LONDON MATHEMATICAL SOCIETY

NEWSLETTER

NEWSLETTER ONLINE:
newsletter.lms.ac.uk

NEW CHAIR FOR CMS

Professor Sir Adrian Smith FRS, Vice-Chancellor of the University of London is to be the new Chair of the Council for the Mathematical Sciences (CMS). It is anticipated that he will take up the post in September 2013, succeeding Professor Frank Kelly CBE, FRS (University of Cambridge).

Professor Sir Adrian Smith said, 'The CMS plays an important role in representing the views of the UK mathematics community on issues of national importance. I am delighted to have the opportunity to contribute to this work.'

In approaching Sir Adrian, the five CMS societies recognised the contribution that he had made to science, in particular the mathematical sciences, during his time in the university sector and Westminster, and that his appointment would be of huge benefit to the mathematical sciences community. Over the past three years, under the leadership of Professor Frank Kelly, the CMS has become the body recognised by government as representing mathematical sciences and with which national policymakers now regularly engage. CMS speaks with one clear voice on issues affecting the current and future health of the discipline and with Sir Adrian at its head will continue to build on recent success to meet the challenges of the future. The five CMS societies are delighted that he has accepted the role.

Sir Adrian has a wealth of experience both in higher education and government. He was Chair of Statistics and Head of the Department of Mathematics at Imperial College London, and also Professor of Statistics and Head of the Department of Mathematics at Nottingham University. He was Principal of Queen Mary, University of London for 10 years – during this time he was also Deputy Vice-Chancellor of the University of London. Sir Adrian joined the Department for Innovation, Universities and Skills (later to become the Department for Business, Innovation and Skills) in 2008 as

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Adrian Smith

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Director General, Science and Research, becoming Director General, Knowledge and Innovation in 2010. He became Vice-Chancellor of the University of London in September 2012.

Sir Adrian is also a past President of the Royal Statistical Society; he was elected a Fellow of the Royal Society in 2001 and received his knighthood in 2011.

Professor Frank Kelly, Chair of CMS said, 'Sir Adrian Smith's work on Bayesian methods has influenced developments across a wide range of the mathematical sciences, and he has deep experience of the workings of government. I and the five Societies are very pleased indeed to welcome Sir Adrian as the next Chair of CMS'.

LMS WEBSITE DEVELOPMENTS

Over the last year the focus has been on developments to the Society's website which enable members to engage more directly with the site and improve navigation within the site. The following list includes some of the main areas of the site which are currently receiving attention.

Member engagement
In early February 2013 members were invited to view their personal details online and asked to update their information. Such details are private to each member and can only be viewed by that member. Work is ongoing to improve this functionality and add to the information over which members will have direct control.

Re-theming and navigation
We have now re-launched the website with a new theme to reflect more clearly the history of the Society and the elegance of mathematics. As part of this re-theming a new and improved system of navigation is being introduced and we are pressing forward with even further improvements in this area.

Online grants and prizes
Over the next few weeks it is the intention to introduce online applications for LMS grants and an online system for the nominations for prizes. Following this some detailed work will be undertaken to improve the administrative functions behind these online processes.

Communications
The Society is keen for mathematicians to use the LMS website to set up discussion forums. If you would like to set up a discussion forum please contact the Operational Webmaster (webmaster@lms.ac.uk). All applications will be considered by the Council Webmaster.

The above is only a flavour of the developments which are currently being pursued for the LMS website. If you have any comments on what is written on here or on the website more generally we would be very pleased to hear from you. You can send comments via email to: website@lms.ac.uk.

Stephen Huggett
General Secretary
Chair, Website Working Group

LMS GRANT SCHEMES

Next Closing Date for Research Grant Applications: 15 May 2013
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, 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 £2000 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, visit the LMS website: www.lms.ac.uk/content/research-grants.
- Applications received by **15 May 2013** will be considered at a meeting in June.
- Applications should be submitted well in advance of the date of the event for which funding is requested.
- Normally grants are not made for events which have already happened or where insufficient time has been allowed for processing of the application.

Queries regarding applications can be addressed to the Grants Administrators or the Programme Secretary (see below) who will be pleased to discuss proposals informally with potential applicants and give advice on the submission of an application.
- Grants Administrators: Sylvia Daly and Elizabeth Fisher and (tel: 020 7291 9971/3, email: grants@lms.ac.uk).

- Programme Secretary: Rob Wilson (r.a.wilson@qmul.ac.uk).

OTHER LMS GRANTS AND FUNDING

Computer Science Small Grants (Scheme 7)
Funding for grants **up to £500** is available to support a visit for collaborative research at the interface of Mathematics and Computer Science either by the grant holder to another institution within the UK or abroad, or by a named mathematician from within the UK or abroad to the home base of the grant holder. The next deadline for applications is 15 May 2013. Please see the website for further details: www.lms.ac.uk/content/computer-science-small-grants-scheme-7.

Childcare Supplementary Grants
Grants of **up to £200** are available to parents working in mathematics to help with the cost of childcare when attending a conference or research meeting. The Society believes that all parents working in mathematics should be able to attend conferences and research meetings without being hindered by childcare costs. Institutions are expected to make provision for childcare costs and parents are encouraged to make enquiries. However, where this is not available, the Society administers a Childcare Supplementary Grants Scheme. Please see the website for further details: www.lms.ac.uk/content/childcare-supplementary-grants.

Small Grants for Education
Funding for grants **up to £800** is available to stimulate interest and enable involvement in mathematics from Key Stage 1 (age 5+) to Postgraduate level and beyond. Anyone working/based in the UK is eligible to apply for a grant. If the applicant is not a member then the application must be countersigned by an LMS member or another suitable person such as a Head teacher or senior colleague. The next deadline for applications is **31 August 2013**. Please see the website for further details: www.lms.ac.uk/content/small-grants-education.

LMS-CMI Research Schools
The Society and the Clay Mathematics Institute

offer funding of **up to £31,000** (including *honoraria* for organisers) towards the cost of running a one-week Research School which provides high quality training for postgraduate students in core areas of mathematics. For further information on Research Schools and how to submit a proposal, please visit: www.lms.ac.uk/events/lms-cmi-research-schools.

Research Workshop Grants
The Society offers grants to support Research Workshops held in the UK. Requests for support (for travel and subsistence of participants, and reasonable associated costs) **in the range £1,000-£10,000** will be considered. For further information and application forms, visit: www.lms.ac.uk/content/research-workshops-grants.

Spitalfields Days
Grants of **up to £500** are available to support an LMS Spitalfields Day, which have been run since 1987 and are in honour of the Society's predecessor, the Spitalfields Mathematical Society (1717-1845). A Spitalfields Day is a one-day meeting, which is usually associated with a long-term symposium on a specialist topic at a UK university. Selected participants, often distinguished experts from overseas, give survey lectures (or other types of lecture accessible to a general mathematical audience) on topics in the field of the symposium. Please see the website for further details: www.lms.ac.uk/content/spitalfields-days#applications.

Young British and Russian Mathematicians Scheme

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

The LMS is offering grants of **up to £500** to meet the travel costs, while the host should apply to the Russian Academy of Sciences for funding towards local expenses for accommodation and subsistence. Please contact Sylvia Daly (grants@lms.ac.uk) for information before contacting the Russian Academy of Sciences for funding.

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

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

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

The LMS is offering grants to the host institution to meet the visitor's actual travel and accommodation costs of **up to £1,500.** Applications should include the following:
1. Name and brief CV of the visitor.
2. A brief budget
3. A brief description of the course of lectures.
4. A letter or email of agreement from the head of the host department, including the proposed dates of the visit.

Financial and academic reports will be required after the visit. Further details of the Scheme can be found on the LMS website: www.lms.ac.uk/content/international-grants#YBR. Applications received by **15 May 2013** will be considered at a meeting in June. Enquiries should be made to the Grants Administrators: Sylvia Daly and Elizabeth Fisher (tel: 020 7291 9971/3, email: grants@lms.ac.uk).

ANNUAL ELECTIONS TO LMS COUNCIL

The Nominating Committee proposes slates of candidates for vacancies on Council and vacancies on its own membership. Anyone who wishes to suggest someone for a position as an Officer of the Society or as a Member-at-Large of Council (now or in the future) is invited to send their suggestions to Dr Penny Davies, the current Chair of Nominating Committee (nominations@lms.ac.uk). Please provide the name and institution of the suggested nominee, his/her mathematical specialism(s), and a brief statement to explain what s/he could bring to Council/Nominating Committee. The Nominating Committee actively welcomes suggestions from the membership.

The Nominating Committee seeks to maintain a balance in gender, subject area and geographical location when drawing up its list of prospective nominees, and LMS members should bear in mind that it is to the benefit of the Society that Council is balanced and represents the full breadth of the mathematical community. Further details about the work of the Nominating Committee can be found on the LMS website at www.lms.ac.uk/about/nominating-committee.

Nominations should be received by **Friday 24 May 2013** in order to be considered by the Nominating Committee.

In addition to the above there exists the option for members to make direct nominations for election to Council or to the Nominating Committee. Direct nominations must be sent to the Executive Secretary's office (nominations@lms.ac.uk) to arrive before **noon on 1 September 2013**. Such nominations must bear the signatures of the nominator and three seconders and of the nominee. A letter with the relevant names and signatures is sufficient; alternatively a form on which to make such nominations is available from the LMS website (http://tinyurl.com/ccuhkcx). Nominations and statements from seconders may also be sent by email from individual verifiable email addresses also to nominations@lms.ac.uk. Members considering making a direct nomination are asked to bear in mind the desirability of Council

being balanced so it represents the full range of mathematical specialisms, UK regions and gender-balance.

The slate proposed by Nominating Committee, together with other direct nominations received up to that time will be posted on the LMS website in early August for members to see before deciding whether they wish to make any further direct nominations. Further nominations will be posted onto the website as they are received.

GENERAL MEETING

There will be a General Meeting of the Society on Friday 5 July 2013, to be held in the Hardy Room, De Morgan House, Russell Square, London WC1B 4HS.

The business shall be:
1) the appointment of Scrutineers
2) announcement of Council's recommendation for Election to Honorary Membership
3) announcement of LMS prize winners for 2013

The General Meeting will be followed by a Society meeting (see page 28). It is hope that as many members as possible will be able to attend.

Fiona Nixon
Executive Secretary

LMS COUNCIL DIARY

22 March 2013
A personal view
In time-honoured fashion, the main business of the Council Meeting began with the President's report. Among the items that Graeme Segal brought to our attention was the European Mathematical Society's ethics statement which sets out 'a code of good practice and ethical behaviour in the publication, dissemination and assessment of mathematical research', which had come into effect at the end of 2012 (see www.euro-math-soc.eu/comm_ethics.html), and which the Society has been requested to endorse. Council will be considering the code in more detail at a later meeting. Graeme also reported on a very successful meeting at the Royal Society on

the occasion of the award of the Crighton medal jointly to Arieh Iserles and Peter Neumann (see page 11), and on the positive feedback from the launch, held at the House of Commons, of the report *Advancing Women in Mathematics: Good Practice in UK University Departments*. Graeme next led us into a general discussion on nominations for the New Year's Honours List. We were all agreed that ensuring mathematicians are more consistently recognised in the Honours Lists would help to improve the public's perception of the importance of mathematics, and that the Society should, when appropriate, play a supportive role in this regard.

Under financial matters, we were guided through the half-year accounts review by the Treasurer, Rob Curtis. There were some variances between the budgeted and the actual figures, but these were largely to be expected due to the uneven nature of income and expenditure throughout the year. It was, however, noted that the grants budget had rather large amounts of underspend. It was thought that applicants may not yet be aware of the increased maximum awards, and that the situation would rectify itself once awareness grew. So members are asked to spread the word! The Treasurer then asked us to consider a request from the International Centre for Mathematical Sciences (ICMS) for an increase in annual grant. We agreed that an increase in annual funding from £12,000 to £16,000 should be awarded as a demonstration of the Society's endorsement of the Centre. The quid pro quo was that we would encourage the ICMS to visibly acknowledge, on its website, the Society's support. Next, and wearing his fundraising hat, the Treasurer presented a proposal to establish an informal network of supporters to be known as *Friends of the LMS*, with the twin-fold purpose of developing the Society's fundraising activities and encouraging members into the Society from fields outside academia. We agreed to authorise the Treasurer to establish such a network, and that a small group of members would be established to consider each new member of this network, though proposed names would require the approval of Council similar to those applying for membership of the Society.

With respect to other financial matters, we agreed that the funding available for Spitalfields Days should be doubled, i.e. increased from £500 to £1,000, and that the regulations should be changed so that funding can be used to support speakers' travel and subsistence. Members are urged to encourage organisations, such as the Isaac Newton Institute and ICMS, to put on Spitalfields Days as part of their meetings (see www.lms.ac.uk/events/spitalfields-days). We also supported Programme Committee's recommendation that the Society should fund one MARM (Mentoring African Research Mathematicians) partnership over the next two years. This, together with equivalent funding from the IMU, will provide a continuation of the funding for the MARM programme until the next ICM in Seoul in July 2014. (The project was initially funded by the Nuffield Foundation and the Leverhulme Trust but their involvement finished at the end of December 2012. For further information about MARM, see www.lms.ac.uk/grants/mentoring-african-research-mathematics).

The chair of Research Meetings Committee, Ulrike Tillmann, reported on developments concerning the short instructional courses for post-

graduate students which, since 2010, have been jointly funded by the Society and the EPSRC. The EPSRC grant ends this year and the Society has been in negotiations with the Clay Mathematical Institute (CMI) in order to establish a partnership to continue funding these very valuable courses. Council was delighted to learn of the Institute's interest in the issue and readily agreed a formal partnership with the CMI for research schools for one year (in the first instance). The schools would have a more international focus than the previous short courses with prestigious international speakers and attracting more international participation.

In the last issue of the *Newsletter*, John Hunton reported on the recent Strategic Retreat of Council. As a follow-up to the Retreat, the President explained that the intention was to use the ideas generated at the Retreat to develop a Strategic Plan for the Society, a draft of which was presented. It was agreed that a Sub-Group of Council Members-at-Large (not Officers) should be appointed to develop the Strategic Plan further, and report back to Council in May.

June Barrow-Green

RECORDS OF PROCEEDINGS AT LMS MEETINGS
ORDINARY MEETING

held on *18 March 2013* at the University of Newcastle as part of the Northern Regional Meeting and Workshop on *Triangulations and Mutations*. Over 50 members and visitors were present for all or part of the meeting.

The meeting began at 2.00 pm with the Vice-President, Professor John Greenlees, in the Chair.

No members were elected to membership.

One member signed the book and was admitted to the Society.

Professor Peter Jorgensen introduced a lecture given by Professor Volodymyr Mazorchuk on *2-categories, 2-representations and their applications*.

Professor Jorgensen then introduced a lecture given by Professor Ivan Smith on *Quadratic Differentials, Stability Conditions and Symplectic Topology*.

After tea, Professor Jorgensen introduced the final lecture given by Professor Bernhard Keller on *Cluster Algebras and Applications*.

The Vice-President, Professor Greenlees, expressed the thanks of the Society to Professor Jorgensen, Dr Bocklandt and Dr Kolb for putting on such a fascinating meeting.

Afterwards, a buffet reception was held in the Penthouse of the Herschel Building.

RECORDS OF PROCEEDINGS AT LMS MEETINGS

ORDINARY MEETING

held on *26 March 2013* at the University of Sheffield during the British Mathematical Colloquium. Over 80 members and visitors were present for all or part of the meeting.

The meeting began at 11.30 am with The President, Dr Graeme Segal FRS, in the Chair.

The Treasurer, Professor Robert Curtis, presented a report on the Society's activities.

Twelve members were elected to Ordinary membership: José Carrillo, Hongsheng Dai, Paul Doust, Bertram During, David C. Ellis, James T. Griffin, Guy McCusker, Simon Morgan, Lasse Rempe-Gillen, Constanze Roitzheim, Marcello Seri, Alessandro Torrielli.

Nine members were elected to Associate membership: Tara Brough, Daniel Candon, Joanne Dunster, A'Bel Farkas, Jian Cheng Guan, Samuel Kamperis, Alastair Litterick, Jonathan Ramalheira-Tsu, Henry Rose.

Two members were elected to Reciprocity membership: Mihai Diaconescu, Eric Nordenstam.

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

Dr Segal introduced a lecture given by Professor Mikhail Kapranov on *Higher Segal Spaces*.

The LMS President expressed the thanks of the Society to the speaker for giving such a fascinating lecture.

RECORDS OF PROCEEDINGS AT LMS MEETINGS

MARY CARTWRIGHT LECTURE AND SOCIETY MEETING.

held on *1 March 2013* at De Morgan House in London. Over 55 members and visitors were present for all or part of the meeting.

The meeting began at 3.30 pm with The President, Dr Graeme Segal FRS, in the Chair.

Eighteen members were elected to Ordinary membership: Stephan Baier, Murad Banaji, Erik Baurdoux, Helen Byrne, Bin Cheng, Howard Covington, Jonathan Evans, Jan Gutowski, Samuel Harrison, Henri Johnston, Markus Linckelmann, Thomas Mc-Court, Frank Oertel, Douglas Smith, Jan S˙sling, Antti Vauhkonen, Christian Voigt, Sergey Zelik.

Two members were elected to Associate membership: Chris Campbell, Noah White.

One member was elected to Reciprocity membership: Debasish Som.

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

Professor Gwyneth Stallard introduced a lecture given by Professor Jeff Lagarias on From *ABC to XYZ or Addition versus Multiplication*.

After tea, Dr Jennifer Scott introduced the Mary Cartwright Lecture given by Professor Margaret Wright on *A Mathematical Journey in Non-Derivative Optimization*.

The President, Dr Segal, expressed the thanks of the Society to the Women in Mathematics Committee for putting on a successful meeting.

Afterwards, a reception was held in De Morgan House, followed by dinner hosted at The Doubletree by Hilton.

LMS COUNCIL 2012-13
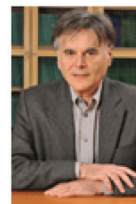
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President
University of Oxford

Professor Ken Brown
Vice President
University of Glasgow

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University College London

Professor Ulrike Tillmann
Member-at-Large
University of Oxford

Professor Alexander Veselov
Member-at-Large
Loughborough University

LONDON MATHEMATICAL SOCIETY

MIDLANDS REGIONAL MEETING

Tuesday 11 June 2013

Ken Edwards Lecture Theatre 2, University of Leicester

2.00 pm   Opening of the meeting
Frances Kirwan (Oxford)
Hyperkähler implosion

3.15 pm   **Franz Pedit** (Amherst, Tübingen)
Constrained Willmore tori: Theory and experiment

4.15 pm   Tea/Coffee (poster session)

5.00 pm   **Peter Topping** (Warwick)
Ricci flow and Riemann surfaces

7.00 pm   Dinner at Kayal (local Kerala restaurant)

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

For further details and to register and to reserve a place at the dinner, please visit http://tinyurl.com/LMSMidlandsRegionalMeeting. The cost of the dinner will be approximately £20, not including drinks.

The meeting forms part of a workshop on **Advances in Surface Theory** from 12-14 June. For further details visit: http://tinyurl.com/AdvancesSurface Theory or contact the organiser (k.leschke@le.ac.uk).

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

DAVID CRIGHTON LECTURES AND MEDAL PRESENTATION 2013

Report

The David Crighton Medal was awarded to **Dr Peter M. Neumann** and **Professor Arieh Iserles** on 14 March 2013 at the Royal Society.

The David Crighton Medal is awarded by the IMA and LMS to a mathematician who is normally resident in the mathematical community represented by the two organisations for services both to mathematics and to the mathematical community. This was the first time the medal had been awarded to two recipients and special approval was given by both The Councils of the IMA and LMS. Dr Graeme Segal, FRS, the LMS President, began the lectures by emphasising that David Crighton is an excellent figure for bringing the IMA and LMS together, because he was president of the IMA in 1996–97, and was about to become LMS president in 2000 when he sadly passed away.

The lectures were well attended by 80 guests, including many IMA/LMS members. Dr Segal presented the David Crighton Medal to Dr Peter M. Neumann, who accepted saying it was a great honour to receive the Medal because it bears David Crighton's name, and that he was very pleased to see Mrs Johanna Crighton in the audience.

Citation for Dr Peter M. Neumann:

Peter M. Neumann has been an animator of British mathematics for fifty years, and has plunged energetically into every aspect of the mathematical world.

First, into research, becoming – like both of his parents – an algebraist. He has worked on permutation groups, combinatorics, and computational group theory. Each of his research articles is beautifully crafted, with its place in mathematics carefully thought out and explained, together with thoughtful comments on where further work might lead. Several of these papers have been highly influential. For example, his creation,

jointly with Cheryl Praeger, of a recognition algorithm for special linear groups opened a new area in computational group theory; his memoir with Adeleke giving a general theory of tree-like relational structures inspired new directions in infinite permutation groups, model theory and graph theory; and his recent paper on synchronising groups is the first of a new attack on the Cerny conjecture for synchronising automatons.

Then, as a teacher, Peter's enthusiasm and the originality of his teaching methods have made him legendary. Very many who encountered him as undergraduates, some of them now prominent mathematicians and some no longer in the mathematical world, speak of how he was the first to awaken them to the joy and fascination of mathematics. At the junior research level his Kinderseminar is famous far outside Oxford. He has successfully supervised nearly forty doctoral students.

On the national mathematics stage he was chairman, in 1991–2 of the committee that presented to the LMS, IMA, and RSS the report that led to four-year MMaths degrees.

Yet another area of his work has been for the *UK Mathematics Trust*, whose founding chairman he became in 1996. This is a body which organises mathematical activities and competitions among schoolchildren. It took over the responsibilities of the British Mathematical Olympiad Committee, and hosted the worldwide Congress of the International Mathematical Olympiad in Glasgow in 2002. During the seven years of his chairmanship he brought the Trust from small beginnings to a large educational charity in whose competitions about three-quarters of a million pupils are now involved each year, and he has continued to work as an enthusiastic volunteer in the Trust's training programmes since stepping down from the chairmanship. The Trust has had an immeasurable effect in raising awareness of mathematics in British schools, and has created a real new enthusiasm for the subject throughout the country, bringing together academics, mathematicians active in other professions, school

teachers, and the wider public.

Finally, Peter has been for many years a stalwart of the *British Society for the History of Mathematics*, and has done as much as anyone to promote the study of the history of mathematics as an important discipline in British universities.

He has himself become a serious mathematical historian, producing a definitive and much acclaimed critical edition of the papers of Galois in 2011.

Lecture by Dr Peter M. Neumann

Tout ce gâchis: Why Edit the Mathematical Manuscripts of Évariste Galois?
Évariste Galois (1811–1832) is better known for his short and turbulent life than he is for his mathematics. He was a revolutionary republican who died at the age of 20 after a duel. He had just spent nine months in prison for wearing a banned republican uniform and carrying loaded fire-arms. His father had committed suicide after political harassment three years before Évariste's death. However it was his novel mathematics and discord with the established mathematicians of his time that made up most of Dr Peter M. Neumann's talk about Évariste Galois' extraordinary life.

Galois' Manuscripts
After his retirement Peter M. Neumann spent several months at the library of the Institut de France in Paris, where all the known surviving works and scraps of Galois' work are kept. There he authored the *Mathematical Writings of Évariste Galois* [1]. The Galois archive has since been made available online [2]. This includes a few main works and many other scraps of paper. All the main works are reproduced in [1] and are mentioned below.

Galois published five short articles when he was around 18, including *Sur la Théorie des Nombres* in June 1830. This work is the foundation for the theory of finite fields as it is now taught to 2nd/3rd year mathematics students.

The *Premier Mémoire* contains the 'Galois Theory' of equations. This was submitted three times to the Paris Academy of Science – in May 1829, February 1830 and January 1831. After the first submission it was suggested that Galois resubmit for consideration in the *Grand Prix de Mathématiques*, but unfortunately the second submission was taken home by Fourier and not found after his death on 16 May 1830, and so Galois' paper was not considered. Galois' third and final submission was rejected by the Academy on the advice of Poisson in July 1831.

It seems strange that Poisson recommended rejection of the paper containing what would become known as Galois Theory. However, using evidence from the only surviving version of the *Premier Mémoire* (the 1831 version), Neumann explained that Galois hadn't defined what a 'group' was in his submission, which understandably left Poisson a little confused. Poisson's annotations are on the manuscript along with later additions from Galois – including his late marginal definition of what he meant by a group. The *Second Mémoire* was probably written in May/June 1830. This paper starts moving away from equations and into group theory in its own right. These two works were not published until 1846, and have been published many times since.

On 29 May 1832, the eve of the fatal dual, Galois wrote a letter to Auguste Chevalier, that was published on Galois' request shortly after his death. The letter concludes with 'Après celà il se trouvera, j'espère, des gens qui trouveront leur profit à déchiffrer tout ce gachis' which means 'After that there will be found, I hope, people who will find profit in deciphering all this mess'. In his lecture Peter's response to this quote was 'that's me'.

So, why edit the manuscripts?
Galois gave us groups, fields, Galois Theory and modern (or abstract) algebra. These have all evolved over time. For instance, modern algebra has evolved a new language

to enable it to be taught better. Mathematics evolves as much through teaching as by original research.

Évariste Galois, révolutionnaire et géomètre is the title of a 1956 biographical novel by André Dalmas. This translates to revolutionary and mathematician (although géomètre now means land surveyor or geometer).

Dr Peter M. Neumann concluded with Évariste Galois, *géomètre révolutionnaire* (revolutionary mathematician)!

References:
1. Neumann, Peter M. (2011) *The Mathematical Writings of Évariste Galois*, European Mathematical Society.
2. www.bibliotheque-institutdefrance.fr/numerisation

After Dr Peter M. Neumann's lecture, the IMA President, Professor Robert MacKay, FRS, introduced Professor Arieh Iserles lecture and presented him with the David Crighton Medal. Professor Iserles said it was a pleasure to receive the award, especially as he knew David Crighton as a head of department, colleague and friend.

Citation for Professor Iserles:
Arieh Iserles' research has been at the leading edge of numerical analysis for his whole career. His early papers dealt with stability and accuracy which were at the forefront of numerical analysis at the time. In particular, he wrote an important paper with Gilbert Strang (1983) on the accuracy of difference schemes and a first book with Syvert Nørsett (1991) on the theory of order stars.

Arieh's most important mathematical contributions include being one of the leading practitioners of geometric numerical integration and in particular the subdiscipline of Lie group methods, which are numerical integration methods for ordinary differential equations on Lie groups and homogeneous spaces. Geometric integrators preserve structure such as the presence of symmetry, invariant volumes and symplectic geometry.

The Lie group integrators preserve not just the Lie group as a manifold, but have built in the presence of a group action and a Lie algebra as the tangent space. Arieh's recent work on highly oscillatory integrals is also deserving of high praise, and is a breath of fresh air in a classically difficult subject. It should be mentioned that the algorithms Arieh studies always exhibit sensitivity to the problems of implementation, so the work covers the whole range from theory to practice.

Two other areas of Arieh's research are worthy of special mention. One is a seminal contribution to approximation theory, by developing the theory of Sobolev Orthogonal Polynomials, with Koch, Nørsett and Sanz-Serna (1991). Another is recent work with Tony Bloch on isospectral flows with Poisson structure, leading to the discovery of a new and fascinating integrable system of Toda type, now known as the Bloch-Iserles system.

Arieh has an outstanding record of service to the research community. There are three main contributions: editorial work, especially that of *Acta Numerica*; to the Society for the Foundations of Computational Mathematics, and finally, a stellar record of teaching and mentoring.

Arieh's editorial work is what editorial work should be but infrequently is. He doesn't just manage; he reads the papers himself and joins in the decision making and advice to authors, rather than relying solely on referees. Arieh founded *Acta Numerica* in 1992. Its pages have included many seminal review articles in a large variety of active and important topics. During 2004–09 it achieved the highest mathematical citation quotient (MCQ) of any journal indexed by *Mathematical Reviews* (*Annals of Mathematics* was in second place). Among many other journals, Arieh also co-managed the Journal of Foundations of Computational Mathematics with Peter Olver and then Mike Todd, and it has achieved pre-eminence as the leading journal of the field.

Arieh was one of the founding members of the *Society of Foundations of*

Computational Mathematics, with Steve Smale and Mike Shub among others. This organisation has been a great success, and Arieh has been fully active as Secretary, Chair, Board member and committee worker. In particular, there is a huge triennial conference with nine days of talks, 18 plenary speakers and more than 20 separate workshops in topics ranging from computational number theory to flocking and swarming. This breadth and diversity with quality is the hallmark of Arieh's vision for FoCM.

Last but not least, is Arieh's contributions to teaching and mentoring, with award winning former students, a strong contribution to women in mathematics, and a textbook on Numerical Analysis. It is hard to give Arieh sufficient credit for the influence he has on others, his energy, enthusiasm, commitment and friendship.

Lecture by Professor Arieh Iserles:

The Future of Life, Mathematics and Everything

Professor Iserles gave a lecture on how to get the best results from mathematical research, in an engaging and amusing style. He began with the Case Against Strategy and then went on to the Case for Strategy in Mathematical Research.

The Case Against Strategy

Arieh Iserles argued that in mathematics the best research is done by individuals (or groups) doing what interests them without a fixed end goal to restrain them. He didn't say that this usually results in the best research, but that this is how we get the best research. So, for the best research, numerous mathematicians must follow their own curiosity and we will get a few exceptional pieces of research as a result and many failures. The alternative, that Professor Iserles attributed to funding agencies is to minimise failure – all projects must be seen as 'success', no matter how meagre. Unfortunately this means that you are stuck doing what you originally set out to do. Arieh used an analogy from

the book of *Samuel I*, in which Saul goes in search of the family asses and finds a kingdom instead. (An unfortunate translation into American English was used to amuse the audience, so for those readers from the USA, asses = donkeys in UK English.) Arieh went on to suggest that Saul would have difficulty explaining his 'abject strategic failure' had he previously obtained a grant for finding the donkeys.

Professor Iserles gave two world-changing examples of mathematical research done in this way. They are the FFT and RSA. Were these planned, mission-orientated projects?

Without FFT (Fast Fourier Transform) there would be no fast communications, multichannel television or internet. But the FFT was not designed for these purposes. In 1805 Gauss first discovered the FFT, but didn't publish it – and this was done before Joseph Fourier discovered the Fourier transform in 1807 – and then it was rediscovered a few times in the early 20th century until a version by Cooley and Tukey in 1965 became famous with over 8,000 citations on Google Scholar.

RSA (Public-key Cryptography) is necessary for e-commerce, including internet shopping and banking. Public-key Cryptography was first discovered at GCHQ in 1973 by Clifford Cocks CMath FIMA and this was kept a secret until 1997. Public-key cryptography wasn't – it was re-discovered and patented by Rivest, Shamir and Adelman in 1977. RSA became a very useful tool after the invention of the internet (dated between 1983 and 1991) and so RSA pre-dates the internet by at least six years. Without the internet, RSA could not be used for e-commerce and so it was clearly not invented with this (or indeed any other) practical use in mind.

The Case for Strategy in Matematical Research

The case above argues that at the level of individual researchers strategy has no place. However, a strategy for mathematics could be implemented at a higher level: research groups, departments/institutions and national/international levels.

So can we predict the future? Arieh Iserles clearly demonstrated we can't with the table below:
- 1953 Predictions
- Nuclear fusion
- Colonies on the moon
- Jetpacks
- Interplanetary travel
- Transonic commercial flight
- Mega-buildings
- Petrol-free cars
- Efficient energy storage
- 2013 Reality
- Computer microchips
- Laptop computers
- Human genome project
- Communications satellites
- MRI scans
- Mobile telephones
- SatNav
- Computer-aided design

The 1953 predictions remain unfulfilled and the 2013 technologies were not predicted. Professor Iserles suggested that mathematics has shifted from being driven primarily by physics (as were the 1953 predictions) to a more eclectic range of driving forces including physics, biology, medicine, and most importantly information (this is what drives the 2013 technologies). Arieh Iserles isn't suggesting that physics and information work in isolation, but that the main driving force has shifted from physics to information over the past 50 years – the information age is here. And we will need to adapt to make the most of this. Not as individuals, but at a higher level, to keep UK mathematics competitive.

Information is the future and is a multidisciplinary mathematical enterprise, for example machine learning currently needs input from Approximation Theory, Bayesian Statistics, Computer Science, Functional Analysis, Graph Theory, Non-Parametric Statistics, Optimisation, Random Matrix Theory…

Arieh Iserles concluded by saying that individual mathematicians should keep proving theorems in the areas that interest them, as this is the way to get excellent research.

However, the mathematical community must have a strategy to take UK mathematics into the future, or else others will go ahead. This future will be eclectic with many driving forces, but the main focus will be information.

Acknowledgement
The author would like to thank Dr Peter M. Neumann and Professor Arieh Iserles for their help with a draft of their reports. Any errors are, of course, mine.

The evening concluded with a buffet reception in the Marble Hall at the Royal Society.

Rebecca Waters
Editorial Officer, *Mathematics Today*

A version of this report will appear in *Mathematics Today*

ISAAC NEWTON INSTITUTE

Call for Proposals

The Institute now invites proposals for one-, four- and six-month research programmes in any branch of the mathematical sciences. Please note a special case should be made for shorter proposals and there is no guarantee these will be held in the summer. The deadline for submission is **31 July 2013**, for consideration at the meeting of the Scientific Steering Committee in October 2013. Details on submitting proposals are at www.newton.ac.uk/callprop.html.

Anyone interested in making a proposal is encouraged to contact the Director, John Toland, by telephone or email, for advice and informal feedback (tel: 01223 335980, email: director@newton.ac.uk).

The Isaac Newton Institute is a national research institute based in Cambridge, UK. It attracts scientists from all over the world to research programmes in *all areas of the mathematical sciences*. At any time there are two visitor programmes at the Institute, each with about twenty participants. For more information see www.newton.ac.uk.

TRIANGULATIONS AND MUTATIONS MEETING

Report

On 18 March the University of Newcastle hosted the LMS Northern Regional Meeting 2013. This meeting was embedded in a five-day workshop on *Triangulations and Mutations*, which was supported by the London Mathematical Society and EPSRC. About 50 people attended the meeting and the workshop.

In many areas of mathematics one is interested in maximal sets of objects with special properties. Usually such sets are not unique but one can mutate such sets by replacing one object of the set by another. A prime example of this are triangulations of marked surfaces, these are maximal sets of nonintersecting arcs between the marked points and triangulation can be mutated by flipping an edge. Other examples are sets of cluster variables in a cluster algebra, (cluster) tilting objects in representation theory, maximal modification modules in commutative algebra and coordinates of Teichmüller space. Also the study of stability conditions in triangulated categories gives rise to the notion of wallcrossing which in some sense can be interpreted as a form of mutation. The main aim of the workshop was to explore connections between these different fields of mathematics inspired by these phenomena.

The LMS Northern Regional Meeting consisted of three talks by experts in different fields related to this. Walter (Volodymyr) Mazorchuk from the University of Uppsala talked about the concept of 2-categorification, Ivan Smith from Cambridge about stability conditions on categories coming from triangulations of surfaces and finally Bernhard Keller talked about cluster categories and mutation.

© Peter Jorgensen

Walter (Volodymyr) Mazorchuk - Uppsala

The workshop explored these ideas in more detail. A nonexhaustive collection of the topics included cluster categories for Grasmannians, quiver mutation, t-structures and stability conditions, cluster algebras coming from marked surfaces, auto-equivalences of triangulated categories, representation theory of algebras with a potential and stable categories of Cohen-Macaulay modules. The list of speakers included Karin Baur (Graz), Thomas Bruestle (Sherbrooke), Anna Felikson (Durham), Vladimir Fock (Strasbourg), Joseph Grant (Leeds), Osamu Iyama (Nagoya), Bernhard Keller (Paris), Alastair King (Bath), Uli Kraehmer (Glasgow), Bernard Leclerc (Caen), Cesar Lecoutre (Kent), Timothy Logvinenko (Cardiff), Robert Marsh (Leeds), Walter Mazorchuk (Uppsala), David Pauksztello (Hannover), Jan Schroer (Bonn), Ivan Smith (Cambridge), Tom Sutherland (Sheffield), Pavel Tumarkin (Durham) and Michael Wemyss (Edinburgh).

The broad range of topics was very inspiring for the people attending the workshop because it offered them different viewpoints on many things they were familiar with in their own research. Also the workshop offered ample opportunities for people from different fields to share their expertise during the coffee breaks and social activities such as the reception, the conference dinner and the field trip to Hadrian's Wall, where some actual wall-crossing took place.

We thank the LMS for its generous support which made this event possible.

Raf Bocklandt
University of Amsterdam

© Peter Jorgensen

Ivan Smith - Cambridge

© Peter Jorgensen

Bernhard Keller - Paris

MATHEMATICS POLICY ROUND-UP

April 2013

RESEARCH

Dual funding structure for research in the UK
A report - *Dual Funding Structure for Research in the UK: Research Council and Funding Council Allocation Methods, and Impact Pathways* - reviews the dual funding system and research income across universities, and analyses the ways that UK academics can maximise their impact. The report was commissioned by BIS and prepared by Centre for Business Research and the UK Innovation Research Centre.

This report analyses the links between research performance, research funding models and the knowledge exchange activities and research motivation of academics in the UK. It looks at the UK system of dual funding support in which university research funding is provided by both institutional block grants from the funding councils based on quality assessment exercises and by funding through peer reviewed competition from the research councils. It provides a statistical analysis of the dual funding system and how it has changed since the 2001 Research Assessment Exercise (RAE).

The report also looks at the constraints that UK academics face when engaging with organisations outside their universities. It provides a detailed statistical analysis of the pattern of impact pathways of UK academics. The report is available at http://tinyurl.com/cou4ymq.

On-going refresh of fellowship priority areas
A new biannual process has been introduced from the 1 April 2013 which will enable potential fellowship applicants to be aware of clearly defined times during the year when EPSRC (where appropriate) will regularly update their fellowship priority areas.

Further information on this and details of the new priority areas that are being introduced by themes at this time can be found at http://tinyurl.com/cdhjwm4.

PhD training to be given £84 million boost
EPSRC announces that this year it is investing £84.2 million in postgraduate training through its annual Doctoral Training Grants (DTGs). This year's investment is the largest round of DTGs made by EPSRC, it includes £10 million for Doctoral Prizes and £1 million for Vacation Bursaries. More information is available at http://tinyurl.com/cgam6fu.

The announcement comes after last month's £350 million call for proposals for a new tranche of http://tinyurl.com/c5lnvd6. Review of EPSRC's strategic advisory routes Dr Suzanne Fortier, Chair of the independent panel which is charged with reviewing how EPSRC obtains and utilises strategic advice has outlined how the panel intends to conduct the review and the areas that will be examined. More information is available at http://tinyurl.com/c2bscrj. The LMS will be responding to this review as part of the Council for the Mathematical Sciences (CMS).

EPSRC strategic advisory team conference
The conference was held on the 18 to 19 March and David Delpy's welcome address is available on the EPSRC website at http://tinyurl.com/bvqfwza.

Changes in maternity leave for postdocs
The Research Councils have made changes to maternity leave provision for postdoctoral students. Grants may now be extended by up to 12 months to cover periods of maternity, paternity or adoption leave for staff employed on a grant. More information is available at www.rcuk.ac.uk/documents/documents/tcfec.pdf.

All Research Council funded students are entitled to take six months of maternity leave on full stipend and a further six months of unpaid maternity leave. Full details can be found in the training grant terms and conditions at www.rcuk.ac.uk/research/Pages/grantstcs.aspx.

The Research Councils are also committed to diversity and equality and a policy state-

ment on these issues is available at http://tinyurl.com/b7cgdrl.

Royal Society warns the Research Council shake-up would be 'detrimental'
The Royal Society has warned those undertaking the triennial review of the UK's research councils against making changes to their existing configuration, saying it would be 'disruptive and detrimental'.
The statement was made in the Royal Society's response to the Department for Business, Innovation and Skills' consultation, as part of the review. The full response is available at http://tinyurl.com/bukchmv.

HIGHER EDUCATION

£4.47 billion to universities and colleges in England for 2013-14
The Higher Education Funding Council for England (HEFCE) will allocate £4.47 billion to 129 universities and higher education colleges and 203 further education colleges for the academic year 2013-14. This funding is allocated for the following key areas and activities:
• £2.3 billion for teaching
• £1.6 billion for research
• £160 million for knowledge exchange
• £280 million in capital grants
• £149 million in special funding
   More information is available at www.hefce.ac.uk/news/newsarchive/2013/name,79992,en.html

Challenges and opportunities: Impact of the higher education reforms on students, universities and colleges
The first comprehensive analysis of the impact of the 2012 changes to higher education funding has been published by HEFCE.
   Latest UCAS data show that demand from young people for full-time courses in 2013-14 may be returning to previous levels following a dip in 2012-13. Beneath these overall figures there is a mixed picture, with different institutions and groups of students affected in different ways.

Only when patterns of demand become more established will we know the answers to longer-term questions such as whether recruitment to postgraduate courses is affected, and whether recent positive trends in widening participation continue to hold up. The report is available at http://tinyurl.com/csomuz9

STEM higher education
The House of Lords debated the Science and Technology Committee's report Higher Education in STEM subjects on Thursday 21 March. The report called for improvements in Science, Technology, Engineering and Maths (STEM) education to ensure that the UK has the highly skilled population necessary to drive growth through education and high-tech industries, as set out in the Government's Plan for Growth. The debate is available at http://tinyurl.com/c8wcoym.

SCHOOLS AND COLLEGES

Letter to Ofqual on A-level reform
The Secretary of State for Education has written to Ofqual with more information on his plans for A-level reform. The Secretary of State's letter and other news items about A-level reform are available at http://tinyurl.com/c3xrys8.

Ofqual publishes A-level reform correspondence
Ofqual has published its response to the Secretary of State's recent correspondence regarding A-level reform. The letter is available at http://tinyurl.com/c2363xd.

Strong maths skills
Children with strong maths skills at age 10 earn significantly more in their 30s. This is the main finding of new research published by the Institute for Fiscal Studies (IFS) and funded by the Department for Education via the Centre for the Analysis of Youth Transitions (CAYT). More information and the full report are available at www.ifs.org.uk/publications/6625.

National Curriculum
Elizabeth Truss MP gave a speech on the National Curriculum to the Fellowship Commission. The transcript of the speech is available at www.education.gov.uk/inthenews/speeches/a00222888/felcom.
   Ms Truss also presented a lecture on A-level reforms at the Institute of Education in London. The transcript of the lecture is available at http://tinyurl.com/c77samp.

OTHER

Open Access reports
The report by Sir John Caines KCB on the Foundation for Science and Technology debate on the theme *Open Access: the Finch Working Group report on expanding access to published research findings* is now available on the Foundation web site www.foundation.org.uk. The debate was held at the Royal Society on 6 March 2013. The speakers were Dame Janet Finch DBE DL AcSS, Chair, Working Group on Expanding Access to Published Research Findings, Professor Douglas Kell, Chief Executive of the Biotechnology and Biological Sciences Research Council, and Steve Hall, Managing Director of IOP Publishing.
   If you would like to make a comment on the debate theme please send an email to office@foundation.org.uk with '06Mar13 Comment' in the subject line.
   The Royal Society also hosted a workshop entitled *Open access in the UK and what it means for scientific research* on the 25 February. The workshop report is available at http://royalsociety.org/events/2013/open-access-workshop.

Women in Mathematics
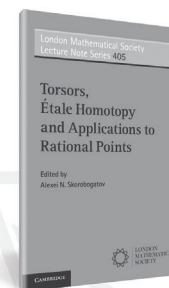*The Guardian* published an article recently about the lack of female mathematics professors in the UK. The article is available at http://tinyurl.com/chzgrhc.

Dr John Johnston
Mathematics Promotion Unit

LMS-EPSRC Short Course

O-Minimality and Diophantine Geometry

Manchester University
8-12 July 2013
Organisers: Gareth Jones and Alex Wilkie

Course outline

The last five years have seen a surprising and fruitful interaction between o-minimality, a branch of model theory, and diophantine geometry. The most spectacular outcome of this interaction is Pila's proof of the André-Oort conjecture for products of modular curves (Annals of Math., 2011). There have been further important developments by several mathematicians including Masser, Zannier, Ullmo, Yafaev, Habegger, and Pila.

The aim of the LMS-EPSRC Short Course is to introduce students in both model theory and number theory to these recent developments. The strategy underlying the diophantine applications will be introduced through a simple example accessible to first-year graduate students, and the key ingredients will each be discussed.

The three main lecture course topics are:

- *Rational points on definable sets* (**Alex Wilkie,** Manchester)
- *Functional transcendence via o-minimality* (**Jonathan Pila,** Oxford)
- *Diophantine applications* (**Philipp Habegger,** Frankfurt)

There will be guest lectures given by **David Masser** (Basel), **Andrei Yafaev** (UCL) and **Gareth Jones** (Manchester).

These lecture courses will be supplemented by tutorial sessions.

Applications: Applications should be made using the registration form available via the Society's website at: **www.lms.ac.uk/content/short-instructional-courses**. Research students, post-docs and those working in industry are invited to apply.

The closing date for applications is **Monday 27 May 2013.** Numbers will be limited and those interested are advised to make an early application.

All applicants will be contacted within two weeks after the deadline; information about individual applications will not be available before then

In the event of over-subscription preference will be given to UK-based research students

Fees

All research students registered at a UK university will be charged a registration fee of **£100**. **There will be no charge for subsistence costs**.

UK-based postdocs will be charged a registration fee of £250, plus half the subsistence costs (£150) **£400** in total.

All others (overseas students and postdocs, those working in industry) will be charged a registration fee of £250 plus the full subsistence costs (£300) **£550** in total.

All participants must pay their own travel costs (for EPSRC funded students, this should be covered by their DTA). Fees are not payable until a place on the course is offered but will be due by Friday 28 June.

LMS-EPSRC Short Courses aim to provide training for postgraduate students in core areas of mathematics. Part of their success is the opportunity for students to meet other students working in related areas as well as the chance to meet a number of leading experts in the topic.

Modern nonlinear PDE methods in fluid dynamics

LMS-EPSRC Short Course
University of Reading
8-12 July 2013
Organisers: Beatrice Pelloni & Eugen Varvaruca

Course outline

The course aims to give the opportunity to a new generation of UK PhD students to attend high quality lectures on the analysis of PDE in fluid dynamics, delivered by leading international experts. The four courses are broadly divided in two strands. The first, containing the courses given by Luigi Ambrosio and Yann Brenier, deals with applications in fluid dynamics of optimal transport methods, more specifically the variational approach to the incompressible Euler equations, and the monotone rearrangement and convection theory for the Navier-Stokes and semi-geostrophic equations. The second, containing the courses of Adrian Constantin and Georg Weiss, deals with methods specific to free-boundary problems in fluid dynamics, addressing respectively the bifurcation theory approach to existence of large-amplitude steady water waves with vorticity, and the use of blow-up techniques in the study of regularity and behaviour at singularities in free boundaries.

The four main lecture course topics are:

- *Variational models for incompressible Euler equations* (**Luigi Ambrosio**, Scuola Normale Superiore, Pisa)
- *Monotone rearrangement and convection theory* (**Yann Brenier**, University of Nice)
- *Bifurcation theory in the context of steady water waves* (**Adrian Constantin**, King's College, London)
- *Analysis of singularities in free-boundary problems* (**Georg Weiss**, Heinrich Heine University, Düsseldorf)

Guest lectures will be given by **Mike Cullen** (Met Office) and **Camillo De Lellis** (University of Zürich).

For further information please visit: www.reading.ac.uk/maths-and-stats/news/LMS-EPSRC-Shortcourse-Reading.aspx

Applications: Applications should be made using the registration form available via the Society's website at: **www.lms.ac.uk/content/short-instructional-courses**. Research students, post-docs and those working in industry are invited to apply.

The closing date for applications is **Monday 27 May 2013.** Numbers will be limited and those interested are advised to make an early application.

All applicants will be contacted within two weeks after the deadline; information about individual applications will not be available before then

In the event of over-subscription preference will be given to UK-based research students

Fees

All research students registered at a UK university will be charged a registration fee of **£100**. **There will be no charge for subsistence costs**.

UK-based postdocs will be charged a registration fee of £250, plus half the subsistence costs (£140) **£390** in total.

All others (overseas students and postdocs, those working in industry) will be charged a registration fee of £250 plus the full subsistence costs (£280) **£530** in total.

All participants must pay their own travel costs (for EPSRC funded students, this should be covered by their DTA). Fees are not payable until a place on the course is offered but will be due by Friday 28 June.

LMS-EPSRC Short Courses aim to provide training for postgraduate students in core areas of mathematics. Part of their success is the opportunity for students to meet other students working in related areas as well as the chance to meet a number of leading experts in the topic.

A POINT OF VIEW: MARY, QUEEN OF MATHS

Maths genius Mary Cartwright was a modest soul and one of the early founders of chaos theory. It's time we recognised her massive contribution says historian Lisa Jardine.

In his *Mathematician's Apology*, published in 1940, the great mathematician G.H. Hardy argued emphatically that pure mathematics is never useful. Yet at the very moment he was insisting that - specifically - "real mathematics has no effect on war", a mathematical breakthrough was being made which contributed to the wartime defence of Britain against enemy air attack.

What is more, that breakthrough laid the groundwork - unrecognised at the time - for an entire new field of science.

In January 1938, with the threat of war hanging over Europe, the British Government's Department of Scientific and Industrial Research sent a memorandum to the London Mathematical Society appealing to pure mathematicians to help them solve a problem involving a tricky type of equation. Although this was not stated in the memo, it related to top-secret developments in Radio Detection and Ranging - what was soon to become known as radar.

Engineers working on the project were having difficulty with the erratic behaviour of high-frequency radio waves. The need had arisen, the memo said, for "a more complete understanding of the actual behaviour of certain assemblages of electrical apparatus". Could any of the Mathematical Society's members help?

The request caught the attention of Dr Mary Cartwright, lecturer in mathematics at Girton College Cambridge. She was already working on similar "very objectionable-looking differential equations" (as she later described them).

She brought the request to the attention of her long-term colleague at Trinity College, Professor J.E. Littlewood and suggested that they combine forces. In a memoir written later in her life, she explained that he already had

Mary Cartwright

the necessary experience in dynamics, having worked on the trajectories of anti-aircraft guns during World War I.

The distinguished physicist and public intellectual Freeman Dyson - who was born in Britain but has, since the 1950s, spent most of his professional life at the Princeton Institute for Advanced Studies in America - heard Cartwright lecture on this work when he was a student at Cambridge in 1942. He gives us a vivid account of the importance of the war work Cartwright and Littlewood did:

"The whole development of radar in World War Two depended on high power amplifiers, and it was a matter of life and death to have amplifiers that did what they were supposed to do. The soldiers were plagued with amplifiers that misbehaved, and blamed the manufacturers for their erratic behaviour. Cartwright and Littlewood discovered that the manufacturers were not to blame. The equation itself was to blame."

In other words, odd things happened when some sorts of values were fed into the standard equation they were using to predict the amplifiers' performance. Cartwright and Littlewood were able to show that as the wavelength of radio waves shortens, their performance ceases to be regular and periodic, and becomes unstable and unpredictable.

This work helped explain some perplexing phenomena engineers were encountering.

Cartwright herself was always somewhat diffident when asked to assess the lasting importance of her war work. She and Littlewood had provided a scientific explanation for some peculiar features of the behaviour of radio waves, but they did not in the end supply the answer in time. They simply succeeded in directing the engineers' attention away from faulty equipment towards practical ways of compensating for the electrical "noise" - or erratic fluctuations - being produced.

So while Cartwright and Littlewood were producing significant results on the stability of solutions to the equation describing the oscillation of radio waves, the engineers working on radar systems decided they could not wait for precise mathematical results. Instead, once it had been identified, they worked around the problem, by keeping the equipment within predictable ranges.

Perhaps in part because of her own overly modest assessment of its importance, Cartwright's original work went relatively unnoticed when it was published in the J*ournal of the London Mathematical Society* shortly after the end of the war. Freeman Dyson maintains that this is a classic example of the way in which real mathematical originality and innovation is missed until a generation after the work has been done:

"When I heard Cartwright lecture in 1942, I remember being delighted with the beauty of her results. I could see the beauty of her work but I could not see its importance. I said to myself, 'This is a lovely piece of work. Too bad it is only a practical wartime problem and not real mathematics.' I did not say, 'This is the birth of a new field of mathematics.' I shared the tastes and prejudices of my contemporaries."

The "new field" Dyson refers to here, which he and his contemporaries failed to recognise, is chaos theory. Cartwright's early contribution to the field is now acknowledged in all histories of the subject, but was largely overlooked for almost 20 years.

The results unexpectedly obtained from the equations predicting the oscillations of

radio waves are part of the foundation for the modern theory that accounts for the unpredictable behaviour of all manner of physical phenomena, from swinging pendulums and fluid flow, to the stock market.

Steadily increase the rate of flow of water into a rotating waterwheel, for example, and the wheel will go correspondingly faster. But at a certain point the behaviour of the wheel becomes unpredictable - speeding up and slowing down without warning, or even changing direction.

The recognition that chaotic behaviour is a vital part of many physical systems in the world around us came in 1961, when Edward Lorenz was running a weather simulation through an early computer. When he tested a particular configuration a second time he found that the outcome differed dramatically from his earlier run. Eventually he tracked the difference down to a small alteration he had inadvertently made in transferring the initial data, by altering the number of decimal places.

Lorenz immortalised this discovery in a lecture entitled *Does the Flap of a Butterfly's Wings in Brazil set off a Tornado in Texas?*.

Today, when we think of chaos theory we associate it with all kinds of fundamentally unstable situations - but one of the most vivid to imagine is still the idea that one flap of a butterfly's wing deep in the Amazon rainforest is the cause of a weather system thousands of miles away.

This is the same kind of unpredictability arising from small changes in initial conditions that Cartwright and Littlewood had recognised and drawn attention to in their work with radio waves several decades earlier.

After the war, Mary Cartwright moved away

from knotty differential equations and ended her collaboration with Littlewood. She went on to have a distinguished academic career in pure mathematics and academic administration, earning a succession of honours.

In 1947 she was the first woman mathematician to be elected to the Royal Society. In 1948 she became Mistress of Girton College Cambridge, then reader in the theory of functions in the Cambridge mathematics department in 1959. From 1961 to 1963 she was president of the London Mathematical Society, and received its highest honour, the De Morgan Medal, in 1968. She was made a Dame Commander of the British Empire in 1969.

She lived long enough to see the field in which she had made those early, important discoveries become a major part of modern mathematics, and to see it take its place in the popular imagination. She was, however, characteristically modest to the end about the part she had played.

Freeman Dyson claims that Littlewood did not understand the importance of the work that he and Cartwright had done: "Only Cartwright understood the importance of her work as the foundation of chaos theory, and she is not a person who likes to blow her own trumpet."

He records, however, that shortly before her death, he received an indignant letter from Cartwright, scolding him for crediting her with more than she deserved.

Dame Mary Cartwright died in 1998 at the age of 97. In one of the many obituaries paying tribute to her, a friend and colleague described her as "a person who combined distinction of achievement with a notable lack of self-importance".

She left strict instructions that there were to be no eulogies at her memorial service.

However, March 8 was International Women's Day, so it feels like a particularly appropriate time to blow Dame Mary Cartwright's trumpet on her behalf - for her brilliance as a mathematician, and as one of the founders of the important field of chaos theory.

Courtesy of BBC News Online – 8 March 2013

VISIT OF ALEXANDER TOVBIS

Professor Alexander Tovbis (University of Central Florida) will be visiting the UK during May and June 2013. His research areas are: Riemann-Hilbert problem and its applications, perturbation and asymptotic methods of nonlinear dynamics, orthogonal polynomials and medical imaging. Professor Tovbis will give the following talks:
- 30 May, University of Reading: *Asymptotic methods for matrix Riemann-Hilbert problems and their applications in integrable systems and orthogonal polynomials* contact Beatrice Pelloni, (b.pelloni@reading.ac.uk)
- 31 May, Loughborough University: *Nonlinear steepest descent method for asymptotic of Riemann-Hilbert Problems*, contact Gennady El (g.el@lboro.ac.uk)
- 10 June, University of Cambridge: *Inversion formula for the cosh-weighted Hilbert transform*, contact Athanassios Fokas (T.Fokas@damtp.cam.ac.uk)

Further details can be obtained from Gennady El (g.el@lboro.ac.uk). The visit is supported by an LMS Scheme 2 grant.

VISIT OF JIM AGLER

Professor Jim Agler (University of California at San Diego) will visit the School of Mathematics and Statistics at Newcastle University from 27 May to 15 June 2013 for collaborative research. Professor Agler is an expert on several branches of mathematical analysis, to which he has made highly original contributions. He has made important discoveries in operator theory and especially its applications to functions of several complex variables. His recent research is characterized by a very effective use of operator-theoretic methods to strengthen and generalize classical results in several complex variables.

Further details can be obtained from Dr Zinaida Lykova (Zinaida.Lykova@ncl.ac.uk). This visit is supported by an LMS Scheme 4 grant.

VISIT OF SEOK KIM

Professor Seok Kim (Perimeter Institute and KIAS) will visit the UK from 2 to 18 June 2013. His current area of research concerns the theory of strongly interacting supersymmetric quantum field theories and their exactly calculable partition functions. Generally, he has been working on various areas of string theory, quantum field theory and quantum gravity, often specialising to field theory solitons, exact partition functions, exact solutions of supergravity, and their applications.

During his visit Professor Kim will deliver a lecture entitled *M5-brane indices from 5d gauge theories* in each of the following places:
- University of Cambridge, Wednesday 5 June at 2.15 pm, Room MR2
- University of Surrey, Tuesday 11 June at 4:00 pm, Room 39/40 AA 04
- Imperial College London, Wednesday 12 June at 2:00 pm

For further information contact Dr Martin Wolf (m.wolf@surrey.ac.uk). The visit is supported by an LMS Scheme 2 grant.

VISIT OF ALEXANDER IZZO

Professor Alexander Izzo (Green State University, Ohio) will be visiting Lancaster, Leeds and Nottingham in June 2013. He works on uniform algebras and approximation. In particular, he works on uniform approximation and algebras on manifolds, and on uniform algebras invariant under group actions. Professor Izzo will give the following talks:
- Lancaster, Wednesday 5 June at 4 pm, Room A54, Postgraduate Statistics Centre: *Algebras of holomorphic functions and a replacement for the peak point conjecture*
- Leeds, Tuesday 11 June at 3:30 pm, MALL 2, School of Mathematics: *Function algebras invariant under group actions*
- Nottingham, Friday June 14 at 3 pm, Room A17, Mathematical Sciences Building: *Algebras of holomorphic functions and a replacement for the peak point conjecture*

For further details contact Joel Feinstein (joel.feinstein@nottingham.ac.uk). The visit is supported by an LMS Scheme 2 grant.

VISIT OF PATRICK GERARD

Professor Patrick Gerard (Paris, Orsay) will visit King's College London from 6 to 17 May 2013. He will give a short lecture course on the topic *The cubic Szegö equation and Hankel operators.*

The course is aimed at advanced PhD students and researchers in the field. The lectures will be held at King's College London and are open to anyone interested. The visit is supported by King's College London. For further information contact Alexander Pushnitski (alexander.pushnitski@kcl.ac.uk).

VISIT OF PAVEL DRABEK

Professor Pavel Drabek (University of Western Bohemia) will visit the UK from 25 June to 2 July 2013. Professor Drabek's interests include half-linear eigenvalue problems, p-Laplacians, Fucik spectra and calculus of variations. He will give seminars at the following universities:
- King's College London, 27 June: *Models of the phase transition with nonsmooth energy functional*
- University of Kent at Canterbury, 28 June: *Models of the phase transition with nonsmooth energy functional*
- Cardiff University, 1 July: *On quasilinear Sturm-Liouville problem with weights*

The talk in Cardiff is also part of a two-day symposium in honour of the late Professor Michael Eastham FRSE. Details may be found on the webpages of the relevant departments. The visit is supported by an LMS Scheme 2 grant.

VISIT OF ANDREY SHILNIKOV

Professor Andrey Shilnikov (Georgia State University) will be visiting London, Bristol and Exeter from 2 to 14 June 2013. His research areas include computational neuroscience, homoclinic bifurcations, analysis of Lorenz attractors. Professor Shilnikov will give the following talks:
- University of Exeter, 4 June: *Symbolic toolkit for exploration of deterministic chaos*
- University of Bristol, 7 June: *Bifurcation theory for bursting patterns in multifunctional central pattern generator models*
- Imperial College, London, 11 June: *Dynamics of neurons coupled by inhibitory and excitatory synapses*

For further information contact Dmitry Turaev, Imperial College London (dturaev@imperial.ac.uk). The visit is supported by an LMS Scheme 2 grant.

DIFFERENTIAL GEOMETRY AND CONTINUUM MECHANICS

A workshop on *Differential Geometry and Continuum Mechanics* will take place from 17 to 21 June 2013 at the ICMS, 15 South College Street, Edinburgh EH8 9AA.

The cross-fertilisation between continuum mechanics, differential geometry, and the theory of partial differential equations has been a recurring theme in the 20th Century. The present century sees a further development of the relations between these areas, covering topics as diverse as isometric embeddings, partial differential equations of mixed type, growth and shape evolution in biological systems, and defects in continua with microstructure. Applications of these topics to novel materials and manufacturing techniques are also coming to the fore.

This workshop will explore these exciting developments. It is intended to be equally enriching for pure and applied geometers, experts in continuum mechanics and partial differential equations, and engineering scientists. Partial support may be available to enable PhD students to attend.

The workshop is supported by The Centre for Analysis and Nonlinear PDEs, The Oxford Centre for Nonlinear PDE, The London Mathematical Society, Bridging the Gap - University of Strathclyde and The Glasgow Mathematical Journal Trust.

For further information visit the workshop website. www.icms.org.uk/workshops/differentialgeometry.

SHARING GOOD PRACTICE IN SERVICE TEACHING IN THE MATHEMATICAL SCIENCES

Mathematics, Statistics and OR For All

Friday 17 May 2013
University of Manchester

For many years, Mathematical Sciences departments and groups have offered service teaching in Mathematics, Statistics and OR to students in a range of other disciplines. This event aims to provide an opportunity for staff involved in this work to meet and share good practice in the teaching, learning, assessment and organisation of service teaching. The purpose of the event is to launch the establishment of a community of practice in this area.

The scope of service provision provided by Mathematics, Statistics and OR subject specialists is wide ranging. The challenges which can arise are many and include teaching large class, engaging students, contextualising content, the use of appropriate learning technologies and building students' confidence in the use of mathematical and statistical techniques. This event will provide the ideal forum for the discussion of these and other challenges and for sharing examples of successful practice in this area.

This event is being funded by the Mathematics, Statistics and Operational Research discipline (www.heacademy.ac.uk/disciplines/maths-stats-or) at the Higher Education Academy (HEA). As such there is no charge for attending this event. Queries about this event should be emailed to Catherine Redfern (Catherine.Redfern@heacademy.ac.uk).

For further information and to book a place go to www.heacademy.ac.uk/events/detail/2013/17_May_MSOR_Manchester.

USING REAL-LIFE EXTENDED MATHEMATICAL PROBLEMS WITH UNDERGRADUATES

A Hands-on Experience
Wednesday 5 June 2013
University of Bath

Professor Chris Budd, from the University of Bath, will lead a masterclass on using real-life extended problems with undergraduates in the Mathematical Sciences. In an intensive day of activity, delegates will work in teams on the formulation, solution and presentation of findings for problems (e.g. industrial and environmental problems) which will be made available on the day. Underpinning all of the activities and discussion will be how to use the approach effectively as a means of providing a rich and engaging learning experience for students.

This event provides a unique opportunity for professional development which is discipline specific and focussed on providing engaging and stimulating learning activities for undergraduates in the Mathematical Sciences. All of the problems encountered during the day will be chosen so that the level of Mathematics required will be accessible to undergraduates. At the masterclass delegates will receive materials which can be used directly with their students.

This event is being run by the Mathematics, Statistics and Operational Research discipline (www.heacademy.ac.uk/disciplines/maths-stats-or) at the Higher Education Academy (HEA). The cost of attending is £75 for staff from HEA subscribing institutions and £150 for others. Lunch and refreshments will be provided. Queries about this event should be emailed to Catherine Redfern (Catherine.Redfern@heacademy.ac.uk).

For further information and to book a place go to www.heacademy.ac.uk/events/detail/2013/05_June_MSOR_Bath.

LONDON MATHEMATICAL SOCIETY

SOCIETY MEETING

Friday 5 July 2013

De Morgan House, Russell Square, London

(Nearest Tube: Russell Square)

3.30 Opening of the meeting and LMS business, including the announcement of the 2013 prize winners (open to all)

Karl-Theodor Sturm (Bonn)
Geometric Analysis on the Space of Metric Measure Spaces

The space X of all metric measure spaces (*X, d, m*) plays an important role in image analysis, in the investigation of limits of Riemannnian manifolds and metric graphs as well as in the study of geometric flows that develop singularities. We show that the space X - equipped with the L^2-distortion distance Δ is a challenging object of geometric interest in its own. In particular, we show that it has nonnegative curvature in the sense of Alexandrov. Geodesics and tangent spaces are characterized in detail. Moreover, classes of semiconvex functionals and their gradient flows on X are presented.

4.45 Tea/Coffee

5.15 **S.R. Srinivasa Varadhan (NYU)**
Probability, counting and large deviations.

Calculations in probability theory often involves counting the number of objects in a given set. Tools from probability theory can therefore be useful in counting as well. We will look at some examples where Large Deviation Theory can be used to perform the count.

6.30 Reception

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

To register for your place at the meeting, please Elizabeth Fisher (lmsmeetings@lms.ac.uk).

A reception will be held at the LMS at 6.30 pm with a dinner afterwards. The venue and cost to attend the dinner are to be confirmed. Those wishing to attend the dinner should contact Elizabeth Fisher (lmsmeetings@lms.ac.uk) before **26 June**.

There are funds available to contribute in part to the expenses of members of the Society or research students wishing to attend the meeting. The meeting will be preceded by a Graduate Student Meeting.

Contact Elizabeth Fisher (lmsmeetings@lms.ac.uk) for further information.

CLAY RESEARCH CONFERENCE AND WORKSHOPS

The Clay Research Conference will be held on 2 October 2013 at the Mathematical Institute of the University of Oxford. The speakers are:
• Peter Constantin (Princeton University)
• Lance Fortnow (Georgia Institute of Technology)
• Fernando Rodriguez Villegas (University of Texas at Austin)
• Edward Witten (Institute for Advanced Study)

The recipient of the 2013 Clay Research Award will be announced at the conference. Presented annually, the Clay Research Award celebrates the outstanding achievements of the world's most gifted mathematicians.

Associated workshops will be held throughout the week of the conference:
• *The Navier-Stokes Equations and Related Topics*, 29 September – 1 October
• *New Insights into Computational Intractability*, 30 September – 4 October
• *Number Theory and Physics*, 30 September – 4 October
• *Quantum Mathematics and Computation*, 30 September – 4 October

Registration to the Clay Research Conference is free but required. Participation in the workshops is by invitation; a limited number of additional places is available. Some financial assistance is available for PhD students and early career researchers; some accommodation is available. For more information email Naomi Kraker (admin@claymath.org). For full details, including the schedule, titles and abstracts when they become available, see www.claymath.org/CRC13/.

These events are held in conjunction with the **University of Oxford's Mathematical Institute Opening Conference** on 3 October, celebrating the opening of the Institute's new building. The speakers are Ingrid Daubechies (Duke University), Raymond Goldstein (University of Cambridge) and Sir Andrew Wiles (University of Oxford). For more information and to register, visit www.maths.ox.ac.uk/opening.

SPECTRAL ANALYSIS AND DIFFERENTIAL EQUATIONS

The meeting *Spectral Analysis and Differential Equations* will take place in Cardiff from 1 to 2 July 2013. It is a memorial meeting to mark the life and work of Michael Eastham FRSE, whose obituary appeared in the December LMS *Newsletter*.

The topics of the meeting include ordinary differential equations, inverse problems, systems of differential equations and non-linear differential equations. The invited speakers are:
• Jussi Behrndt (Graz)
• Christer Bennewitz (Lund)
• E. Brian Davies, FRS (King's College)
• Pavel Drabek (Pilsen)
• Hubert Kalf (LMU München)
• Bryan Rynne (Heriot-Watt)
• Karl Michael Schmidt (Cardiff)
• Andrei Shkalikov (Moscow)

Further information, including registration details, can be found on the website www.cs.cf.ac.uk/easthammemorial. This meeting is supported by an LMS Conference grant.

OPEN SYSTEM IDENTIFICATION

A one-day conference on *Open System Identification* will take place in Room 5, Old College, South, Aberystwyth from 10:00-17:30 on Monday 10 June 2013. The speakers are:
• Madalin Guta (Nottingham)
• Marcus Cramer (Ulm)
• Giulia Gualdi (Florence)
• Daniel Oi (Strathclyde, Glasgow)
• Sophie Schirmer (Swansea)
• Daniel Burgarth (Aberystwyth)

There is a £20 registration fee which covers coffee breaks and the conference lunch. Registration and enquiries via email to Daniel Burgarth (burgarth@gmail.com) until **31 May**. Further details can be found at http://goo.gl/EztCw. This conference is supported by an LMS Conference grant awarded under the 'Celebrating New Appointments' scheme.

LMS POPULAR LECTURES 2013

Institute of Education, London – Tuesday 25 June

King Edward School, Birmingham – Thursday 26 September

Professor Ray Hill
University of Salford

Mathematics in the Courtroom

In this talk, Professor Ray Hill shows how the misuse of mathematics can lead to miscarriages of justice, and how the correct use of mathematics can help to prevent them.

Dr Vicky Neale
University of Cambridge

Addictive Number Theory

For hundreds of years, mathematicians have asked intriguing questions about adding whole numbers, for example concentrating on particularly important sequences such as the prime numbers and the square numbers.

We shall discuss some of these problems (solved and unsolved), and some of the elegant techniques from across mathematics that have been used to tackle these problems.
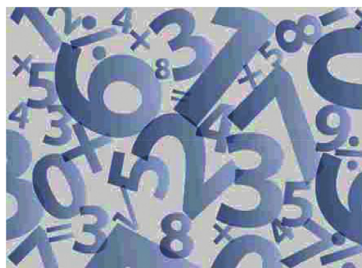
LONDON: Commences at 7.00 pm, refreshments at 8.00 pm, ends at 9.30 pm. Admission is free, with ticket. **Register by Thursday 20 June.**

BIRMINGHAM: Commences at 6.30 pm, refreshments at 7.30 pm, ends at 9.00 pm. Admission is free, with ticket. **Register by Friday 20 September.**

To register for tickets, please email popularlectures@lms.ac.uk or visit the LMS website for abstracts and a registration form (www.lms.ac.uk/content/popular-lectures).

LMS INVITED LECTURES 2013
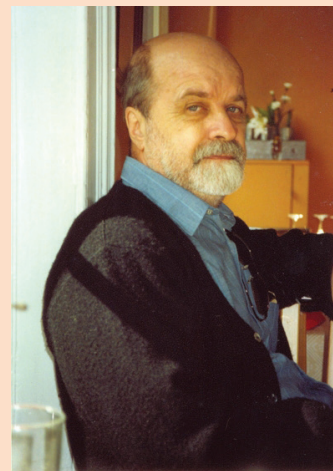
**Professor Fedor Bogomolov
(Courant Institute, NYU)**

***Birational Geometry
and Galois Groups***

**10-14 June 2013
University of Edinburgh**

The lectures will discuss the relation between the structure of the Galois group of algebraic closure of a field of rational functions and the structure of the field itself. More precisely, they will cover how to extract effectively birational invariants (i.e. geometric invariants of projective models of the field from the Galois group).

There will also be supplementary lectures by:

G. Brown (Loughborough) *Fano 4-fold hypersurfaces*
I. Cheltsov (Edinburgh) *Finite subgroups of Cremona group*
T. Logvinenko (Warwick) *Derived categories and birationality*

University and local Guesthouse accommodation will be available.

Limited financial support is available with preference given to UK research students. Please contact the organisers for further details (i.cheltsov@ed.ac.uk, J.Martinez-Garcia@sms.ed.ac.uk).

Deadline for funding: **1 May 2013**.

For further details on the 2013 Invited Lectures visit www.maths.ed.ac.uk/cheltsov/fedya/

STOCHASTIC DIFFERENTIAL DELAY EQUATIONS WORKSHOP

A workshop on *Stochastic Differential Delay Equations and Their Applications* will take place at the University of Strathclyde from 10 to 11 June 2013. Stochastic differential delay equations (SDDEs) have become more and more popular, not only because they are useful in many branches of science and industry including finance, renewable energy, biology, ecosystems, but also present many challenges to mathematical research as well as provide mathematicians with a great opportunity to collaborate together with economists, engineers, ecologists, biologists. UK has several world leading groups in the field of SDDEs and their applications.

This two-day workshop is to bring researchers and their research students along with some international invited speakers together to promote, encourage, and influence more cooperation, and to bring together various disciplines e.g. theoretical, numerical and applied that attempt to understand SDDEs and solve practical problems. The invited speakers include:
- J. Appleby (Dublin)
- T. Caraballo (Sevilla)
- N. Ford (Chester)
- U. Kuchler (Berlin)
- K. Liu (Liverpool)
- J. Pan (Strathclyde)
- A. Rodkina (Jamaica)
- M. Riedle (Kings)
- S. Sabanis (Edinburgh)
- L. Shaikhet (Ukraine)
- L. Szpruch (Oxford)
- L. Xu (Brunel)
- W. Yan (Strathclyde)
- C. Yuan (Swansea)

For further information, including how to register, visit the website http://personal.strath.ac.uk/x.mao/talks/SDDE2013/. The workshop is supported by an LMS Conference grant.

UCL GEOMETRY AND TOPOLOGY DAY

As recently announced, the Department of Mathematics at University College London made new appointments in geometry and topology, which resulted in the creation of a new research group. To help celebrate this development, UCL hosted two half-day events on 20 February and 20 March 2013. To help celebrate an additional recent appointment to this group, UCL will host another half-day event on 31 May 3013. The meeting will focus on *Geometric Analysis*. The speakers will be:
- Tobias Lamm (Karlsruhe Institute of Technology)
- Felix Schulze (UCL)
- Peter Topping (University of Warwick)

The meeting is open to everyone and the event will be followed by a reception and a dinner to which all are welcome.

Updated information will be provided on the UCL Geometry and Topology Group website www.homepages.ucl.ac.uk/~ucahjde/geometry/geom-topol-days.htm. To register your interest in attending the event or for any enquiries, email Felix Schulze (f.schulze@ucl.ac.uk). The meeting is supported by an LMS Conference grant.

QUANTUM INFORMATION AND CONTROL

The *Quantum Information and Control Joint Research Group* will hold a meeting from 4 to 5 July 2013 at Nottingham University. The meeting is dedicated to the memory of Viacheslav Belavkin, and his pioneering work in the field of quantum information processing and control. His obituary appeared in the February LMS *Newsletter*. Invited speakers include:
- Gerard Milburn (University of Queensland)
- Robin Hudson (Loughborough University)
- Jason Ralph (Liverpool University)
- Alessio Serafini (University College London)

For further information contact John Gough (jug@aber.ac.uk). The meeting is supported by an LMS Scheme 3 grant.

RIEMANN-HILBERT PROBLEMS

A meeting on *Riemann-Hilbert Problems and their Applications* will take place at Reading University from 29 to 30 May 2013. In the past decade, a variety of different mathematical problems have found a unifying element in the fact that they can be formulated, in some sense, as a so-called Riemann-Hilbert problem (RHP), a classical problem in complex analysis. The possibility of interpreting as a RHP many different mathematical questions, especially arising in the modelling of large or random systems, has lately received a lot of attention from the mathematical community, and RH formulations can be found in the context of random matrix theory, statistical physics, and fluid mechanics, for example.

The objective of this meeting is to bring together people working in the areas of Riemann-Hilbert problems and their applications in different branches of mathematics and mathematical physics, such as random matrix theory, operator theory, and asymptotic analysis. The main aim is to discuss the current state of the field and, most importantly, to explore further plans for the future. The invited speakers are:
- Lorna Brightmore (University of Bristol)
- Cristina Camara (Instituto Superior Tecnico, Lisbon)
- Athanassios S. Fokas (University of Cambridge)
- Jon Keating (University of Bristol)
- Igor Krasovsky (Imperial College London)
- Francesco Mezzadri (University of Bristol)
- Beatrice Pelloni (Reading University)
- Antti Perala (University of Helsinki)
- Eugene Shargorodsky (King's College London)
- Alexander Tovbis (University of Central Florida)

The registration fee is £10.00. For further information visit the website http://www.personal.reading.ac.uk/~vn904206/RHPs2013.html or contact the organizer Jani Virtanen (j.a.virtanen@reading.ac.uk). The meeting is supported by an LMS Conference grant.

TWO ONE-DAY COLLOQUIA IN COMBINATORICS 2013

Two linked one-day colloquia in combinatorics will be taking place in London. The first day will be held at Queen Mary, University of London, on Wednesday 15 May and the second will take place at the London School of Economics and Political Science on Thursday 16 May. It is hoped that the talks will be of wide interest to all those working in combinatorics or related fields. The schedule is as follows:

Queen Mary, University of London (15 May)
- Julia Böttcher (LSE) *A Blow-up Lemma for sparse graphs*
- Ben Green (Cambridge) *The sum-free set constant is 1/3*
- Simon Griffiths (IMPA) *The triangle-free process and R(3,k)*
- Dan Hefetz (Birmingham) *Winning strong games through fast strategies for weak games*
- Wojciech Samotij (Tel Aviv) *Typical structure of graph homomorphisms*
- Anusch Taraz (Munich) *Density and Ramsey results concerning graphs with sublinear bandwidth*

London School of Economics (16 May)
- Noga Alon (Tel Aviv) *Random Cayley graphs*
- Roman Glebov (Warwick) *On bounded degree spanning trees in the random graph*
- Gábor Kun (Budapest) *A measurable version of the Lovász Local Lemma*
- Viresh Patel (Birmingham) *A conjecture of Thomassen on Hamilton cycles in highly connected tournaments*
- Endre Szemerédi (Budapest) *On subset sums*
- Julia Wolf (Paris) *Sumsets, sampling and almost periodicity*

Anyone interested is welcome to attend. Some funds are available to contribute to the expense of research students who wish

to attend the meetings. Further details can be obtained from the web page www2.lse.ac.uk/maths/Seminars/Colloquia_2013.aspx or from Rebecca Lumb (r.c.lumb@lse.ac.uk).

There are also some funds available from the London Mathematical Society for help with childcare costs. Further details can be found on their website www.lms.ac.uk/content/childcare-supplementary-grants. Support for this event from the London Mathematical Society and the British Combinatorial Committee is gratefully acknowledged by the organisers.

STRING-MATHS UK 2013

String-Maths UK will take place from 10 to11 May 2013 at the University of Surrey. The main aim of this conference to is to bring together mathematicians and theoretical physicists working on ideas related to string theory and quantum field theory. There has been a long and fruitful history in the interplay between mathematics and physics. Many ideas in physics have led to new and exciting developments in mathematics. Conversely, mathematics has led to new and powerful techniques that have rendered many problems in string theory soluble. Invited speakers include:
• Philip Candelas (Oxford)
• Miranda Cheng (IMJ and LPTHE)
• Dario Martelli (King's College London)
• Lionel Mason (Oxford)
• Ilarion Melnikov (AEI Potsdam)
• Sara Pasquetti (Surrey)
• Brian Wecht (Queen Mary)

The organizers hope to bring together researchers working at the intersection between these two fields to summarise current developments and explore future research directions. The meeting will be largely informal with plenty of time for discussions.

For further information visit the website at http://personal.maths.surrey.ac.uk/st/M.Wolf/conferences/smuk2013/index.html. The conference is supported by an LMS Conference grant.

NUMBER THEORY, GEOMETRY AND CRYPTOGRAPHY

A workshop on the subject of *Number Theory, Geometry and Cryptography* will take place at the University of Warwick from 1 to 5 July 2013. This workshop is part of the 2012-2013 EPSRC Warwick Number Theory Symposium, and is organised by John Cremona and Samir Siksek (Warwick), with Kenny Paterson (Royal Holloway, University of London) and Nigel Smart (Bristol). Invited speakers include:
• Dan Bernstein (UIC)
• Wouter Castryck (Leuven)
• Xing Chaoping (NTU Singapore)
• Ronald Cramer (Leiden)
• Andreas Enge (Bordeaux)
• Stephen Galbraith (Auckland)
• David Kohel (Marseille)
• Tanja Lange (Eindhoven)
• Vadim Lyubashevsky (ENS)
• James McKee (Royal Holloway)
• François Morain (École Polytechnique)
• Phong Nguyen (ENS)
• Denis Simon (Caen)
• Andrew Sutherland (MIT)

For further information visit the website www2.warwick.ac.uk/fac/sci/maths/research/events/2012-2013/numbertheory/ which gives further information, including how to register.

This meeting is supported by EPSRC and the Warwick Mathematics Research Centre and is organised by John Cremona and Samir Siksek (Warwick), with Kenny Paterson (Royal Holloway, University of London) and Nigel Smart (Bristol).

In the week preceding the workshop, from 24 to 28 June, the Warwick Mathematics Institute will also be holding a Summer School on *Number Theory for Cryptography*. This will feature lecture courses by Dan Bernstein, Andreas Enge, Tanja Lange and François Morain, aimed at PhD students in number theory and closely related areas who have little or no knowledge of cryptography or the applications of mathematics in cryptography. For further information, see the website above.

RATIONAL POINTS - GEOMETRIC, ANALYTIC AND EXPLICIT APPROACHES

A workshop on the subject of *Rational Points - Geometric, Analytic and Explicit Approaches* will take place at the University of Warwick from 27 to 31 May 2013. This workshop is part of the 2012-2013 EPSRC Warwick Number Theory Symposium, and is organised by John Cremona, Samir Siksek and Damiano Testa (Warwick) with Roger Heath-Brown (Oxford) and Michael Stoll (Bayreuth). Invited speakers include:
• Martin Bright (Beirut)
• Tim Browning (Bristol)
• Nils Bruin (Simon Fraser)
• Jean-Lous Colliot-Thélčne (Orsay)
• Ulrich Derenthal (Munich)
• Tim Dokchitser (Bristol)
• Tom Fisher (Cambridge)
• David Harary (Orsay)
• David Holmes (Leiden)
• Ronald van Luijk (Leiden)
• David McKinnon (Waterloo)
• Jonathan Pila (Oxford)
• Jeroen Sijsling (Warwick)
• Alexei Skorobogatov (Imperial)
• Peter Swinnerton-Dyer (Cambridge)
• Bianca Viray (Brown)
• Olivier Wittenberg (ENS)
• Trevor Wooley (Bristol)

For further information visit the website www2.warwick.ac.uk/fac/sci/maths/research/events/2012-2013/numbertheory/ which gives further information. This meeting is supported by EPSRC and the Warwick Mathematics Research Centre.

QUANTUM MARGINALS

14 – 18 October 2013

Isaac Newton Institute for Mathematical Sciences

in association with the Newton Institute programme
Mathematical Challenges in Quantum Information
(27 August – 20 December 2013)

Workshop organisers: Matthias Christandl (ETH Zürich), Michael Walter (ETH Zürich) and Andreas Winter (Bristol).

Understanding the quantum marginals, or reduced density matrices (RDMs), of multipartite quantum states is a fundamental theme in quantum information theory. Recent work has built on tools from convex analysis and random matrix theory as well as on the link to algebraic and symplectic geometry and asymptotic representation theory. In this workshop, we aim to bring together mathematicians, physicists and computer scientists to discuss recent developments, communicate open problems as well as to identify new directions for the future study of quantum marginals:

• The quantum marginal problem/N-representability problem in quantum chemistry and mathematical physics
• The study of entropies and entropy inequalities, entanglement and correlations of multipartite quantum states in quantum information theory
• Mathematical aspects: geometry, representation theory and complexity theory

Closing date of the receipt of applications is **26 July 2013**. Further information and application forms are available from the website at www.newton.ac.uk/programmes/MQI/mqiw02.shtml.

THE LONDON MATHEMATICAL SOCIETY

JOINTLY WITH GRESHAM COLLEGE

Tuesday 14th May 2013

6:00 pm at The Museum of London

Mathematics: The Next Generation

Professor Peter Cameron

Queen Mary, University of London

Mathematics is important to us all. So it is important to enable young mathematicians, clear-thinking and passionate about their subject, to contribute at the highest level. Professor Cameron will talk about his experience designing and presenting a course for first-semester university students aiming to produce mathematicians.

ADMISSION FREE

NO RESERVATIONS REQUIRED – FIRST COME, FIRST SERVED

Museum of London, London Wall, London EC2Y 5HN
Nearest underground stations: Barbican, St Paul's and Moorgate

020 7831 0575 enquiries@gresham.ac.uk www.gresham.ac.uk

COMBINATORICS, ALGEBRA, AND MORE

A Conference in Celebration of Peter Cameron

To mark Peter Cameron's retirement from Queen Mary, University of London and to celebrate his many mathematical achievements (so far), this conference will take place from 8 to 10 July 2013, at Queen Mary, University of London. The topics covered will include a wide range from combinatorics and algebra, reflecting Peter Cameron's broad mathematical interests.

The conference will feature talks by Peter himself, João Araújo, László Babai, R.A. Bailey, Michael Giudici, Timothy Gowers (tbc), Robert Johnson, Martin Liebeck, Dugald Macpherson, Peter Neumann, Donald Preece, Thomas Prellberg, Alan Sokal, Anatoly Vershik, Bridget Webb, and Geoff Whittle.

There will be at least one open problem session, and we expect the conference to be an excellent opportunity for informal discussion and collaboration.

Visit the conference website www.maths. qmul.ac.uk/~camconf/ for more information and from where you can register, book on-site accommodation, and reserve a place at the conference dinner (to be held on Wednesday 10 July).

The conference is open to all. PhD students are very much encouraged to attend, and are offered reduced fees for registration and the conference dinner. In addition, PhD students based in the UK without official funding for conference attendance are invited to email the conference organizers (camconf@maths.qmul.ac.uk) to request financial assistance with travel and/or accommodation.

The conference is organised by David Ellis and Leonard Soicher. Financial support from the School of Mathematical Sciences, QMUL, the Centre for Discrete Mathematics, QMUL, and the London Mathematical Society is gratefully acknowledged.

CETL-MSOR CONFERENCE 2013

Next Steps

The CETL-MSOR 2013 Conference *Next Steps* will be held at Coventry University from 10 to 11 September. In November 2012, the CBI published a report entitled First Steps – the first aspiration of which is *Better education should be our over-riding long-term priority*. The conference will explore ways in which learning and teaching in Mathematics, Statistics and OR in higher education can contribute to this aspiration within a rapidly changing environment. The principal themes of the conference will be:
• employability
• meeting the needs of a diverse student population
• technology-enhanced learning and teaching
• the National HE-STEM Programme legacy

Authors are invited to submit abstracts of no more than 500 words by **Monday 2 June 2013** which explore the themes of the conference. Interesting reports on issues relating to the wider teaching and learning of mathematics and statistics that do not fit directly with the themes will also be considered.

For further details of the conference and the abstract submission form visit the website at www.sigma-network.ac.uk/cetl-msor2013.

UNCERTAINTY IN INTERACTION NETWORKS

A two-day meeting on the challenge of understanding and predicting random effects in interaction networks will be held at the University of Bath from 12 to 13 June 2013, hosted by the Department of Mathematical Sciences and the Centre for Networks and Collective Behaviour.

This workshop will provide a venue for UK mathematicians working in the areas of networks and stochastic modelling to dis-

cuss methodologies and explore common ground in this emerging research area. There will also be invited speakers from other disciplines, known for the application of network theory. Confirmed invited speakers include:

• Robert May (Oxford)
• Peter Grindrod CBE (Reading)
• Sheri Markose (Essex)
• Yamir Moreno (Zaragoza)
• Ginestra Bianconi (QMUL)
• Neil Walton (Amsterdam)

Interested researchers are invited (including postgraduate students) to contribute talks and/or posters. For further information visit the website at people.bath.ac.uk/ma3tcr/uiin or contact Dr Tim Rogers (t.c.rogers@bath.ac.uk). The workshop is supported by an LMS Conference grant.

OBITUARIES

MICHAEL BUTLER

Dr Michael Charles Richard Butler, who was elected a member of the LMS on 15 December 1955, died on 18 December 2012, aged 83.

Peter Giblin writes (with advice from Mary Rees and Claus Ringel): Michael and his wife Sheila Brenner, who died in 2002, were active members of the mathematics departments of the University of Liverpool from the time of their appointments in 1957, when they both moved from the University of London. Until the merger of the two departments (and Statistics) in the 1990s Sheila was in the Department of Applied Mathematics and Michael in the Department of Pure Mathematics; but from the early 1960s, and a joint research leave to Michael's home country of Australia, they worked together on problems in algebra.

Michael's earlier work was devoted to questions in homological algebra. His detailed study of a class of torsion-free groups of finite rank (now called Butler groups) showed the complexity of such groups. His use of representations of posets in order to study abelian groups was very influential as one of the first general reduction techniques. In several papers he described the surprising dichotomy between tame and wild behaviour of module categories. In their joint work Michael and Sheila developed 'tilting theory', now an indispensable tool in algebra and geometry providing a general framework for dealing with equivalences of triangulated categories. Their first major publication on this was in 1980: G*eneralizations of the Bernstein-Gelfand-Ponomarev reflection functors*, in the proceedings of the second ICRA (International Conference on Representations of Algebras). From its beginning, Michael was one of the scientific advisors for the ICRA conference series which started in 1974 in Ottawa, Canada, and now is held every second year in different countries. Michael and Sheila's last joint publication was in 2007, five years after Sheila's death. Together, they organized a very successful symposium at the University of Durham in 1985.

Michael was a highly successful Head of the (then) Department of Pure Mathematics in Liverpool in the 1980's: perhaps surprisingly so, given his strong, forthrightly expressed, and even unfashionable, left-wing views, which were also an important part of his partnership with Sheila. But he also had exceptional organisational ability, and was naturally kind, courteous, pragmatic and level headed. Michael formally retired in 1996 but continued active in work and conference attendance until his medical condition prevented it. Michael and Sheila had no children, but Michael, from a large family, has dozens of collateral descendants, and will also be missed by his many friends around the world.

MARY ELLEN RUDIN

Mary Ellen Rudin (née Estill), Professor Emeritus at the University of Wisconsin-Madison, USA, and a member of the American Academy of Arts and Sciences, died on 18 March 2013. She was one of the greatest figures in set-theoretic topology and her work included solutions of a great number of difficult and well known problems. Among them is the first construction of a Dowker space (in 1955 from a Suslin line and in 1971 in ZFC), the first S-space (from a Suslin line in 1972) and a positive answer to the Nikiel conjecture (1999). The latter was one of her most celebrated results, and it was obtained at the age of seventy five. Mary Ellen's work is characterized by a number of highly imaginative constructions and a great originality, as well as a profound understanding of sophisticated set-theoretic methods.

Born on 7 December 1924 in Hillsboro, Texas in an educated family, she went to the University of Texas, where she got her PhD in 1949 under the supervision of Robert Moore. She then obtained a position at Duke University, where she met a fellow mathematician Walter Rudin (1921-2010), whom she married in 1953. In 1959 the Rudins moved to Madison and spent the rest of their working lives there. They had a lovely family life, including four children, and a huge number of friends and visitors, often staying in their house. Jointly they were a symbol of mathematical openness, while the house, a Frank Lloyd Wright design with no interior walls, was a symbol of the Rudin way of living. Mary Ellen had sixteen graduate students, many of whom became top mathematicians themselves.

Mirna Džamonja
University of East Anglia

REVIEWS

### THE CURIOUS INCIDENT OF THE DOG IN THE NIGHT-TIME
Apollo Theatre, London

Before the performance of *The Curious Incident of the Dog in the Night-Time* began, two things caught my attention. Both, it turned out, were relevant to the play. One was that some of the seats had been covered with white cloth. As little notes on them explained, and as I ought to have guessed in the first place, these corresponded to the prime numbers less than 714, the number of seats in the Apollo Theatre.

The other was the stark black and white geometrical design of the set and how, effective though it was, it fit uncomfortably with the complex ornate decorations of a theatre built over a century ago. The play was originally produced on the Cottesloe stage of the modern National Theatre so this may not have been intentional, but for me it symbolised beautifully how Christopher, a 15 year old with Asperger's Syndrome and an unusual ability in logical reasoning and especially in mathematics, finds the real world so difficult to comprehend.

One of Christopher's many problems is that he cannot tell lies. It's not that he's especially virtuous; it's just that he insists on taking everything literally. This gets him into trouble several times and provides some comic moments for the audience. It also contrasts with the difficulties that the people around him get into because they haven't always told the truth when it mattered.

The Curious Incident is an outstanding play and I'd recommend it to anyone. But mathematicians will get even more from it because

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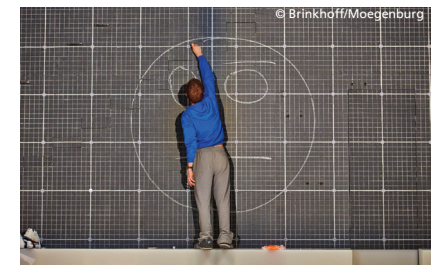
we can recognise in Christopher (in an excellent performance by Luke Treadaway) traits that we know are real because they are exaggerated versions of what we can surely see in ourselves and people we know.

Others may find it hard to understand why Christopher should be so fascinated by the patterns that abound in mathematics. For us, he is overdoing it, but we know what he feels.

As for his obsession with the literal truth, have you never been at a meeting where something was proposed that you knew was stupid and illogical but you realised would benefit you or your department? Didn't you have to bite your tongue to stop yourself intervening on the side of logic and against your own interests? If you did, then you, like me, will appreciate this play even more than most.

Peter Saunders
King's College London

PROOF
Menier Chocolate Factory, London SE1

Robert, who has just died as *Proof* begins, was a brilliant mathematician who made major advances in three different fields when he was very young and then suffered a mental breakdown from which he never really recovered. The play is centred on his younger daughter, Catherine, who inherited some of his talent for mathematics but never developed it because she was looking after him. She also has some of his instability.

The other main character is Hal, once Robert's graduate student at Chicago and now a member of the faculty. Hal has come to the house to work through Robert's notebooks in the hope of finding something worthwhile in what are mostly the ramblings of a seriously disturbed mind.

The play is not, however, really about mathematics or mathematicians. You could turn the characters into novelists or artists and use the same plot, right down to the details of the denouement. Of course there's no reason why what the characters in a play do for a living or where they happen to live has to be central to the action. But I don't think the play will have more to say to someone who knows mathematicians any more than it will for a person who knows Chicago or its university.

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Proof was interesting enough to hold my attention for the evening, but I didn't find it an especially good play. It touches on some important issues, such as the position of women in mathematics, but goes deeply into none of them. I was surprised to learn that it won a Pulitzer Prize when it was first produced in New York. It didn't help that I tend not to warm to the sort of contemporary American play in which the characters shout a lot and engage more in angry repartee than in dialogue. For me the most moving scene was one played more quietly, a flashback in which Catherine realises exactly how bad a state her father is in. That gave me a glimpse of what the play might have been.

Peter Saunders
King's College London

THE IRRATIONALS: A STORY OF THE NUMBERS YOU CAN'T COUNT ON by Julian Havil, 2012, Princeton University Press, 320 pp, £19.95, US$29.95, ISBN: 978-0-6911-4342-2.

'It can be of no practical use to know that is irrational, but if we can know, surely it would be intolerable not to know.' Any mathemati-

cally curious reader who shares Ted Titchmarsh's sentiment will surely enjoy the most recent popular mathematical offering of Julian Havil. Irrational numbers are most readily thought of not in terms of what they are, but rather what they are not. While undoubtedly convenient, this unsatisfactory definition obscures their true nature *The Irrationals* takes the reader on a fascinating journey, spanning close to 2,500 years, to explain how we arrived at our current state of knowledge about these fundamental numbers.

The story begins in ancient Greece with the struggle to come to terms with incommensurable magnitudes. It continues with the Hindu and Arabic mathematicians and their dexterous manipulation of surds. The 'early history' culminates in the late 17th century with Wallace's insight into the nature of, namely that it is not what we now call an algebraic number.

The heart of Havil's book begins with Euler's remarkable use of continued fractions to establish the irrationality of e. At this point more demands are starting to be made of the reader, both in terms of mathematical preparation and willingness to work through technical details. Despite the author's deft handling of the latter, a solid grasp of calculus seems essential for a reader to navigate his arguments (and too much would be lost by skimming them). Already though, there is much to delight the mathematically astute reader and many more pearls are in store as Havil's account moves into the modern era.

The narrative continues with Apéry's proof that (3) is irrational, and lingers on the crucial idea of approximating numbers by rationals. Here, the reader's diligence is essential in order to grasp the subtleties that follow, but apprehension of the claim that the Golden Ratio is the 'most irrational' number is an immediate reward. The conclusion of the book is wonderful, as the reader is introduced to transcendental numbers, the mysterious Markov Spectrum,
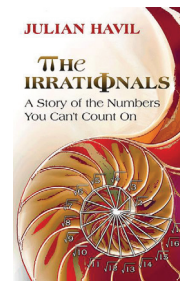
and the decisive works of Cantor, Dedekind, Hilbert and Weierstrass.

It is too often the case with popular science writing that the author leaves the reader with the vague sense of having been treated like an infant. Not so with Havil, whose writing is crisp, direct, and sophisticated. That said, the question remains as to whether this is a "popular" book in the accepted sense. It would certainly be a vastly rewarding read for the mathematics undergraduate taking the step from calculus to real analysis. As to the true target audience, perhaps it is best to leave it to the author who, in his introduction, appeals to the words of the former president of Princeton University, James McCosh: 'The book to read is not the one that thinks for you but the one that makes you think.'

Peter Brooksbank
Bucknell University

THINKING STATISTICALLY by Uri Bram, Kuri Books, 2011, 48 pp, £4.99, ISBN 9781 46991 2332; 2013, 78 pp, £4.99, ISBN 9781 48117 3506.

This whimsical slim volume considers three statistical ideas: ways in which samples may be biased; possible omissions of relevant factors; and updating prior probabilities via Bayes' theorem. It uses simple examples to illustrate its points, largely eschews equations, and can be comfortably absorbed inside an hour. 'Less is more' is well exemplified in its forty-odd pages. This is not a textbook, but could be used as supplementary reading to help less numerate students appreciate statistical ideas: just as literature enthusiasts will re-read favourite books, despite knowing the characters and plot inside-out, so readers can revisit this book to appreciate its messages, delivered with charm and good humour.

John Haigh
University of Sussex

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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.

MAY 2013

1-3 Modelling Biological Evolution 2013 Conference, Leicester (423)
10-11 String-Maths UK, Surrey (425)
13 Operator Algebra Day, Aberdeen (423)
14 LMS-Gresham Lecture, Peter Cameron, Museum of London (425)
16 Tropical Mathematics and Its Applications Workshop, Birmingham (424)
15-16 Combinatorics Colloquia, London (425)
17 Sharing Good Practice in Service Teaching in the Mathematical Sciences, Manchester (425)
20-22 Wales Mathematics Colloquium 2013, Powys (424)
27-31 Rational Points - Geometric, Analytic and Explicit Approaches Workshop, Warwick (425)
29-30 Riemann-Hilbert Problems and their Applications Meeting, Reading (425)
31 Geometry and Topology Day, University College London (425)

JUNE 2013

5 Using Real-Life Extended Mathematical Problems with Undergraduates, Bath (425)
5 Combinatorics One Day Meeting, Oxford
10 Open System Identification Conference, Aberstwyth (425)
10-11 Stochastic Differential Day Equations and Their Applications Workshop, Strathclyde (425)
10-14 LMS Invited Lectures, Fedor

Bogomolov, Edinburgh (425)
11 LMS Midlands Regional Meeting, Leicester (425)
11-14 MAFELAP 2013, Brunel
12-13 Uncertainty in Interaction Networks Meeting, Bath (425)
12-14 Advances in Surface Theory Workshop, Leicester (425)
17-21 Differential Geometry and Continuum Mechanics ICMS Workshop, Edinburgh (425)
20-21 Conformal Geometry in Mapping, Imaging and Sensing Workshop, Imperial College London (424)
24-25 High-Dimensional Inference with Applications, University of Kent (424)
24-28 Liquid Crystal Defects and their Geometry INI Workshop, Cambridge (421)
24-28 Dynamics of Suspensions, Gels, Cells and Tissues INI Workshop, Cambridge (422)
25 LMS Popular Lectures, London (425)
25-28 Number Theory for Cryptography Summer School, Warwick (425)
30-5 Jul British Combinatorial Conference, Royal Holloway College, University of London (422)

JULY 2013

1-2 Spectral Analysis and Differential Equations Meeting, Cardiff (425)
1-2 Bifurcation Theory, Numerical Linear Algebra and Applications, Bath (424)
1-4 Dense Granular Flows 2nd IMA Conference, INI, Cambridge (416)
1-5 Number Theory, Geometry and Cryptography Workshop, Warwick (425)
3-13 Polylogarithms as a Bridge between Number Theory and Particle Physics LMS-EPSRC Durham Symposium
4-5 Quantum Information and Control Meeting, Nottingham (425)
5 LMS Meeting, London (425)
8-10 Combinatorics, Algebra, and More: A Conference in Celebration of Peter Cameron, Queen Mary, University of London (425)

8-12 Discrete Integrable Systems INI Follow-up Workshop, Cambridge (424)
8-12 O-Minimality and Diophantine Geometry, LMS-EPSRC Short Course, Manchester (425)
8-12 Modern Nonlinear PDE Methods in Fluid Dynamics, LMS-EPSRC Short Course, Reading (425)
8-12 Banach Algebras and C*-algebras Meeting, IMPAN, Warsaw (423)
15-19 Polynomial Optimisation Summer School and Workshop, INI, Cambridge (420)
15-25 Graph Theory and Interactions LMS-EPSRC Durham Symposium
29-2 Aug Computational Group Theory, LMS-EPSRC Short Course, St Andrews (424)

AUGUST 2013

6-12 International Mathematics Competition, Blagoevgrad, Bulgaria (424)
3-11 Groups St Andrews 2013, St Andrews (410)
19-23 Random Graphs, Geometry & Asymptotic Structure LMS-EPSRC Short Course, Birmingham (424)
26-30 Topology in Low Dimensions LMS-EPSRC Short Course, Durham (424)

SEPTEMBER 2013

2 Heilbronn Day, Groups and Their Representations, Manchester (423)
2-4 Advanced Decomposition Methods for Partial Differential Equations Minisymposium, Kingston (424)
2-6 New Mathematical Directions for Quantum Information INI Workshop, Cambridge (423)
3-6 Brauer's Problems in Representation Theory – 50 years on, Manchester (423)
9-13 Spectral Geometry, Chaos and Dynamics, Loughborough
10-11 Next Steps CETL-MSOR 2013 Conference, Coventry (425)
11-13 Mathematics of Surfaces 14th IMA

Conference, University of Birmingham (416)
15-21 Quantum (semi)groups and (co)actions Meeting, Leeds (423)
16–20 Holography: From Gravity to Quantum Matter INI Workshop, Cambridge (424)
22-27 Heidelberg Laureate Forum, Heidelberg (422)
26 LMS Popular Lectures, Birmingham (425)
29–1 Oct The Navier-Stokes Equations and Related Topics Clay Research Workshop, Oxford (425)
30-4 Oct New Insights into Computational Intractability Clay Research Workshop, Oxford (425)
30-4 Oct Number Theory and Physics Clay Research Workshop, Oxford (425)
30-4 Oct Quantum Mathematics and Computation Clay Research Workshop, Oxford (425)

OCTOBER 2013

2 Clay Research Conference, Oxford (425)
3 University of Oxford's Mathematical Institute Opening Conference (425)
14–18 Quantum Marginals INI Workshop, Cambridge (425)
29 Oct – 1 Nov Non-Equilibrium Statistical Mechanics and the Theory of Extreme Events in Earth Science INI Workshop, Cambridge (424)

NOVEMBER 2013

15 LMS AGM, London

APRIL 2014

7-10 British Mathematical Colloquium, QMUL

AUGUST 2014

13-21 ICM 2014, Seoul, Republic of Korea (403)
17-19 Mathematical Cultures Conference, De Morgan House, London (417)

DAVID CRIGHTON MEDAL
AWARDED BY THE IMA AND LMS TO
DR PETER M. NEUMANN AND PROFESSOR ARIEH ISERLES

The Royal Society on 14 March 2013
(report on pages 11-15)

LMS President Graeme Segal and Peter M. Neumann

IMA President Robert MacKay and Arieh Iserles

Arieh Iserles
The Future of Life, Mathematics and Everything

Peter M. Neumann
Tout ce gâchis: Why Edit the Mathematical Manuscripts of Évariste Galois?

Peter M. Neumann, Johanna Crighton, Arieh Iserles

The audience