

LONDON MATHEMATICAL SOCIETY

NEWSLETTER

No. 436 May 2014

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Society Meetings and Events

2014

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Friday 4 July

Hardy Lecture, Society Meeting, Graduate Student Meeting, London

Wednesday 9 July

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Mathematics and the First World War Meeting, London

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LMS AGM London

NEWSLETTER ONLINE: newsletter.lms.ac.uk

MATHEMATICAL SCIENTISTS TAKE THEIR RESEARCH TO PARLIAMENT

Dr David Platt, a researcher at the University of Bristol, won the Gold medal (sponsored by the Clay Mathematics Institute) in the mathematical sciences session of this year's SET for Britain event, walking away with a £3,000 prize. This was a notable year for the mathematical sciences as it was the first time they were invited to take part in the event.

David presented his mathematics research to dozens of politicians and a panel of expert judges, and his research, proving Goldbach's weak conjecture, was judged against 29 other shortlisted researchers' work, from an original entry of over 50 posters.

David, said, 'The standard of the posters was fantastic and to be judged the best is a great honour'. Professor Nicholas Woodhouse, President of the Clay Mathematics Institute (CMI), sponsors of the Gold Mathematical Sciences award, said, 'CMI is delighted to support the inaugural SET for Britain Mathematical Sciences exhibition. The Institute is dedicated to increasing and disseminating mathematical knowledge and supports the work of leading researchers throughout the world at various stages of their careers. The future of mathematics in the UK is both challenging and exciting and we believe it is essential to nurture the best technical talent'

The Silver award and £2,000 went to Dr Christian Yates from the University of Oxford for his research in understanding locust swarming behavior using mathematical models. The Bronze



(I to r) Professor Sir Adrian Smith (Chair, CMS); Dr Stephen Benn (Member, Parliamentary and Scientific Committee); Dr David Platt, Gold Medal Winner (University of Bristol); Professor Nick Woodhouse (President, Clay Mathematics Institute); Andrew Miller MP (Chair, Parliamentary and Scientific Committee)

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Silver Medal Winner: Dr Christian Yates (University of Oxford)

award (sponsored by the Bank of England) and £1,000 went to Dr Julie Vile from Cardiff University for her research in developing analytical techniques to forecast demand for ambulance services and optimise their deployment.

Sir Adrian Smith, Chair, the Council for the Mathematical Sciences (CMS) commented: 'The CMS is delighted that the mathematical

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Editorial team

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sciences have been involved in this prestigious event for the very first time; it is a wonderful opportunity to showcase the importance of the mathematical sciences to a wider audience. It is paramount to encourage early-career research scientists, engineers, technologists and mathematicians and the SET for Britain event is a very effective way of doing this. We have been encouraged by the enthusiastic response from early-career researchers in the mathematical sciences and feel sure this will this continue in the future'.

SET for Britain is the largest national event of its kind where Scientists, engineers and mathematical scientists arrived in Parliament on Monday 17 March to compete for the coveted Westminster Medal while exhibiting their groundbreaking research to politicians during SET for Britain 2014.

The Parliamentary and Scientific Committee ran the event in collaboration with the Council for Mathematical Sciences, the Institute of Physics, The Physiological Society, the Royal Academy of Engineering, the Royal Society of Chemistry, the Society of Biology and the Society of Chemical Industry, with financial support from BP, the Clay Mathematics Institute, Essar, INEOS, Warwick Manufacturing Group (WMG), Germains Seed Technology, Boeing, the Bank of England and the Institute

> **General Editor** Mr A.J.S. Mann

(a.mann@gre.ac.uk) **Reports Editor**

Professor R.A. Wilson (r.a.wilson@gmul.ac.uk)

Reviews Editor Professor D. Singerman (d.singerman@soton.ac.uk)

Administrative Editor S.M. Oakes (newsletter@lms.ac.uk)



Bronze Medal Winner: Dr Julie Vile (Cardiff University)

of Biomedical Science.

SET for Britain aims to help politicians understand more about the UK's thriving science and engineering base and rewards some of the strongest scientific and engineering research being undertaken in the UK.

As Andrew Miller MP, Chairman of the Parliamentary and Scientific Committee and the event's parliamentary host, said, 'This annual competition is an important date in the parliamentary calendar because it gives MPs and Peers an opportunity to speak to a wide range of the country's best young researchers. "These early career engineers, mathematicians and scientists are the architects of our future and SET for Britain is the politicians' best opportunity to meet them and understand their work'.

All of the exhibitors were entered into competition with researchers from their discipline – be it biology, chemistry, engineering, mathematical sciences or physics – for a bronze (£1,000), silver (£2,000) and gold (£3,000) prize and certificate.

At the end of the exhibition, the gold winner from each discipline had the opportunity to explain their research to a panel of judges to convince them that their research, and their ability to convey it, was worthy of the Westminster Medal.

FURTHER BOOST FOR THE MATHEMATICAL SCIENCES

The Chancellor of the Exchequer, George Osborne, has announced 22 new **Centres for Doctoral Training** (CDT). The new CDTs come on top of the 91 Centres previously announced by the Engineering and Physical Sciences Research Council (EPSRC) in November 2013 and January 2014. This latest government investment in a further 1,100 students through these additional 22 Centres brings the total investment in CDTs to over £500 million

The new CDTs supported in the mathematical sciences are:

- Professor Andreas Kyprianou (University of Bath) Statistical Applied Mathematics at Bath (SAMBa)
- Professor James Norris (University of Cambridge) Analysis (Cambridge Centre for Analysis)
- Professor Anthony Carbery (University of Edinburgh) Mathematical Analysis and its Applications: Maxwell Institute Graduate School in Analysis & Applications (MIGSAA) jointly sponsored by the Scottish Funding Council; and
- Professor Peter Sollich (King's College London) Cross Disciplinary Approaches to Non-equilibrium Systems

This success continues to reflect the importance of mathematical sciences research in underpinning our 21st century technology, economy and society. This is also recognised in the employment market, where the prospects for our graduates and postgraduates are amongst the best. The flow of trained mathematical scientists into other disciplines and into the industries of the future relies upon our universities' research and teaching excellence.

The list of full list of mathematical science CDTs is available on the LMS website at www.lms.ac.uk/policy/doctoral-training.

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MATHEMATICS POLICY ROUND-UP April 2014

RESEARCH

Plans for world class research centre in the UK

The government is creating a world-class research institute specialising in data science dedicated to to British mathematician and WW2 code-breaker Alan Turing.

'The Alan Turing Institute for Data Science will benefit from a £42 million government investment over 5 years that will strengthen the UK's aims to be a world leader in the analysis and application of big data. It will also ensure that the UK is at the forefront of data-science in a rapidly moving, globally competitive area, enabling first-class research in an environment that brings together theory and practical application. Once operational, this will be a world-leading institute, attracting the best talent and investment from across the globe. It will provide a fitting memorial to Alan Turing.'

More information is available at http:// tinyurl.com/lupyewy

Performance and Economic Impact Report 2012 - 2013

EPSRC has published its *Performance and Economic Impact Report 2012-2013*. The report highlights the main achievements for the year: http://tinyurl.com/qg5374v

RCUK Impact Report

According to RCUK this report shows that, 'the UK research base is not only at the cutting edge of scientific and academic discovery, but also is doing more to translate this into practical wider benefits. This helps to keep us ahead in the global race'.

The report is available at http://tinyurl.com/ obfk6gx

SCHOOLS AND COLLEGES

Core mathematics

ACME has responded to the Department for

Education informal consultation on 'Core Maths'. The ACME response can be found at http://tinyurl.com/q3ewp5j

The Department for Education has opened applications for schools and colleges to bid for funding to become early adopters of core maths qualifications, with teaching to begin in Autumn 2014: http://tinyurl.com/mh8p26c

Nuffield Foundation response to DfE Core Mathematics policy statement http://tinyurl. com/lwz5pj4

Subject Knowledge Enhancement Programme Guide 2013/2014

The Department for Business, Innovation and Skills (BIS) has published the Mathematics Subject Knowledge Enhancement (SKE) programme guide 2013/2014.

In the programme guide BIS sets out who might want to do Subject Knowledge Enhancement courses, including:

 those who have studied mathematics to a highly advanced level, but over time have lost some of the 'basics' needed to teach at secondary level; 5

- those who have studied a degree related to mathematics, rather than an exact match:
- those who have changed career and may have a related degree with a lot of knowledge; and
- specifically supporting programmes which allow trainees to teach maths to GCSE and level 3.

The programme guide is available at http:// tinyurl.com/qypgrfe

Maths Hubs

The Department for Education recently announced ± 11 million to fund around 30 Maths Hubs to support schools and colleges to achieve excellence in maths from primary through to 16-18 education.

The Department is seeking exceptional schools with strong vision and proven leadership in maths education to apply to lead a Maths Hub. Schools which meet the eligibility criteria and have a strong track record of working in partnership with other schools to

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support their improvement were invited to submit expressions of interest by Wednesday 9 April.

At this point applications were assessed by an independent judging panel against a range of criteria.

Successful applicants were then informed during the week commencing 21 April 2014 about whether they were required to submit a full proposal.

The hubs will be operational from the autumn term 2014

If you have any queries regarding the Maths Hubs contact the National Centre for Excellence in the Teaching of Mathematics (NCETM) at mathshubs@ncetm.org.uk.

OTHER

RCUK grant holders age and gender data

RCUK age and gender data for grant holders has been published. Information on this and other RCUK diversity projects is available at www.rcuk.ac.uk/funding/diversity/

Royal Society summary diversity report

A summary report of diversity data analysis – A picture of the UK scientific workforce has been published by the Royal Society/

'A lack of diversity across the scientific community represents a large loss of potential talent to the UK according to the chair of the Royal Society's Equality and Diversity Network (EDAN), Professor Edward Hinds FRS'.

The report is available at http://tinyurl.com/ ps8lhn2

Public Attitudes to Science 2014

Public Attitudes to Science (PAS) 2014 is the fifth in a series of studies looking at attitudes to science, scientists and science policy among the UK public. Ipsos MORI conducted the study in partnership with the British Science Association, on behalf of the Department for Business, Innovation and Skills (BIS) and the Economic and Social Research Council (ESRC).

The full report is available at http://tinyurl. com/o6r4dvj

> Dr John Johnston Joint Promotion of Mathematics

LMS GRANT SCHEMES

Next Closing Date for Research Grant Applications: 15 May 2014

Applications are invited for the following grants:

Conferences (Scheme 1)

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

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

Postgraduate Research Conferences (Scheme 8)

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

Visits to the UK (Scheme 2)

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

Research in Pairs (Scheme 4)

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

International Short Visits (Scheme 5)

Grants of **up to £3,000** are available to support a visit for collaborative research by a named mathematician from a country in Africa (or countries where mathematics is in a similar position) to the home base of the grant holder. Grants of **up to £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, please visit the LMS website: www.lms.ac.uk/content/researchgrants.

- Applications received by 15 May 2014 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 (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

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. The maximum award is £10,000, but a typical award is in the range of £3,000 - £5,000. Applications for partial support of workshops with other sources of support will be considered. Applications should normally be submitted 12 months in advance of the proposed workshop. For further information visit: www.lms.ac.uk/content/researchworkshops-grants.

Young British and Russian Mathematicians Scheme

Next Deadline: 15 May 2014

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:

 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).

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- A brief CV (no more than one side of A4).
- A brief budget.

 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 accommoda-

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tion costs of **up to £1,500**. Applications should include the following:

- Name and brief CV of the visitor.
- A brief budget
- A brief description of the course of lectures.
- 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. Applications received by 15 May 2014 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).

Grants of up to £1,000 are available to support

Spitalfields Days

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Next Deadline: 15 May 2014

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.

Grace Chisholm Young Fellowship

The Society offers two fellowships of £1,000 (consisting of £500 personal support and £500 contribution to a host institution) each year to mathematicians who need support when their mathematical career is interrupted by family responsibilities, relocation of partner, or other similar circumstance.

These fellowships, named after Grace Chisholm Young, aim to provide some support, making possible some continuous mathematical activity, so enabling the fellow to be in a position to apply for posts when circumstances allow. The Fellowship will give an endorsement

of the holder's status as a mathematician, so that the break in formal employment should not prevent them from resuming a career as a mathematician at a later stage. Please see the website for further details: www.lms.ac.uk/ grants/grace-chisholm-young-fellowships.

Small Grants for Education

Next Deadline: 31 August 2014

Funding for grants **up to £800** is available to stimulate interest and enable involvement in mathematics from Key Stage 1 (age 5+) to Post-graduate 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. Please see the website for further details: www.lms.ac.uk/ content/small-grants-education.

Computer Science Small Grants (Scheme 7) Next Deadline: 15 November 2014

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. 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.

ewsletter@lms.ac.uk



AN INVITATION TO GEOMETRY & TOPOLOGY VIA G,

LMS-CMI Research School

Imperial College 7-11 July 2014

Organisers: Mark Haskins (Imperial), Jason Lotay (UCL) and Simon Salamon (KCL)

The aim of the research school will be to give a thorough introduction to G_2 geometry, starting from fundamental material and progressing through to recent breakthroughs and current research in which the UK plays a leading role. The school will also introduce participants to topics of broader interest in algebra (e.g. representation theory), analysis (e.g. elliptic regularity), geometry (e.g. holonomy) and topology (e.g. characteristic classes). The course will also indicate some connections beyond mathematics to contemporary theoretical physics (M-theory). The three main courses are:

- Special holonomy (Robert Bryant, Duke)
- Calibrated submanifolds (Jason Lotay, UCL)
- G, manifolds (Johannes Nordström, Bath)

There will be three guest lectures by:

- Nigel Hitchin (Oxford) Title TBC
- Bobby Acharya (KCL) Theoretical physics and its connections with G₂ geometry
- Mark Haskins (Imperial) Recent advances in research in G, geometry

These lecture courses will be supplemented by tutorial sessions.

For further information visit: www.claymath.org/events/invitation-geometry-and-topology-g2

Applications: Applications should be made using the registration form available via the Society's website at: www.lms.ac.uk/events/lms-cmi-research-schools. Research students and post-docs in mathematics and in theoretical physics are particularly encouraged to apply.

The closing date for applications is **Monday 12 May 2014**. 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

Fees: All research students and early career researchers will be charged a registration fee of £150. There will be no charge for subsistence costs.

Other participants will be charged a registration fee of ± 250 plus the full subsistence costs (± 350) **\pm 600** in total. Some contribution to travel costs will be available for both UK-based and overseas-based participants.

Fees are not payable until a place on the course is offered but will be due by 9 June 2014.

These Research Schools are co-sponsored by the Heilbronn Institute.

LMS-CMI Research Schools aim to provide training for young researchers in core areas of mathematics. Students and post-docs can meet a number of leading experts in the topic as well as other young researchers working in related areas.

The LMS is the UK's learned society for mathematics. Registered charity no. 252660 (www.lms.ac.uk) The CMI is charitable private operating foundation, incorporated in the USA.

CLAY RESEARCH FELLOWS

The Clay Mathematics Institute

is pleased to announce that June Huh, Miguel Walsh and Alex Wright have been appointed Clay Research Fellows.

June Huh will receive his PhD in 2014 from the University of Michigan under the supervision of Mircea Mustață. He applies algebraic geometry and singularity theory to problems in combinatorics and other areas. His recent interests include singularities of projective hypersurfaces, positivity of Chern classes of Schubert varieties, and connections between realizability problems in algebraic geometry and combinatorial geometry. June has been appointed as a Clay Research Fellow for a term of five years beginning 1 July 2014. Miguel Walsh was born in Buenos Aires,

Argentina. He received his Licenciatura' degree in 2010 from Universidad de Buenos Aires and his PhD from the same institution in 2012, under the supervision of Román Sasyk. During this period he held a CONICET doctoral fellowship. He is currently based at the University of Oxford. His research so far has focused on inverse problems in arithmetic combinatorics, the limiting behaviour of ergodic averages and the estimation of rational points on curves. Miguel has been appointed as a Clay Research Fellow for a term of four years beginning 1 July 2014.

C MI C MI e Huh, Miguel of alg

Alex Wright will receive his PhD in 2014 from the University of Chicago under the supervision of Alex Eskin. His recent work concerns dynamics on moduli spaces and special families of algebraic curves that arise in this context. His interests include dynamics, geometry, and especially ergodic theory on homogenous spaces and Teichmüller theory. Alex received his BMath from the University of Waterloo in 2008. Alex has been appointed as a Clay Research Fellow for a term of five years beginning 1 July 2014. For more information, visit www.claymath.

org.

LMS HONORARY MEMBER WINS 2014 ABEL PRIZE

This year's Abel Prize has been awarded to the Russian mathematician **Professor Yakov G. Sinai**, Princeton University, US and Landau Institute for Theoretical Physics, Russian Academy of Sciences, for his 'fundamental contributions to dynamical systems, ergodic theory, and mathematical physics'. Sinai will be presented with the Prize by HRH Crown Prince Haakon at an award ceremony in Oslo on 22 May 2014.

Sinai has been particularly influential in connecting the world of (dynamical) deterministic systems with the world of probabilistic (stochastic) systems. One of the major developments of 20th century mathematics was the development of a rigorous theory – probability theory

VOICE OF THE FUTURE 2014

The Council for Mathematical Sciences (CMS) once again sent young mathematical scientists to this year's *Voice of the Future* event. The event is an opportunity for scientists aged 16-35 to put their questions to an assembled panel of MPs at the House of Commons. The event, organised by the Society of Biology, took place at Portcullis House on Wednesday 19 March 2014.

This year's CMS nominated participants were Simon White (MRC Biostatistics Unit) and Dr Vincent Knight (Cardiff University) - both of whom asked the panel questions, and Maria Thorpe (University of Manchester), Dr Clare Dunning (University of Kent), Daniel Green (Keele University) and James



David Willets, MP

House of Commons Select Committee for Science & Technology and Sir Mark Walport the Government Chief Scientific Adviser.

MP, members of the

You can watch *Voice of the Future* at www.bbc. co.uk/democracylive/house-of-commons-26632445.

- for discussing random or uncertain events. The power of this body of tools and language is now embedded in the fabric of our society, where stochastic differential equations are part of common place modelling in biology, economics and decision making.

Many mathematical results are named after him, including Kolmogorov–Sinai entropy, Sinai's billiards, Sinai's random walk, Sinai-Ruelle-Bowen measures and Pirogov-Sinai theory.

Professor Sinai was elected an Honorary Member of the LMS in 1992.

Professor Terry Lyons FRS, President of the LMS, said, 'Yakov G. Sinai is a giant who has transformed so much of our understanding of systems that evolve. By considering the simple example of an elastic point bouncing around (billiards) in a convex region he was able to demonstrate how physical systems can convert predictable deterministic behaviour into organised and well understood randomness and so explain the phenomena that has challenged philosophers for generations. He made deep contributions to the study of entropy, or information production, which are vital tools for understanding these systems. This stellar input became a foundation for a stream of work that today we take for granted in underpinning our understanding of dynamical systems and mathematical physics. It is said that his letter in defence of a colleague in the then Soviet Union explains why it was only in 1981, 17 years after submitting his PhD thesis, that he became a professor'. More information is available at www. abelprize.no/

ANNIVERSARY APP

One (of many) ideas for celebrating the 150th anniversary of the LMS is to have an app especially written for the occasion. Are there any mathematicians out there who are secret app writers and who would be interested in taking this on? What would you like to see such an app do? Please contact Stephen Huggett at general. secretary@lms.ac.uk.

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LONDON MATHEMATICAL SOCIETY MIDLANDS REGIONAL MEETING

Loughborough University Monday 16 June 2014

2.00 pm	Opening of the meeting
	Werner Müller (Bonn University)
3.00 pm	Gigliola Staffilani (MIT)
4.00 pm	Tea/Coffee
4.30 pm	Alexander Pushnitski (King's College London)
6.00 pm	Wine Reception/Dinner

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

For further details and to register and to reserve a place at the dinner, please visit http:// homepages.lboro.ac.uk/~maeh/waves14/lms14.html. The cost of the dinner will be approximately £35, including drinks.

The meeting forms part of a workshop on *Scattering Theory and Wave Equations* from 16-18 June 2014. For further details visit: http://homepages.lboro.ac.uk/~maeh/waves14/index.html or contact the organiser (C.Garetto@lboro.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.

wsletter@lms.ac.uk

http://newsletter.lms.ac.u

TURING GATEWAY TO MATHEMATICS

Based at the Isaac Newton Institute for Mathematical Sciences (INI) in Cambridge, the Turing Gateway to Mathematics (TGM) is an initiative that recognises and promotes the impact of mathematics on other academic disciplines, society, culture and in the economy, and acts as a national forum where mathematical challenges from other fields can be raised. In short, its intention is to be a gateway through which two-way traffic between academic mathematicians and potential users of mathematics can pass.

While there are synergies and strong ties between INI and TGM, their goals are different: TGM exists to facilitate the flow of existing knowledge and ideas from the mathematical sciences to potential users, whereas INI aspires to organise ground-breaking mathematical research programmes across a wide spectrum of disciplines where rigorous mathematical challenges are to be found.

Launched in March 2013 and named after Alan M. Turing because of his exceptionally wide influence, the TGM aims to play a national

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role in mathematical knowledge exchange.

- Here are some examples of its recent activity:
- Mathematics in biology is a very active area for the TGM. In partnership with the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs www.nc3rs.org.uk/) and EPSRC's Predictive mOdelling for hEalthcare through MathS (POEMS) network, the TGM is hosting the Annual Maths Study Group to explore mathematical techniques which could negate/reduce reliance on animal experimentation.
- The TGM ran a Mathematics for the Prediction of Financial Risk workshop, featuring speakers from Deloitte, Barclays and the University of Cambridge Statistical Laboratory. In partnership with the Institute and Faculty of Actuaries, the event carried Continuing Professional Development points for insurance practitioners and attracted a range of participants from both insurance and banking.
- Working with GCHQ, the TGM is helping



Mathematical connections



Peter Haynes speaking at the University of Cambridge Mathematical Sciences Showcase

address a need to build UK capacity in postquantum research over the next few years. This is driven by the realistic possibility that in the medium term the power of quantum computation will have the potential to compromise cyber security systems. The current need is to develop classical cryptographic security into schemes that are resistant to quantum computer attack. A key aim is to further develop UK research and teaching in relevant areas. A two day workshop to explore these issues will take place on 8-9 May 2014 in Cambridge.

The multi-disciplinary nature of mathematical



Alan Turing sculpted in slate at Bletchley Park

sciences presents numerous challenges for knowledge exchange activities. Thus, as well as focusing on widening access to mathematics generally, the TGM aims to shorten pathways to impacts, for example in the context of the REF, and strengthen education and training in areas where mathematical skills are needed. The Turing Gateway to Mathematics is not proscriptive about how it addresses these challenges and welcomes all ideas and enquiries. Further information on how to engage with TGM and its upcoming activities can be found at www.turing-gateway.cam. ac.uk/.



The TGM team of Jane Leeks (left) and Clare Merritt

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http://newsletter.lms.ac.uk





THE LONDON MATHEMATICAL SOCIETY JOINTLY WITH GRESHAM COLLEGE

Wednesday, 21 May 2014

6:00pm at The Museum of London

The Secret Mathematicians

Professor Marcus Du Sautoy, OBE

University of Oxford

From composers to painters, writers to choreographers, the mathematician's palette of shapes, patterns and numbers has proved a powerful inspiration. Artists can be subconsciously drawn to the same structures that fascinate mathematicians as they hunt for interesting new structures to frame their creative process.

Professor du Sautoy will explore the hidden mathematical ideas that underpin the creative output of well-known artists and reveal that the work of the mathematician is also driven by strong aesthetic values.

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

newsletter@lms.ac.uk





BOUNDED GAPS BETWEEN PRIMES

LMS-CMI Research School

Oxford 22-26 September 2014

Organisers: Ben Green and Roger Heath-Brown (Oxford)

In a spectacular breakthrough, Yitang Zhang proved that there are infinitely many pairs of primes differing by at most 70 million. Due to further advances of Maynard and Tao and the collaborative Polymath Project, 70 million has been reduced to a few hundred. This course will introduce attendees to the mathematics surrounding these developments. There will be four lecture courses:

- Introduction to prime number theory. ζ- and L-functions, the prime number theorem (Andrew Granville, Montreal)
- The Bombieri-Vinogradov theorem about distribution of primes in progressions. Introduction to sieve theory (Kannan Soundararajan, Stanford)
- The methods of Goldston, Pintz and Yıldırım and Maynard-Tao (James Maynard, Montreal/ Oxford)
- Inputs from algebraic geometry (Emmanuel Kowalski, ETH Zurich)

These lecture courses will be supplemented by tutorial sessions.

Distinguished guest lectures will be given by Terence Tao (UCLA) and Yitang Zhang (University of New Hampshire).

Applications: Research students, post-docs and those working in industry are invited to apply. The closing date for applications is **15 June 2014**. For further information, please visit the website: www.claymath.org/events/bounded-gaps-between-primes. Applications should then be made using the registration form available via the Society's website at: www.lms.ac.uk/events/lms-cmiresearch-schools.

Fees: For participants from outside Oxford (except those working in industry), fees include conference fee, accommodation, meals and conference dinner. PhD students: £150; Early-career researchers: £250. For Oxford University participants, fees include conference fee, lunches and conference dinner only. PhD Students and Early Career Researchers: £100.

For all other participants (e.g. those working in industry), fee includes conference fee, lunches and conference dinner only. Registration fee: £250. (Accommodation and evening meals can be requested at a further cost of £650.) All UK-based participants must pay their own travel costs. For overseas-based participants, support will be available on application if contribution towards travel costs is required. Fees are not payable until a place on the course is offered but will be due by 1 August 2014.

These Research Schools are co-sponsored by the Heilbronn Institute.

LMS-CMI Research Schools aim to provide training for young researchers in core areas of mathematics. Students and post-docs can meet a number of leading experts in the topic as well as other young researchers working in related areas.

The LMS is the UK's learned society for mathematics. Registered charity no. 252660 (www.lms.ac.uk) The CMI is charitable private operating foundation, incorporated in the USA.

EUROPEAN NEWS

Eminent Russian mathematician detained and fined

The Russian mathematician Victor Vassiliev. member of the Russian academy of sciences and president of the Moscow Mathematical Society, famous for the invention of Vassiliev invariants in knot theory, was arrested in Moscow on 21 February 2014, as participant of a peaceful protest in support of the defendants of the Bolotnaya Square Case; he was released shortly afterwards. On 5 March, Zamoskovoretsky Court in Moscow convicted him guilty of shouting slogans and resisting detention; he will have to pay a substantial fine. Professor Vassiliev denies both charges. Several of his academic colleagues were witnesses on his behalf confirming that the charges are false.

The European Mathematical Society is deeply concerned about the use of the police and the courts against peaceful protest. The society expresses its warm support to Professor Vassiliev.

[Source: euro-math-soc.eu/node/4575, 6 Mar 2014]

CIMPA Research Schools

CIMPA is the International Center for Pure and Applied Mathematics, based in Nice, France, is calling for research proposals (Research Schools) for 2016. The aim of CIMPA is to promote international cooperation in higher education and research in mathematics and their interactions as well as related subjects, for the benefit of developing countries. CIMPA organizes research schools of about two weeks in developing countries. The purpose of these schools is to contribute to the research training of the new generation of mathematicians, women and men.

Proposals in applied mathematics or related to applications of mathematics are especially welcome. Proposals in the most mathematically or economically deprived areas are encouraged and will be given priority. It is preferable that a project of a Research School does not coincide with that of a conference. The research schools are organized locally with the help of CIMPA. The deadline for a (nonmandatory) pre-proposal is **15 June 2014**, with complete proposals due by 1 October 2014.

[Source: www.cimpa-icpam.org/spip.php?rubrique2]

BCAM distinction

BCAM, the Basque Center for Applied Mathematics in Bilbao, has been recognized by the Severo Ochoa program as one of the five Spanish centres that are among the best in the world in their field. The research institutions have been selected among 57 centres which competed for the distinction of excellence that the Spanish State Department for R&D awards in the framework of its program. The 'Severo Ochoa Centers of Excellence' accreditation is a subprogram of the State Department for Research, Development and Innovation of the Ministry of Economy and Competitiveness, whose aim is to strengthen excellence in research carried out in Spain in any scientific field. This recognition is valid for four years with a grant of €4 million as set by the call.

The main strategic value provided by the BCAM Research Program is to strengthen the current research and the development of new research lines, in order to provide tools to analyze, understand and reduce as far as possible the complexity of the world that surrounds us. Advanced modeling and simulation techniques that currently allow solving problems of diverse areas (industrial, energy, materials, health, social, ecological, financial) are particularly important in this field. The aim of BCAM is also to transfer its excellence in research in Applied Mathematics to other scientific, technological and industrial agents, contributing in a sustainable manner to XXI century societal challenges. For further information about BCAM see www.bcamath.org.

[Source: BCAM press release, 18 Mar 2014]

EMS Newsletter

The March 2014 edition of the *EMS Newsletter* is available online (www.ems-ph.org/journals/ journal.php?jrn=news). It contains, among many other interesting items, a lively editorial on the Heidelberg Laureate Forum which

took place in September 2013. The format of the HLF is a week-long symposium where laureates of the Abel Prize, the Fields Medal (including the Nevanlinna prize) and the ACM Turing Award join with young researchers of undergraduate, graduate and post-graduate levels. The mathematics laureates present were Sir Michael Ativah, Gerd Faltings, Curt McMullen, Stephen Smale, Endre Szemerédi, Srinivasa Varadhan, Cédric Villani, Vladimir Voevodski, Avi Wigderson and Efim Zelmanov; moreover, among Turing awardees present there were Ronald Rivest and Adi Shamir (the "RS" from the RSA algorithm), as well as Stephen Cook and Richard Karp, pioneers of complexity theory. UK young mathematicians are strongly encouraged to take part in these remarkable events in future.

ERC President underlines need for frontier research

In a keynote speech at a public hearing in the European Parliament on 12 February 2014, the European Research Council (ERC) President Professor Jean-Pierre Bourquignon highlighted the success of the European Research Council, citing the ERC as proof that the European Union can make a difference. The presentation, which took place in the Committee on Industry, Research and Energy (ITRE), turned the spotlight on 'The European Research Area - from Framework Programme 7 to Horizon 2020'. At this hearing Professor Bourguignon spoke about 'The ERC under Horizon 2020: Why do we need, and how can we achieve, excellent fundamental and frontier research in Europe?' He acknowledged the role of the scientific community in initiating the ERC, as well as the subsequent support from national governments, the European Commission and the European Parliament, which he praised for its "brave decision to support basic research". He also took the occasion to touch on the substantial budget increase the ERC has received for the next seven years, which he said will enable the organisation to develop further.

Asked about the need to harmonise rules and procedures in research within the EU member states, Professor Bourguignon stated that uniformity is not the answer, compatibility is the key. "For scientists, political boundaries do not exist - the quality of work is more important than the procedures", he said. In his opinion, "the European Research Area can be the common denominator for the multitude of instruments and institutions currently supporting research".

[Source: edited from ERC document available at http://erc.europa.eu. The hearing can be viewed at http://vimeo.com/86522607]

Turkish Mathematical Society

Last September, the Turkish Math Society called its members for a special General Assembly. The main item in the meeting was the EMS Code of Practice and its dissemination in the Turkish Math community. Before the meeting, the Code and its Turkish translation was shared and discussed with the members. The response to the Code was very positive, and it was accepted unanimously in the General Assembly.

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[Source: EMS e-News, 10 February 2014]

Marie Sklodowska-Curie Actions Programme

The European Commission has issued a call for Individual Fellowships (IF) under the Marie Sklodowska-Curie Actions Programme. IFs provide opportunities to acquire and transfer new knowledge and to work on research in a European context (EU Member States and Associated Countries) or outside Europe. The scheme particularly supports the return and reintegration of researchers from outside Europe who have previously worked here. It also develops or helps to restart the careers of individual researchers that show great potential, considering their experience, and provides opportunities to acquire and transfer new knowledge. Deadline: 11 September 2014.

[Source: euro-math-soc.eu/node/4635, 19 Mar 2014]

David Chillingworth LMS/EMS Correspondent

LSD & LAW 2014

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The annual London Stringology Days and London Algorithmic Workshop (LSD & LAW) was hosted at King's College London from 6 to 7 of February 2014. A total of 60 participants (15 women) from different institutions and universities around the world attended this two day meeting, and 25 talks in eight sessions were given by various participants. Professor Michael

Luck, Head of School of Natural and Mathematical Sciences at King's College London welcomed the participants.

The talks covered many aspects of mathematics, theoretical or applied, including; combinatorics on words; algorithms on words; graph and tree algorithms; data compression; bioinformatics; computational complexity; and automata theory.

Talks on *algorithms on words* were given by Amihood Amir (Israel) and Christian Komusiewicz (Germany); on graph and tree algorithms and parallel processing by lain Stewart (UK), Jan Travnicek (Czech Republic) and Alexander Tiskin (UK); on data compression by Sergio De Agostino (Italy), Jan Holub (Czech Republic) and Travis Gagie (Finland); on automata theory, algorithms on words and



Tomas Flouri (Heidelberg Institute for Theoretical Studies) Automated plausibility analysis of large phylogenies

graph algorithms by Loek Cleophas (South Africa), Bruce Watson (South Africa), Robert Mercas (Germany) and Michele Zito (UK); on combinatorics on words by Jakub Radoszewski (Poland), Laura Giambruno (France) and Tomasz Walen (Poland); on bioinformatics by Nadia Pisanti (Italy), Laurent Mouchard (France) and Tomas Flouri (Germany); on graph algorithms by Moez Draief (UK), Robert Elsaesser (Austria) and Mohammed Amin Abdullah (UK): and on combinatorics and algorithms on words by Zsuzsanna Liptak (Italy), Mireille Regnier (France), Bill Smyth (Canada) and Wojciech Rytter (Poland).

The following are details of two of the many excellent talks.

Computing k-th Lyndon word and decoding lexicographically minimal de Bruijn sequence,

was given by Dr Jakub Radoszewski (University of Warsaw). A Lyndon word on alphabet A is a word that is strictly smaller in lexicographic order than all of its rotations. Dr Radoszewski presented polynomial-time methods for computing the k-th in the lexicographic order Lyndon word of a given length n on A. A de Brujin sequence is a cyclic sequence of a given alphabet A for which every possible subsequence of length *m* in A appears as a sequence of consecutive characters exactly

once. Dr Radoszewski used the connections between Lyndon words and minimal de Bruijn sequences to devise the first polynomial-time method for *decoding* minimal de Bruijn sequence of any rank r: it determines the position of an arbitrary word of length r This year's Mary Cartwright Lecture took within the de Bruijn sequence.

Global majority consensus by local majority polling on graphs of a given degree sequence, was given by Dr Mohammed Amin Abdullah (University of Birmingham). Suppose in a graph G vertices can be either red or blue. Let *k* be odd. At each time step, each vertex v in G polls k random neighbours and takes the majority colour. Dr Abdullah studied this protocol on graphs of a given degree sequence, in the setting where each vertex is initialised red independently with fixed probability p < 1/2 and is otherwise blue. Dr Abdullah showed that, with high probability consensus is reached on the initial global majority within time O(log log n), where n is the number of vertices in the graph. This is subject to certain restrictions on the degree sequence and sufficient bias in p. Dr Abdullah further showed that on such graphs, any local protocol in which a vertex does not change colour if all its neighbours have that same colour, has a matching lower bound.

Costas Iliopoulos and Solon Pissis were the co-chairs of the Organizing Committee. The meeting was supported by an LMS Conference grant and the Department of Infor-

matics at King's College London, A Special Issue of the Journal of Discrete Algorithms with selected contributions from the LSD & LAW 2014 meeting is currently being organised by the co-chairs of the Organising Committee. More information about this meeting can be found at www.inf.kcl.ac.uk/events/ ISD&IAW14

> Solon Pissis King's College London

MARY CARTWRIGHT **LECTURE 2014**

Report

place at the York Centre for Complex Systems Analysis (YCCSA) at the University of York on 28 February 2014. The overall theme of the day was Symmetry in Science. The opening lecture on Moonshines was delivered by Anne Taormina from Durham University. Particular emphasis was put on the recent discovery of Mathieu Moonshine, a phenomenon linking information encoded in a mock modular form that naturally appears in the theory of superstrings propagating on K3 surfaces, and the sporadic group Mathieu 24. How this huge symmetry group acts within the string theory remains a mystery and has captured the interest of theoretical particle physicists, algebraic geometers, number and group theorists.

The Mary Cartwright Lecture was given by Reidun Twarock on Viruses and Geometry: Hidden Symmetries in Virology. It showed that mathematical tools from group, graph and tiling theory can be used to better understand structural constraints on viruses and provide a new perspective on how viruses form, evolve and infect their hosts. Reidun showed that these new mathematical tools also apply to nested carbon cage structures called fullerenes, and she demonstrated how they can be used

Reidun Twarock (left), Briony Thomas (middle) and Anne Taormina (right) at the Mary Cartwright Lecture of the London Mathematical Society.



Tomasz Walen (University of Warsaw)

On the maximum number of non-standard squares in a string

http://newsletter.lms.ac.uk

to address open problems in bionanotechnology. She also reported on recent models that have enabled the discovery of a mechanism in virus assembly in collaboration with her experimental collaborator Peter Stockley from the Astbury Centre for Structural Molecular Biology in Leeds, that has inspired the development of a novel anti-viral strategy against (singlestranded) RNA viruses.

The talks were complemented by an exhibition of polyhedral art and design by Briony Thomas from the School of Design at the University of Leeds, who is currently spending her sabbatical at YCCSA. Briony frequently showcases her work at conferences on mathematics and art, such as the Bridges conferences, and organizes exhibitions dedicated to mathematical art. She also develops material from these exhibitions to contribute to school outreach programmes.

The meeting was well attended by students, postdocs and staff and stimulated lively discussions among participants. It was opened by Ken Brown, Vice President of the LMS, and the speakers were introduced by Gwyneth Stallard, the chair of the LMS's Women in Mathematics Committee.

Photographs from the conference can be found on the back cover of this *Newsletter*.

Reidun Twarock University of York

RECENT ADVANCES IN NONLINEAR PDE AND CALCULUS OF VARIATIONS

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The Department of Mathematics and Statistics of the University of Reading, jointly with the Oxford Centre for Nonlinear PDE of the University of Oxford organised a workshop on the *Recent Advances in Nonlinear PDE and Calculus of Variations.* The very successful event was held at the University of Reading from 12 to 14 February 2014. The organisers were Nicholas Katzourakis (University of Reading) and Greogory Seregin (University of Oxford). The event was partially financially supported by an LMS Conference grant to celebrate new appointments. Financial support from Oxford was also in the context of

a similar grant awarded to new academic staff members recently appointed to permanent UK positions in a University. In both cases, the grant was awarded to the organiser Nicholas Katzourakis of the University of Reading.

This event was one of the first of its kind held in the UK and in particular in Reading. The event brought together famous experts of several origins employed in several countries and working on different aspects of Nonlinear Partial Differential Equations and Calculus of Variations, in order to discuss the latest developments in these two interconnected disciplines.



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The main focus was on the following topics: vector-valued and scalar calculus of variations for integral functionals, nonlinear elasticity, convex integration, Young measures, vector-valued and scalar calculus of variations for supremal functionals, homogenisation, probabilistic and game-theoretic methods in PDE, fully nonlinear elliptic PDE, subelliptic PDE, water waves and free boundary problems, theoretical numerical methods for fully nonlinear PDE, and more.

The speakers where: Nicholas Alikakos (Athens, Greece), Sir John Ball (Oxford, UK), Bernard Dacorogna (Lausanne, Switzerland), Nicolas Dirr (Cardiff, UK), Georg Dolzmann (Regensburg, Germany), Federica Dragoni (Cardiff, UK), Petri Juutinen (Jyvaskyla, Finland), Nicholas Katzourakis (Reading, UK), Kostantinos Koumatos (Oxford, UK), Juha Kinnunen (Aalto, Finland), Jan Kristensen (Oxford, UK), Juan Manfredi (Pittsburgh, USA), Francesca Prinari (Ferrara, Italy), Tristan Pryer (Reading, UK), Filip Rindler (Warwick, UK), Ali Taheri (Sussex, UK), Eugen Varvaruca (Reading, UK) and Igor Velcic (Zagreb, Croatia). Robert Jensen (Chicago, USA) and Changyou Wang (Kentucky, USA) were in the original list of speakers but eventually cancelled for personal reasons.

The atmosphere during the event was very relaxed and pleasant. On each of the three days there were six 45-minute talks and one posterdiscussion session. In between all the talks were large breaks of 15-45 minutes and plenty of coffee available all day long. All speakers and participant received vouchers for free lunch that could be utilised in all the eating places in the Whiteknights Campus of the University of Reading, and also LMS registration packs. The workshop dinner was held in one of the best eating places in the town centre of Reading, with free buffet consisting of 150 different dishes of 10 plus different origins.

There were more than 40 people present on all three days. All the speakers and participant enjoyed this high-class very successful event and informal discussion took place for the possibility to hold a series of such international scientific events in Reading.

> Nicholas Katzourakis University of Reading

VISIT OF ROBERT GILMAN

Professor Robert Gilman (Algebraic Cryptography Center, Stevens Institute of Technology, USA) will be visiting the UK from 28 May to 9 June 2014. His expertise is in geometric and combinatorial group theory, including connections between languages, automata and group theory, and equations in groups. During his visit Professor Gilman will give lectures at:

- University of Warwick, Thursday 29 May (contact Derek Holt: d.f.holt@warwick. ac.uk)
- University of St Andrews, Wednesday 4 June

(contact Tara Brough: t.brough@st-andrews.ac.uk)

 University of Newcastle, Friday 6 June (contact Sarah Rees: sarah.rees@ncl.ac.uk) Further details about the visit can be obtained from Tara Brough (t.brough@st-an drews.ac.uk). The visit is supported by an LMS Scheme 2 grant.

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Dr Conall Kelly (The University of the West Indies, Mona campus, Kingston, Jamaica) will visit the UK in June 2014. His interests lie in the area of stochastic differential and difference equations, including numerical methods for stochastic systems. During his visit Dr Kelly will give lectures at:

- The University of Manchester during the week of 2-16 June (contact Sergei Fedotov: sergei.fedotov@ manchester.ac.uk)
- The University of Nottingham, 11 June (contact Marco Iglesias: mmarco.iglesias@ nottingham.ac.uk)
- University of Bath, 13 June (contact Tony Shardlow: tony.shardlow@ bath.edu)

Further details, when available, can be obtained from Professor Sergei Fedotov, or one of the other contacts listed above. The visit is partially supported by an LMS Scheme 2 grant.

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VISIT OF ALEKSEY KOSTENKO

Dr Aleksey Kostenko (Faculty of Mathematics, University of Vienna, Austria) will be visiting the UK from 8 to 24 May 2014. His expertise is in mathematical physics, spectral theory and inverse spectral problems. During his visit Dr Kostenko will give lectures at:

• University of Leeds, School of Mathematics, Friday 9 May,

An isospectral problem for global conservative solutions of the Camassa-Holm equation (contact Alexander Mikhailov: A.V.Mikhailov@leeds.ac.uk)

 Cardiff University, School of Computer Science and Informatics, Monday 12 May, Indefinite Sturm-Liouville spectral problems and the HELP inequality (contact Malcolm Brown: Malcolm.Brown@cs.cardiff.ac.uk)
 University of Essex, Department of Math-

ematical Sciences, Thursday 22 May, The Camassa-Holm equation and the inverse spectral transform method (contact Georgi Grahovski: grah@essex.ac.uk)

Dr Kostenko will also attend the two-day workshop Spectral Analysis and Differential Equations (a memorial meeting to Professor W.N. Everitt) which will be held at Cardiff University from 15 to 17 May 2014 (www.cs.cf. ac.uk/everittmemorial).

Dr Kostenko will be based at the Department of Mathematical Sciences, University of Essex, Colchester. For further information contact Georgi Grahovski (grah@essex.ac.uk). The visit is supported by an LMS Scheme 2 grant.

VISIT OF VASSILIS ROTHOS

Dr Vassilis Rothos (Aristotle University of Thessaloniki, Greece) will visit the UK in June 2014. His interests include localised waves and coherent structures in spatially discrete differential equations. During his visit Dr Rothos will give lectures at:

- Imperial College London, 4 June at 3 pm Bifurcation of travelling waves in implicit nonlinear lattices: Applications in magnetic metamaterials
- University of Surrey, 6 June at 4 pm Localized structures in nonlocal media
- Loughborough University, 11 June at 1 pm

Nonlinear localization in rf-SQUID metamaterials

Further details about the visit and talks can be obtained from Hadi Susanto (hsusanto@ essex.ac.uk). The visit is supported by an LMS Scheme 2 grant.

FILTERING HIGH DIMENSIONAL COMPLEX SYSTEMS

This meeting will take place at the University of Warwick from Monday 30 June to Wednesday 2 July 2014. The meeting will be focussed on the role of mathematics within a subject area that has been driven, to a large extent, by application areas arising in the geophysical sciences, in particular numerical weather prediction, oceanography and oil recovery. Whilst these engineering applications are of enormous practical importance, the mathematical analysis of filtering algorithms for such high dimensional complex systems is in its infancy. The speakers are:

- Marc Boucquet (CEREA)
- Mikal Branicki (Edinburgh)

Mike Fisher (ECMWF)

- Ian Grooms (NYU)
- Ibrahim Hoteit (KAUST)
- Kayo Ide (UMD)
- Kody Law (KAUST)
- Andy Majda (NYU)
- Maelle Nodet (INRIA)
- Sebastian Reich (Potsdam)
- Andrew Stuart (Warwick)
- Peter Jan Van Leeuwen (Reading)

The meeting is supported by an LMS Conference grant from which there is some funding for UK-based graduate students. To register visit the website at http://tinyurl. com/pqv7h6c.

LONDON MATHEMATICAL SOCIETY MEETING AND RECEPTION

Tuesday 19 August 2014

International Congress of Mathematicians Seoul, South Korea

The London Mathematical Society will be holding a meeting and reception during the next International Congress of Mathematicians, in Seoul from 13-21 August 2014.

The Society meeting and reception will be held from 5.00 pm - 9.00 pm on Tuesday 19 August. LMS members will have the opportunity to sign the Members' Book, which dates back to 1865.

LMS members who wish to attend the meeting and reception should apply for their free ticket to Elizabeth Fisher, (Imsmeetings@Ims.ac.uk) no later than Friday 25 July. The Society hopes to entertain as many as possible of its members, but numbers are limited by the capacity of the room.

The LMS will also host a stand during the ICM and would like to invite members to drop by, see the latest publications and meet the LMS Officers and staff.



GROUPS IN GALWAY 2014

A two-day meeting on group theory and related topics will be held at National University of Ireland, Galway, from Friday 23 to Saturday 24 May. The speakers include:

- Philippe Elbaz-Vincent (Université Grenoble)
- Herbert Gangl (Durham University)
- Kevin Hutchinson (University College Dublin)
- Radha Kessar (City University London)
- Grant Lakeland (University of Illinois at Urbana-Champaign)
- Markus Linckelmann (City University London)
- Jacques Thévenaz (EPFL)

Further information can be found at the conference homepage www.maths.nuigalway.ie/ conferences/gig14/ or contact the organizers Alexander Rahm (alexander.rahm@nuigalway. ie) or Sejong Park (sejong.park@nuigalway.ie).

POSTGRADUATE GROUP THEORY CONFERENCE 2014

The 16th Postgraduate Group Theory Conference (PGTC) will be held at the University of Birmingham from 24 to 27 June 2014. The PGTC is an annual student-organised conference which aims to bring together postgraduates working in mathematics and who have an interest in group theory. All are welcome.

The highlights of the conference will be plenary lectures by Radha Kessar (City University London) and Andrea Lucchini (University of Padua). The main conference will consist of talks by contributed by participants as well as a poster session. The environment is intended to be relaxed and stimulating. It will be an ideal opportunity to meet other students whose PhD studies are centred on group theory.

Registration is via the website at http:// web.mat.bham.ac.uk/pgtc14/. The meeting is supported by an LMS Postgraduate Research Conference Scheme 8 grant and by the School of Mathematics of the University of Birmingham.

YOUNG RESEARCHERS IN MATHEMATICS 2014



The University of Warwick will be hosting the 6th annual Young Researchers in Mathematics (YRM) conference from 30 June to 3 July 2014. This popular event is open to postgraduate students and postdocs working in all areas of mathematics. YRM gives young mathematicians a chance to meet their peers from other

universities and to learn about research in their area of expertise. This year there are two plenary speakers: lain Stewart (Warwick) and Jeremey Gray (Open University) and 14 tracks: Algebra, Algebraic Geometry, Analysis and PDEs, Combinatorics, Differential Geometry, Dynamical Systems,

Financial Maths and Stochastic Analysis, Fluid Mechanics, Maths and Physics, Maths and Biology, Number Theory, Probability, Set Theory and Logic, and Topology.

The majority of talks will be given by the postgraduate delegates. This is a great opportunity for students to give talks about their research in front of an enthusiastic audience. Talk abstracts and posters proposals should be submitted during registration. For further information and to register, please see the conference webpage: www.warwick.ac.uk/ vrm2014.

The conference is supported by an LMS Postgraduate Research Conference Scheme 8 grant, the Heilbronn Institute and Winton Capital.

LMS-WIMCS ANALYSIS DAY

An LMS-WIMCS Analysis Day (second workshop in the series) will take place at the Department of Mathematics and Physics, Aberystwyth University, on Wednesday 7 May 2014 from 10:00 - 17:30. The meeting, which is open to all, will highlight topics in applications of analysis, including materials science. The speakers are: • Kirill Cherednichenko (Cardiff)

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- Norman Dancer (Swansea and Sydney)
- Nicolas Dirr (Cardiff)
- Apala Majumdar (Bath)
- Angela Mihai (Cardiff)

For further information visit the meeting webpage at http://fp7.imaps.aber.ac.uk/ wimcs_aber/. To register send an email by **5 May 2014** to Gennady Mishuris (ggm@aber. ac.uk) with your name, affiliation and whether or not you wish to stay for dinner. The meeting is supported by an LMS Joint Research Groups in UK Scheme 3 grant and the Wales Institute of Mathematical and Computational Sciences.

CLAY RESEARCH CONFERENCE AND WORKSHOPS

The 2014 *Clay Research Conference* will be held 1 October at the Mathematical Institute of the University of Oxford. The speakers are:

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- Ben Green (Oxford)
- Jonathan Pila (Oxford)
- Paul Seidel (MIT)
- Scott Sheffield (MIT)

The recipient of the 2014 Clay Research Award will be announced at the conference. Presented annually, the Clay Research Award celebrates outstanding achievements in mathematical research.

Associated workshops will be held throughout the week of the conference:

- Advances in Probability (Ivan Corwin and Martin Hairer), 28 September – 2 October
- Analytic Number Theory (Ben Green and Roger Heath-Brown), 29 September – 3 October
- Functional Transcendence around Ax–Schanuel (Jonathan Pila and Alex Wilkie), 29 September – 3 October
- Symplectic Topology (Dominic Joyce, Alexander Ritter, and Ivan Smith), 29 September – 3 October

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

RANDOM INTERACTING SYSTEMS

A school and workshop on *Random Interacting Systems* will take place from 23 to 27 June 2014 at the University of Bath. It will focus on recent developments on random interacting systems, including (but not restricted to) interacting and self-interacting particle systems, random walks and other stochastic processes in random environments, random and evolving graphs, the Gaussian free field, random interlacements, random polymers, percolation and spin systems.

The meeting will comprise the following two mini-courses:

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- Hugo Duminil-Copin (Université de Genčve) Geometric representations of low-dimensional spin systems
- Christophe Garban (ENS Lyon) Lectures around Liouville quantum gravity and multiplicative chaos theory

and invited talks by the following speakers:

- Kenneth Alexander (University of Southern California)
- Gérard Ben-Arous (Courant Institute of Mathematical Sciences)
- Nathanael Berestycki (University of Cambridge)
- Ivan Corwin (MIT)
- David Croydon (University of Warwick)
- Nadine Guillotin-Plantard (Univ Lyon 1)
- Ori Gurel-Gurevich (Hebrew University of Jerusalem)
- Frank den Hollander (Universiteit Leiden)
- Neil O'Connell (University of Warwick)
- Ron Peled (Tel Aviv University)
- Alejandro Ramírez (Pontificia Universidad Católica de Chile)
- Perla Sousi (University of Cambridge)
- Rongfeng Sun (National University of Singapore)

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- Pierre Tarrčs (University of Oxford)
- Augusto Teixeira (IMPA)
- Yvan Velenik (Université de Genčve)

There is a £60 registration fee, and some funding is available to contribute to local expenses of some participants, with preference given to PhD students, post-docs and voung researchers. There will be slots for a small number of contributed talks. For more information, including how to register, visit http://people.bath.ac.uk/ados20/workshop14/.

The meeting is supported by grants from the LMS (Scheme 1), ESF and the University of Bath.

MAGNETOHYDRODYNAMICS

The 2014 UK National Conference on Geophysical, Astrophysical and Industrial Magnetohvdrodvnamics will take place at Department of Mathematical Sciences, University of Exeter, from 22 to 23 May 2014. The conference is a medium-sized, single-thread meeting of the UK Magnetohydrodynamics research community.

It is expected that the conference would be involved between 60 and 80 participants with a number of international participants.

The meeting will start around 10:00 am on Thursday 22 May and close on Friday afternoon 23 May 2014. The invited speakers include:

Paul Roberts (UCLA)

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• David Gubbins (University of Leeds)

In addition, there will be shorter presentations (15-20 minutes) by young researchers disseminating their research results as well as a poster session. The website for the registration and further information is located at http://tinyurl.com/ptuowjt with the deadline • Henrik Jensen (Imperial College London) for registration of 15 May 2014.

The 2014 UK MHD conference is supported by an LMS Conference grant and a STFC grant. There is some limited funding available to support the travel of PhD students to Exeter. If you have any questions regarding this conference such as requesting travel funds please send an email to ukmhd2014@exeter. ac.uk.

COMBINATORICS IN OXFORD

A one-day meeting in combinatorics will be held in Oxford on 5 June 2014. The meeting will take place in the Mathematical Institute, with talks starting at 11am and coffee available beforehand from 10.30 am. This year's speakers are:

Some funds may be available to contribute to the expenses of research students who wish to attend the meeting. Further at http://tinvurl.com/32vrf2d. The meeting is supported by an LMS Conference grant

MATHEMATICAL **MODELLING OF BIOLOGICAL AND CULTURAL EVOLUTION**

The meeting Mathematical Modelling of Biological and Cultural Evolution will take place in the Department of Mathematics at City University London on Friday 13 June 2014. The focus of the meeting will be on mathematical modelling of evolutionary dynamics and complexity. Confirmed speakers are:

- Stephen Cornell (University of Liverpool)
- Anne Kandler (City University London)

There is a £10 registration fee. Some funding is available to contribute to the travel expenses of research students. For more information, including how to register, contact the organiser. Anne Kandler by email (anne.kandler.1@city. ac.uk). The meeting is supported by an LMS Conference grant.



Isaac Newton Institute for Mathematical Sciences

FREE BOUNDARY PROBLEMS: THEORY AND APPLICATIONS

23 – 27 June 2014

in association with the Newton Institute programme Free Boundary Problems and Related Topics 6 January - 4 July 2014

Organisers: Gui-Qiang Chen (Oxford), Charlie Elliott (Warwick) and John King (Nottingham).

Background: In conjunction with the Isaac Newton Institute programme, this is the 13th international conference on Free Boundary Problems: Theory and Applications, in the series beginning in Montecatini (Italy, 1981) and succeeding in Maubuisson (France, 1984), Irsee (Germany, 1987), Montreal (Canada, 1990), Toledo (Spain, 1993), Zakopane (Poland, 1995), Crete (Greece, 1997), Chiba (Japan, 1999), Coimbra (Portugal, 2005), Stockholm (Sweden, 2008), and Chiemsee (Germany, 2012).

Aim: to bring together mathematical scientists with interests in the theory, numerics and applications of free boundary problems and discuss recent significant advances and current trends/directions in Free Boundary Problems and Related Topics.

There will be six focus sessions on Free Boundary Problems (FBPs):

- Analysis of Free Boundary Problems
- FBPs in Fluid Mechanics
- FBPs in mixed PDEs
- Numerics for FBPs
- FBPs in Materials Science
- FBPs in Biology

Closing date of the receipt of applications is 25 May 2014. Further information and application forms are available from the website at:

www.newton.ac.uk/programmes/FRB/frbw04.shtml

- Jacob Fox (MIT)
- Jeff Kahn (Rutgers)
- Gil Kalai (Jerusalem)
- Rob Morris (IMPA)
- Angelika Steger (ETH Zurich)

Anyone interested is welcome to attend. details can be obtained from the web page and the British Combinatorial Committee.

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Isaac Newton Institute for Mathematical Sciences

PRINCIPLES & APPLICATIONS OF CONTROL TO QUANTUM SYSTEMS

4 – 8 August 2014

in association with the Newton Institute programme Quantum Control Engineering: Mathematical Principles and Applications 21 July – 15 August 2014

Organisers: John Gough (Aberystwyth)

International program committee members: Hideo Mabuchi (Stanford), Yuxi Liu (Tsinghua), Hendra Nurdin (New South Wales) and Mazyar Mirrahimi (INRIA)

The 21st Century has witnessed a significant advancement in our capacity to exercise control over quantum systems and to harness their specifically non-classical resources: complementary to this has been a fundamental shift in theory towards an engineering focussed perspective. Quantum control has already lead to significant improvements in technologies ranging from magnetic resonance to prototype quantum computers, from quantum high-precision sensors to quantum logic clocks, from single atom transistors to quantum noise suppression in gravitation wave detectors. The recent Nobel prize-winning works of Haroche and Wineland are both underpinned by dedicated control theoretic principles. We are at the formative stages of a 21st Century's industrial revolution centred around Quantum Technology, and it is natural to view quantum control engineering as an essential framework behind its development, crucial to problems of design, stabilization, error-correction, noise reduction and filtering, and combating decoherence.

This is the ninth international workshop on Principles and Applications for Control of Quantum Systems. Our aim is to bring together researchers in mathematics, physics, control theory, dynamical systems, stochastic processes, signal processing and information science to strengthen the community of quantum control.

As in previous workshops, all lectures will be from invited speakers, which will present recent developments at the forefronts of theoretical research, experimentation and motivating applications.

A poster session will be held during the meeting; participants can submit a title/abstract from the Registration page (details about poster sizing will be sent later by email).

Closing date of the receipt of applications is 25 May 2014.

Further information and application forms are available from the website at: www.newton.ac.uk/programmes/FRB/frbw04.shtml

TWO ONE-DAY COLLOQUIA IN COMBINATORICS 2014

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 14 May and the second will take place at the London School of Economics and Political Science on Thursday 15 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 (14 May) Maths Lecture Theatre, Mathematical Sciences Building

- Ben Barber (Birmingham)
 Partition regularity without the columns
 property
- Ehud Friedgut (Rehovot) Combinatorial problems in the symmetric group, stability and quasi-stability
- Vytautas Gruslys (Cambridge) Orientations of hypergraphs and sparse Ramsey theory
- Peter Keevash (Oxford) The existence of designs
- Konrad Swanepoel (London) Counting double-normal pairs in Euclidean space
- Miklós Simonovits (Budapest) Stability methods, supersaturated graphs, phase transitions

London School of Economics (15 May) New Theatre, East Building

- József Balogh (Szeged and Urbana) On the typical structure of sum-free sets
- Peter Cameron (St Andrews)
 Combinatorial problems from transformation semigroups
- Penny Haxell (Waterloo) Extremal graphs for connectedness
- Diana Piguet (Birmingham) An approximate version of the tree packing conjecture for bounded degree graphs
- Pavel Valtr (Prague) Happy ending theorem and some related questions and results

 Paul Wollan (Rome)
 When are directed graphs well-quasi-ordered under taking minors

Anyone interested is welcome to attend. Some funds are available to contribute to the expenses of UK-based research students who wish to attend the meetings. Further details can be obtained from the web page http://tiny. cc/Colloquia 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. The meeting is supported by an LMS Conference grant and the British Combinatorial Committee.

CATEGORY THEORY 2014

The meeting *Category Theory 2014* will take place in the Centre for Mathematical Sciences at the University of Cambridge, from Sunday 29 June to Saturday 5 July 2014. This conference is the main annual meeting in the mathematical area of Category Theory. It is a truly international meeting with recent venues including Sydney (2013), Vancouver (2011), Genova (2010), Cape Town (2009), and Calais (2008). In Cambridge, the conference will comprise a full programme of talks over six consecutive days, including six presentations by invited speakers and talks in plenary and parallel sessions. The invited speakers are:

- Maria Manuel Clementino (University of Coimbra, Portugal)
- Martin Hyland (University of Cambridge, UK)
- Joachim Kock (Autonomous University of Barcelona, Spain)
- Steve Lack (Macquarie University, Sydney)
- Jaap van Oosten (University of Utrecht, Netherlands)
- Angelica Osorno (Reed College, Portland, USA)

The standard registration fee is £150 until 29 May (and £170 afterwards), while the fee for research students is £110 (£130 after 29 May). Registration will close on **12 June 2014**. The meeting is supported by an LMS Conference

http://newsletter.lms.ac.u

- Grant. Some funding is available to contribute to accommodation expenses of research students, in particular those at UK universities. For more information, including how to register, see the conference website www. ct2014.dpmms.cam.ac.uk.
- RINGS OF DIFFERENTIAL AND INTEGRAL OPERATORS

The meeting *Rings of Differential and Integral Operators* will take place at Plymouth University on Thursday 5 June 2014. It will focus on algebraic aspects of differential equations, integro-differential equations and boundary value problems. Confirmed speakers are:

- Vladimir Bavula (University of Sheffield, UK)
- Alban Quadrat (Inria Saclay, France)
- Markus Rosenkranz (University of Kent, UK) For more information visit the website at www.tech.plym.ac.uk/Research/applied_math-

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ematics/LMS_Robertz.html or contact the organiser, Daniel Robertz (daniel.robertz@ plymouth.ac.uk). The meeting is supported by an LMS Conference grant.

MOST 2014

The Mathematics of String Theory (MOST) workshop will take place from 2 to 3 June 2014 at King's College London. The goal of this workshop is to bring together mathematicians and theoretical physicists working on ideas related to string theory and supersymmetric 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 powerful techniques that have rendered many problems in string theory soluble.

The workshop intends to bring together researchers working at the intersection between these two fields to summarise current developments and explore future research directions. The meeting will allow for plenty of time for discussions. Speakers include:

- Tom Bridgeland (Sheffield)
- Xenia de la Ossa (Oxford)

- Tudor Dimofte (IAS)
- Joel Fine (Brussels)
- Mark Gross (Cambridge)
- Lotte Hollands (Oxford)
- David Skinner (Cambridge)
- Richard Thomas (Imperial)

For information and questions about the workshop contact Sakura Schafer-Nameki (sakura.schafer-nameki). Closing date for registration and payments is **19 May 2014**. Information is available from the website at: www. mth.kcl.ac.uk/~ss299/MOST. The workshop is supported by an LMS Conference grant.

ACTIVITIES ON SYMMETRIES AND CORRESPONDENCES

Activities on Symmetries and Correspondences in number theory, geometry, algebra and quantum computing: intra-disciplinary trends will take place from 3 to 10 July in Nottingham and Oxford. They include a workshop and a conference.

Recent work in arithmetic, functional, geometric Langlands correspondences, noncommutative summation formulas, new developments in anabelian geometry, higher adeles and zeta integrals for arithmetic schemes, dualities on arithmetic surfaces, equivariant arithmetic geometry, higher commutative summation formulas, as well as related work in representation theory, algebraic analysis, geometry, *K*-theory, integrable systems and archimedean *L*-functions, the study of interaction with mirror symmetry, TQFT and quantum computation reveal new intra-disciplinary fundamental structures and stunning perspectives.

Talks at the Oxford conference from 5 to 10 July will be of a more general, overview and programme nature, describing new trends and perspectives and sketching potential for developments and interaction with other areas of mathematics.

- The speakers from July 5-8 include:
- F. Bogomolov (Courant Institute/ Nottingham)
- K. Buzzard (ICL)
- T. Chinburg (Philadelphia)
- C. Deninger (Münster)

newsletter@lms.ac.uk

- E. Frenkel (Berkeley)
- D. Gaitsgory (Harvard)
- D. Joyce (Oxford)
- M. Kapranov (Yale)
- L. Lafforgue (IHES)
- R. Meyer (Göttingen)
- M. Morrow (Bonn)
- S. Oblezin (Nottingham)
- C. Soulé (IHES)
- M. Suzuki (TIT, Tokyo)
- Yu. Tschinkel (Courant Institute)
- Sh. Zhang (Princeton)

Some funding is available to support local accommodation for young researchers. For more information, and to register visit the website at www.maths.nottingham.ac.uk/personal/ibf/ files/sc3.html.

The conference will be preceded by an instructional workshop on higher structures in number theory, from 3 to 4 July in Nottingham. The conference is aimed at young researchers and experts in neighbouring areas in number theory, representation theory, geometry and mathematical physics. Expository lectures will provide an overview of main aspects of higher local fields associated to arithmetic schemes and algebraic varieties, geometric and analytic higher adelic structures and applications, anabelian geometry for finitely generated fields, higher Haar measure and integration, higher class field theory, zeta functions and adelic zeta integrals of arithmetic schemes. Speakers include:

- F. Bogomolov (Courant Inst/Nottingham)
- O. Bräunling (Essen)
- A. Cámara (Besançon)
- M. Kapranov (Yale)
- M. Morrow (Bonn)
- T. Oliver (Nottingham)
- M. Suzuki (TIT, Tokyo)

Some funding is available to support local accommodation. For more information, and to register, visit the website at www.maths.nottingham.ac.uk/personal/ibf/files/hsnt1.html.

The organizers are: Ivan Fesenko (Nottingham), Yakov Kremnitzer (Oxford), Sir Martin Taylor (Oxford) and Boris Zilber (Oxford). Supported by CMI, QMAC, Oxford, University of Nottingham and Bogomolov's Laboratory, Moscow.

GROUPS, NUMBERS, AND DYNAMICS 30 June – 4 July 2014



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in association with the Newton Institute programme Interactions between Dynamics of Group Actions and Number Theory 9 June – 4 July 2014

Workshop organisers: Anish Ghosh (East Anglia), Alexander Gorodnik (Bristol) and Barak Weiss (Ben Gurion University of the Negev).

Aim: to bring together researchers working in number theory, group theory and the theory of dynamical systems to discuss problems arising at the interface of arithmetics and dynamics of group actions. In recent years several promising connections between these fields has been discovered that resulted in striking breakthroughs.

Among the areas addressed during the workshop will be in particular connections between dynamics on homogeneous spaces and Diophantine geometry; exponential sums, dynamics on nilmanifolds and higher order correlations; periodic orbits, period integrals and L-functions including connections with quantum chaos.

Closing date of the receipt of applications is **25 May 2014**. Further information and application forms are available from the website at:

www.newton.ac.uk/programmes/GAN/ganw01.shtml

SYMMETRIES IN GRAPHS, MAPS AND POLYTOPES

The 5th SIGMAP Workshop, *Symmetries in Graphs, Maps and Polytopes*, will take place from 7 to 11 July 2014 at the ELIM Conference Centre, West Malvern. The aim of the workshop is to continue the SIGMAP series and give the worldwide community of researchers in symmetries of discrete objects and structures the opportunity to gather together, exchange information and present their newest findings. It is expected to set up a new momentum for this community and further enhance research into important connections between embedded graphs, Riemann surfaces, dessins d'enfant and Galois theory by including a mini-course on these topics. The invited speakers are:

Marston Conder (University of Auckland)

Shaofei Du (Capital Normal University, Beijing)

- Gareth Jones (University of Southampton)
- Cai Heng Li (University of Western Australia)
- Aleksander Mednych (Novosibirsk State University)
- Roman Nedela (Matej Bel University, Slovakia)
- Primoz Potocnik (University of Ljubljana)
- David Singerman (University of Southampton)
- Asia Ivic Weiss (York University, Toronto)
- Jurgen Wolfart (J.W. Goethe University, Frankfurt)

Gareth Jones, David Singerman and Jurgen Wolfart will give a mini-course on connections between maps, Riemann surfaces and dessins d'enfant in their invited lectures scheduled for the morning of Wednesday 9 July.

For further information visit the website at http://mcs.open.ac.uk/SIGMAP/ or contact the organiser Jozef Siran (jozef.siran@open.ac.uk). The workshop is supported by an LMS Conference grant.

³² MEMBERS' OPINIONS have your say

All opinions submitted to this section are strictly those of the contributor and do not necessarily represent the views of the London Mathematical Society. If you would like to respond to any of the opinions published below, or have a separate contribution which you would like published on matters relevant to mathematics please contact newsletter@lms.ac.uk. Items are accepted at the discretion of the Editor and subject to available space in any given edition.

SHOULD MATHEMATICIANS COOPERATE WITH GCHQ?

Dr Richard Pinch, Strategic Advisor for Mathematics Research at GCHQ, who has been a member of the LMS for over 35 years, writes the following in response to Dr Leinster's opinion piece *Should Mathematicians Cooperate With GCHQ?*:

Dr Leinster's opinion piece makes a range of allegations of unethical and unlawful conduct against GCHQ. The allegations are so widely drawn that it is impossible for GCHQ to recognise them as a description of its activities.

GCHQ, along with the other intelligence agencies of the UK, is subject to some of the most rigorous legislative and oversight arrangements in the world. These ensure that all the work of the agencies is carried out in accordance with a strict legal and policy framework so that their activities are at all times legal, authorised, necessary and proportionate.

GCHQ does not comment on intelligence matters, but would draw your readers' attention to the comments of the Foreign Secretary in the House of Commons on 10 June 2013, auoting the Interception Commissioner: "it is my belief ... that GCHQ staff conduct themselves with the highest levels of integrity and legal compliance", and to Director GCHQ's evidence to the Intelligence and Security Committee of Parliament on 07 November 2013: "My people are motivated by saving the lives of British forces on the battle field, they are motivated by fighting terrorists / serious criminals, by meeting that foreign intelligence mission as well. If they were asked to snoop, I would not have the workforce. They would leave the building."

LONDON MATHEMATICAL SOCIETY POPULAR LECTURES 2014

Institute of Education, London – Wednesday 9 July

University of Birmingham – Wednesday 24 September

Professor Kevin Buzzard Imperial College London

What's in a number?

Much of our work and our leisure interests are now stored in digital format -- i.e., as numbers. This has weird consequences: for example some numbers are now copyrighted, and other numbers are illegal.

Professor Buzzard will explain some of these stories, and also what happens if one tries to digitise mathematics itself.



39793238402043383279502884 34211706798214808651328236 35211055596446229489549303 45648566923460348610454326 96282925409171536436789255 57595919530921861173819326 33011949129833673362440656 29317675238467481846766946 14684409012249534301465495 59813629774771309960518707 34690830264252230825334468 76691473035982534904287554

Dr Julia Gog University of Cambridge

Epidemics and viruses: the

mathematics of disease

Dr Gog will look at how mathematics has been applied to help understand and control infectious diseases, from the scale of a single virus particle through to a global influenza pandemic, and considers some mathematical challenges for the future.

LONDON: Commences at 7.00 pm, refreshments at 8.00 pm, ends at 9.30 pm Admission is free, with ticket. **Register by Thursday 3 July**.

BIRMINGHAM: Commences at 6.30 pm, refreshments at 7.30 pm, ends at 9.00pm Admission is free, with ticket. **Register by Thursday 18 September.**

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

OBITUARY JERZY HERSZBERG



Dr Jerzy Herszberg, who was elected a member of the London Mathematical Society on 20 December 1951, died on 5 February 2014, aged 84. Lilian Button writes: Jerzv Herszberg was born

in Poznan and lived

there until 1939

where he was separated from his mother and sister, never to see them again. Released by the Americans, he came to England in 1947 with no English or school mathematics, and he achieved a PhD by 1954. He was one of a group of geometers let by Professor Semple and Professor Bernard Scott at King's College, London. For a number of years Jerzy went to meetings of the Geometry seminar held alternately at King's and Sussex University.

I knew him as a colleague at Exeter where he was a lecturer (1955-1961). He then went on to Birkbeck College, London, primarily to teach evening classes to older students who had missed the conventional start to a degree. His universal friendliness was returned by the many neighbours who cared for him at the end.

REVIEWS

34 **COMBINATORICS: ANCIENT AND MODERN**

From there they went to a concentration camp

edited by Robin Wilson and John J. Watkins, Oxford University Press, 2013, 368 pp, £55.00, US\$99.95, ISBN 978-0-19-965659-2.

COMBINATORICS:

ANCIENT & MODERN

You might think that the subject of combinatorics started in the 17th and 18th centuries, with (for example) Fermat and Pascal's work on games of chance, Euler's solution to the

Königsberg bridges problem and his celebrated formula for polyhedra being early highlights. But in fact its history stretches back much further than this, with problems such as the systematic listing of the 64 hexagrams in the I Ching (six lines, each being either Ying or Yang), the classification of metres in Vedic chants (combinations of short and long syllables, whose lengths must sum to a fixed value), the construction of magic squares, and the combinatorial or algebraic

properties of 'Pascal's' arithmetical triangle all binatorial patterns and ends with a personal having much older histories.

The book under review is a collection of essays by various authors that together provide a picture of the history of combinatorics. As its title implies, the book is divided into Ancient and Modern parts (with the late-Renaissance providing the dividing point). The first part begins with essays on ancient math-

> ematical traditions, with sections on Indian, Chinese, Islamic and Jewish combinatorics, followed by a pair of essays on Renaissance mathematics and an essay on the long history of the arithmetical triangle. The second part is organised by mathematical topic, with essays on graph theory, partitions, designs, latin squares, enumeration and finite set theory. In addition, the book begins with an essay by Donald Knuth on the history of the generation and listing of com-

perspective by Peter Cameron on the nature of combinatorics now, and the role of combinatorics in mathematics and society.

As the editors say in their introduction, there

will inevitably be topics that are missed out in a book of a reasonable length. All the core combinatorial topics are there, but of course there are many topics that are omitted (or nearly so). The editors mention combinatorial optimisation, combinatorial identities and recreational combinatorics explicitly; but there is little on applications of combinatorics to other areas of mathematics (nothing on root systems, to take just one example), or to computer science, biology or physics.

sweep of combinatorics within 350-or-so pages of text. If you are interested in discrete mathematics, I would urge you to put the book on your beach or Christmas reading list: it is a perfect book to dip into, and you will be sure to discover something you didn't know. I feel that I have gained a much better appreciation of the history of the areas of combinatorics it covers: there is nothing at all like it that I have seen.

Royal Holloway, University of London

I think the book brilliantly conveys the grand

UNDILUTED HOCUS-POCUS: The Autobiography of Martin Gardner Princeton University Press, 2013, 288 pp, £16.95, \$24.95, ISBN 978-0-691-15991-1.



Martin Gardner. who died in 2010, is very well-known in mathematical circles as the author of the 'Mathematical Games' column of Scientific American for more than 25 years from 1957 to 1986. But readers who expect to find some of the many gems which

appeared in that column repeated in this book will be sorely disappointed. They appear in the 15 volumes of The New Martin Gardner Mathematical Library published by Cambridge University Press. To paraphrase a well-known television advert, this book does exactly what it says on the cover: it is Martin's life-story.

The book consists of 21 chapters with a foreword by Persi Diaconis and an afterword by James Randi. For a mathematician the most interesting chapter is probably Chapter 15, entitled Scientific American. The previous 14 chapters give almost no hint at all of what is to come mathematically. They take us from Martin's earliest memories and his life in Tulsa, Oklahoma, to his time at the University of Chicago, and then as a journalist and in the navy. Martin hated high school, describing it as 'like four years in prison', and only briefly mentions a geometry teacher, Pauline Baker, who didn't recognise that tic-tac-toe had anything to do with mathematics. Chapters 5 to 9 on his time at the University of Chicago where he obtained a bachelor's degree in philosophy are perhaps the most amusing. In them he describes some of the rather bizarre religious and philosophical views of the professors. Indeed there is much comment on people's beliefs throughout the book, including Martin's own. Chapter 20 is simply entitled God and Chapter 21 My Philosophy. Chapter 8 contains what is perhaps the most quotable sentence from the book. 'The University of Chicago was a Baptist college where Jewish professors were teaching Catholic theology to atheists."

After the navy, Martin worked for the magazines Esquire and Humpty Dumpty, first in Chicago and then in New York. He had become interested in topology and had also contributed a series of articles on mathematical magic to Scripta Mathematica. He was introduced by a friend to the hexahexaflexagon and wrote an article on flexagons which appeared in the December 1956 issue of Scientific American. This lead to him writing the famous column and as it says in the book, 'the rest is history'. Martin describes this as 'the second luckiest event in my life', the first of course being meeting his wife, Charlotte. In order to write the column, Martin bought all the books he could find on recreational mathematics including W.W. Rouse Ball's classic Mathematical Recreations and Essays. By writing the column. Martin came to meet many

Simon R. Blackburn

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dark energy. In truth it is just flat Minkowski

spacetime in curvilinear coordinates. That may

have persuaded some that there is little of

interest in Milne's work. The present truly im-

It is not just the story of the man by a dutiful

daughter, but a true work of scholarship, aided

by the countless experts she has consulted.

It describes in non-technical but accurate

language Milne's scientific work, its back-

ground, the controversies he was caught up

in, academic politics, accounts of his numerous

meetings and correspondence, both scientific

and social, with a staggering number of now

legendary contemporaries, together with some

telling commentary on the society of his time.

Meg Weston Smith is to be thanked for

informing us with such panache of the struggles

* Editor's note: Hill's brigands were a group of math-

ematicians led by A.V. Hill working on first world war

and triumphs of her remarkable father.

pressive book should dispel any such illusion.

LMS NEWSLETTER

eminent mathematicians and he comments that as he did so his column became more sophisticated.

As well as mathematics, Martin's other great passion was magic and his involvement in this occurs throughout the book. Although the chapters essentially proceed chronologically, there is no detailed biographical information; the only date mentioned is 21 October 2009, Martin's 95th birthday. The book might be

described more as reminiscences. We do not formally meet Martin's parents and family until Chapter 11 and his wife Charlotte until Chapter 18. But it is a well-written autobiography, obviously a labour of love, easy to read and gives insight into the man who entertained so well and did so much to popularise mathematics for many years.

> Terry S. Griggs The Open University

BEATING THE ODDS: THE LIFE AND TIMES OF E.A. MILNE by Meg Weston, World Scientific, 2013, pp 350, £18.00, US\$28.00, ISBN 978-1-84816-907-4.

The title of this remarkable and extremely informabiography, tive by one of his daughters, reflects the struggles and difficulties encountered by the mathematician, astrophysicist and former president of the LMS.

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Despite being

tragically cut short of heart failure at the early age of 55, his was a life full of great achievements and distinctions and great public service. lived through one of the most revolutionary periods in the history of science. Born to humble but aspiring parents and by dint of a succession of hard-earned scholarships Milne found himself going up to Trinity College, Cambridge to read Mathematics just two months after the outbreak of the First World War. By 1916 he was obliged to abandon his undergraduate studies for war work but was fortunate to be recruited together with R.H Fowler, to work on ballistics, as one of future nobel laureate A.V. Hills Brigands.* Despite never having completed his degree he gained a Trinity Prize Fellowship in 1919 on the strength of the research on ballistics he had carried out in the previous three years. Turning to the theory of stellar structure, and despite disagreements with A.S. Eddington, he was elected to the Bever Chair at Manchester in

1924 and to the newly created Rouse Ball Chair at Oxford in 1928 for his pioneering work on stellar atmospheres, having partially recovered from a bout of the often fatal encephalitis lethargica during the pandemic of 1924.

Settling down to the life of a professor at Oxford proved to be guite challenging, but Milne persisted and was instrumental in transforming astrophysics and astronomy at Oxford, and the same time entering the field he is probably best remembered for nowadays: cosmology. No conventional thinker. Milne formulated a controversial and radically different viewpoint from both Einstein's initial 1917 static model and Friedmann and Lemaitre's expanding universe picture, some form of the latter being almost universally adopted after the work of Hubble and others establishing the existence of galaxies outside our Milky Way whose redshifts are proportional to their distance from us. Despite opposition at that time, and since, to Milne's theory of Kinematic Relativity many of his novel ideas remain relevant. In particular, the use of (what came to be called) radar measurements of distance and the idea that physics requires two different time-scales, atomic and astronomical, are influential today because they are closely connected with the causal, conformal and metric structure of space-time and the associated question of whether dimensionless combinations of 'constants of nature' are truly constant in time. Roger Penrose, the third Rouse Ball Professor has written an admiring introduction to the book which points this out. Another of his

important insights was that the expanding universe was already implicit in Newtonian gravity.

Milne's later life was clouded in tragedy. In 1938 his first wife, suffering from severe postnatal depression after the birth of their third child, committed suicide. In 1939 he was back working on ballistics, under very trying personal circumstances and an enormous workload. On returning to Oxford all should have been looking up but sadly his second wife committed suicide in 1945. Milne's health began to deteriorate. Nevertheless, sustained by his Christian faith, he remained active and at times cheerful. His sudden death in Dublin prevented him from delivering a series of lectures summing up his life's work; these were published posthumously as Modern Cosmology and the Christian Idea of God.

Nowadays Milne's name is known to many cosmologists only from the Milne solution of Einstein's equations, an asymptotic solution of the Friedmann equation for universes which become emptier and emptier of matter and

CAMBRIDGE

Cientificas. Madrid





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Garv Gibbons

University of Cambridge

Moduli Spaces Automorphisms and Equivalence Leticia Brambila-Paz. Centro de Investigación en Matemáticas Moduli Spaces **Relations in** Automorphisms A.C. (CIMAT). Mexico and Equivalence **Topological** Peter Newstead, Relations in University of Liverpool Fopological Dynan **Dynamics** Richard P. W. Thomas. David B. Ellis, Imperial College of Science, Technology and Medicine. Londor Beloit College, Wisconsin Oscar Garcia-Prada Robert Ellis. Consejo Superior de Investigaciones Beloit College, Wisconsin • The authors' original approach provides A volume designed to introduce a clearer and simpler treatment of some key those at the graduate level and above to ideas and classical results some of the main ideas and problems in moduli theory · Provides plenty of scope for further research · Contains lecture notes on both foundational material · The self-contained exposition and detailed proofs give and cutting-edge research topics a level of rigour that will appeal to both novices and experts Each chapter is written by leading researchers London Mathematical Society Lecture Note Series, No. 411 London Mathematical Society Lecture Note Series, No. 412 Paperback | 9781107636385 | March 2014 | £50.00 Paperback | 9781107633223 | May 2014 | £45.00 ww.cambridge.org/lms411 CAMBRIDGE www.cambridge.org

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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 2014

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2 Whittaker Colloquium, Edinburgh (435) 7 LMS–WIMCS Analysis Day, Aberystwyth (436)

9 Geometry Day V, King's College London (434)

14–15 Two linked one-day Colloquia in Combinatrics, Queen Mary, University of London and LSE (436)

15–17 Norrie Everitt Memorial Meeting, Cardiff (432) 19–21 Wales Mathematics Colloquium,

Gregynog Hall, Powys (434) 21 LMS–Gresham College Joint Meeting,

London (436)

22–23 Magnetohydrodynamics, Exeter (436)

23–24 Groups in Galway 2014, National University of Ireland, Galway (436)

JUNE 2014

- 2-3 Mathematics of String Theory (MOST)
 Workshop, King's College London (436)
 5 Combinatrics in Oxford, Oxford (436)
 5 Belfast Harmonic Analysis Day, Queen's
 University Belfast (435)
- **5** Rings of Differential and Integral Operators Meeting, Plymouth (436)
- **12-18** Curves and Surfaces Conference, Paris
- 13 Mathematical Modelling of Biologi-

cal and Cultural Evolution, City University London (436)

16 Midlands Regional Meeting, Loughborough (436)

16–20 Interactions between Dynamical Systems and PDEs, EMS Summer School, Barcelona

16 Scattering Theory and Wave Equations Workshop, Loughborough (435)

23–24 BioDynamics Workshop, Exeter 23–27 European Women in Mathemat-

ics 6th Summer School, Institute Mittag-Leffler, Sweden

23–27 Random Interacting Systems School and Workshop, Bath (436)

23–27 Free Boundary Problems: Theory and Applications INI Conference, Cambridge (436)

23–28 Centralized and Distributed Multiagent Optimization: Models and Algorithms, CIME-EMS Summer School, Cetraro 24–27 Postgraduate Group Theory Conference, Birmingham (346)

29–5 Jul Category Theory 2014 Meeting, Cambridge (436)

30–2 Jul Filtering High Dimensional Complex Systems Meeting, Warwick (436)

- **30-3 Jul** Young Researchers in Mathematics Conference, Warwick (436)
- 30–4 Jul Groups, Numbers, and Dynamics
- INI Workshop, Cambridge (436) 30–4 Jul First Joint International Meeting RSME-SCM-SEMA-SIMAI-UMI, Bilbao

30–5 Jul Building Bridges, LMS–CMI Research School, Bristol (434)

JULY 2014

3–4 Higher Structures in Number Theory Workshop, Nottingham (436)
4 Hardy Lecture, LMS Meeting, London

newsletter@lms.ac.uk

4 LMS Graduate Student Meeting, London

5–10 Activities on Symmetries and Correspondences Conference, Oxford (436) 7–11 Symmetries in Graphs, Maps and Polytopes Workshop, ELIM Conference Centre, West Malvern (436)

7–11 An Invitation to Geometry & Topology Via G₂, LMS–CMI Research School, Imperial College London (436)

9 LMS Popular Lectures, London (436) 13–15 Modelling in Industrial Mainte-

- nance and Reliability IMA Conference, Oxford
- 23–25 ISSAC 2014 Kobe University, Japan
 28–1 Aug Mathematical Relativity, ESI-EMS-IAMP Summer School, Vienna
 29–4 Aug International Mathematics
 Competition for University Students, Blagoevgrad, Bulgaria (435)

AUGUST 2014

4–8 Principles and Applications of Control to Quantum Systems INI Workshop, Cambridge (436)

12 & 14 International Congress for Women in Mathematics 2014, Seoul, Republic of Korea (433)

13–21 ICM 2014, Seoul, Republic of Korea (435)

17–19 Mathematical Cultures Conference, De Morgan House, London (417)

18–21 Operator Methods in Harmonic Analysis Workshop, Queen's University Belfast

19 LMS Meeting and Reception, ICM, Seoul, Republic of Korea (436)

25–29 Algebraic Lie Theory and Representation Theory, LMS–CMI Research School, Glasgow (435)

28–30 15th International Pure

Mathematics Conference, Islamabad

SEPTEMBER 2014

3–5 Stable Homotopy Theory Conference, University of Manchester 3-5 Jordan Geometric Analysis and Applications, Queen Mary, University of London (432) 3–5 Operator Theory Workshop, Queen's University, Belfast (435) 5–6 Caucasian Mathematical Conference Tbilisi, Georgia 6 Mathematics and the First World War, LMS Meeting, London (435) 22–26 Bounded Gaps Between Primes, LMS–CMI Research School, Glasgow (436) 24 LMS Popular Lectures, Birmingham (436)**28–2 Oct** Advances in Probability Clay Research Workshop, Oxford (436) **29–3 Oct** Analytic Number Theory Clay

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29–3 Oct Symplectic Topology Clay Research Workshop, Oxford (436)

OCTOBER 2014

1 Clay Research Conference, Oxford (436)

NOVEMBER 2014

14 LMS AGM, London

MARCH 2015

30–2 Apr Joint Meeting of the BMC and BAMC, Cambridge (436)

JULY 2015

13–17 Conference on Stochastic Processes and their Applications, Oxford

LMS MARY CARTWRIGHT MEETING University of York, Friday 28 February 2014 (report on page 19)



Introduction by Gwyneth Stallard Chair of the LMS Women in Mathematics Committee



Reidun Twarock (University of York) Mary Cartwright Lecturer Viruses and Geometry: Hidden Symmetries in Virology



Anne Taormina (Durham University) Moonshines



Exhibition of polyhedral designs



An exhibition of polyhedral designs by Briony Thomas (School of Design, University of Leeds) inspired by Reidun Twarock's viral tiling theory