match-funding for half of the grant awarded (for example, for a 6 week grant at £180 per week, departments will be asked to contribute £540 and the Society will contribute £540). Departments offering match-funding will be able to receive funding for up to 4 half-funded Bursaries. Departments not willing to provide match-funding will only be able to receive funding for up to 2 Bursaries. Please bear in mind that this is a national scheme with a limited number of bursaries.
- **Mature students** are eligible to apply, but must not have a previous degree in any subject.
- Students will normally be expected to be on track for a first class degree in order to be considered.
- Students must be registered at a **UK institution** for the majority of their undergraduate degree.
- Supervisors and students do not necessarily have to be based at the same institution, however we expect that they will work together at the same institution for the duration of the project and have regular meaningful personal contact.
- Bursaries will not be awarded for projects that are a **part of degree work**, or that take place overseas for more than 50% of the project time.
- Bursaries will only be granted for the student named on the application form; awards are not transferable between students.

How to apply
- Application Forms can be downloaded from the Society's website: www.lms.ac.uk/content/grants.
- Applications must be made by the project supervisor on behalf of the student, and not by the student.
- Applications should be discussed with the nominated student, who should also contribute to the project design.
- Applications should include the student's academic record and a supporting statement from his/her academic tutor.
- Applications must be signed by the Head of Department to confirm his/her approval for the award to be administered by the department *(awards are not offered directly to individual researchers but to the institutions to which they belong)*.

Further information including the Guidelines on How to Apply are available from the Society website: www. lms.ac.uk/content/grants. Queries may also be addressed to Katy Henderson (urb@lms.ac.uk).

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LMS UNDERGRADUATE SUMMER SCHOOL 2016

As part of its role in sustaining the mathematical community, the London Mathematical Society has introduced Undergraduate Summer Schools. The aim is to introduce modern mathematics to the best UK Mathematics undergraduates, who are not in their final year of study, and to make them think seriously about an academic career. The inaugural summer school at Loughborough in 2015 was considered to be a success and we are now pleased to invite nominations for the LMS Summer School 2016. The School will be held between 10 and 22 July 2016 at the University of Kent.

The Summer School will be a combination of short lecture courses with problem solving sessions and colloquium style talks from a range of leading mathematicians.

The school will be limited to 50 undergraduate participants. Participants will be students on mathematics programmes, not in their final year of study. The final selection of participants will be made by the Local Organising Committee on the recommendation of the Head of Department and/or LMS representative.

Students from 30 institutions attended the inaugural summer school (see report below) and we hope that as many institutions as possible will make nominations for 2016.

Nominations should be received by **18 December 2015** and should be sent to lmssummerschool@lms.ac.uk. Institutions are asked to send their nominations in a single batch with a cover letter that ranks their nominees. Further information and forms are available at www.lms.ac.uk/events/lms-summer-schools.

Report of the Inaugural Summer School 2015

In order to celebrate their 150 anniversary, the London Mathematical Society has started a series of undergraduate summer schools to give students a taste of mathematical research in upcoming fields. The first was held in July earlier this year at Loughborough University for two weeks, accommodating up to 50 students. Undergraduates from around the country not in their final year of study were invited to apply through their university.

The study programme comprised lectures, exercise classes and colloquium talks. The lectures were structured into eight separate courses, each taught by lecturers invited from top universities across the UK. They covered a wide variety of different subjects: fluid dynamics; mathematical biology; algebra; and geometry. Exercise classes spread throughout each course gave participants the chance to apply and consolidate their newfound knowledge to a set of problems and questions.

In our experience at the LMS Summer School, although the topics appeared to be seemingly unrelated, there turned out to be many common themes that linked the courses together. This was very helpful because the added familiarity gained in an earlier course made it easier to comprehend the later courses. Complex analysis was one such link, arising in the context of the fluid dynamics course by Darren Crowdy (Imperial College) and the material on continued fractions and hyperbolic geometry by Caroline Series (University of Warwick). Another was the platonic solids, which first arose in the lectures by Reidun Twarock (University of York) on groups and virology, and then again in the purely algebraic talk on quivers by Gwyn Bellamy (University of Glasgow). The links helped reinforce the connectedness of mathematics and was one of the many successes of the course.

Each day concluded with a colloquium talk. The aim of these talks was to provide a general overview without getting into the details. Subjects varied widely, from origami paper folding (geometry) by Tadashi Tokieda (University of Cambridge)

to a discussion of *What is Research in Mathematics* by Sir Timothy Gowers (University of Cambridge).

Accommodation for the fortnight was provided by Loughborough University. The campus is large with great sports facilities, including tennis courts, football pitches and even a gym for those keen mathematicians. The food was excellent – three full meals each day which were very welcome after the demanding lectures!

There was a midweek evening trip to Bradgate Park Trust, where we were given a tour by Alexander Veselov (University of Loughborough), one of the organisers of the Summer School. Over the weekend there were also two excursions. On Saturday we visited Lincoln followed by Woolshorpe Manor, the birthplace of Sir Isaac Newton. On Sunday we visited Chatsworth House in Derbyshire; luckily the house is very large because it rained all day and most people stayed inside!

Mai Bui, Jeff Leung and John Scott
University College, London

Editor's note: Two further reports of this Summer School appeared in the November edition of the *LMS Newsletter*

RECORDS OF PROCEEDINGS AT LMS MEETINGS
ORDINARY MEETING

held on *18 September 2015* at the University of Birmingham as a joint Meeting with the European Mathematical Society (EMS). The meeting formed part of the Joint Anniversary Mathematical Weekend (from 18-20 September 2015) to mark 150 years of London Mathematical Society and 25 years of the European Mathematical Society. Over 90 members and visitors were present for all or part of the meeting.

The meeting began at 1.00 pm with the Society's President, Professor Terry Lyons FRS, and the EMS President, Professor Pavel Exner, sharing the Chair.

Professor Lyons signed the Records of Proceedings of the two previous Society Meetings in July 2015.

No members were elected to Membership.

No members signed the book and were admitted to the Society.

Professor Lyons then handed over to the President of the EMS, Professor Exner, who talked about the history of the tradition of Joint Mathematical Weekends and about the activities of the EMS, including the EMS prizes which would next be awarded at the 7ECM in Berlin in 2016.

Professor Exner then handed over to Professor Andrew Schofield, the Pro-Vice Chancellor and Head of the College of Engineering and Physical Sciences at Birmingham, who welcomed delegates to the University of Birmingham.

Professor Schofield then handed over to Daniela Kühn who introduced a lecture given by Professor Noga Alon titled *Graphs, Vectors and Integers*.

Later that evening, a reception was held at The Bridge Study Room.

The conference dinner was held on Saturday 19 September at Staff House. After dinner speeches and votes of thanks were given by the Head of the School of Mathematics at Birmingham, Professor Paul Flavell, the LMS President and the EMS President.

The Joint Anniversary Mathematical Weekend closed on Sunday 20 September.

LONDON
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LMS 150th Anniversary
LMS Invited Lecturer 2016

Professor Edgar Knobloch (UC Berkeley)
Dynamics, Patterns and Spatially Localised Structures

21-25 March 2016
Loughborough University, Department of Mathematical Sciences

In a series of 10 lectures Professor Knobloch will describe and illustrate recent progress in understanding the origin and properties of spatially localised structures formed in dissipative, pattern-forming systems such as the Swift-Hohenberg equation. He will provide a mathematical and a physical explanation of homoclinic snaking of stationary states and related results for spatially localised temporal oscillations. He will use the theory to develop an understanding of similar phenomena observed in fluid dynamics, reaction-diffusion systems and nonlinear optics.

There will also be supplementary lectures by:

Daniele Avitabile (Nottingham), *Numerical computation of coherent structures in spatially-extended systems*
Claude Baesens (Warwick), *Bifurcations of flows on the two-torus*
Thomas Bartsch (Loughborough), *Introduction to transition state theory*
Anatoly Neishtadt (Loughborough), *Slow-fast dynamical systems*
Alastair Rucklidge (Leeds), *Introduction to pattern formation*
Uwe Thiele (Münster), *Dynamics of soft matter systems: evolution equations and the bifurcations of depinning transitions*

Participants are invited to contribute further lectures or posters.

University accommodation will be available. Also, limited financial support is available with preference given to UK research students. Please contact one of the organisers for further details: Thomas Bartsch (T.Bartsch@lboro.ac.uk), Andrew Archer (A.J.Archer@lboro.ac.uk) or Anatoly Neishtadt (A.Neishtadt@lboro.ac.uk). Deadline for funding: 19 February 2016

For further details on the 2016 Invited Lectures please visit www.lms.ac.uk/events/lectures/forthcoming-lms-invited-lecturer and www.lboro.ac.uk/lms-2016

1865 - 2015

LMS INVITED LECTURE SERIES 2017
CALL FOR PROPOSALS

Proposals for the Invited Lecture Series 2017 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 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 an annual Invited Lectures series should:
- include meetings at which a single speaker gives a course of about ten expository lectures, examining some subject in depth;
- be held over a five day period (Monday to Friday) during a University vacation;
- be residential and open to all interested.

A grant of up to £4,000 is available to the host department to support attendance at the lectures. In addition to full expenses, the lecturer is offered an honorarium of £1,250 for giving the course. It is intended that the texts of the lectures given in the series shall be published and an honorarium of £1,500 is also available upon receipt of lecture notes in a publishable form.

Enquiries about the Invited Lectures should be directed to the Programme Secretary at the Society (lmsmeetings@lms.ac.uk). The deadline for the submission of proposals is **5 February 2016**.

For more information about the scheme and how to submit a proposal, please visit: www.lms.ac.uk/events/lectures/invited-lecturer-proposals

The Invited Lecturer for 2016 is **Professor Edgar Knobloch** (UC Berkeley), who will visit Loughborough from 21-25 March 2016 to give a series of lectures on *Dynamics, Patterns and Spatially Localised Structures* (see opposite page).

Recent previous lecturers have been:

2015	M. Shapiro (Michigan State University)
	Cluster algebras and integrable systems
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

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LMS GRANT SCHEMES 2016

Please note that the deadline for Research Grant Applications has been brought forward. Next Closing Date for Research Grant Applications: <u>22 January 2016</u>.

Applications are invited for the following grants:

Conferences (Scheme 1)
Grants of **up to £7,000** are available to provide partial support for conferences held in the United Kingdom. This includes a maximum of £4,000 for principal speakers, £2,000 to support the attendance of research students who are studying at universities in the UK, and £1,000 to support the attendance of participants from Scheme 5 or former Soviet Union countries.

Celebrating new appointments (Scheme 1)
Grants of **up to £600** are available to provide partial support for meetings held in the United Kingdom to celebrate the new appointment of a lecturer at a UK university.

Postgraduate Research Conferences (Scheme 8)
Grants of **up to £4,000** are available to provide partial support for conferences held in the United Kingdom, which are organised by and are for postgraduate research students.

Visits to the UK (Scheme 2)
Grants of **up to £1,500** are available to provide partial support for a visitor to the UK, who will give lectures in at least three separate institutions. Awards are made to the host towards the travel, accommodation and subsistence costs of the visitor.

Research in Pairs (Scheme 4)
Grants of **up to £1,200** are available to support a visit for collaborative research either by the grant holder to another institution abroad, or by a named mathematician from abroad to the home base of the grant holder. Grants of up to £600 are available to support a visit for collaborative research either by the grant holder to another institution within the UK, or by a named mathematician from within the UK to the home base of the grant holder.

International Short Visits (Scheme 5)
Grants of **up to £3,000** are available to support a visit for collaborative research 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. Grants of **up to £2,000** are available to support a visit for collaborative research by the grant holder to a country in Africa (or countries where mathematics is in a similar position).

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

- Applications received by **22 January 2016** 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 Administrator (see below) who will be pleased to discuss proposals informally with potential applicants and give advice on the submission of an application.

Grants Administrators: Anthony Byrne, 0207 927 0807, email: grants@lms.ac.uk.

LMS GRANT SCHEMES: 2014–2015 AWARDS

The Society is pleased to report that in 2014-15 the Programme Committee awarded a total of £89,324.07 for the following research visits:

Scheme 2: Visitors to the UK

Visitor	From	Three Institutions where lectures are given	Applicant	Grant
A. Maestirpieri	Institute Argentino de Matematica (Argentina)	Newcastle, Leeds, Lancaster	M. Dritschel	£1,400.00
C. Manolescu	UCLA (USA)	Oxford, Cambridge, Edinburgh, Glasgow	A. Ranicki	£1,310.00
D. Banks	Duke University (USA)	Cambridge, Durham, Imperial	F. Coolen	£1,500.00
K. Dajani	Utrecht University (The Netherlands)	Warwick, York, Manchester	C. Walkden	£1,280.00
E. Liflyand	Bar-Ilan University (Israel)	Imperial, Bath, Leeds	M. Ruzhansky	£1,480.00
N. Gantert	Technische Universitat München (Germany)	Bath, Bristol, UCL	N. Sidorova	£1,120.00
P. Will	Fourier Institut (France)	Durham, York, Liverpool	J. Parker	£875.00
A. Vaintrob	University of Oregon (USA)	Edinburgh, QMUL, Sheffield, Manchester	J. Figueroa-O'Farrill	£1,500.00
P. Chatzipantelidis	University of Crete (Greece)	Leicester, Reading, Sussex	A. Cangiani	£1,450.00
P. Secchi	University of Brescia (Italy)	Surrey, Oxford, Imperial	B. Cheng	£1,500.00
A. Helemskii	Moscow State University (Russia)	Lancaster, Newcastle, Leeds	H. G. Dales	£1,250.00
M. Fragoulopoulou	Athens (Greece)	Lancaster, Newcastle, Leeds	H. G. Dales	£1,170.00
S. Srivastava	Delhi (India)	Newcastle; Lancaster; Leeds; Oxford	C. Batty	£1,500.00
D. E. Pelinovsky	McMaster (Canada)	UCL; Reading; Bath	E. R. Johnson	£1,500.00
I. Farah	York, Toronto (Canada)	Aberdeen; Glasgow; Lancaster	A. Tikuisis	£1,150.00
A. Katavolos	Athens (Greece)	Lancaster; Newcastle; QUB	E. Kakariadis	£1,500.00
E. Shemyakova	State University of New York (USA)	Manchester; Glasgow; Loughborough	T. Voronov	£1,490.00
M. Yakimov	Louisiana State University (USA)	Newcastle; Edinburgh; Leeds	P. Jorgensen	£1,418.10
N. Saveliev	University of Miami (USA)	Kings College London; Loughborough; Reading	D. Vassiliev	£1,500.00
Y. Stepanyants	University of Southern Queensland (Australia)	Loughborough; UCL; Keele	K. Khusnutdinova	£1,500.00
Y. Hou	Princeton (USA)	Southampton; Warwick; Oxford	J. W. Anderson	£1,500.00

Scheme 4: Research in Pairs

Applicant	Institution	Collaborator	Institution	Grant
J. Deane	Surrey	G. Gentile	Università Roma Tre (Italy)	£900.00
M. Nazarov	York	N. Jing	North Carolina State (USA)	£1,200.00
E. Hunsicker	Loughborough	M. Banagl	University of Heidelberg (Germany)	£760.00

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Applicant	Institution	Collaborator	Institution	Grant
R. Evans	Oxford	V. Didelez	Bristol	£580.00
C. Young	Hertfordshire	E. Mukhin	Indiana (USA)	£1,200.00
M. Wildon	Royal Holloway University of London	K. J. Lim	Nanyang Technological University (Singapore)	£868.97
B. Lemmens	Kent	B. Lins	Hampden-Sydney College (USA)	£1,000.00
S. Sangwine	Essex	E. Hitzer	International Christian University, Tokyo (Japan)	£1,200.00
M. G. Blyth	University of East Anglia	N. Aksel	University of Bayreuth (Germany)	£840.00
M. Pfeiffer	St Andrews	A. Cain	Universidade Nova de Lisboa (Portugal)	£1,000.00
E. Kakariadis	Newcastle	O. M. Shalit	Technion - Israel Institute of Technology (Israel)	£1,120.00
H. G. Dales	Lancaster	A. T-M Lau	University of Alberta (Canada)	£660.00
D. Proment	University of East Anglia	W.T.M. Irvine	University of Chicago (USA)	£1,150.00
O. Maleva	Birmingham	M. Dymond	University of Innsbruck (Austria)	£705.00
A. Mikhailov	Leeds	Y. Kodama	Ohio State University (USA)	£1,200.00
G. Williams	Open University	T. S. Holm	Cornell University (USA)	£885.00
J. P. Wang	Kent	V. Novikov	Loughborough University	£600.00
B. Noohi	QMUL	K. Kaveh	University of Pittsburgh (USA)	£1,140.00
C. Iliopoulos	King's College London	L. Brankovic	Newcastle, New South Wales (Australia)	£1,200.00
N. F. Smyth	Edinburgh	G. El	Loughborough	£540.00
J. Fraser	Manchester	T. Kempton	St Andrews	£600.00
G. Bianconi	QMUL	N. Dorogovstev	Aveiro (Portugal)	£1,120.00
E. Kakariadis	Newcastle	E. G. Katsoulis	East Carolina (USA)	£1,200.00
A. Popov	Newcastle	P. Tradacete	Carlos III de Madrid (Spain)	£990.00
L. Lacasa	QMUL	J. Gómez-Gardeńes	Zaragoza (Spain)	£1,200.00
Z. Lian	Loughborough	P. Liu; K. Lu	Peking (China); Brigham Young (USA)	£850.00
D. Breit	Heriot-Watt	L. Diening	LMU Munich (Germany)	£720.00
I. Tomasic	QMUL	M. Wibmer	RWTH Aachen (Germany)	£700.00
Z. A. Lykova	Newcastle	J. Agler	University of California, San Diego (UCSD)	£1,200.00
M. Wolf	Surrey	B. Jurco	Charles University (Prague)	£1,020.00
J. McInroy	Bristol	S. Sidki; S. Shpectorov	Universidade de Brasilia (Brazil); Birmingham	£1,200.00
D. Pauksztello	Manchester	N. Broomhead; D. Ploog	Leibniz (Hanover); Bonn (Germany)	£1,200.00
G. El	Loughborough	A. Tovbis	University of Central Florida (USA)	£1,200.00
A. Kasprzyk	Imperial College London	K. Tveiten	Stockholm (Sweden)	£715.00
S. Foss	Heriot-Watt	A. Sakhanenko	Novosibirsk (Russia)	£1,200.00

Applicant	Institution	Collaborator	Institution	Grant
P. Date	Brunel	L. Mihaylova	Sheffield	£540.00
C. Christopher	Plymouth	A. Buica	Babes-Bolyai University (Romania)	£730.00
D. M. J. Calderbank	Bath	E. Legendre	Institut de Mathematiques de Toulouse (France)	£1,000.00
Y. Bazlov	Manchester	A. Berenstein	Oregon (USA)	£1,200.00
P. Clarkson	Kent	K. Jordaan	Pretoria (South Africa)	£1,200.00
M. Farber	QMUL	G. Panina	St. Petersburg Institute (Russian Academy of Sciences) (Russia)	£1,170.00
E. Kakariadis	Newcastle	G. Eleftherakis	University of Patras (Greece)	£1,160.00
W. Bahsoun	Loughborough	C. Bose	University of Victoria (Canada)	£1,080.00
R. J. Boys	Newcastle	S. Beecham; A. Metcalfe	University of South Australia; University of Adelaide (Australia)	£1,200.00
E. V. Ferapontov	Loughborough	R. Vitolo	University of Salento (Italy)	£970.00
Z. Wang	Bath	D. Tseluiko	Loughborough	£600.00
R. Baker	Oxford	M. Simpson	Queensland University of Technology (Australia)	£1,200.00
C. J. Fewster	York	L. H. Ford	Tufts University (USA)	£1,200.00
S. J. Hall	Buckingham	W. Batat	Ecole Nationale Polytechnique d'Oran (Algeria)	£1,128.00
Y. F. Lin	Queen's University Belfast	J. Ludwig	Universite de Lorraine (France)	£1,140.00
M. Cerasuolo	Portsmouth	B. Buonomo	University of Naples Federico II (Italy)	£630.00
Y. Netrusov	Bristol	D. Edmunds	Sussex	£600.00
C. Yates	Bath	R. Mort	Edinburgh	£550.00
J. Bray	QMUL	C. M. Roney-Dougal	St Andrews	£600.00
E. Crooks	Swansea	D. Hillhorst	CNRS and Universite Paris-Sud (France)	£570.00
V. Gould	York	D. Yang	Xidian University (China)	£1,200.00
N. Diamantis	Nottingham	F. Brunault	Ecole Normale Supérieure de Lyon (France)	£390.00
M. Hunt	Bath	J. He	Ningbo University (China); Cambridge	£430.00

Scheme 5: International Short Visits

Visitor	Institution	To Visit	Applicant	Grant
O. Prianychnykova	Donetsk National Technical University	Liverpool	I. Potapov	£2,700.00
M. Rahman	BUET, Bangladesh	King's College London	M. Crochemore	£3,000.00
T. T. Le	North West University (Mafikeng)	Birmingham	K. Magaard	£1,450.00

Applicant	Applicant's Institution	To Visit		Grant
R. Halburd	UCL	Khemarak University (Cambodia)		£1,400.00
O. M. Pamen	Liverpool	University of Doula (Cameroon)		£1,900.00
I. Moffatt	Royal Holloway University of London	University of the Witwatersrand (South Africa)		£2,000.00
D. Sirl	Nottingham	Universite de Ziguinchor (Senegal)		£779.00

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LMS 150th Anniversary
LMS Book of Presidents

The London Mathematical Society was established during the energetic and confident heyday of Victorian Britain. With over eighty photographs of previous presidents and De Morgan Medal winners, *The Book of Presidents 1865-1965* looks at the first 100 years of the Society's existence. As the book traces the Society's evolution through its Presidents and De Morgan Medallists, we learn which branches of mathematics were in vogue at any particular time, and come to appreciate the Society's rich history.

"This lovely little book is one of the best the London Mathematical Society has published… This is a book that can – and should – both be read from cover to cover and dipped into… Dipping into it randomly one sees some of the quirks and oddities that make an important institution human"

Peter M Neumann, Queen's College Oxford.

The Book of Presidents 1865-1965 is available from the London Mathematical Society.

- LMS Members' price is £15.
- Full price is £19.

Christmas Offer: Free P&P (Normally Europe £3. Rest of the World £5)

To order a copy; please email membership@lms.ac.uk or download an order form from the LMS website: http://www.lms.ac.uk/sites/lms.ac.uk/files/About_Us/history/BoP_book_order_form.pdf

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LMS 150th Anniversary

LMS South West and South Wales Regional Meeting and Workshop
Aspects of Homotopy Theory

14 December 2015
School of Mathematics, University of Southampton

1:00	Registration
1:30-2:30	**Ralph Cohen (Stanford University)**
	Topological Field Theories and How to Compare Them
2:30-3:00	Tea/coffee break
3:00-4:00	**Jie Wu (National University of Singapore)**
	Combinatorial Approaches to Homotopy Theory
4:00-4:30	Tea/coffee break
4:30-5:30	**Ian Leary (University of Southampton)**
	Uncountably Many Groups of Type FP
6:00	Wine reception

Workshop Speakers (15-17 December):

- Alexander Berglund (Stockholm University)
- Piotr Beben (University of Southampton)
- Natalia Castellana (Universitat Autònoma de Barcelona)
- Alexander Gaifullin (Steklov Mathematical Institute, Moscow)
- John Greenlees (University of Sheffield)
- Brendan Owens (University of Glasgow)
- Nansen Petrosyan (University of Southampton)
- Oscar Randal-Williams (University of Cambridge)
- Svjetlana Terzic (University of Montenegro, Podgorica)
- Sarah Whitehouse (University of Sheffield)

More information is available at www.personal.soton.ac.uk/jg1u11/LMSregional.html

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CHALKDUST LAUNCH PARTY

There is always a sense of anticipation in the air at the beginning of a new academic year in the University College London Mathematics Department. Freshers wander bemusedly through the corridors, new PhD students stare in alarm at the pile of freshly printed research papers on their desk, and returning staff hurriedly try to finish the latest addition to their own pile of papers before the inevitable overload of teaching takes over for the term. However, this year saw an exciting new fixture in the first-week schedule, as maths magazine *Chalkdust* launched its second issue.

Keen to build on the success of the inaugural issue in March, we had taken delivery of 1,500 pristine copies of our new magazine, with its striking cover depicting the Fermat point as painted by Suman Vaze. On the afternoon of Tuesday 6 October 2015, a hundred of these shiny new magazines lay arranged artistically on a table in the departmental common room, along with a generous selection of nibbles, a mathematically-themed tombola (primes win prizes!), and a dozen members of the *Chalkdust* team bedecked in our new *Chalkdust* t-shirts. At precisely 3:07 pm, the doors were opened and the aforementioned staff and students of the UCL Mathematics Department streamed in, along with invited guests and interested friends. The pile of magazines (as well as the nibbles) swiftly diminished; some guests launched without delay into the infamous Crossnumber puzzle, while others began with the exclusive interview with 2014 Fields medallist Artur Avila, or brushed up on their algebra with Robert Smith?'s engaging article about the Jacobian matrix. For the Chalkdust team, witnessing the packed room devouring fascinating mathematics and sausage rolls in equal measure, it felt that a summer of hard work had finally paid off.

Particularly welcome was Professor David Colquhoun, whose article *The Perils of p-values* is featured in the magazine, as well as Lauren Sexton from G Research and Katherine Wright from the London Mathematical Society, without whose generous sponsorship the magazine could not exist. By the end of the afternoon, they had been joined by over 150 curious mathematically-minded souls, and a thoroughly enjoyable time had been had by all. Since then, many of the remaining 1,400 copies have been distributed to schools, universities and pub-based maths clubs (yes, really!) up and down the country, and for the *Chalkdust* team, preparation for Issue 3 is well underway.

Chalkdust is available for free online at www.chalkdustmagazine.com, where you can also request paper copies of the magazine for your institution, and read our weekly blog. Issue 3 will be published in Spring 2016.

Samuel Brown
Chalkdust Creative Director

Committee for Women in Mathematics

The International Mathematical Union Committee for Women in Mathematics (CWM) was created by the IMU Executive in March 2015. CWM has a website www.mathunion.org/cwm/ whose purpose is to provide an internationally based resource for women mathematicians.

During its first meeting from 4 to 5 September 2015, reports of activities for women in mathematics from the various parts of the world were presented. In the last two years, women in mathematics have come together to launch meetings and networks in many countries. Helping to establish and supporting such networks at the continental or subcontinental level especially in Asia, Latin America and Africa is CWM's most important goal from now until ICM Rio 2018 and its budget will be used mainly for this purpose.

CWM is inviting proposals for funding of up to €3,000 for initiatives aimed at establishing networks for women in mathematics. For more details see below. CWM also plans to organize a pre-ICM 2018 event: *(WM)²* - World Meeting for Women in Mathematics.

Besides other resources, the CWM website contains information about many national and international organisations and events for female mathematicians. CWM welcomes further information suitable for inclusion on the website which should be sent to info-for-cwm@mathunion.org

As the only international Committee for Women in Mathematics, we believe CWM has a vital role to play and we are grateful to the IMU for giving us this platform and support.

Marie-Françoise Roy, CWM Chair
Caroline Series, CWM Vice-Chair

CWM funding call for 2016

The IMU's Committee for Women in Mathematics invites proposals for funding of up to €3,000 for activities or initiatives taking place in 2016, and aimed at establishing or supporting networks for women in mathematics, preferably at the continental or regional level, and with priority given to networks and individuals in developing or emerging countries. CWM's help could include, for example, funding meetings, travel for individuals for consultation purposes, or advice and support in creating websites. Other ideas for researching and/or addressing problems encountered by women in mathematics may also be considered.

Proposers should write a short account (no more than two pages) explaining the nature of their activity and how it fulfills the above aims, as well as indications on how CWM money would be spent and other funding which may be available. There will be one call for applications regarding activities in 2016 with deadline of **15 January 2016**. It is anticipated that further calls will be made in subsequent years.

Applications should be sent to info-for-cwm@mathunion.org

Successful applications will be informed no later than **29 February 2016**. Depending on demand, successful applications may not be funded in full. Successful applicants will be asked to send before the end of 2016 a short report of the activity with details of how the budget was spent.

EUROPEAN NEWS

The following items are from the EMS webpage www.euro-math-soc.eu/news.

Nordic Congress of Mathematicians
The 27th Nordic Congress of Mathematicians takes place in Stockholm in the week 16 to 20 March 2016 on the occasion of the 100th anniversary of Institut Mittag-Leffler. The first day of the Congress will be devoted to the history of the Institute, followed by scientific talks on 17 to 20 March. One of the plenary speakers is Sara van de Geer (Zürich) whose lecture is sponsored jointly by the Bernoulli Society and the EMS (see www.mittag-leffler.se/congress-2016).

Bernoulli Center - call for proposals
The Bernoulli Center (CIB) in Lausanne invites you to propose a one-semester programme in any branch of the mathematical sciences. Such a programme will benefit from the resources and funding of CIB, allowing for long-term and short-term visitors, conferences, seminars, workshops, lecture series or summer schools. You, together with one or more colleagues, could be the scientific organiser of such a semester and rely on the dedicated staff of CIB to prepare and run the programme. We invite you to submit a two-page letter of intent by 5 January 2016. This submission should outline the programme and indicate already the key participants that are envisioned. Write to the CIB director Nicolas Monod at cib.director@epfl.ch. There is no requirement to include an EPFL-affiliated organiser (see http://cib.epfl.ch/CallForProposal.php).

Bernoulli Brainstorm
The Bernoulli Center (CIB) is now inviting applications for its new *Bernoulli Brainstorm* scheme. The CIB supports small groups of researchers (two to four participants) who want to find ideal research conditions for a short, intensive time. This is the opportunity to finally finish a difficult paper, or to start a new collaboration, or to take a good shot at a hard problem. You will be removed from the duties of your home affiliation and insulated from the intellectual distractions of a wider confer-

ence schedule. We cover travel and local costs from a few days up to two weeks (or more in special cases). This is an open call: submit your application any time by email to the CIB director Nicolas Monod at cib.director@epfl.ch with CVs and a short but precise research proposal (one page). The CIB will select a small number of proposals; the whole procedure will be fast and flexible with regard to dates. This scheme is specifically designed for teams not affiliated with EPFL (see: http://cib.epfl.ch/BernoulliBrainstorm.php).

Heidelberg Laureate Forum
Young computer scientists and mathematicians from all over the world can apply for one of the 200 coveted spots to participate in the *4th Heidelberg Laureate Forum* (HLF). For one week, the recipients of the Abel Prize, the ACM A.M. Turing Award, the Fields Medal, and the Nevanlinna Prize engage in a cross-generational scientific dialogue with young researchers in Heidelberg, Germany. The application period for the 4th HLF runs from 1 November 2015 until 3 February 2016. The 4th HLF will take place from 18 to 23 September 2016 (see www.heidelberg-laureate-forum.org).

HORIZON 2020
The latest H2020 biannual Work Programme (2016-2017) was adopted and is now available via the H2020 participant portal. It outlines the calls and funding opportunities available over the next two years, and offers a total budget of almost €16 billion. Of particular interest: are the *FET-Open* and the *Marie Skłodowska-Curie* actions under 'Excellent science' and the *Widespread calls*. For further information visit the website at http://tinyurl.com/nfhcdqf.

Caucasian Mathematics Conference
The *Second Caucasian Mathematics Conference* (CMC II) will be organized in Van, Turkey on 25 and 26 August 2016 under the auspices of the European Mathematical Society and the cooperation of the Armenian, Azerbaijan, Georgian, Iranian, Russian and Turkish Math-

ematical Societies. The scope of the Caucasian Mathematical Conferences is to bring together mathematicians from Caucasian and neighbouring countries bi-annually in one of these countries. The CMC is partially supported by the EMS and is welcoming mathematicians from all over the world (see http://euro-math-soc.eu/cmc/).

David Chillingworth
LMS/EMS Correspondent

THAT IS ALL YOU NEED TO KNOW
New Diorama Theatre, Euston; 15-19 December 2015

The show began in 2012 when the theatre company *Idle Motion* was inspired to put the life of visionary Alan Turing on stage. Research quickly led them to Bletchley Park where they learnt that the exceptional effort that went into breaking the Enigma code was much larger than one man's genius. What was particularly inspiring, in the modern world where people broadcast their lives at the click of a button, was that the 10,000 people who worked there kept it a secret for 30 years. Having signed the Official Secrets Act they were unable to tell their friends, their family - even each other - about the crucial work that they were doing.

Idle Motion, having met at a school in Oxford, are fast gaining a reputation internationally for producing poignant, innovative and visually arresting contemporary theatre setting physical elements against imaginative staging and multimedia backdrops. The company worked closely with Bletchley Park throughout the process and was fortunate to be granted exclusive access to their archives interviews with veterans talking about their time at the Park.

This is the last chance to catch the show on a UK stage and experience the Bletchley Park that Cumberbatch didn't show you; the genius of Gordon Welchman, the hidden heroism of the thousands of women who worked there and the story of how close it came to becoming luxury commuter flats in the 1990s if it weren't for a local group of passionately determined volunteers.

That is All You Need to Know is a celebration of humanity's ability to solve the impossible, to crack the most complex of problems, and of the extraordinary people whose quiet work changed the course of our history.

Check out the trailer here - www.youtube.com/watch?v=IMcpp1Dw_fY and to book tickets visit www.idlemotion.co.uk.

Grace Chapman
Co-Artistic Director, Idle Motion

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2016 LOUIS BACHELIER PRIZE – CALL FOR NOMINATIONS

The Louis Bachelier Prize is a biennial prize jointly awarded by the London Mathematical Society (LMS), the Natixis Foundation for Quantitative Research and the Société de Mathématiques Appliquées et Industrielles (SMAI). The Prize will be awarded to a mathematician who, on the 1st January of the year of its award, has *fewer than 20 years* (full time equivalent) of involvement in mathematics at postdoctoral level, allowing for breaks in continuity, or who in the opinion of the Bachelier Prize Committee is at an equivalent stage in their career.

The Prize will be awarded to the winner for his/her exceptional contribution to mathematical modelling in finance, insurance, risk management and/or scientific computing applied to finance and insurance.

Nominations are now open for the 2016 Louis Bachelier prize. A form for making nominations is available to download at https://www.lms.ac.uk/prizes/louisbachelierprize.

The closing date is 31ˢᵗ January 2016.

The prize-winner will have a list of outstanding publications in top quality academic journals in the areas of quantitative finance, risk management, or computational methods in finance and be recognised by his/her peers in academia and the industry for his/her exceptional contribution to mathematical modelling in finance. Nominees must be permanent residents in Europe (in the geographical sense).

The prize winner will receive €20,000 including £5,000 to organise a scientific workshop in Europe on their area of research interests.

The Louis Bachelier Prize, initially "Prix NATIXIS–SMAI", was instituted in 2007 by the NATIXIS Foundation for Quantitative Research and the Société de Mathématiques Appliquées et Industrielles.

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LMS PRIZES 2016
CALL FOR NOMINATIONS

The London Mathematical Society welcomes nominations for the 2016 prizes, to recognise and celebrate achievements in and contributions to mathematics.

In 2016, the LMS Council expects to award:

De Morgan Medal
The Society's premier award; the only grounds for the award of the Medal are the candidate's contributions to mathematics.

Fröhlich Prize
Awarded for original and extremely innovative work in any branch of mathematics.

Senior Berwick Prize
Awarded in recognition of an outstanding piece of mathematical research actually published by the Society during the eight years ending on 31 December 2015.

Whitehead Prizes
Awarded for work in and influence on mathematics.

Anne Bennett Prize
Awarded for work in and influence on mathematics, particularly acting as an inspiration for women mathematicians.

For further information and nomination forms, please visit the LMS website (www.lms.ac.uk/content/nominations-lms-prizes) or contact Duncan Turton, Secretary to the Prizes Committee at the Society (tel: 020 7927 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.

Closing date for nominations:
Monday 25 January 2016

Institute of
mathematics
& its applications

LONDON
MATHEMATICAL
SOCIETY
150 YEARS

CHRISTOPHER ZEEMAN MEDAL 2016
CALL FOR NOMINATIONS

The Councils of the LMS and the IMA are delighted to invite nominations for the 2016 award of the Christopher Zeeman Medal, which is the UK award dedicated to recognising excellence in the communication of mathematics.

The IMA and the LMS wish to honour mathematicians who have excelled in promoting mathematics and engaging with the general public. They may be academic mathematicians based in universities, mathematics school teachers, industrial mathematicians, those working in the financial sector or indeed mathematicians from any number of other fields.

Most importantly, these mathematicians will have worked exceptionally to bring mathematics to a non-specialist audience, whether it is through giving public lectures, writing books, appearing on radio or television, organising events or through an entirely separate medium. The LMS and IMA want to celebrate the achievements of mathematicians who work to inspire others with their work.

The award is named after Professor Sir Christopher Zeeman, FRS, president of the LMS between 1986 and 1988. His notable career has been pioneering not only in the fields of topology and catastrophe theory but also because of his ground breaking work in bringing his beloved mathematics to the wider public. Sir Christopher was the first mathematician to be asked to deliver the Royal Institution Christmas Lectures in 1978, a full 160 years since they began. His Mathematics into Pictures lectures have been cited by many young UK mathematicians as their inspiration. In recognition of both his work as a mathematician and his contribution to the UK mathematics community, Sir Christopher received the LMS-IMA David Crighton Medal in 2006.

A form for nominations is available at www.ima.org.uk/zeeman2016nomination.html or from Alison Penry at: Institute of Mathematics and its Applications, Catherine Richards House, 16 Nelson Street, Southend-on-Sea, Essex, SS1 1EF; or email alison.penry@ima.org.uk.

Nominations must be received by **28 February 2016**.

YOUNG RESEARCHERS IN MATHEMATICS CONFERENCE

Report

The Young Researchers in Mathematics Conference 2015 was held at the Mathematical Institute, University of Oxford, in the Andrew Wiles Building from 17 to 20 August. This conference, now an established annual event, has grown to be the largest meeting of mathematics graduate students in the UK.

Born out of the 'Beyond Part III' meeting at the University of Cambridge, this conference now moves between institutions each year. It serves as an invaluable opportunity for PhD students to meet their peers from other universities. Over the four days there were so many talks given by students that in some sessions six parallel talks were held. Throughout the event 15 topic keynotes were delivered by established academics who gave their time to come and share their work with the delegates.

Sir Andrew Wiles FRS opened the conference, welcoming the 180 delegates to Oxford and the Mathematical Institute. The proceedings then began with two keynotes followed by student talks in the afternoon. The first evening then saw a wine reception and poster competition, judged by a group of the keynote speakers.

On the second evening, as part of the 150th celebrations of the LMS a public lecture was held. This began with an opening speech about the Society by current president Terry Lyons FRS, followed by a fantastic talk by Vicky Neale titled *7 things you need to know about prime numbers*. In the true spirit of a public lecture, it served as an accessible talk that was enjoyed by all attendees and provoked an interesting discussion about current paradigms in mathematics research. This served as a great celebration of the LMS in not only supporting research students, but also reaching out and sharing mathematics with the wider community. On the third evening a hugely popular plenary lecture was given by past president of the LMS Dame Frances Kirwan FRS.

One of the most interesting features of this conference series is how it's organised by a group of current PhD students. This year students from the University of Oxford and Oxford Brookes University came together to organise the event and in previous years similar such collaborations have been fostered to bring the conference to a specific location.

The conference has enjoyed such continued

Participants outside the Andrew Wiles Building

success thanks to the overwhelming support given by sponsors, speakers, institutions and attendees. The generous sponsorship of this conference aims to make this meeting an additional event that PhD students attend, alongside topic-specific conferences and more general meetings catering for academics at all stages of their careers. The LMS provided a bursary scheme that waived the registration fee of this conference to students who also attended the BMC/BAMC in Cambridge this year. This, along with the LMS Scheme 8 grant awarded, was crucial in the success of the conference. The YRM committee graciously thanks all the sponsors of this conference: the LMS, IMA, SIAM, Heilbronn Institute, Winton Capital, Santander Universities,

Vicky Neale

ThinkTank Maths, G-Research and Oxford University Press.

Next year the conference will be held at St Andrew's University from 1 to 4 August 2016.

Sam Kamperis
YRM Committee 2015

NORTH BRITISH FUNCTIONAL ANALYSIS SEMINAR
Report

A meeting of the *North British Functional Analysis Seminar* (NBFAS) was held at the University of Newcastle on Friday 9 and Saturday 10 October 2015. As the meeting (unfortunately) coincided with the Rugby World Cup, it was extremely hard to find reasonably priced accommodation in and around Newcastle upon Tyne; as a result the participation numbers were lower than usual. However, those who came enjoyed two highly interesting sets of two one-hour lectures by Professor John McCarthy (Washington University, St. Louis, USA) and Professor Anton

Baranov (Chebyshev Laboratory, St Petersburg University, Russia), both in the area of Operator Theory. Professor McCarthy spoke on *Non-commutative function theory and functional calculus* while Professor Baranov's talks had the title *Spectral theory of rank one perturbations of compact self-adjoint operators*.

NBFAS is partly supported by an LMS Scheme 3 grant which is gratefully acknowledged.

Dr Martin Mathieu
Queen's University Belfast,
NBFAS Secretary

Anton Baranov
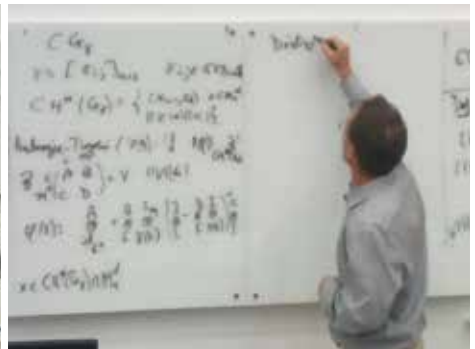
John McCarthy

CLASSIC AND STOCHASTIC GEOMETRIC MECHANICS

The UK-Japan Winter School on *Classic and Stochastic Geometric Mechanics* will take place from 4 to 7 January 2016 at Imperial College London. The school will feature guest lectures, short talks by students and the following three short courses:

- Zdzislaw Brzezniak (York)
  Stochastic geometric partial differential equations
- Tadahisa Funaki (Tokyo)
  Topics in stochastic partial differential equations
- Yoshihiro Shibata (Waseda)
  Two phase problems for viscous fluids

The school is organised by Martins Bruveris, Darryl Holm, Tudor Ratiu and Hiroaki Yoshimura. Registration is by email to Martin Bruveris (martins.bruveris @brunel.ac.uk). There is no registration fee. Limited funding is available to support young UK-based researchers. For further information visit the website at www.brunel.ac.uk/~mastmmb/ukjapan16/. The school is supported by an LMS Conference grant.

SYMBOLIC DYNAMICS TO APPROXIMATION METHODS

The workshop *From Symbolic Dynamics to Approximation Methods* has as main interest to enhance the structure and the contents of the London Stringology Days & London Algorithmic Workshop (LSD & LAW) annual meetings organised at King's College London from 4 to 5 February 2016, and to further underline the importance of mathematical methodologies in algorithmic research. This one-day satellite workshop focuses on the space discretisation of general dynamic systems, a topic very close to massive data handling that increasingly becomes one of the most thought after problems issue of our current times. The meetings focus on exchanging latest research ideas, generating new collaborations, activating research and publishing papers that emerge out of talks and discussions at the workshop. A collection of papers originating from past LSD&LAW meetings are published in special issues of *Journal of Discrete Algorithms and Journal of Mathematics in Computer Science*.

Both meetings are open to everyone interested free of charge. The organisers expect that all participants of the main meeting also attend the satellite workshop. The addition of the satellite workshop is especially beneficial for PhD students in UK who work in the area of algorithms. It provides them access to the best examples of applying advanced mathematical methods in their research areas and to potential collaborations. The satellite workshop increases the interest in algorithmic research within the more general UK mathematics community by showing new potential application.

The conference is supported by an LMS Conference grant and by the Department of Informatics of King's College London. For more information visit the website www.inf.kcl.ac.uk/events/LSD&LAW16/.

SPECTRAL ANALYSIS

The sixth workshop on *Spectral Analysis with Matlab* will be held at Northumbria University, Newcastle upon Tyne from 14 to 16 December 2015. The workshop focuses principally on applications of spectral analysis techniques, such as wavelets and empirical mode decomposition, to time series from physiology and signal and image processing. It will adopt a hands-on approach by making use of a mixture of lectures and laboratory sessions and an introduction to Matlab will be provided on the first day. The speakers will include:

- Maia Angelova (Northumbria)
- Ruben Fossion (UNAM, Mexico)
- Natalia Janson (Loughborough)
- Richard Morton (Northumbria)
- Ana Leonor Rivera López (UNAM, Mexico)
- Valentina Zharkova (Northumbria)

Registration fees (regular £120, PGR £50) include handouts, lunches, refreshments and the usage of Matlab toolboxes.

For more information and registration, visit the website at http://group28.northumbria.ac.uk/Wavelets/ or contact the organisers Maia Angelova (maia.angelova@northumbria.ac.uk) or Benoit Huard (benoit.huard@northumbria.ac.uk).

ALGEBRAISATION AND GEOMETRISATION IN THE LANGLANDS PROGRAMME

Algebraisation and Geometrisation in the Langlands Programme is a conference to be held in Bristol from 29 March to 1 April 2016.

The theorems of the local Langlands programme relate complex representations of reductive groups over local fields, and complex representations of the absolute Galois group of the local fields. The two main topics can be couched in terms of changing the two types of fields involved. On the one hand, one might seek to change the coefficient field of the representations. The organisers will be particularly interested in the modular local Langlands programme, with representations over a field of positive characteristic. On the other, one can change the base field of the geometry and formulate the correspondence in a completely geometric language. This approach has some striking parallels with physics, particularly string theory. Both directions are increasingly interdisciplinary.

Further information, including confirmed speakers and registration, is available at www.bristol.ac.uk/maths/langlands2016. The organisers are Robert Kurinczuk and Tom Oliver (University of Bristol), email: langlandsbristol2016@gmail.com.

The conference is supported by HIMR and LMS conference grants. Financial support will be available for a number of UK based PhD students. There are a limited number of speaking opportunities for early career researchers, and PhD students are strongly encouraged to submit posters to be presented at the wine reception and displayed throughout the conference.

LANCASTER BANDITS

The *Multi-Armed Bandit Workshop* will take place from 11 to 12 January 2016 at the Department of Mathematics, Lancaster University. The multi-armed bandit problem is an interdisciplinary research topic originating in mathematics and statistics, and now studied extensively in operations research and computer science. The crux of the problem is to devise provably efficient methods to maximise the reward in a sequential decision-making scenario in which the rewards available for selecting different actions are not known in advance and must be discovered as the scenario unfolds. Current mathematical research in the area focuses on convex analysis, probability theory and asymptotic analysis. Applications of the problem include medical trials, website optimisation, communication networks and business and management.

The conference will bring international experts to Lancaster and allow UK researchers and research students to interact with research leaders of the field. Research students will have the opportunity to present their work in 20-minute talks and during poster sessions which will give them opportunity to gain feedback.

The meeting is supported by an LMS Conference grant and the STOR-i DTC, Lancaster. Further details can be found at http://tinyurl.com/nh9gun3.

EASTER PROBABILITY MEETING

The 2016 UK Easter Probability Meeting on *Random Structures Arising in Physics and Analysis* will take place from 4 to 8 April 2016 at Lancaster University. The UK Easter Probability Meeting is a long-standing tradition and is used to bring together the UK probability community. The aim is to discuss recent developments, to speak about future research and also to give PhD students an opportunity to become part of the UK probability community.

The meeting consists of four mini-courses of three lectures each, given by leading international researchers on current topics in probability theory. The remaining time is reserved

for 45-minute talks by invited speakers, shorter talks by PhD students, a poster session and time for discussions. The mini-course speakers and topics are:

- Alice Guionnet (MIT) *Random matrices, free probability and topological expansions*
- Michel Ledoux (Toulouse) *Concentration inequalities: basics and some new challenges*
- Jason Miller (Cambridge) *Quantum Loewner evolution*
- Vladas Sidoravicius (IMPA) *Three lectures on random walk in dynamically changing environments*

Detailed information about the meeting, including the invited speakers and how to register, is on the webpage at www.lancaster.ac.uk/maths/easter-probability-meeting/. Registration deadline is **29 February 2016**.

The meeting is supported by an LMS Conference grant. Due to the LMS grant there is funding for six UK-based PhD students to give short talks. See the website for details of how to apply. Enquiries can be emailed to probability@lancaster.ac.uk.

OBITUARIES

PROFESSOR BARRY COOPER, who was elected a member of the London Mathematical Society on 17 October 1974, died on 26 October 2015, aged 72.

DR JEAN DEWALLENS, who was elected a member of the London Mathematical Society on 18 March 1965, died on 28 September 2015, aged 76.

DR JOHN HUMPHREYS, who was elected a member of the London Mathematical Society on 20 June 1968, died on 13 October 2015, aged 73.

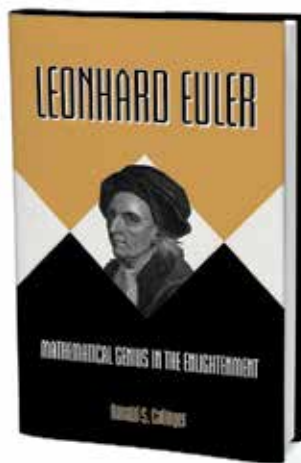**DR HAZEL PERFECT** who was elected a member of the London Mathematical Society on 19 March 1964, died on 8 July 2015, aged 88.

PROFESSOR KLAUS ROTH, FRS, FRSE, who was elected a member of the London Mathematical Society on 17 May 1951, died on 29 October 2015, aged 90. Professor Roth was awarded the De Morgan Medal in 1983.

In due course it is anticipated to publish their obituaries in the *LMS Newsletter.*

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ART IN THE LIFE OF MATHEMATICIANS edited by Anna Kepes Szemerédi, American Mathematical Society, 2015, pp 282, £40.50, US$49, ISBN 978-1-4704-1956-1.
Contributors: M.F. Atiyah, B. Bollobás, E. Bombieri, E. Frenkel, T. Gowers, A. Granville, J. Granville, I. Łaba, P.D. Lax, Y Manin, M Marcolli, A Naor, SJ Nelson, J. Nešetřil, A. Perl, M. Petříček, K.F. Roth, M. Spencer, B. Szegedy, C. Villani, V. Voevodsky.

According to the editor the book originates in her interest in knowing from mathematicians what art means to them. The result is a 284-page book consisting of 16 contributions from professional mathematics. Some are very famous such as Sir Michael Atiyah and some younger and less well known (yet?). Many are active artists (painters, photographers, musicians, actors, dancers) at a professional level besides being professional research mathematicians.

The contributors have interpreted the implications of the book's title in very varied and entirely different ways. Some give lengthy and detailed autobiographic accounts of the place of art in their life. Others discuss general aspects of the relationships between art and mathematics. Some see the relation as fundamental in the sense that both art and mathematics try to understand and describe the world through abstraction. Others see any similarity as more restricted, e.g. Peter Lax finds painting and mathematics to be closely related, but thinks that music and mathematics are quite different because music exists in time while mathematics is independent of time. It is entertaining to learn that Timothy Gowers when young was more interested in becoming a musician and composer than a mathematician. It is also refreshing to learn that several professional research mathematicians and theoretical physicists are active artists. I find most interesting the contributions that speculate about the specific ways art and mathematics are related. I feel the book might have gained from slightly more focus. The contributions that do not address the relation between art and mathematics are entertaining, but somewhat in the same way as they would have been if the authors had told us about their interest in, say, football. These essays do not reveal much about how the mathematician's way of thinking and grasping the world compares with the artist's engagement with same world.

I found the joint contribution *The Fragility of Beauty in Mathematics and in Art* by Enrico Bombieri and Sarah Jones Nelson bold and fascinating because they have decided to try to address an obvious, though still mysterious, parallel between art and mathematics. All mathematicians will be able to tell us about proofs and
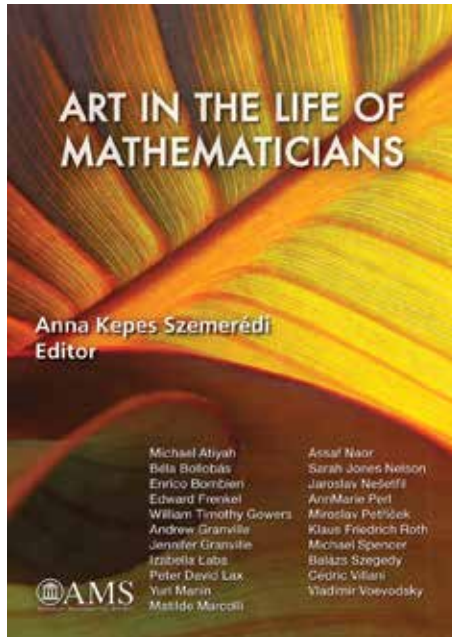
mathematical connections they find particularly beautiful. And some artists even today are willing to use the word beauty. But one may wonder whether the ideas of 'beauty' the two groups talk about have anything in common. For similar reasons, I was particularly taken by the essay by Cédric Villani's *Mathematics and Art*, in which he presents an articulate description of some of the manifest ways mathematics and art are connected. And I liked Mathilde Marolli's *A Drifter of Dadaist Persuasion* because she describes in a lively way, how mathematics and art form an integrated whole for her as a painter and a mathematician.

It is not entirely clear to me which audience this book tries to address. Perhaps the editor and most of the contributors have in mind non-mathematicians that will find it interesting to learn that even people suffering from being brilliant mathematicians can take a very active, and often an executive, interest in art.

The book may very well be inspiring to people who consider mathematics and art as entirely unrelated. This view I fear may easily become engrained by the way mathematics seems typically to be taught in primary and secondary school.

The book's many tales of how mathematicians engage with art either as practitioners or spectators can hopefully help to dispel the stereotypic notion of the mathematician's brain as thinking in a completely singular way.

The discussion of the nature of beauty in art and in mathematics is worthwhile for both mathematicians and artists. Each group may very well be stimulated to think at a deeper level about the nature of their enterprise, and a more mature and considered understanding of the role of art and mathematics can, I suppose, only be of great value to all of us.

Henrik Jensen
Imperial College

This law was conjectured by Euler and Legendre and proved by Gauss in 1796 who referred to it as the "golden theorem" (aureum theorema). Now it is called the quadratic reciprocity law and is considered to be one of the most important and beautiful results in Number Theory. Generalizations form a substantial part of Algebraic Number Theory, including parts of the Langlands programme.

Altogether Gauss published eight different proofs of the quadratic reciprocity law. His quest for new and illuminating approaches was continued by several authors (including Cauchy, Jacobi, Dirichlet, and Eisenstein); until 1883 altogether 66 different proofs had been published, and nowadays there are even more than three hundred proofs known. These are listed by Lemmermeyer in the appendix of the book under review.

In 1885, Oswald Baumgart received his doctorate with a thesis entitled *Über das quadratische Reciprocitätsgesetz. Eine vergleichende Darstellung der Beweise des Fundamentaltheoremes in der Theorie der quadratischen Reste und der denselben zu Grunde liegenden Principien*. It contains all proofs of the quadratic reciprocity law until 1883 known to him (25 in number) and provides a first analysis of the various methods. This study had been continued by Paul Bachmann in his monograph *Niedere Zahlentheorie* from 1902 and later, in some sense, by Franz Lemmermeyer in his book *Reciprocity Laws*: *From Euler to Eisenstein* from 2000. Baumgart's original thesis was written in German and had been published in Schlomilch's *Zeitschrift für Mathematik und Physik*. It is now available online at the Niedersächsische Staats- und Univer-
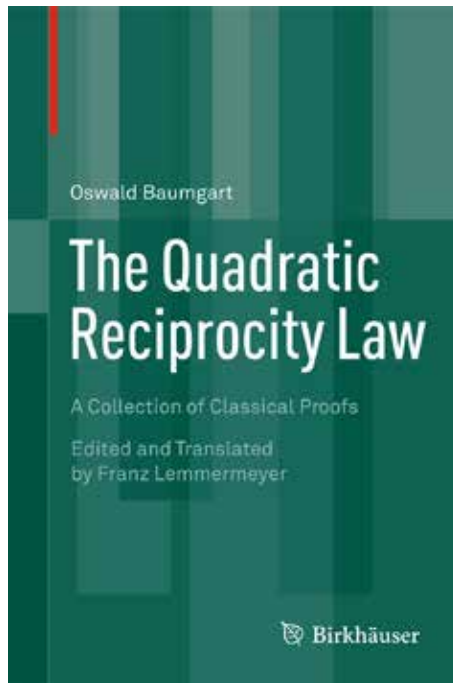
sitätsbibliothek Göttingen (https://gdz.sub.uni-goettingen.de). The book under review provides an English translation by Franz Lemmermeyer, who is an expert in both the history of mathematics and also in algebraic number theory, of this highly remarkable thesis.

In particular, the many valuable comments of the translator make the reading a pleasure and accessible to mathematicians not trained in studying the older literature. For example, we learn that at the time of Baumgart the term 'mathematical induction' had been used for making a conjecture based on empirical evidence. L e m m e r m e y e r has also corrected details in Baumgart's thesis, in particular a large gap in the presentation of a proof by Kummer. However obvious mistakes are passed by without comment.

The book consists of essentially two parts (plus appendices by the translator providing a list of all proofs of the quadratic reciprocity law until today and a renewed bibliography). The first part briefly presents the very beginnings before Gauss entered the stage and the different proofs under discussion. It is not only the author's aim to collect the various approaches to this central result in Number Theory but also a short study of its development. The intention of Baumgart is best reflected in his own words ''the history of this theorem is a faithful reflection of the simultaneous history of mathematics in the small'' (p. xiv). In the preface Lemmermeyer mentions that he is going to publish a book on the history of number theory up to the reciprocity law and its early proofs -- a reading the reviewer is looking forward to with great pleasure.

The reviewer's favourite proofs of the quadratic reciprocity law are those of Gauss (in particular those which rely on Gauss' lemma), Eisenstein (both the geometric and the analytic one), and Kronecker (using the Pell equation which actually is an idea one can already find in Legendre). Besides Baumgart's book one can recommend the reading of *Gauss, Eisenstein, and the ''Third'' Proof of the Quadratic Reciprocity Theorem: Ein kleines Schauspiel* by Reinhard C. Laubenbacher and David J. Pengelley, published in the Mathematical Intelligencer in 1994.

The second part of Baumgart's thesis provides a comparative analysis of the proofs presented in the first part. In addition to the translator's comments and his aforementioned book on reciprocity laws in general these sources give a highly interesting account of the quadratic reciprocity law, its various proofs and their relations, and, last but not least, part of the development of Number Theory since the times of Legendre and Gauss.

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UNITY AND DISUNITY IN MATHEMATICS AND OTHER MATHEMATICAL ESSAYS by Philip J. Davis, American Mathematical Society, 2015; pp 149 pp, £32.50, US$39, ISBN 978-1-4702-2023-9.

I have long been an admirer of Philip Davis and Reuben Hersh's books *The Mathematical Experience and Descartes' Dream*. These are not works of mathematics. They are pieces of rhetoric, with the intention of raising, and discussing, questions which concern mathematics. What is this subject we study? What are we doing when we 'do' mathematics? How do we know a mathematical fact is 'true'? What is the impact of the mathematisation of society? Should we care about that? These are genuinely passionate works; the authors believe that there are serious and interesting questions to raise, and use any means at their disposal to achieve this end, including hyperbole. For example (of Applied Mathematics) they write "More and more often these days, these tasks are set and paid for by the military and involve the preparation of the premature end on life of this planet." This is not the mode of discourse of a mathematical paper, but that is not their end; they are interested in ideas which, in their view, are vitally important. They want their readers to chew them over for themselves.

Philip Davis's most recent book *Unity and Disunity in Mathematics and other Mathematical Essays* could be simply characterised as 'more of the same'. Davis has cast himself into the mould of the classic Victorian amateur polymath; his interests in questions which surround mathematics have lead him to study extremely widely, and to engage with academics from quite different fields to his own. As a result, he can move seamlessly between subjects as diverse as (say) the historian Oswald Spengler, the mathematical activity of the poet Paul Valéry, the ontological status of the unicorn, or the mathematics of the US electoral system.

This most recent book has less of a common theme than the others. It is instead a somewhat heterogeneous collection of essays – some written in the style, but not the method, of a mathematical paper – each on a topic which has exercised Davis at some point over the years. He throws out thoughts with a somewhat scattergun technique (at times one feels he thinks in bullet points), but what he lacks in cohesion he makes up for in variety and diversity. He is never dull.

Overall, though, this is a less satisfying oeuvre than the previous. If you have not read those books, I could not recommend this as a starting place; it may seem, frankly, somewhat incoherent and inconsistent. However, I do recommend (if you have not read it) you go out and buy two copies of *The Mathematical Experience*; one for yourself, and one for a friend. If you find yourself throwing the book on the floor (and some, uncomfortable with the rhetorical style will do that), then spend no more money on this author. If though, like me, you want to know more about Davis and his ideas, and you have read the earlier works, then *Unity and Disunity* is a pleasant side-dish.

Dave Sixsmith
University of Nottingham
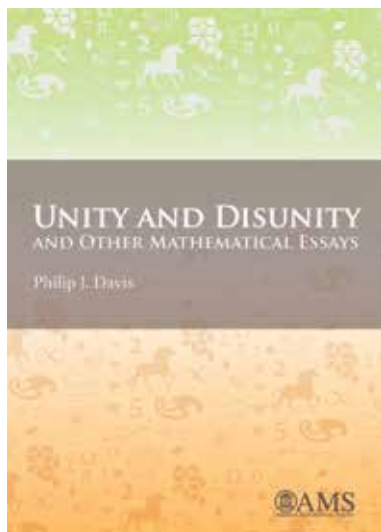
ETHzürich

Assistant Professor of Applied Mathematics

→ The Department of Mathematics at ETH Zurich (www.math.ethz.ch) invites applications for above-mentioned position. The assistant professor will be member of the Seminar for Applied Mathematics, SAM (www.sam.math.ethz.ch).

→ Candidates should have an exceptional research potential in some area of applied mathematics. Particular attention will be given to numerical analysis and computational mathematics, preferably complementing current research directions at the SAM.

→ The responsibilities of the future professor include research and teaching in numerical analysis and computational mathematics for students of mathematics, engineering and natural sciences at all levels. There is the possibility to lead his or her own research group within the SAM. The new professor will be expected to teach undergraduate level courses (German or English) and graduate level courses (English).

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→ Applications should include a curriculum vitae, a list of publications, and a statement of future research and teaching interests. The letter of application should be addressed **to the President of ETH Zurich, Prof. Dr. Lino Guzzella. The closing date for applications is 31 January 2016.** ETH Zurich is an equal opportunity and family friendly employer and is further responsive to the needs of dual career couples. We specifically encourage women to apply.

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

DECEMBER 2015

4 LMS-BATH-WIMCS Analysis Day, Bath (452)
7-11 Combinatorial Mathematics and Combinatorial Computing Australasian Conference, Brisbane, Australia (445)
7-11 New Mathematical and Computational Problems, INI Workshop, Cambridge (449)
9-10 Ada Lovelace 200 Symposium: Celebrating the Life and Legacy of Ada Lovelace, Oxford (451)
10-11 LMS Joint Meeting with the Edinburgh Mathematical Society, Edinburgh (453)
14-16 Spectral Analysis with Matlab, Northumbria University (453)
14-17 LMS South West & South Wales Regional Meeting and Aspects of Homotopy Theory Workshop, Southampton (453)
14-18 Geometric Analysis, King's College London (450)
14-18 The Role of the Higher Infinite in Mathematics and other Disciplines, INI Workshop, Cambridge (450)
15-16 LMS Prospects in Mathematics, Loughborough (453)
15-17 Cryptography and Coding IMA Conference, Oxford (448)
17-18 Charles Hutton Research Symposium, All Souls College, Oxford (452)

JANUARY 2016

4-7 Classic and Stochastic Geometric Mechanics, Imperial College London (453)
5 Algebra, Coding Theory and Cryptography Workshop, Durham (452)
5-6 Adaptive Algorithms for Computational PDEs, Birmingham (452)
11-12 Multi-Armed Bandit Workshop, Lancaster (453)
20-22 British Postgraduate Model Theory Conference, Manchester (452)
27 Well-posedness and Singularity Formation for Nonlinear Evolution Problems, King's College London (452)

FEBRUARY 2016

4-5 From Symbolic Dynamics to Approximation Methods, King's College (453)
26 Mary Cartwright Lecture, London

MARCH 2016

16-20 Nordic Congress of Mathematicians, Stockholm (453)
21 LMS Society Meeting at the BMC, Bristol
21-24 BMC 2016, Bristol
21-25 LMS Invited Lectures, Edgar Knobloch (Berkeley), Loughborough (453)
29-1 Apr Algebraisation and Geometrisation in the Langlands Programme, Bristol (453)

APRIL 2016

4-8 Easter Probability Meeting on *Random Structures Arising in Physics and Analysis,* Lancaster University (453)
5-8 BAMC 2016, Oxford

JULY 2016

8 LMS Graduate Student Meeting, London
8 LMS Meeting, London
21 LMS Meeting at the 7ECM, Berlin
18-22 7ECM, TU Berlin (451)

AUGUST 2016

1-4 Young Researchers in Mathematics Conference, St Andrews
25-26 Caucasian Mathematics Conference, Turkey (453)

NOVEMBER 2016

11 LMS Graduate Student Meeting, London
11 LMS Annual General Meeting, London

DECEMBER 2016

20 LMS South West & South Wales Regional Meeting, Bath

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JOINT ANNIVERSARY WEEKEND
held at the University of Birmingham from 18 to 20 September 2015
(see report on the front page)

Aner Shalev – Plenary speaker

Noga Alon – Plenary speaker

Martin Liebeck – Invited Special Lecturer

Cheryl Praeger – Invited Special Lecturer

Niccolò Guicciardini and Peter Neumann

LMS organisers Jesse Garrick and Elizabeth Fisher