

NEWSLETTER

LMS PRESIDENT-DESIGNATE

The London Mathematical Society is pleased to announce Professor Caroline Series FRS, University of Warwick, as President-Designate. Professor Series will take over from the current President, Professor Simon Tavaré, FRS, FMedSci, in November 2017. Professor Series is known for her leading contributions to hyperbolic geometry and symbolic dynamics, and for the major impact of her numerous initiatives towards the advancement of women in mathematics.

Professor Tavaré commented, "I welcome the opportunity to work with Professor Series in her year as President-Designate as we continue the LMS's efforts to support mathematics in the UK".



No. 460 July 2016

(Cont'd on page 3)

NIGEL HITCHIN AWARDED SHAW PRIZE IN MATHEMATICAL SCIENCES

N igel J. Hitchin, Savilian Professor of Geometry at the University of Oxford and Past President of the LMS, is the winner of the 2016 Shaw Prize in Mathematical Sciences. This international award honours individuals who are currently active in their respective fields and who have recently achieved distinguished and significant advances, who have made outstanding contributions in academic and scientific research or applications, or who in other domains have achieved excellence.

Professor Hitchin was awarded the prize for "his far-reaching contributions to geometry, representation theory and theoretical physics. The fundamental and elegant concepts and techniques that he has introduced have had wide impact and are of lasting importance".



(Cont'd on page 4)

SOCIETY MEETINGS AND EVENTS

- 21 July: Society Meeting at the 7ECM, Berlin page 21
- 15 September: Midlands Regional Meeting, Birmingham page 14
- 21 September: Popular Lectures, Birmingham page 15
- 11 November: Graduate Student Meeting, London
- 11 November: Annual General Meeting, London
- 20 December: SW & South Wales Regional Meeting, Bath
- 24 February 2017: Mary Cartwright Lecture, London
- 3–7 April 2017: LMS Society Meeting at BMC, Surrey
- 30 June 2017: Graduate Student Meeting, London
- 30 June 2017: General Meeting, London



Contents No. 460 July 2016





Birthday Honours	4
Collingwood Memorial Prize	7
Excellence in Mathematics Education	
Award	5
Shaw Prize in Mathematical Sciences	1
Calendar of Events	42

Calendar of Events

LMS Items

Council Diary	10
LMS Prizes	6
News for Undergraduates, PGs & ECRs	11
President Designate	1

LMS Meetings

Midlands Regional Meeting & Workshop1	4
Popular Lectures1	5
Society Meeting at 7ECM Berlin2	21

Meetings

Algebra, Combinatorics, Dynamics and	
Applications	30
British Science Festival	31
Dynamic Networks INI Workshop	32
Geometric Models of Nuclear Matter	30
Mathematics Education for the	
Next Decade	29
New Developments in Data Privacy	
INI Workshop	32
Representations and Homology	30
Statistical Modelling INI Workshop	34



Stochastic Analysis29 Topics in SDEs and their Link to (S)PDEs29
News American Mathematical Society
Obituaries Barth, Karl35 McCrudden, Michael34
Reports Cecil King Travel Scholarship23 David Crighton Medal
Reviews Livro de Problemas de Almada Negreiros38 Mathematical Mindsets41 Quite Right40 The G.H. Hardy Reader36
Visits Izzo, Alexander28 Lamouki, Reza29

Professor Series obtained her PhD from Harvard University in 1976 after which she was a lecturer at the University of California Berkeley. She then returned to the UK to the position of research fellow at Newnham College, Cambridge. From 1978 she has held positions at the University of Warwick.

Professor Series' research concerns intricate and fundamental questions about the geometry of surfaces and 3-manifolds. Her work has been highly influential in both hyperbolic geometry and symbolic dynamics. Revealing their deep links, it has had applications to ergodic theory and Diophantine approximation, and was a precursor to the theory of word hyperbolic and automatic More recently, Professor Series groups. developed an original geometrical approach to understanding spaces of Kleinian groups.

Besides ground breaking research, she has contributed extensively to the mathematical community both nationally and internationally. In particular, she has a distinguished record in encouraging women mathematicians: as a founder member of European Women in Mathematics, in initiating UK Women in Mathematics Days, as Chair of the European Mathematical Society's Women in Mathematics Committee, Vice Chair of the IMU Committee for Women in Mathematics, and through her involvement in the first International Conferences of Women Mathematicians and associated initiatives. She was also the first recipient of the Senior Anne Bennett Prize of the LMS in recognition of her work in mathematics and in particular the advancement of women in mathematics. In 2016 Professor Series was elected a Fellow of The Royal Society (FRS).

Professor Series' notable contributions to the work of the LMS include as Chair of the LMS Nominating Committee, Council Member at Large, International Mathematical Union Representative, BMC Committee Representative and Chief Editor of the LMS Student Texts. She was also the first Mary Cartwright Lecturer in 2000.

Her work has also included membership of the Research Assessment Exercise (RAE) Pure Mathematics sub-panel (2008) and the Research Excellence Framework (REF) Mathematical Science Panel (2014).

Professor Series has also communicated her research to a wider audience, including in the elegant publication *Indra's Pearls* and also as one of the interviewees in the LMS film *Thinking Space*, which was produced as part of the Society's 150th Anniversary celebrations in 2015. Professor Series has also given presentations at the Royal Institution and presented an LMS Popular Lecture in 1999. She was also President of the Mathematical Section, British Science Association in 2011.

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http://newsletter.lms.ac.uk

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Professor Hitchin is a Fellow of the Royal Society and a long-standing member of the London Mathematical Society, serving as its President from 1994-1996. He was also awarded the London Mathematical Society's Pólya Prize in 2002. He gave a keynote talk at the launch of the Society's 150th Anniversary celebrations at Goldmiths' Hall, London, on *Creativity, Curiosity and Discovery* where he explored the age-old question of whether mathematics is invented or discovered.

The Shaw Prize is an annual award first presented by the Shaw Prize Foundation in 2004. Established in 2002 in Hong Kong, it honours people working in the fields of astronomy, life science and medicine, and mathematical sciences. The 2016 Shaw Prizes are worth US\$1.2m to each winner.

Professor Simon Tavaré, the current LMS President, said 'Nigel Hitchin is of one of the most influential geometers of our time. The impact of his work in differential and algebraic geometry is immense and has stimulated development in a wide variety of areas including mathematical physics. The LMS is delighted that Nigel, one of the Society's former Presidents, has been honoured with this justly deserved award'.

Presentation of the Shaw Prize, awarded annually by the Shaw Prize Foundation, will be at a ceremony in September in Hong Kong.

Further information is available at: http://tinyurl.com/hhha5p8.

PROFESSOR ALICE ROGERS RECEIVES OBE IN BIRTHDAY HONOURS

Professor Alice Rogers. Emeritus Professor of Mathematics. Kina's College, London, has received an OBE in the Oueen's Birthday Honours list for services to Mathematics Education and Hiaher Education. She is a leader in the field of geometry and

4



analysis on supermanifolds and has made a substantial contribution to the academic life of King's College London over the past 35 years, both as Head of Department and as an Advanced Research Fellow.

Professor Rogers has given many years of service to the London Mathematical Society, and to the UK mathematics community as a whole. Her service for the Society currently stands at 15 years, a number of which have been spent as a member of Council and four as Vice President of the Society. Professor Rogers has greatly contributed to two important aspects of the Society's work.

Firstly, Professor Rogers served as a member of the LMS Women in Mathematics Committee between 2000 and 2005, the last three of those years as Committee Chair. During this time she established the promotion of opportunity for women in mathematics as a central aspect of this Society's business. She put in place a series of events and activities aimed at encouraging women academic mathematicians – many of these events still being in place today. Professor Rogers' work has reached thousands of women scientists and has encouraged many to continue in mathematics research.

Secondly, Professor Rogers has made a significant range of contributions to mathematics education. Since 2013, she has served the Society in the role of Education Secretary. She is very highly regarded across the mathematics community for her work in the crucial area of mathematics

education at secondary and tertiary level and has led the Society's education work with distinction, making clear interventions in policy matters with government, taking forward a programme of activity aimed at enhancing teacher professional development, and establishing an undergraduate summer school.

On hearing the news LMS President Professor Simon Tavaré FRS said, "Alice Rogers has worked with the broad mathematics community and with those at the highest level of UK government in the furtherance of Mathematics School and Higher Education and this reward is richly deserved. The LMS is delighted that Alice's contribution has been recognised in this way."

In addition to her work for the Society, Professor Rogers has a long record of service to important organisations in UK mathematical education. She has sat on the Joint Mathematical Council, the Advisory Committee on Mathematical Education, the Council for the Mathematical Sciences and worked with the Quality Assurance Agency, in addition to being instrumental in establishing and running the Kings College London Mathematics School.

EXCELLENCE IN MATHEMATICS EDUCATION AWARD

Professor Tony Gardiner has been named by Texas A&M University as the recipient of the 2016 Excellence in Mathematics Education Award. Durina his career in education. Professor Gardiner has made a significant con-

tribution to enhancing the problem-solving skills for mathematics students in the UK and around the world. He has been instrumental in developing aspects of the UK mathematics curriculum in schools and has contributed to the work of various mathematics organisations including as Education Secretary of the London Mathematical Society and he continues to be an LMS Council member and member of the Education Committee. Professor Gardiner also helped to found the UK Mathematics Trust and has served as Chair of the Education Committee of the European Mathematical Society. More information is available at http://tinyurl.com/zc9nm96.



Call us now on 0207 927 0800 or email roombookings@demorganhouse.co.uk to check availability, receive a quote or arrange a visit to our venue.

LMS PRIZES 2016

The winners of the LMS Prizes for 2016 were announced at the Society meeting on Friday 8 July 2016. The Society extends its congratulations to these winners, and its thanks to all the nominators, referees and members of the Prizes Committee for their contributions to the Committee's work this year.



PROFESSOR SIR TIMOTHY GOWERS, FRS, of the University of Cambridge is awarded a **De Morgan Medal** for his seminal contributions to functional analysis, additive number theory and combinatorics, as well as for his numerous activities on the national and international mathematical stages.



PROFESSOR DOMINIC JOYCE, FRS, of the University of Oxford is awarded a **Fröhlich Prize** for his profound and wide-ranging contributions to differential and algebraic geometry.



DR KEISUKE HARA of Mynd Inc and **PROFESSOR MASANORI HINO** of Kyoto University are jointly awarded a **Senior Berwick Prize** in recognition of their paper Fractional Order Taylor's Series and the Neo-Classical Inequality, *Bull Lond Math Soc* 42 (2010), 467-477.



DR AREND BAYER of the University of Edinburgh is awarded a **Whitehead Prize** for his breakthroughs in the study of stability conditions on derived categories and their associated moduli spaces, and for his pioneering applications of this work to birational geometry.



DR GUSTAV HOLZEGEL of Imperial College London is awarded a Whitehead Prize for his work on the celebrated black hole stability problem in general relativity, especially his pioneering papers on asymptotically (anti) de Sitter black holes.

No. 460 July 2016

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DR JASON MILLER of the University of Cambridge is awarded a **Whitehead Prize** for his landmark contributions to the geometric understanding of the two-dimensional free field, and its relation to SLE curves.



DR CAROLA-BIBIANE SCHÖNLIEB of the University of Cambridge is awarded a **Whitehead Prize** for her spectacular contributions to the mathematics of image analysis and inverse imaging problems.



DR JULIA WOLF of the University of Bristol is awarded an **Anne Bennett Prize** in recognition of her outstanding contributions to additive number theory, combinatorics and harmonic analysis and to the mathematical community.



PROFESSOR DAMIR FILIPOVIĆ of the École Polytechnique Fédérale de Lausanne and Swiss Finance Institute is awarded a **Louis Bachelier Prize** for his contributions to stochastic modelling in finance and insurance. Filipović has made notable contributions to the study of interest rate models, the theory of affine processes and the design of regulation for insurance companies.

COLLINGWOOD MEMORIAL PRIZE

The 2016 Collingwood Memorial Prize has been awarded to **Dillon Matthew Robert Reihill**, Collingwood College, Durham University.

The Collingwood Memorial Prize, estab-

lished in memory of Sir Edward Collingwood FRS, President of the Society 1969-70, is awarded to a final-year mathematics student at the University of Durham who intends to continue to a higher degree in mathematics. 8

EPSRC'S DOCTORAL TRAINING PARTNERSHIPS AND THE MATHEMATICAL SCIENCES

Evidence collected by the LMS from UK Mathematical Sciences departments appears to support widespread concern in the community that the change in the funding mechanism between 2015 and 2016 would lead to a reduction in the number of PhDs in the mathematical sciences funded by EPSRC. At the time of writing, returns have been received from 37 departments, revealing that DTP awards to these mathematical sciences departments have declined from 135 PhD scholarships starting in 2015, to 102 starting in 2016. This has resulted in a loss to the mathematical sciences of 33 postdoctoral studentships and a loss of funding amounting to more than £2million.

Here is the background. EPSRC's Doctoral Training Partnerships (DTPs) constitute one of the two main mechanisms for the public funding of UK PhDs in the mathematical sciences, the other being via Centres for Doctoral Training (CDTs). For PhDs starting in autumn 2015 and earlier, the share-out of DTP funds for the mathematical sciences was carried out separately from the funds for the other subjects in EPSRC's remit; for these other subjects, an algorithm based on institutional levels of EPSRC grant income was used, but it was recognised that this would not work for the mathematical sciences, because of the low overall level of grants going to mathematics. Instead, the allocations were decided by a panel that considered cases made by departments. A list of the 45 departments receiving DTP awards for mathematical science PhDs starting in 2015 is at https:// www.epsrc.ac.uk/research/ourportfolio/ themes/mathematics/introduction/train/dta/ allocations/.

For 2016 starts, however, the system was changed: now, DTP funds across all of EPSRC's remit are shared out among institutions, on a two-yearly basis, by a single algorithm based on total institutional grant income from EPSRC.¹ With the aim of preventing damage to mathematical sciences PhD training in the UK arising from this change, universities were required to produce a Statement of Intent describing inter alia how they would support mathematical sciences PhD training. To address the considerable scepticism about the likely outcome of this process, Philip Nelson, Chief Executive of EPSRC, wrote a letter to institutions on 15 May 2015 in which he stated,²

"Given the changes to the process and recognising the importance of the DTP for Mathematical Sciences, we will ask institutions to make particular reference to this subject in the Statement of Intent."

The Statements of Intent were reviewed by an EPSRC Panel in the autumn of 2015. The 40 institutions in receipt of EPSRC DTP funds for 2016 starts are listed at https://www.epsrc. ac.uk/newsevents/news/ministerdtpqt/.

The online survey of departments was carried out by the LMS in March and April of 2016, acting on behalf of the Council for the Mathematical Sciences (CMS) and making use of the HoDoMS mailing list. Digging beneath the headline numbers displayed above, a more detailed breakdown of the emerging pattern of the apparent 25% cut in DTP-funded PhD places is evident from the scatter plot³ on the page opposite. Each point on the plot represents the DTP-funded EPSRC PhD places in mathematical sciences for a department in 2015 and 2016, though of course one should bear in mind that there a number of "multiple points" where several departments returned identical data. The scatter plot makes clear that the reduction is being predominantly suffered by smaller departments. If unchecked this will lead to a further concentration of resources in a diminishing and geographically concentrated group of institutions, resulting in a serious reduction in the availability of mathematical sciences expertise across the UK higher education



sector and thereby to associated industry, enterprise and commerce.

Particularly striking is the plight of those five mathematical science departments which received a DTP award for 2015 starts, but whose institution received no DTP award at all for 2016 starts. This happened because the new EPSRC algorithm imposes a minimum threshold of institutional EPSRC grant funding, with these universities falling below that level. The universities in guestion can be read off from the web lists mentioned above: they are East Anglia, Kent, Leicester, the Open University and Royal Holloway. Together, they have lost at least 11 mathematical sciences PhD scholarships, their EPSRC mathematical sciences PhD funding disappearing simply because of the relatively low involvement of these institutions in the other EPSRC subjects.

At the institutional level, a number of departments are using alternative sources to partially counter the effects of the shortfall in DTP funds. In some cases, additional institutional funding has been provided, several Department although Heads expressed strong doubts about whether this would be sustained in the medium term. Several departments indicated that they are using departmental funds to create one or more Graduate Teaching Posts, where the appointed candidate carries on research for a PhD while teaching undergraduate courses.

typically over a longer period than a standard PhD.

What are the **concerns?** (i) A reduction of approximately a quarter in DTP PhD awards in the mathematical sciences represents a massive cut in mathematical sciences training support by EPSRC, an area recognised – not least by the EPSRC itself⁴ - as being of huge importance to the economic and scientific success of the UK. It is clear that the letter from Philip Nelson has failed to achieve the desired effect.

(ii) The effect on the 5 departments listed above, which have lost all DTP funding simply because their universities are insufficiently active in other EPSRC-supported fields, is particularly stark and potentially very damaging. In total these departments have lost 11 DTPfunded PhD places as compared to 2015. This is a further concentration of resources in a smaller set of institutions, a process which over time is liable to reduce the current wide geographic spread of excellence in the mathematical sciences across the UK's academic landscape, which will affect not just academia but also industry, enterprise and commerce throughout the UK.

(iii) The new algorithm has resulted in a loss to the mathematical sciences of 33 postdoctoral studentships and conversely has resulted in a gain to the other science disciplines at the expense of mathematical sciences.

(iv) Mathematical sciences attracts the least amount of funding of all of the EPSRC disciplines and has now suffered a **further loss of funding amounting to more than £2million**.

What is the **way forward?** At a national level, the CMS, including both the LMS and other learned societies, will be making strong representations to EPSRC regarding what opportunities exist to address the anomalies raised above with regard to the new DTP algorithm and, to assure the future health of the people pipeline, how the associated funding now lost to the mathematical sciences discipline can be restored in the short and longer terms.

Comments and suggestions are welcome, in letters to the *Newsletter*, posts on the

LMS blog, or – if you prefer – privately to me. I also urge everyone who is concerned about the situation to join in using whatever contacts they have at EPSRC to argue for action to improve the situation. The frustration expressed in their survey returns by many Department Heads, deserves a serious response from the EPSRC.

> Ken Brown LMS Vice President

¹For details, see https://www.epsrc.ac.uk/skills/students/ dta/grants/. To quote from there: "The algorithm is based on a comprehensive profile of EPSRC research grants and fellowships. Other training grants (CDTs, previous DTPs and Industrial CASE) remain outside the calculation. Large capital and institutional awards, such as Impact Acceleration Accounts, are also excluded."

²http://tinyurl.com/jqs5gs9

³Thanks to Peter Diggle (Lancaster) for this.

⁴See e.g. the Deloitte report, http://tinyurl.com/hhdgx3y, and the CMS leaflet, http://tinyurl.com/hfj2pep

LMS COUNCIL DIARY 1 April and 20 May 2016: A personal view

This diary entry covers two Council meetings: one held 1 April and the next 20 May. As usual, Council's first item of business, apart from the standard approval of minutes, etc., is to receive an update on the activities of the President. Highlights included attending the February Society Meeting incorporating Gwyneth Stallard's Mary Cartwright Lecture, and the British Mathematical Colloquium in Bristol, as well as various meetings aimed at furthering collaborations between the Royal Society and the LMS. The President also convened meetings of the Council's Strategic Sub-Group, tasked with reviewing strategic priorities for Council and planning Council's 2017 Strategic Retreat, and informed Council that LMS Representatives would be contacted to invite suggestions for matters the Council might consider at the Retreat. The President also informed Council that the Presidential Search Committee has identified his successor, to be announced at the Society Meeting on 8 July 2016 and appears on the front page of this LMS Newsletter.

The General Secretary updated Council on the Newsletter Review; after extensive consultation with Representatives, the Review Group has proposed various changes to content and format, as well as combining the Newsletter Editorial Board with the Website Editorial Board. Council agreed that costings should be provided before any decisions were taken. In order to keep things moving in the meantime, the General Secretary will informally seek suitable candidates for the role of Editor-in-Chief.

Vice-President Brown provided updates on the work of the Research Policy Committee. A particular item of note was a survey of UK mathematical sciences departments undertaken to establish the distribution of Doctoral Training Grant funding within departments. A more detailed article appears on pages 8–9 of this *LMS Newsletter*, and will be circulated to Heads of Departments of Mathematics and to LMS Representatives. Council agreed this was a matter of great concern, and expressed gratitude to the Committee for undertaking the important work of data-gathering and dissemination of results to CMS and EPSRC.

Other activities of note included the agreement of Prizes and Prize Citations for 2016, introduction of Operational Plans and Priorities for 2016-17 (that is, budget planning), and an update on the LMS Mathematical Sciences Directory UK project. Council also discussed a proposal by Alina Vdovina for support of mathematicians without academic affiliation, including retirees and early career people seeking positions; Council agreed that this is an important activity that will be taken forward by Vdovina and the Executive Secretary and brought back for further discussion.

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No. 460 July 2016

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LMS NEWS FOR UNDERGRADUATES, MASTERS STUDENTS, PHD STUDENTS, POST-DOCS AND EARLY CAREER RESEARCHERS

POST-DOCS AND EARLY CAREER RESEARCHERS

Date for your diary: 15 September 2016 Application deadline for Research Grants.

- Have you recently been appointed to your first positions as a new lecturer? Why not host a scientific meeting to celebrate this important milestone in your career. Grants of up to £600 are available from the LMS Celebrating New Appointments scheme: www.lms.ac.uk/grants/celebrating-new-appointments-scheme-1
- Planning a research visit with your collaborator? Apply to the LMS for support of up to £1,200 from a Research in Pairs Grant (Scheme 4). Further details online: www. lms.ac.uk/grants/research-pairs-scheme-4
- The LMS also runs other grant schemes. For more information, visit www.lms. ac.uk/grants or email grants@lms.ac.uk.

PhD STUDENTS

Date for your diary: 15 September 2016

Application deadline for Postgraduate Conference Grants (Scheme 8). Thinking of organising your own UK conference for your peers? Apply to the LMS for support of **up to £4,000.** Further details online: www.lms.





ac.uk/grants/postgraduate-research-conference-grants-scheme-8.

MASTERS STUDENTS

Date for your diary: 15-16 December 2016

The next LMS Prospects in Mathematics Meeting will be held in York. Further details will be available in due course and online: www.lms.ac.uk/events/ lms-prospects-mathematics-meeting.

UNDERGRADUATES

Funding for Undergraduate Society Meetings Funds of up to £500 are available to support meetings of Undergraduate Mathematical Societies to cover the travel and accommoda-

> tion costs for an invited speaker (from academia or industry) and to cover catering costs e.g. a wine reception after the meeting. Further information and an application form is available online: www.lms.ac.uk/grants/ LMS-Funding-Undergrad-Soc-Meetings.

> Date for your diary: 15-16 December 2016 The next LMS Prospects in Mathematics Meeting will be held in York. Further details will be available in due course and online: www.lms.ac.uk/events/ lms-prospects-mathematics-meeting.

EUROPEAN NEWS

ECM 2016

A reminder that the 7th European Congress of Mathematics takes place in Berlin from 18 to 22 July: for all details see www.7ecm. de/home.html. The official registration deadline has passed (over 1,300 participants have already enrolled) but you can still register if you do not mind your name being absent from the Congress documentation. The Congress is preceded by a meeting of the Council of the EMS, at which new members of the Executive Committee and two new Vice-Presidents are to be elected, and a vote will be taken on the choice of venue for ECM 2020: Sevilla (Spain) or Portorož (Slovenia).

New ERCOM members

Congratulations to two new members from Spain of ERCOM (European Research Centres on Mathematics): BCAM (Basque Center for Applied Mathematics) Bilbao, www.bcamath.org and ICMAT (Instituto de Ciencias Matemáticas) Madrid, www.icmat.es.

CSASC 2016

This conference will take place from 20 to 23 September 2016 at Institut d'Estudis Catalans in Barcelona. CSASC is a joint meeting of the Czech, Slovenian, Austrian, Slovak and Catalan mathematical societies. For information see csasc2016.espais.iec.cat.

Spanish Society of Applied Mathematics (SeMA)

This year SeMA celebrates its 25th birthday: see www.sema.org.es. The SeMA Journal has awarded the title of Best Paper 2016 to 'A priori error estimate of a multiscale finite element method for transport modeling' by Franck Ouaki, Grégoire Allaire, Sylvain Desroziers and Guillaume Enchéry, and SeMA has awarded the title of Best Young Researcher in Applied Mathematics in Spain 2016 to Juan Calvo (Universitat Pompeu Fabra). A new journal edited in Spain aims to publish works in applied mathematics and its applications to nonlinear sciences. See http://tinyurl.com/zreyra2.

Raising Public Awareness Committee (RPAC)

The website *Mathematics-in-Europe*, a portal of the *Raising Public Awareness* (RPA) committee of the EMS, has recently been renewed as a magazine, with articles, interviews, news, stories, and many other sections, making it easy for people of all backgrounds to read about the ubiquity and beauty of mathematics. The new web page is www.mathematics-in-europe-eu.

EMS Newsletter No. 100

The 100th Newsletter of the FMS is online at http://tinyurl. com/jw5gyc5. includes It an editorial bv President Pavel Exner with articles and mathematical surveys from the EMS's 25th anniversary celebra-



tion on 22 October 2015 in Paris. You will find a survey about Bitcoin and cryptology, a tribute to Abbas Bahri and his mathematical work, plus an historical article on Beppo Levi, as well as a presentation (first of a series) from the archives of the *Istituto per le Applicazioni di Calcolo 'Mauro Picone*' in Rome, among many other interesting topics.

EMS Publishing House

The EMS-PH has recently published *Measure* and Integration by Dietmar A. Salamon. For details and more information about the Publishing House www.ems-ph.org.

> David Chillingworth LMS/EMS Correspondent

MATHEMATICS POLICY ROUND-UP June 2016

RESEARCH

Chair of EPSRC

Minister for Universities and Science Jo Johnson has announced that Dr Paul Golby has been reappointed as Chair of EPSRC. The reappointment is from 1 April 2016 for two years. More information is available at http:// tinyurl.com/z9ylxb7.

HIGHER EDUCATION

Government Higher Education White Paper

This white paper sets out a range of reforms to the higher education and research system. In some cases these plans are subject to Parliament. More information is available at http:// tinyurl.com/z23uswz.

STEM degree provision and graduate employability: Wakeham review

This independent review by Sir William Wakeham looks at the employment situation among STEM graduates and the role of accreditation of courses. The review focuses on the skills requirements of employers, how STEM graduates' skills and knowledge relate to labour market demand, and how existing accreditation systems support this. The Review is available at http://tinyurl.com/jjarypu.

Teaching Excellence Framework: year 2 - technical consultation

This consultation is seeking views on the detailed proposals for the operation of the Teaching Excellence Framework (TEF) in year 2, including:

- how the TEF will assess teaching excellence;
- the criteria that will define teaching excellence;
- how judgements about excellence will be made, including the evidence base and use of core metrics; and
- how TEF outcomes will be communicated. The consultation closes on 12 July 2016. More information is available at http://tinyurl. com/zc5r6dz.

Higher Education and Research Bill

The government published on 19 May 2016 its Higher Education and Research Bill, introducing new legislation to give more young people the opportunity to access high-quality university education and boost life chances and opportunity for



all. It will enact the reforms in the white paper, Success as a Knowledge Economy. More information is available at http://tinyurl.com/ hfvycwn.

SCHOOLS AND COLLEGES

Making education your business: A practical guide to supporting STEM teaching in schools and colleges

A practical guide launched by the Royal Society and CBI says 'that to support science, technology, engineering and mathematics (STEM) education in the UK businesses need to collaborate with teachers. With most young people attributing their decision to pursue STEM subjects to an inspirational teacher, working with teachers is the best way to secure the UK's future STEM workforce'. More information is available at http://tinyurl.com/h2m3cte.

Scottish Survey of Literacy and Numeracy

School students in Scotland are doing less well in maths according to Scottish government figures. Between 2013 and 2015, the proportion of P4 and S2 students performing 'well or very well' fell. The statistics feature in the latest Scottish Survey of Literacy and Numeracy (SSLN) which is an annual sample monitoring national performance of school children at P4, P7 and S2 in literacy and numeracy. The survey is available at www.gov. scot/Resource/0050/00500749.pdf.

> Dr John Johnston Joint Promotion of Mathematics

LMS Midlands Regional Meeting and Workshop on Interactions of Harmonic Analysis and Operator Theory

Birmingham, 13-16 September 2016

MINI-COURSES

Kaj Nyström

Javier Parcet

SPEAKERS

Pascal Auscher

Tony Carbery University of Edinburgh

Martin Dindoš

Dorothee Frey Delft University of Technology

Sylvie Monniaux Aix-Marseille Université

> Fulvio Ricci Scuola Normale Superiore

Charles Batty University of Oxford

Andrea Carbonaro Università degli Studi di Genova

Véronique Fischer University of Bath

José María Martell Instituto de Ciencias Matemáticas

Detlef Müller Christian-Albrechts-Universität zu Kiel

Maria Vallarino Politecnico di Torino

Jim Wright

Organisers: Alessio Martini and Andrew Morris (Birmingham)



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LONDON MATHEMATICAL SOCIETY EST. 1865

http://web.mat.bham.ac.uk/lmsmidlands2016/



LMS Popular Lectures 2016

BIRMINGHAM (University of Birmingham)

21st September 18:30

Heather Harrington (University of Oxford) - The shape of data in biology - In recent years, areas of pure mathematics (maths for maths' sake) such as algebra, geometry and topology, are being applied to problems in biology. Dr Harrington will describe how to understand living systems using cutting-edge mathematics.

Julia Wolf (University of Bristol) - One, Two, Red, Blue - Ever wondered why Noughts and crosses always results in a draw? In this talk Dr Wolf will explore the surprisingly deep mathematics behind this popular game and its variants.

Commences at 6.30 pm, refreshments at 7.30 pm, ends at 9.00pm Admission is free, with ticket. Register by Thursday 15 September.

To register for tickets, please use the online registration facility at: www.lms.ac.uk/events/popular-lectures.

The London Mathematical Society is the UK's learned society for mathematics. Founded in 1865 for the promotion and extension of mathematical knowledge, the Society has a membership of over 2500 drawn from all parts of the UK and overses, its principal activities are the organisation of meetings and conferences, publication of journals and books, provision of financial support for mathematical activities, and contribution to public debates on issues related to mathematics, research and education. London Mathematical Society, De Morgan House, 57-58 Russell Square, London WC1B 4H5. Tel +44 (0)20 7537 3686; Fax +44 (0)20 7523 3655; Email: Ima@imaacuk; Web: www.limaacuk; Registered charity no. 252660

DISCOVERING THE BEAUTY OF MATHEMATICS AT THE CHELSEA FLOWER SHOW

I had already decided to visit Chelsea Flower Show this year with my son, David, a keen gardener. When I heard via Twitter about Winton Capital's Beauty of Mathematics Garden (#BeautyofMathematics), I was even more excited by the outing. David was a little less enthused by this news, but did at least agree to see this garden first, although if he hoped this would stop me talking about mathematics for the rest of the visit it didn't quite have the desired effect.

The idea of a garden celebrating the beauty of mathematics is a delightful thought for any mathematician who has a passion for gardening. This garden, designed by Nick Bailey, Head Gardener at Chelsea Physic Garden, won a welldeserved Silver Gilt award. According to Nick, every plant is driven by mathematical algorithms and algorithms are also used by Winton Capital so this garden embodies everything that is plants and everything that is Winton. There are a series of videos explaining some of the ideas behind the garden on Winton Capital's website: www. wintoncapital.com/en/about-us/sponsorship/co-chelsea-flower-show.

The central feature of the garden is a magnificent copper curve, representing both an emerging seedling and the Fibonacci spiral. It is elaborately etched with equations which are illuminated at night. However it is the planting that I found most at-



Centre point of Winton garden - room under the centre of the Fibonacci Spiral

tractive. The plants have been chosen for their symmetry. There are lupins, irises and leucospermums to provide colour as well as pattern, and several spiky plants such as *banksi integrifolia* and *yucca rostrata*. However my favourite plant was the *aloe polyphylla* which comes from South Africa. This plant is made up of several beautiful spirals echoing the main copper Fibonacci spiral. Mirroring the spirals in this plant is an exquisite copper water feature on the other side of the main path, which provides another focal point in the garden.

Whilst I expected that I would thoroughly appreciate the mathematical symbolism of this garden, I was surprised by the numerous positive comments from other visitors who were presumably less familiar with the mathematics represented. Apart from my son's comments, I didn't hear any of the usual mutterings about the supposed irrelevance of mathematics or people's lack of enjoyment of the subject that too often come up when the 'M word' is mentioned in front of non-mathematicians.

As we moved around the Flower Show I realised that there was mathematics in several other gardens and exhibits at Chelsea, albeit implicit rather than explicit. For example the eccentric Harrods garden designed by Diarmuid Gavin would have needed mathematical physics to work out the speed of the turning bay trees and bobbing box-hedge balls to make sure that they were synchronised with each other, and the World Vision garden could be described as a collection of cosine or sine waves although I am not sure that the designer, John Warland, was aware of the mathematics. Both of these gardens were also Silver Gilt award winners.

At the end of our visit we saw the artist Adrian Gray demonstrating the art of stone balancing. This was absolutely remarkable, and while my son went off to talk to Adrian about photography I was left wondering how Adrian found the centre of gravity of the stones, and the mathematics behind this amazing skill.

Next year, even if there is not a designated mathematical garden, I am sure that a visit to Chelsea in search of mathematical ideas in garden design will be equally delightful.

> Noel-Ann Bradshaw University of Greenwich

INTRODUCTION TO THE DEUTSCHE MATHEMATIKER-VEREINIGUNG

(German Mathematical Society)

The Deutsche Mathematiker-Vereinigung (DMV), founded 125 years ago in Bremen, represents and works for the interests of mathematics and of mathematicians in Germany. It promotes research, teaching, applications, as well as national and international exchange of ideas and experiences. It organizes and supports mathematical events, activities, and initiatives.

DMV has launched its active Media Office as well as a Network Office Schools–Universities following the extremely successful National 'Year of Mathematics 2008' that was co-sponsored and co-organized by DMV. Both offices are located at Freie Universität Berlin, directed by Günter M. Ziegler. On this basis, DMV promotes the interests of mathematics in education and research policies, in schools and in academia: It tries to enhance the public awareness and image of mathematics, but it also actively works on policy issues, such as structural and curricula reforms. Among many projects, it organizes two public *Gauß Lectures* each year, as well as its annual national meeting, the News

Jahrestagung. Its school activities include DMV Abiturpreis (an award offered for an excellent mathematics graduate at each high-school in Germany), the Mathematical Advent Calendar (a web-based competition at www.mathe-im-advent.de with far more than 100,000 participants each year from more than 50 countries). It is online with the websites www.mathematik.de and dmv.mathematik.de. Every second year it awards DMV Media Prizes for outstanding journalism on mathematical topics with public impact.

DMV has about 5,000 personal members, most of them at Universities and Research Institutes, but it also has and invites membership from industry and from schools. Local DMV representatives are active at most universities across Germany. Special interest groups (*Fachgruppen*) organize activities in various mathematical fields; for example, the Fachgruppe *Discrete Mathematics* organizes a Symposium and awards the *Richard Rado Prize* every second year.

DMV produces three major publications: The full-color Notices of the DMV, *Mitteilungen der DMV*, is a magazine of general interest that appears four times a year. The Jahresbericht has been publishing surveys as well as high-level research contributions since 1890 – it started with a paper on set theory by Georg Cantor. *Documenta Mathematica* is a 100% free open-access journal started by DMV in 1996, twenty years ago.

DMV was founded in 1890, based on the mathematics section of the German Society of Scientists and Doctors founded in 1822. The first president was Georg Cantor. In his honour, DMV bi-annually awards the Cantor Medal for outstanding mathematical accomplishments. Later presidents included Felix Klein (1897), David Hilbert (1900), Hermann Weyl (1932) and Friedrich Hirzebruch (1962, 1990). In 1990 the DMV united with the Mathematical Society of the German Democratic Republic. Today DMV's main office is located in the heart of Berlin. DMV represents Germany in the European Mathematical Society (EMS) and in the International Mathematical Union (IMU). It maintains contacts with foreign mathematical societies - in particular, it has a Reciprocity agreement with the London Mathematical Society. Jointly with the IMU, DMV awards the Gauß Prize for Applications of Mathematics every four years on occasion of the International Congress of Mathematicians (ICM).

> Robert Wöstenfeld, DMV Network Office Schools–Universities Günter M. Ziegler, member of the governing board (Präsidium) of DMV



Founders of the DMV

THE AMERICAN MATHEMATICAL SOCIETY

The American Mathematical Society (AMS), founded in 1888, is a non-profit membership organization that promotes interest and research in mathematics through its publications, meetings, programs, services, advocacy, and outreach activities. The AMS has approximately 30,000 members worldwide and offices in Rhode Island, Michigan, and Washington, DC.

Through our Publications Division, we are a leading publisher of mathematics research, producing approximately 80 books each year, sixteen scholarly journals, and MathSciNet, the premier online gateway to the world's mathematical literature.

AMS Books

The AMS publishes one of the most respected collections of mathematical literature in the world. The AMS Book Program began with our Colloquium series, which has its roots in the famous 1894 lectures of Felix Klein. Mathematical Surveys followed, as well as conference proceedings, volumes from summer workshops, and regular translations, especially from Russia. The AMS has added additional monograph and copublication series (including Graduate Studies in Mathematics, Student Mathematical Library, Clay Mathematics, and Courant Lecture Notes).

AMS Journals

AMS peer-reviewed journals are of the highest quality in mathematical research. Our journals have been published since 1891 and cover a broad range of mathematics. In addition to its own journals, the Society publishes several translated journals and distributes a number of journals for mathematical societies around the world.

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- links to articles, journals, and publishers;
- linked reference lists;
- citation information on articles, books, and journals.

The AMS and the LMS

The American Mathematical Society has enjoyed a history of warm relations with the London Mathematical Society, beginning in 1888, when American mathematician Thomas Fiske, inspired by visits to meetings of the London Mathematical Society, proposed the creation of the New York Mathematical Society (which would later evolve into the AMS).

Today, the two societies continue to collaborate on publishing projects and also maintain reciprocal membership agreements, allowing members of each society to enjoy the benefits of membership in the other at a reduced rate.

For more information on the AMS and its publication program, visit www.ams.org.

Robert M. Harington, D.Phil. Associate Executive Director, Publishing





THE CASE OF ACADEMICIAN NIKOLAI NIKOLAEVICH LUZIN

Edited by Sergei S. Demidov, Russian Academy of Sciences & Boris V. Lëvshin Translated by Roger Cooke

A campaign to "Sovietize" mathematics in the USSR in 1936 was launched with an attack on Nikolai Nikolaevich Luzin, the leader of the Soviet school of mathematics, in *Pravda*. Luzin was fortunate in that only a few of the most ardent ideologues wanted to destroy him utterly. As a result, Luzin, though humiliated and frightened, was allowed to make a statement of public repentance and then let off with a relatively mild reprimand. The present book contains the transcripts of five meetings of the Academy of Sciences commission charged with investigating the accusations against Luzin.

History of Mathematics, Vol. 43

Jul 2016 386pp 9781470426088 Hardback £95.95



GALLERY OF THE INFINITE

Richard Evan Schwartz, Brown University

A mathematician's unique view of the infinitely many sizes of infinity. Written in a playful yet informative style, it introduces important concepts from set theory (including the Cantor Diagonalization Method and the Cantor-Bernstein Theorem) using colourful pictures, with little text and almost no formulas.

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Society Meeting & Reception

At the 7ECM, Berlin, Germany Thursday 21 July 2016

Lecture Theatre, Main Building, TU Berlin

4.30 Opening of the meeting, **Terry Lyons (Oxford)** From Hopf Algebras to Machine learning via Rough Paths

Rough path theory aims to build an effective calculus that can model the interactions between complex oscillatory (rough) evolving systems. At its mathematical foundations, it is a combination of analysis blended with algebra that goes back to LC Young, and to KT Chen. Key to the theory is the essential need to incorporate additional non-commutative structure into areas of mathematics we thought were stable. At its high points, there are the regularity structures of Martin Hairer that allow robust meaning to be given to numerous core nonlinear stochastic pdes describing evolving interfaces in physics.

Classic results, by Clark, Cameron and Dickinson, demonstrate that a nonlinear approach to the data is essential. Rough path theory lives up to this challenge and can be viewed as providing fundamentally more efficient ways of approximately describing complex data; approaches that, after penetrating the basic ideas, are computationally tractable and lead to new scalable ways to regress, classify, and learn functional relationships from data. One non-mathematical application that is already striking is the use of signatures on a daily basis in the online recognition of Chinese Handwriting on mobile phones.

6.00 Reception (Ticket required)

LMS members will have the opportunity to sign the Membership Book which dates back to 1865. For a ticket to the reception, please email Elizabeth Fisher (Imsmeetings@Ims.ac.uk)

The London Mathematical Society is the UK's learned society for mathematics. Founded in 1865 for the promotion and extension of mathematical knowledge, the Society has a membership of over 2500 drawn from all parts of the UK and overseas. Its principal activities are the organisation of meetings and conferences, publication of journals and books, provision of financial support for mathematical activities and contribution to public debrates on issues related to mathematics, research and education. London Mathematical Society, De Morgan House, 57-58 Russell Square, London WC18 4HS. El +44 (0)20 7637 3666; Fax: +44 (0)20 7323 3655; Email: Ims@ims.ac.uk; Vebs.www.lms.ac.uk; Registered charity no. 252660



THE DAVID CRIGHTON MEDAL

Report

The 2015 IMA-LMS David Crighton Medal was awarded to Professor Frank Kelly, CBE, FRS, Hon FIMA, at The Royal Society on 12 May 2016.

The audience of IMA members, LMS members and invited guests was welcomed by the President of the IMA, Professor Chris Linton, CMath FIMA, who reminded the audience that the David Crighton Medal was instituted in 2002 in memory of Professor David Crighton, who was President of the IMA and President-designate of the LMS.

Professor Simon Tavaré, FRS FIMA, LMS President, then introduced Frank Kelly, reading the citation below and introducing Frank's talk with the observation that Frank has always had a way of making very difficult things seem very simple. The citation reads:

Frank Kelly is awarded the David Crighton Medal of the London Mathematical Society and the Institute of Mathematics and its Applications for services both to mathematics and to the mathematical community. Kelly's work on the fundamental properties of communication networks has had direct application to the design of telephone networks and internet protocols. The importance and impact of his work more broadly is reflected in the large number of citations his papers receive, together with the award of international prizes. He is the Head of a Cambridge college, and has chaired groups working to improve children's experience of mathematics. He has been Chief Scientific Adviser to the Government (Department for Transport) and chaired the Council for the Mathematical Sciences at an important time for the mathematics community. He was elected a Fellow of the Royal Society in 1989 and awarded a CBE in 2013.

Professor Frank Kelly began his engaging lecture by remembering how well-loved David Crighton was at Cambridge and showing us some photos at www.damtp. cam.ac.uk/about/dgc/.

The lecture, *Mathematics and Financial Markets*, centred around a simple and analytically tractable model of a limit order book that Frank developed with Elena



Simon Tavaré presents the award to Frank Kelly

Frank Kelly

Simon Tavaré, Frank Kelly and Chris Linton (I to r)

newsletter@lms.ac.uk

Yudovina (http://arxiv.org/abs/1504.00579). Frank suggested that this simple model could be used to gain insight into trading strategies and allow regulators (and society) to decide which trading behaviours they would like to encourage. Frank also noted that many mathematics graduates are traders, but few are regulators and suggested that the market needs more advanced mathematics (not less) as is often suggested after the 2008 financial crash.

After the lecture Chris Linton thanked the speaker for an excellent talk that demonstrated how a simple mathematical model can have real world applications.

Rebecca Waters IMA Editorial Officer Mathematics Today

CECIL KING TRAVEL SCHOLARSHIP

Report

I used the Cecil King Travel Scholarship to travel to visit Sheehan Olver at the University of Sydney for three months from January to April 2016. We worked on some problems in computational spectral theory and related problems in orthogonal polynomials.

The first outcome of my research was that the so-called connection coefficient matrix, which is the change of basis matrix between two families of orthogonal polynomials, is a useful new tool for the spectral theory of the Jacobi operators. I proved that for Jacobi operators that are a finite rank perturbation of Toeplitz, the connection ceofficients matrices provide an explicit, computable formula for the spectral measure.

We also investigated the infinite dimensional QL algorithm, which allowed us to formulate a method of transforming these Jacobi operators to a canonical form and implement a functional calculus. We were able to store these highly structured infinite dimensional matrices in finite memory and perform the operations without losing that information: it is an early example of truly infinite dimensional numerical linear algebra.

Alex Townsend (MIT) also visited

Sheehan for three weeks in February. We discovered that the connection coefficient matrix for Jacobi polynomials with different parameters can be decomposed using Hadamard products of Toeplitz and Hankel matrices, leading to a new class of fast polynomial transforms.

I am very grateful to the London Mathematical Society and the Cecil King Foundation for not only giving me an opportunity to develop as a researcher, but also to escape the British winter.

> Marcus Webb University of Cambridge



Marcus Webb

24

LMS NEWSLETTER

THE DYNAMICS OF COMPLEX SYSTEMS: A MEETING IN HONOUR OF THE 60TH BIRTHDAY OF ROBERT MACKAY FRS, 18-20 MAY 2016 Report

There was an expectant atmosphere as around 120 participants gathered on Wednesday 18 May 2016 in Lecture Theatre MS.01 of the Zeeman Building at the University of Warwick at the start of the LMS supported meeting on the **Dynamics of Complex Systems**. And rightly so. The meeting, held in honour of the forthcoming 60th birthday of Professor Robert MacKay FRS, had a line-up of speakers drawn from the greats of pure and applied dynamical systems, mathematical physics and complex systems science, all areas in which Robert has made significant and lasting contributions.

The programme was grouped into themes, with sessions on Hamiltonian dynamics and K.A.M. theory, waves and turbulence, biological modelling, dynamics on lattices, social dynamics, renormalization, billiard systems, topology and astronomy, as well as general dynamical systems. Keynotes (amongst a total of 43 invited talks) included (in chronological order) Jean-Pierre Eckmann (Geneva), Tom Bridges (Surrey), Raphael Douady (Stony Brook and Paris I), Jim Meiss (Colorado), Rafael de la Llave (Georgia Tech), Alessandra Celletti (Rome – Tor Vergata), Serge Aubry (CE Saclay), Kostya Khanin (Toronto), Jacques Laskar (Observatoire de Paris), Charles Tresser (Aperio), Robert MacKay (Warwick), Henk Broer (Groningen), Jaume Llibre (Autonoma Barcelona), Sergey Bolotin (Wisconsin and Steklov), John Guaschi (Caen) and Phil Boyland (Florida Gainesville).



Robert Mackay

There is insufficient space to describe in detail all the keynote talks, let alone all the excellent contributions by other participants, so I hope I will be forgiven for focusing on three presentations that were for me particularly special. The first was by Jacques Laskar in which he showed how the approximate unidirectionality of eccentricities in the orbits of asteroids in the far solar system provided strong evidence for the existence of a new planet which might replace the now demoted Pluto. The second was by Robert himself, in which (using real-time Mathematica) he revealed his ideas towards a spectral interpretation of the Riemann zeroes, corresponding to the guantum dynamics of a charged particle on a surface of curvature -1 with a magnetic field 9/4. My third favourite



Participants

was the final talk of the meeting, given by Phil Boyland with the title *When topology forces dynamics*, during which he demonstrated both mathematically (using the theory of pseudo-Anosov maps) and experimentally (including a machine devised by Robert) how dynamical complexity arises from the underlying system topology.

The lively poster session (sponsored by the European Physical Society) was of a particularly high standard, and first and second prize were deservedly won, respectively, by PhD students Jake Shipley (Sheffield) with *Binary black hole shadows, chaotic scattering and the Cantor set* and Aine Byrne (Nottingham) with *Next generation neural mass modelling.*

Naturally, each participant will have their own special memories from the meeting, but surely high on everyone's list will be David Rand's after-dinner speech on the Thursday night, in which he charted (with his characteristic gentle humour) Robert's career from Cambridge, via Princeton, IHES and Queen Mary University of London, to Warwick (with a significant return to Cambridge) and Robert's key work building up the Nonlinear Systems Laboratory and the Centre for Complexity Science at Warwick. David's speech was followed by other affectionate tributes and a slide show of Robert's colleagues and friends over the past 35 or so years.

There are many people to thank for their hard work in organising the meeting: our hosts the Warwick Mathematics Research Centre, especially Hazel Higgens; our sponsors EPSRC, EPS, IMA, LMS and Professor Jeff Johnson, the session chairs, the speakers and other participants, and my fellow organisers. However, pride of place must go to Claude Baesens (who did the lion's share of the work) and, of course, Robert MacKay whose extraordinary contribution to mathematics and science was amply demonstrated by this wonderful meeting.

> Ben Mestel The Open University

Further information on the meeting is available from: https://www2.warwick.ac.uk/ fac/sci/maths/research/events/2015-16/nonsymposium/dcs/



Reception for Robert MacKay

OPERATORS, OPERATOR FAMILIES AND ASYMPTOTICS Report

The research conference Operators, Operator Families and Asymptotics took place from 16 to 19 May 2016 at the Department of Mathematical Sciences, University of Bath. As was reported in the February issue of the LMS Newsletter, the conference was aimed at providing an overview of applications of the techniques of operator theory to the asymptotic analysis of parameter-dependent differential equations and boundary-value problems.

From the physical point of view, the parameter in a mathematical problem often represents a length-scale in the situation modelled by the equation; for example, a wavelength in wave propagation, or the inhomogeneity size in the theory of periodic composites. The theory of linear operators (symmetric, self-adjoint, dissipative, non-selfadjoint) in a Hilbert space, which has enjoyed several decades of outstanding progress, has been mostly restricted to abstract analysis of general classes of operators, accompanied by ad-hoc examples and applications to perturbations of the Laplace operator. The meeting was a step in re-assessing the existing body of knowledge in the related areas, as a modern operator-theoretic version of the classical asymptotic analysis.

The conference was attended by over 40 specialists in the areas of analysis and its applications where the asymptotic behaviour of an operator family presents a mathematician with an exciting analytical challenge and a physicist with a new tool to address problems at the frontline of materials research. One special feature of the conference was that each of the 17 speakers, chosen by an international programme committee, had a full hour to present their work, which allowed the audience to delve deeper into the topics



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touched on by the talk. It was pleasing to see that, as a consequence, all of the talks generated a series of questions, which were vigorously discussed by the audience. It also meant that the 10 minutes allocated for questions following each talk served as a basis for a more substantial discussion during the coffee and lunch breaks and in the evening. Participants remarked that they were motivated to pursue questions that emerged as a result of these discussions, which in our view indicates that the conference was a success.

The conference was supported by the London Mathematical Society (Scheme 1 Conference grant), University of Bath, EPSRC and Bath Institute for Mathematical Innovation (BIMI).

> Kirill Cherednichenko University of Bath

YOUNG APPLIED ANALYSTS IN THE UK Report

The second Young Applied Analysts in the UK (YAAUK) conference took place from 26 to 27 May 2016 at the University of Bath. Applied analysis is still underrepresented in the UK compared to other subjects in applied mathematics, and the first YAAUK conference, which took place two years ago at the University of Glasgow, was motivated by the boost UK applied analysis had recently received from hirings in the build up to the REF 2014.

This conference continued the format set out in the first;

the speakers were predominantly early career researchers (lecturers and postdocs) from throughout the UK. In addition to these 14 speakers, Professor José Antonio Carrillo de la Plata, "the oldest young applied analyst" (in his words), delivered a plenary lecture on the Degenerate Keller-Segel Model in the Diffusion-Dominated Regime, which was an inspiration to the younger analysts.

The first YAAUK conference included a panel discussion to address the challenge of developing home-grown talent in applied analysis. This time we took direct action and shone the spotlight on six promising very young applied analysts in a session of short talks by PhD students.



Some of the attendees

The meeting was well attended with about 30 participants from 15 institutions. The talks covered a breadth of topics in PDEs and the calculus of variations including geometric measure theory, homogenization, liquid crystals, material microstructure, nonlinear elasticity, nonlocal problems, optimal transport theory, regularity theory for elliptic PDEs, and statistical mechanics. We are pleased to report that applied analysis in the UK is alive and flourishing.

This conference was supported by the London Mathematical Society, the Bath Institute for Mathematical Innovation and the Edinburgh Mathematical Society.

> Lucia Scardia University of Bath

NORTH BRITISH FUNCTIONAL ANALYSIS SEMINAR Report

A meeting of the North British Functional Analysis Seminar (NBFAS) was held at Queen's University Belfast on Monday 30 and Tuesday 31 May 2016. The distinguished speakers were Professor Eva Kopecká (University of Innsbruck, Austria) Products of projections in Hilbert space, and Professor Jan Stochel (Jagiellonian University Krakow, Poland) Analytic composition operators on reproducing kernel Hilbert spaces of entire functions. Further details on the programme including abstracts of the talks are available on the NBFAS website at www1.maths.leeds. ac.uk/nbfas/belf16.html.

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

Dr Martin Mathieu Queen's University Belfast NBFAS Secretary



Eva Kopecká

Jan Stochel

VISIT OF ALEXANDER IZZO

Professor Alexander Izzo from Bowling Green State University will be visiting Dr Joel Feinstein at the University of Nottingham from 14 to 20 August 2016.

Professor Izzo studies Banach algebras using concrete and abstract methods from complex analysis in one variable, several complex variables, and functional analysis. During his visit he will continue his work with Joel Feinstein on Banach and uniform algebras. In particular they will be looking at a variety of problems concerning regularity conditions, peak points and antisymmetry for uniform algebras.

Professor Izzo will give a seminar entitled Analytic structure in maximal ideal spaces at the University of Nottingham on Wednesday 17 August at 4 pm, Room C27, Physics Building.

For further details contact Joel Feinstein (Joel.Feinstein@nottingham.ac.uk) The visit of Professor Izzo is supported by an LMS Scheme 4 Research in Pairs grant.

VISIT OF REZA LAMOUKI

Professor Gholam Reza Rokni Lamouki (University of Tehran) is visiting the UK from 21 June to 20 July 2016. His research interests are in dynamical systems and control theory, especially partial stability with links to adaptive control theory, and mathematical biology. During his visit, Professor Lamouki will be based primarily at the University of Exeter – Penryn Campus, hosted by Professor Stuart Townley (s.b.townley@exeter. ac.uk). He will give a seminar there on 6 July. He will also visit and speak at the University of Bath between 18 and 21 July: contact Dr Chris Guiver (c.guiver@bath.ac.uk).

For further details contact Stuart Townley (s.b.townley@exeter.ac.uk). The visit is supported by an LMS Scheme 5 grant.

MATHEMATICS EDUCATION FOR THE NEXT DECADE

The 13th international conference of the *Mathematics Education for the Future Project* held in Catania, Sicily in September 2015 was attended by 130 people from 22 countries.

The next conference will be held next year at Balatonfüred, Lake Balaton, Hungary from 10 to 15 September 2017. The conference, *Mathematics Education for the Next Decade*, continues the search for innovation in mathematics, science, computing and statistics education. The thirteen previous conferences since 1999 were renowned for their friendly and productive atmosphere, and attracted many movers and shakers from around the world. There is now a call for papers and workshop summaries for presentation at the conference and publication in the printed conference proceedings. For further details and updates email alan@cdnalma.poznan.pl.

STOCHASTIC ANALYSIS

A conference on *Stochastic Analysis* in honour of István Gyöngy's 65th Birthday will be held at the School of Mathematics, University of Edinburgh from 10 to 12 September 2016. Stochastic Analysis is an area of mathematics that has been growing in importance for the last half century. It is an active area of research and there have been important very recent theoretical advances.

The conference hosts many eminent researchers. The list of invited speakers and further information is available at www.ed.ac. uk/maths/conference-on-stochastic-analysisedinburgh-2016. The meeting will offer a golden opportunity for participants to interact with world leaders in the field, generate new ideas and reinforce existing collaborations. Participants should register at the conference website. There is some financial support for early career researchers.

The meeting is supported by an LMS Conference grant (www.lms.ac.uk/), EMS Research Support Fund (www.ems.ac.uk), MIGSAA (www.maxwell.ac.uk/migsaa) and School of Mathematics, University of Edinburgh (www. maths.ed.ac.uk).

TOPICS IN SDES AND THEIR LINK TO (S)PDES

An afternoon workshop on *Topics in SDEs and their Link to (S)PDEs,* celebrating a new appointment, will be held at the School of Mathematics, University of Leeds on Monday 19 September 2016.

The aim of this event is to present some of the current results in the research area of the organiser (Elena Issoglio), which is stochastic analysis. In particular discussing stochastic differential equations, forward-backward stochastic differential equations, stochastic partial differential equations and the interplay between these areas. We want to bring together researchers from the north of England with an interest in stochastic analysis, particularly young researchers, to stimulate discussions and possibly start new collaborations. The main speakers are:

Francesco Russo (ENSTA-ParisTech)

- Goncalo Dos Reis (University of Edinburgh)
- Elena Issoglio (University of Leeds)

There will also be three short talks by PhD students and Post-Docs from Manchester and York.

For further information about this meeting visit the website at www.maths.leeds. ac.uk/topics_in_sdes or email Elena Issoglio (e.issoglio@leeds.ac.uk). Anyone interested is welcome to attend. This meeting is supported by an LMS Conference grant Celebrating New Appointments.

REPRESENTATIONS AND HOMOLOGY

A one-day meeting on *Representations* and *Homology* will be held on Thursday 22 September 2016 at the University of East Anglia. The meeting will focus on representation theory and homological algebra. The speakers are:

- Joe Chuang (City University, London)
- Peter Jřrgensen (Newcastle University)
- Joseph Grant (University of East Anglia, Norwich)

Email j.grant@uea.ac.uk if you would like to attend. There will be a dinner in the evening. Support is available for research students or early career researchers to attend. More information will be available at http://josephgrant. eu/meeting2016.html.

The meeting is supported by an LMS Conference grant Celebrating New Appointments and by the School of Mathematics at the University of East Anglia.

ALGEBRA, COMBINATORICS, DYNAMICS AND APPLICATIONS

A workshop on Algebra, Combinatorics, Dynamics and Applications will take place at Queen's University Belfast from 29 August to 1 September, 2016. It will focus on recent developments and classical ideas in the interplay between structural properties of algebras, properties of their representations and combinatorics and dynamics. More general structures appeared in various applications, in particular in physics, analysis, geometry, topology, homotopy theory and coding theory will be also considered. The topics will include quadratic, potential and monomial algebras, their homological properties and Koszul type complexes, operadic generalisations, poisson and symplectic structures, Calabi-Yau algebras, A-infinity structures, nonassociative structures, dynamics and integrability.

The organisers are N.K. Iyudu and S.A. Shkarin. Anyone interested is welcome to attend. Some funds may be available to contribute to the expenses of research students who wish to attend the meeting. Further details can be found at the webpage of the workshop: http:// tinyurl.com/j546e6d. The meeting is supported by an LMS Conference grant.

GEOMETRIC MODELS OF NUCLEAR MATTER

The second conference on *Geometric Models* of *Nuclear Matter* will take place from Monday 12 to Thursday 15 September 2016 at the University of Kent. Skyrme proposed to model atomic nuclei as solitons in a non-linear field theory of pions. This model has stimulated innovative and compelling research in a variety of di erent fields from nuclear physics to pure mathematics. This conference will bring together researchers that work on various aspects of the Skyrme model and related models. In addition, we have invited nuclear physicists who work on related research questions, further increasing the academic impact of the conference.

There is a grant to support a small number of PhD students travelling from the UK. Email Steffen Krusch (S.Krusch@kent.ac.uk) if you fall into this category and wish to apply for (partial) funding. A list of speakers and further information is available at www.kent.ac.uk/ smsas/personal/skyrmions/GMNMC2016.html.

The conference is supported by an LMS Conference grant, the IoP Mathematical and Theoretical Physics Group and the IoP Nuclear Physics Group.

BRITISH SCIENCE FESTIVAL 2016

The Festival is organized by the British Science Association (a.k.a. the British Association for the Advancement of Science) and is hosted this year by **Swansea University from Tuesday 6 to Friday 9 September** (www.britishscienceassociation.org/british-science-festival).

The four-day Festival will be followed by a Family Weekend, 10–11 September.

These are some of the mathematical sciences related events in the main programme.

Presidential Lecture and Reception

Post-modern cryptography: the unbreakable code?

Cryptography is the cornerstone of our online security, protecting our email messages, credit card information and medical records. The mathematician and Advisor to GCHQ **Richard Pinch** will explore security and privacy in an increasingly connected world and describe how new technologies such as quantum computing could threaten our cyber-security.

4 pm Wednesday 7 September

Adventures across the 7th Dimension



In 7 dimensions there exist special shapes that may give us the tools to unlock the mysteries of the universe. Looking for this unique geometry is challenging but a possible solution takes inspiration from nature: specifically, soap bubbles and thermodynamics. In this talk **Jason Lotay** (UCL) will take a mathematical journey across multiple dimensions, whilst exploring their role in art, science and popular culture.

2 pm, Tuesday 6 September

Can we predict the unpredictable?

How can we attempt to predict earthquakes, financial crashes and acts of terrorism? Such events can often seem random but researchers can unpick the underlying complexity using probability models known as Hawkes processes. Alan Hawkes (Swansea) himself and his collaborator Maggie Chen (Cardiff) will discuss the wide-ranging applications of these mathematical models. 12 midday Wednesday 7 September

The calculus of contagion

One of the tools in the disease-fighter's arsenal is mathematics. How can we measure disease spread? How can a few key people shape an outbreak? Which infections are hardest to control? Adam Kucharski (London School of Hygiene and Tropical Medicine) in this Award Lecture will describe his experience working to understand new disease threats, from Ebola to pandemic flu. 12 midday Wednesday 7 September

Can Maths Solve the Sepsis Problem and Save Lives?

Sepsis kills 40,000 people p.a. in the UK. Blood poisoning leads to precipitous collapse in heart function leading to multiple organ failure and death within days. Health experts suggest that earlier detection and treatment would substantially reduce mortality rates. The talk, by **Philip Aston** (Surrey) and **Manasi Nandi** (Institute of Pharmaceutical Science, KCL), will show how mathematical methods applied to physiological data can be used to address an important health issue.



12 midday Thursday 8 September



No. 460 July 2016

Wiley and the **London Mathematical Society** are pleased to announce their forthcoming publishing partnership New for 2017 Transactions of the Bulletin of the London Mathematical London Mathematical London Mathematical Society Society 9 OPEN As of January 2017, the Journal of the London Mathematical Society, Proceedings of the London Mathematical Society, Transactions of the London Mathematical Society and Bulletin of the London Mathematical Society will be published by Wiley and hosted on Wiley Online

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iournals will be available in both PDF and MathJax.



WILEY

MICHAEL MCCRUDDEN



Dr Michael McCrudden, elected a member of the London Mathematical Society on 18 November 1965, died on 29 October 2015, aged 72.

Shrikrishna Dani, Charlotte McCrudden, Roger Plymen, Nigel

Ray and John Reade write: Mick McCrudden was born and raised in Derry, Northern Ireland. He attended St Columbia's College during 1954-60, and graduated from Queen's University Belfast with a BSc in 1964 and an MSc in 1965. He then moved to England, and obtained his PhD from the University of Birmingham in 1969, under the supervision of Murray Macbeath; his thesis addressed a problem in measure theory on locally compact groups.

After a year in the USA at the University of Washington, Seattle, Mick was appointed to a

Lectureship in Mathematics at the University of Manchester in 1971, where he remained until his retirement in 2010. He had been promoted to Senior Lecturer, and then Reader in 1993.

For most of his mathematical career Mick was identified with the "embedding problem", which seeks to understand the relationship between two classes of measures on a locally compact group, namely those that are infinitely divisible and those that are continuously embedded. Many of his publications during 1974-2007 are on this, or related topics. His 1981 Mathematische Zeitschrift paper made a breakthrough, by establishing a previously conjectured embedding theorem for any connected Lie group, under the proviso that the measure be large in a certain precise sense. The review of the article in Mathematical Reviews pronounced that "This settles a longstanding problem of probability theory in Lie groups". His work gained special recognition from the German school of Herbert Hever and his colleagues, and led to successful visits to Tubingen and Oberwolfach. In 1985, a chance

> Isaac Newton Institute for Mathematical Sciences

STATISTICAL MODELLING OF SCIENTIFIC EVIDENCE 7 – 10 November 2016

in association with the Isaac Newton Institute programme **Probability and Statistics in Forensic Science** (18 July – 21 December 2016)

This workshop will be devoted the use of cutting-edge statistical methods in all the trace analysis situations that cause problems in court: physical evidence problems such as fibre or soil analysis, and DNA problems such as mixed samples, LCN samples, degraded samples and rare Y-haplotypes. The investigations will be supported by analysis of key well-known cases such as the Amanda Knox trial (low template and mixed DNA and rare Y-haplotype).

Further information available from the website www.newton.ac.uk/event/fosw03

Closing date for receipt of applications: 2 August 2016.

encounter at Oberwolfach with S.G. Dani launched a fruitful collaboration between the two, lasting over twenty years; in particular, it included two papers, in Inventiones Mathematicae (1992) and Advances in Mathematics (2007), which resolved the embedding problem for a large class of Lie groups. The collaboration caused him to visit Mumbai in 2002 and 2007, and strengthened his reputation amongst Indian probabilists. During this era he supervised PhD students Duncan Kelly-Lyth and Seth Walker, and published joint work with both of them.

Mick was a popular and effective teacher of students of all levels and abilities, and was known for his willingness to bring an outrageous sense of humour to bear at opportune moments in flagging classroom situations.

He was also a committed supporter of the Manchester Mathematics tradition of socialising with the wider University community, both at lunchtimes and evenings. Until the early 1970s these gatherings had focused on the College Hotel, close to the Mathematics Tower on Oxford Road. After the demolition of the College, they migrated to the Grafton Arms, and later to the Salutation. Beyond closing time, it was not unknown to return to the Tower for further midnight drinks. In similar spirit he popularised annual Departmental trips to the Lake District, centred around a University-owned cottage in Satterthwaite.

Apart from mathematics. Mick was a competent guitarist and singer, who loved to entertain all and sundry whenever the occasion arose. He delighted in composing songs of his own, on subjects ranging from temperamental office equipment to the menu of a local curry house. He was also an enthusiastic 5-a-side football player, and was an integral part of the 'Maths Staff' team that competed each year in Manchester University's season-long Canada Cup competition, and regularly emerged victorious from games against startled students. His team-mates included LMS members Jeff Paris and Nigel Ray, who recall that he was particularly proud of his excellent left foot!

Mick is survived by his children Charlotte, Megan and Patrick, and his ex-wife Sara.

KARL BARTH



Professor Karl Barth, who was elected a member of the London Mathematical Society on 17 October 1975, died on 5 May 2016, aged 77.

Phil Rippon writes (with assistance from Annette Lawson, Karl's

partner of 18 years): Karl grew up in Texas City, Texas, where he was Valedictorian for his class at Texas City High School. He received his Bachelor's Degree, Master's Degree and PhD in Mathematics from Rice University in Houston, and served as a U.S. Army Captain before joining the faculty at Syracuse University, where he was promoted to associate professor in 1970, to professor in 1977 and retired in 2005. In 1975/6 and again in 1987 he visited the UK as a Senior Visiting Fellow of the Science and Engineering Research Council to work with David Brannan (Queen Elizabeth College and then The Open University), with whom he wrote several papers, and he made many subsequent research visits to the UK.

In his PhD thesis Karl worked on the boundary behaviour of analytic and meromorphic functions that are defined in the unit disc, building on earlier work of his PhD supervisor Gerald MacLane, and other trail blazers such as Fatou, Lindelöf, Iversen, Beurling, Collingwood, Lohwater, Cartwright, Seidel, Bagemihl and Erdős. He wrote nearly forty papers on this topic, many published in LMS journals, AMS journals and Crelle's Journal.

During his early career Karl worked extensively with Walter J. Schneider (Syracuse and then Carleton, Ottawa), mainly on the construction of extremely complicated counter-

examples to existing conjectures, and later he worked for many years with Phil Rippon (Open University), mainly on solutions and partial solutions to problems and conjectures of Gerald MacLane. This latter collaboration was sustained in later years by Karl's regular trips to London where Annette lives. His many visits to the Open University were much appreciated as he was a highly sociable colleague as well as a great collaborator with an encyclopaedic knowledge of the history of his subject, and at least one further paper from this collaboration is currently under development. His other research collaborators included Jim Clunie, Walter Hayman and Linda Sons.

During his time at Syracuse, Karl also served on a range of senior university committees. Outside work, he was an avid runner, fisherman, opera lover and reader. Earlier in his life, he ran marathons in New York City, London and Washington DC, and for thirty years he enjoyed being a member of a lunchtime running group. Later he loved fishing with his daughter Clea on Cayuga Lake, and attending operas at Glimmerglass with many good friends, as well as both opera and theatre in London's rich environment with Annette. He also loved to travel, including wonderful journeys to Africa, Australia, New Zealand and Italy. Above all he loved the company of friends, with delicious food, wine and laughter.

Karl was predeceased by his second wife Lois Black, his daughter Justine Barth and his brother Paul Barth. He is survived by his partner Annette, daughter Clea Barth, four stepsons, and three step-grandchildren.

36

THE G.H. HARDY READER

Edited by D.J. Albers, G.L. Alexanderson and W. Dunham, Cambridge University Press and MAA Press, 2016, pp 410, 34.99, US\$49.99, ISBN 978-1107594647.

G.H. Hardy was the leading British mathematician of the first half on the twentieth century, inspiring a generation of number theorists and analysts. He was also the most loval, dedicated and influential member of the London Mathematical Society. He was elected as a member in 1901, and served as Secretary from 1917 to 1926. He is the only member to have served two terms as President, serving from 1926 to 1928, and fron 1939 to 1941, and he was awarded the De Morgan medal in 1929. As he said in his Presidential Address of 1928, Mv record of attendance in 1917 has no blemish. I have been at every meeting both of the Council and of the Society, and have sat through every word of every paper'.

Hardy was also the most generous benefactor of the Society; he left his estate (with a life interest to his sister Gertrude) and the copyright of his many books to the Society, and the Hardy Lectureship was created in his honour.

On Hardy's death, the London Mathematical Society appointed a committee to prepare the publication of Hardy's collected papers (including those written jointly with J.E. Littlewood). In doing so, they grouped the papers by subject, dividing them into some dozen groups, and provided introductions and comments on each of these groups, and on individual papers. This was a massive task, and the seven volumes, totalling over 5,000 pages, appeared over 14 years, from 1966 to 1979. In addition, there was a full obituary notice by E.C. Titchmarsh in the *Journal*, together with `Some Aspects of Hardy's Mathematical Work' which appeared in 1950.

What then did I expect to receive, when asked to review the G.H. Hardy Reader, published under the imprint of Cambridge University Press? First, the story of Hardy's life, so elegantly told by Titchmarsh. Secondly, an account of his work, as we see it today - the earlier comments are now some forty to fifty years old. What is the `circle method', with its major and minor arcs, and how is it used today? Are we still concerned with counting partitions? Where do Hardy's inequality and the Hardy-Riesz inequality fit into modern analysis?

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At a lower level, it would be good to read Hardy's inaugural lecture as Savilian Professor in Oxford, and, for light relief, the attempt by Hardy and Littlewood, in an Acta Mathematica paper, to explain their arguments to continental and American mathematicians by making an analogy with cricket - `The problem is most easily grasped when stated in the language of cricket, or any other game in which an

average is recorded.' `The arguments used in Sections 5-6 are indeed mostly of the type which are intuitive to a student of cricket averages'.

In fact, none of these appear. The book is published in America, principally by the Mathematical Association of America. which caters for a membership rather different from that of the American Mathematical Society or the London Mathematical Society. Its members can I suppose be considered as `men (and women too) like John Farev'. John Farev was

a geologist in Napoleonic times who made a fundamental and important observation about series of fractions (the Farey series), though he gave no proof and did nothing more. Many members of the MAA may well know much more mathematics, but it is assumed throughout that mathematical knowledge does nor go much further than high school mathematics.

The editors pick out four 'Hardy gems', which do not serve Hardy's mathematics well. For example, an inequality is shown, without explaining its use. The editors rather coyly mention the Cauchy-Schwarz inequality; in fact Hardy gave two proofs of the inequality; the second, which uses Parseval's equation, and is related to harmonic analysis, is much more interesting. Hardy is renowned for saying that the mathematics that he did had no practical use. But this must not be misinterpreted. He wrote 'the best mathematics is *serious* as well as beautiful - `important' if you like', and `A `serious' theorem is one which contains `significant' ideas'. Of the four `Hardy gems', only one (the Hardy-Weinberg law) meets these criteria; the others reflect the old `Mathematical Tripos' ideas, which Hardy did so much to abolish.

That apart, there is much to enjoy here. The story of Hardy's life is told (but without the elegance of Titchmarsh), and there is a fasci-

> nating collection of stories relating to him. It is perhaps a pity though that there is not more about his time in America, and his relations with European mathematicians. There are numerous pictures, of Hardy, and of others. There are three good expository articles, for the American Association for the Advancement of Science, and for the British Association. although these are at an elementary level. There is much else. including Hardy's `What is Geometry' and `Case against the Mathematical Tripos' (which the editors

seem to think 'has long since disappeared': not so – last year, there were some 220 third year candidates, and 250 candidates for Part III (about half coming to Cambridge having graduated elsewhere)). Not all of Hardy's thoughts have weathered well -'Some Notes on Certain Theorems in Higher Trigonometry', concerned with teaching the exponential and circular functions to schoolboys (something he did not do!) is quite bizarre: surely with 'some elementary notions with regard to convergence' and the binomial theorem, one simply proves that $e^z \cdot e^w = e^{(z+w)}$, and all else follows.

Hardy wrote about Euclid that `these are works to take away on holiday, and read at breakfast and lunch and tea and in bed'. This may be said about the present work; but not to read `in one's study'.

> Ben Garling University of Cambridge



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LIVRO DE PROBLEMAS DE ALMADA NEGREIROS

(Almada Negreiros - Book of Problems) by Simăo Palmeirim Costa and Pedro J. Freitas, Sociedade Portuguesa de Matemática, 2015, pp 128, €8.00, ISBN: 978-9899950009.

People usually become famous because of something they do, some particular skill that makes them stand out. Almada Negreiros (1893-1970) became famous because he was very good at doing many different things. He was a painter, a writer, a caricaturist and an occasional choreographer, scenographer and actor. Often mentioned as one of the most important Futurist artists in Portugal, Almada Negreiros was also one of the central figures of Orpheu, a literary magazine linked to the Modernist movement. Although it is possible to find several geometric elements in his illustrations and paintings, it is in Almada's murals, for instance in the mural Comecar in the Calouste Gulbenkin Museum in Lisbon, that those elements are more clearly present. Since Almada has learned geometry by himself, one would expect that most of his constructions would not be rigorous enough to be studied from a mathematical point of view. However, the authors of this book believed they could find interesting geometric relations behind some of Almada's paintings, drawings and sketches. Their method is the following: they take one drawing and they use observation and mathematics to try to find the protocol of the construction and Almada's main goal (to divide the circumference, to



find the golden angle, etc); then, with the help of Geoalgebra, а dvnamic mathematics software. compare they Almada's result with the exact value (obtained usina triaonometric laws. triangle similarity and congruence, etc). Since, in most cases, there are not many notes in the original work, sometimes it is not clear how the drawings were made, what was the sequence of steps that lead to the final constructions. This is the main challenge of the book and, aware



of the somehow speculative nature of their approach, the authors, at the beginning of the longest (and last) chapter, invite the readers to find their own interpretation and not just to follow what is proposed.

As mentioned in the introduction, one of the most interesting, although not completely surprising, conclusions that come out of this book is that Almada was much more concerned about the mathematical rigor in his preliminary studies than in the final work of art. For the readers not so familiar with mathematics, the authors have included a chapter about proportions and trigonometry, with a special section devoted to the golden ratio, a concept that influenced so many visual works in the history of art and, in particular, Almada's constructions. Not so obvious, but quite fascinating, are the relevant roles that the relation 9/10 and the Bauhütte point play in several of his geometric studies.

Most of the figures of the book, as well as very complete information about Modernism in Portugal, can be found at the site: www.modernismo.pt.

> Daniel Pinto Department of Mathematics FCTUC-University of Coimbra

Editor's note: This book is written in Portuguese but the 29 colour illustrations will appeal to non-Portuguese readers.

QUITE RIGHT: THE STORY OF MATHEMATICS, MEASUREMENT & MONEY

by Norman Biggs, Oxford University Press, 2016, pp 192, £19.99, ISBN 978-0198753353.

To write a short history of any academic discipline is a difficult job to do well. The author needs to have a command of the subject which enables him to give a sense of the broad sweep of the discipline across time. He also needs to be able to judiciously choose particular places, people and developments which will give the reader a good set of 'anchors' in the key aspects of the subject. In *Quite Right* Norman Biggs, emeritus professor of mathematics at the LSE, has done both of these things wonderfully well, and produced an excellent history of mathematics.

To achieve such a feat in only 176 pages Biggs takes the social and financial uses of mathematics throughout history as a guiding theme. Do not be misled however; this is not a history of financial mathematics. It is much broader than that. Rather, the author uses the ideas of measurement and money to help mark a path through mathematical history. This allows him to emphasise both the inherent usefulness of the subject, and the fact that developments in mathematics have often been driven by practical problems. That such problems include the number of ways the Hindu god Vishnu may hold the four symbols of his attributes, the best strategy to adopt in the card game Le Her, and public-key cryptography, illustrates both the power of mathematics, and the author's eye for a well-chosen example. Of course, Biggs includes much that we would expect in any introductory history of mathematics. Euclid, Archimedes, Cardano and Tartaglia, the development of calculus and the rise of probability theory are all dealt with. Moreover, other topics (such as develop-

THE NEW MATHEMATICAL SCIENCE by Dr Mehran Basti

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No. 460 July 2016

ments in notation), which are mentioned only in passing, are dispatched with the accuracy and concision of an author who is in command of his subject. Finally, a set of endnotes provides the interested reader with good pointers for further study.

Quite Right must be one of the shortest histories of mathematics on the market, with, I think, only the late Jackie Stedall's The History of Mathematics: A Very Short Introduction having fewer pages. However, this book's brevity is one of its many strengths. A lot of territory is covered very well in a relatively short read. Thus, if you want an brief introduction to the history of mathematics, either for yourself, or to use as part of a first course on the subject for students, then you would be Quite Right to make this book your choice.

Mark McCartney School of Computing and Mathematics University of Ulster

MATHEMATICAL MINDSETS

by Jo Boaler, John Wiley, 2016, pp 320, £13.00, €18.20, ISBN: 978-0470894521.

It is reasonably problematic to review accurately a book one has only partially read; indeed, this review has been in a "frozen" state for some weeks while I have tried to find the right approach. It seems best to explain the problem, and leave you decide whether this is unfair.

I should state that I am a secondary school Maths teacher. As such I am both reasonably well-informed about the state of secondary school mathematics, and also concerned to learn how to be a better teacher. Indeed, my main motivation for reviewing this book was to seek pedagogical improvement. I approached this work keen to learn.

The book starts well. I am completely in agreement with the author that very many students are afraid of mathematics. This fear is, very often, a cause of significant underachievement. I am completely in agreement that, as educators, we need to recognise and address this fear (which often perpetuates even into adulthood).

And then, only on page 4, we find the following quote.

A. (A) "...for the vast majority of children – about 95% – any levels of

school math are within their reach".

(my italics). This is a remarkable statement. It is saying, for example, that nearly all years 7s would be capable, later in their school career, of finding the fifth roots of a complex number. This certainly does not happen at the moment. (Professor Boaler's assessment of why this is not the case



seems to be because the teachers "have spent years deciding who can and who can't do maths and teaching them accordingly".)

If you have less familiarity with secondary education, try the following version of (A) (which is my own), which would seem to be notionally equivalent:

A. (B) "... for the vast majority of undergraduates - about 95% - any levels of university math are within their reach".

The saying that "extraordinary claims extraordinary evidence" reauire is something of a truism, perhaps. However, there is no doubt that (A) genuinely is an extraordinary claim. However, there is barely a trace of evidence presented. There is some discussion of research into the brains of blackcab drivers, and notions of brain plasticity (which is not in doubt). But that seems to be as far as

it goes. We are told that "Einstein did not read until he was nine", which is not even a true story.

Of course, there might be plenty of research evidence available, just not presented in the book. If (A) is true then I, and just about every teacher on the planet, have let their students down. If (A) is true then we need to completely rethink and rework the way we do maths education.

My experience, based on many years as a teacher, is that (A) is simply not true. Very few students will be capable of finding the fifth roots of a complex number. That is not a value judgement, but it seems to be a fact. I am prepared to be convinced otherwise, but it is not clear that there is anything in this book to do so.

> Dave Sixsmith The Open University

F EVENTS		8 Mathematical Communication during the Cold	
ociety meetings and other		War, Oxford (459)	
ts. Further information		11-15 Graph Limits and Statistic INI Workshop,	
om the appropriate LMS		Cambridge (457)	
number is given in brackets.		11-15 ECMTB, Nottingham (459)	
on the Society's website		11-25 Algebraic Combinatorics and Group	
ntent/calendar). Please send		Actions, Herstmonceux Castle, East Sussex (456)	
tions to calendar@lms.ac.uk.		13-15 Representation Theory of Algebraic	
		Groups in honour of Stephen Donkin, York	
	1	(457)	
		15 Mathematical Foundations in Bioinformatics,	
rameworks 2016, Warwick		Kings College London	
in Nonlinear PDE and		18-22 Representation Theory and Physics	
Reading (458)		Workshop, Leeds (458)	
lysis and Simulation: Crime		18-22 7ECM, TU Berlin (456)	
ng, Oxford (457)		20 Mathematical Foundations in Bioinformatics,	
nd Anonymisation INI		King's College London (458)	
lge (457)		21 LMS Meeting at the 7ECM, Berlin (460)	
Compactification,		25-27 Bayesian Methods for Networks INI	
		Workshop, Cambridge (457)	
dabout, Nottingham (459)		25-31 International Mathematics Competition	
dent Meeting, London (459)		for University Students, Blagoevgrad, Bulgaria	
MS Meeting, London (459)		(455)	

CALENDAR OF

This calendar lists So mathematical event may be obtained fro Newsletter whose n A fuller list is given (www.lms.ac.uk/con updates and correct

JULY 2016

4-8 PDE Software Fr 4-8 Modern Topics i Geometric Analysis, 4-8 Modelling, Ana and Image Processi 5-8 Data Linkage ar Workshop, Cambrid 6-8 The Stone-Cech Cambridge (458) 6-8 Ouantum Roun 8 LMS Graduate Stu 8 Hardy Lecture & L

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No. 460 July 2016

AUGUST 2016

1 Galway Topology Colloquium, Leicester (459) 1-4 Young Researchers in Mathematics Conference, St Andrews 2-5 Topology and its Applications, Leicester (459) 8-12 Graded Geometry and Applications to Physics, Sheffield (459) 25-26 Caucasian Mathematics Conference, Turkey (453) 29-31 British Topology, Glasgow (459) 29-1 Sep Algebra, Combinatorics, Dynamics and Applications, Queen's University Belfast (460) 30-2 Sep The Nature of Questions Arising in Court that can be Addressed Via Probability and Statistical Methods INI Workshop, Cambridge (458)

SEPTEMBER 2016

1-2 Invariant Subspaces and Banach Algebras, Leeds (459)

5-8 Hitchin 70, Aarhus (458)

5-9 Combinatorics and Operators in Quantum Information Theory LMS Research School, Belfast (458)

5-9 Kronecker Coefficients and their

Applications to Complexity Theory and Quantum Information Theory, City University London (459)

6-7 Transpennine Topology Triangle, Manchester (458)

6-9 British Science Association, Swansea (460) 7 O-Minimality and Diophantine Geometry, Manchester (459)

10-12 Stochastic Analysis in honour of István Gyöngy's 65th Birthday, Edinburgh (460)

9-11 Hitchin 70, Oxford (458)

12-15 LMS Midlands Regional Meeting and Workshop, Birmingham (460)

12-15 Geometric Models of Nuclear Matter, Kent (460)

12-16 Hitchin 70, Madrid (458)

12-16 Data Linkage: Techniques, Challenges and Applications INI Workshop, Cambridge (458)

13 Random Matrix Theory: Perspectives and Applications, Canterbury (459) 13-16 LMS Midlands Regional Meeting and Workshop, Birmingham (460) 15-16 Heilbronn Annual Conference, Bristol (459)16-17 Mathematical Biography, A MacTutor Celebration, St Andrews (458) 18-23 Heidelberg Laureate Forum (454) 19 Topics in SDEs and their Link to (S)PDEs. Leeds (460) 21 LMS Popular Lectures, Birmingham (460) 22 Representations and Homology, University of East Anglia (460) 23 CSAC Conference, Barcelona (460) 26-29 Bayesian Networks and Argumentation in Evidence Analysis INI Workshop, Cambridge (459)26-30 Clay Research Workshops, Oxford (459)

28 Clay Research Conference, Oxford (459)

OCTOBER 2016

28 Privacy: Recent Developments at the Interface between Economics and Computer Science INI Workshop, Cambridge (459)

NOVEMBER 2016

7-10 Statistical Modelling of Scientific Evidence
INI Workshop, Cambridge (460)
11 LMS Graduate Student Meeting, London
11 LMS Annual General Meeting, London

DECEMBER 2016

5-9 New Developments in Data Privacy INI
Workshop, Cambridge (460)
12-16 Dynamic Networks INI Workshop,
Cambridge (460)
20 LMS South West & South Wales Regional
Meeting, Bath

SEPTEMBER 2017

10-15 Mathematics Education for the Future Decade, Balatonfüred, Lake Balaton, Hungary (460)

THE BEAUTY OF MATHEMATICS AT THE CHELSEA FLOWER SHOW

(report on page 16)



Mathematical equations on the Fibonacci Spiral



Adrian Gray balancing stones



Copper bowl water feature mirroring patterns and symmetries of plants



World Vision garden



The Harrods British Eccentrics garden



End point of Fibonacci Spiral