LMS COUNCIL DIARY

12 October 2012

A personal view

The meeting opened with a few moments silence in remembrance of Anne Bennett. Anne had provided important support to Council, as well as to the many Committees which came under her wing, and we all benefited from the extraordinary amount of work she did to ensure the smooth running of Society business. As Fiona Nixon so eloquently described in her tribute to Anne (which appeared in the previous Newsletter), Anne made a real difference both to the Society and to the staff at DMH with whom she worked. Council will feel her loss very keenly.

We agreed that a fitting way to remember Anne would be to establish a Women in Mathematics Prize in her name, with the details of the prize to be worked out by the Women in Mathematics Committee.

The most substantial business matter of the day was to consider and approve the Trustees’ Report and Annual Accounts so that they can be presented at the AGM. Rob Curtis, the Treasurer, who fluently guided us through the papers, congratulated Ephrem Belay for the excellent work he had done in preparing the accounts, noting too that the auditors were full of praise for Ephrem’s work. Overall, the Society’s finances are in reasonable shape – taking inflation into account, the Society effectively broke even – but there is no room for complacency, especially when considering the current discussions around academic publishing. In addition, as Rob pointed out, there is the salutary fact that the Society’s invested assets now are nominally worth roughly the same as they were worth a decade ago, excluding the current value of De Morgan House. At the May Council meeting, Rob had made a compelling argument for exploring the possibility of the Society investing in property, and at today’s meeting he presented the worked-up business case. After a thoroughgoing discussion, we agreed to the purchase of residential rental property in central London as part of the Society’s investment portfolio.

Rob Curtis also reported on the results of the Members Survey which took place over the summer. Just over 40% of members responded to the survey, with 83% voting in favour of expanding the criteria for Ordinary Membership and 71% voting in favour of expanding the criteria for Associate Membership. It was gratifying to see such a conclusive outcome and one that will contribute towards expanding the reach of the Society. We agreed the appropriate amendments to
the criteria for membership, and these will be reported at the AGM. With the advent of the option of electronic voting in the forthcoming Society Elections, we spent some time discussing the election procedures. For this item we had the benefit of the presence of the Scrutineers, Don Collins and Peter Saunders, which was extremely helpful. While we felt that a move to electronic only voting was a desirable aim, it was agreed that this should not be rushed and that while it was hoped that members would take up the option of electronic voting, the option to vote by paper should be maintained for the time being.

The Society’s website made its customary appearance on the agenda. However, this time the main item for discussion was a proposal from an outside organisation. Plus (http://plus.maths.org/content), a free online magazine produced by the Millennium Mathematics Project, directed by Professor John Barrow at Cambridge, would like to produce content for the website. We all thought it seemed a promising idea and we expressed the hope that members would take up the option of electronic voting, the option to vote by paper should be maintained for the time being.

The first day of the month prior to publication, or the closest preceding working day. Notices and advertisements by the Society (tel: 020 7927 0801, email: prizelists@lms.ac.uk) or contact Duncan Turton, Secretary to the Prizes Committee at the Society (grants@lms.ac.uk). The deadline for submission of proposals is Friday 7 February 2013. Recent previous lecturers have been: 2012 A. Borodin (MIT) Determinantal Point Processes and Representation theory; 2011 E. Candès (Stanford) Compressed Sensing; 2010 M. Bramson (University of Minnesota) Stability of Queuing Networks. The LMS Invited Lecturer 2013 will be Fedor Bogomolov (Courant Institute, NYU) who will give lectures on Birational Geometry and Galois Groups. See poster on page 21 of the Newsletter.
LMS NEWSLETTER http://newsletter.lms.ac.uk

LMS GRANT SCHEMES

Next Closing Date for Research Grant Applications: 31 January 2013

Applications are invited for the following grants:
- Conferences and postgraduate research conferences held in the UK (Schemes 1 and 8)
- Celebrating new appointments (Scheme 1)
- Visits to the UK (Scheme 2)
- Joint Research Groups (Scheme 3 – see below about renewal of Scheme 3 grants)
- Research in Pairs (Scheme 4)
- International short visits with the main focus on Africa (Scheme 5)

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

- Applications received by 31 January 2013 will be considered at a meeting in February.
- Applications should be submitted well in advance of the date of the event for which funding is requested.
- Normally grants are not made for events which have already happened or where insufficient time has been allowed for processing of the application.

Queries regarding applications can be addressed to the Grants Administrators or the Programme Secretary (see below) who will be pleased to discuss proposals informally with potential applicants and give advice on the submission of an application.

Grants Administrators: Sylvia Daly, Elizabeth Fisher, Barbara Graczyk (tel: 020 7291 9971 / 3, and 0207 927 0808, email: grants@lms.ac.uk).

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

Other LMS Grants & Funding

Computer Science Small Grants (Scheme 7)

Funding for grants up to £500 is available to support a visit for collaborative research at the interface of Mathematics and Computer Science either by the grant holder to another institution within the UK or abroad, or by a named mathematician from within the UK or abroad to the home base of the grant holder. The next deadline for applications is 31 January 2013 – see the website for further details: www.lms.ac.uk/content/computer-science-small-grants-scheme-7.

Childcare Supplementary Grants

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

Small Grants for Education

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

LMS-EPSRC Short Courses

The Society and EPSRC offer funding of up to £12,200 (including honoraria for organisers) towards the cost of running a one-week Short Course which provides high quality training for postgraduate students in core areas of mathematics. For further information on Short Courses and how to submit a proposal, please visit: www.lms.ac.uk/content/short-course-organisers.

Research Workshop Grants

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

Spitalfields Days

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

Young British and Russian Mathematicians Scheme

Visits to Russia

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

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

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

Financial and academic reports will be required after the visit.

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

Visits to Britain

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

The LMS is offering grants to the host institution to meet the visitor’s actual travel and accommodation costs of up to £1,500. Applications should include the following:

1. Name and brief CV of the visitor.
2. A brief description of the course of lectures.
3. A letter or email of agreement from the head of the host department, including the proposed dates of the visit.

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1. Name and brief CV of the visitor.
2. A brief description of the course of lectures.
3. A letter or email of agreement from the head of the host department, including the proposed dates of the visit.

Financial and academic reports will be required after the visit.

Further details of the Scheme can be found on the LMS website: www.lms.ac.uk/content/international-grants#YBR. Applications received by 31 January 2013 will be considered at a meeting in February.

Enquiries should be made to the Grants Administrators: Sylvia Daly, Elizabeth Fisher and Barbara Graczyk (tel: 020 7291 9971/3, and 0207 927 0808, email: grants@lms.ac.uk).

LMS SUBSCRIPTION Reminder

Members are reminded that their annual subscription, including payment for publications, for the period November 2012 – October 2013 was due on 8 November 2012, and should be paid by 8 December 2012 at the latest.

In the case of members who already have a direct debit set up, no action need be taken. All members should now have received a reminder via email or letter, detailing how to pay their subscription. If you have not received a reminder please contact the Membership Department (email: membership@lms.ac.uk; tel. 020 7291 9973 or 0207 927 0808).

Subscription forms, direct debit mandate forms and further information can be downloaded from the LMS website at www.lms.ac.uk/content/paying-your-subscription.
MARY CARTWRIGHT LECTURE AND SOCIETY MEETING

Friday 1 March 2013

De Morgan House, 57-58 Russell Square, London WC1B
(Nearest tube: Russell Square)

Programme:

3.30 Opening of the meeting
  Jeff Lagarias (University of Michigan)
  From ABC to XYZ

4.30 Tea

5.00 Mary Cartwright Lecture
  Margaret Wright
  (Courant Institute, New York University)
  A Mathematical Journey
  in Non-Derivative Optimization

To register, please contact Elizabeth Fisher/Katy Henderson (womeninmaths@lms.ac.uk) by Friday 22 February. Late registrations for places may be still be accepted, subject to availability.

The reception will be followed by a dinner at the DoubleTree by Hilton London West End, at a cost of £35 per person, inclusive of wine. If you would like to attend the dinner, please contact Elizabeth Fisher/Katy Henderson (womeninmaths@lms.ac.uk) by Friday 22 February.

There are limited funds available to contribute in part to the expenses of members of the Society or research students to attend the meeting. Please contact Elizabeth Fisher/Katy Henderson (womeninmaths@lms.ac.uk) for further information.
ANDREI GONCHAR

Andrei Gonchar died on 10 October 2012, at the age of 81. He was born in Leningrad (now St Petersburg), graduated from school in Yerevan (Armenia), and enrolled in Moscow State University in 1949. From 1954 to 1957 he was a postgraduate student at the same university, with Sergei Mergelyan as his advisor, and he taught there from 1957 to 1991. Since 1964 he was also a research fellow and a head of department at the Steklov Mathematical Institute. He was a member of the Soviet (now Russian) Academy of Sciences since 1987 (a corresponding member since 1974) and held high administrative posts at the Academy for some period of time. From 1992 to 1993 he was the Organizing Director of the Russian Foundation for Basic Research, a newly formed government agency supporting fundamental research.

Gonchar’s interests in mathematics were focused on rational approximation of functions. He was one of the central figures in the development of theory of Hermite-Padé approximations and orthogonal polynomials with varying weight. He brought forward a radically new method of solution of classical problems in rational approximation, which is based on vector equilibrium problems of potential theory in the presence of an exterior field. Now this method is widely used in theoretical and practical investigations. With its help Gonchar solved Varga’s famous ‘15th’ problem. He reported on this result at the International Congress of Mathematicians in Berkeley in 1986 and it received ample recognition.

He paid much attention to publishing activities of the Academy. For 25 years he was the editor-in-chief of Matematicheski Sbornik, the oldest Russian mathematical journal. Thanks in part to Gonchar’s warm relations with Sir Michael Atiyah, a partnership in journal publishing between the Russian Academy of Sciences, the London Mathematical Society and Turpion Ltd has been actively developing since the mid-1990s.

Nikolai Kruzhilin and Sergei Suetin Steklov Mathematical Institute, Moscow

RUSSELL SMITH

Dr Russell Alexander Smith, who was elected a member of the London Mathematical Society on 18 November 1965, died on 19 August 2012, aged 86.

Lorna Smith writes: Russell was born in Katherine in New South Wales, Australia. He studied for a BSc at New England University College Armidale and Sydney University where he was awarded a University Medal in Mathematics in 1948. He was awarded the Baker Traveling Scholarship and came to St John’s College, Cambridge where he took the Cambridge Mathematical Tripos and then continued to a PhD supervised by Dame Mary Cartwright. After the PhD Russell returned to Australia, to a lectureship at Sydney University, but he then came back to the UK in 1954, to a lectureship at Durham University. Russell stayed at Durham University throughout the rest of his career, progressing first to Senior Lecturer and then to Reader in 1968, a role he held until his retirement in 1990. In 1985 he was awarded an ScD by the University of Cambridge.

Russell’s research interests concentrated around the theory of Ordinary Differential Equations. He published papers in number theory relating to sums of squares and worked on the functional equations of L-series related to quadratic forms and the distribution of rational points on hypersurfaces, as well as improving an earlier result in a result of Ramanujan concerning squares of the sum of the divisors of integers. The breadth of his interests also enabled him to contribute to a range of interdisciplinary areas, including collaborating with mathematical physicists working on string theory.

Russell was a dedicated teacher who gave very clear and well-presented lectures. Both students and colleagues benefited from his helpfulness and the encouragement that he gave. He always had time to listen, and gave well thought-out and sympathetic advice.

Russell was devoted to his wife Katherine, who died sadly in 2001. He is survived by four children, five grandchildren and eight great-grandchildren.

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JORAM LINDENSTRAUSS

Professor Joram Lindenstrauss, who was elected a member of the London Mathematical Society on 17 October 1974, died on 29 April 2012, aged 75.

David Preiss writes: Joram Lindenstrauss was professor of the Hebrew University of Jerusalem, member of the Israel Academy of Sciences, foreign member of the Austrian Academy of Sciences, recipient of the Israel Prize in Mathematics, Banach’s medal winner, teacher and adviser of numerous outstanding mathematicians and founder of a powerful school of modern functional analysis. He was born in Tel Aviv in 1936 and educated at the Hebrew University of Jerusalem, where he was deeply influenced by his teacher Aryeh Dvoretzky.

He held longer term visiting positions at the Yale University, University of Washington, University of California, University of Texas and Texas A&M University and a number of other shorter term positions. Via his deep results, books, lectures, survey papers and collaborations (for the last three decades especially in connection with Lior Tzafriri), became the basic reading for everyone interested in the theory of Banach spaces, and the more recent Geometric Nonlinear Functional Analysis written jointly with Yoav Benyamini, is becoming similarly influential.

Like so many others, I was deeply influenced by Joram’s work. A referee called me ‘a mathematician of Lindenstrauss’s school’ long before political situation allowed us to meet and work together. When this barrier was finally broken, we jointly investigated the still puzzling problems of Fréchet differentiability. It became a very enjoyable long term ‘on and off project’ (as Joram called it), developed during his visits to London, Warwick and Prague (where Jaroslav Tišer joined our work), but mainly during my two longer and many shorter visits to Jerusalem. In spite of that, we would probably never have finished it were it not for the support of Joram’s family and especially of his wife, Naomi. We finally managed to put all the bits and pieces together in Autumn 2011 when Joram was already seriously ill, and he still saw the appearance of our research monograph Fréchet Differentiability of Lipschitz Functions and Porous Sets in Banach Spaces in February 2012. In spite of his deteriorating health, after finishing this work we still discussed directions in which further research may go.

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MICHAEL EASTHAM

Professor Michael Stephen Patrick Eastham, FRSE, who was elected a member of the London Mathematical Society on 19 December 1963, died on 27 October 2012, aged 74.

Malcolm Brown and Desmond Evans write: Michael Eastham will be remembered as a leading mathematical analyst who contributed extensively to the theory of ordinary differential equations.

Michael was born in London on 2 December 1937. After attending Manchester Grammar School, he entered Merton College, Oxford in 1956 and graduated in 1959 with double first class honours in Mathematics. He then was a research student of the eminent analyst Professor E.C. Titchmarsh and obtained his DPhil in 1962; during 1959-61, he was a Domus Senior Scholar at Merton College. He was admitted to the Degree of Doctor of Science of Oxford University in 1974. After lectureships in Reading (1962-65) and Southampton (1965-69), he spent the years 1969-88 in the University of London, at Chelsea and then King’s Colleges, being promoted to Professor in 1980. He received the Keith Prize and Gold Medal of the Royal Society of Edinburgh in 1978 and was elected...
to a Fellowship of the Royal Society of Edin-
burgh in 1982. From 1988 until 1991 he was
Professor of Mathematics in Bahrain and
was Honorary Research Professor at Cardiff
University School of Computer Science and In-
formatics from 1995.

Michael was a widely acknowledged author-
ity on the spectral theory of differential equa-
tions, and was particularly well-known for
his analytical skills. He made many significant
contributions to such topics as the asymptotics
of solutions of linear differential systems, the
deficiency index problem, periodic problems,
spectral concentration and resonances. He
was the author of 124 research publications
and five books.

Michael is survived by his widow, Heather,
two sons and four granddaughters. He was a
dear friend and will be greatly missed by all
who knew him.

ISAAC NEWTON INSTITUTE

Call for Proposals

The Institute invites proposals for research
programmes in all areas of the mathematical
ciences and their applications. The Scientific
Steering Committee usually meets twice each
year to consider proposals for programmes
(of 4-week, 4-month or 6-month duration) to
run two or three years later. Proposals to be
considered at these meetings should be sub-
mitted by 31 January or 31 July respectively.
Details on submitting proposals are available
on the website (www.newton.ac.uk/callprop.
html).

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

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

MATHMATICS IN THE
NEW ELIZABETHAN AGE
(60 Years of British Mathematics)

This article arose from a discussion meeting
organised by the Parliamentary and Scientific
Committee entitled British Scientific Achieve-
ment over the Last 60 Years, which took place
in July 2012. A number of distinguished speak-
ers were invited to present at the meeting:
Professor Brian Cox, Professor Dame Nancy
Rothwell, President, Society of Biology and
Professor Lesley Yellowlees President, Royal
Society of Chemistry. The audience included
several mathematicians and the Council for
the Mathematical Sciences (CMS) was asked
by the Secretary of the Parliamentary and Sci-
entific committee to contribute this article to
the meeting report, which was first published
in the autumn issue of Science in Parliament
magazine.

In June 1993 Andrew Wiles gave a series of
seminars at the newly-created Isaac Newton
Institute for Mathematical Sciences in Cam-
bridge. In the final minutes of the last semi-
nar he claimed to have solved a 350 year old
mathematical problem: Fermat’s Last Theo-
rem. This became headline news across the
world because of the romance in the story
(lone British mathematician solves ancient
mystery), and also because the problem itself
is relatively easy to state. The interest gen-
erated by this achievement is rare for math-
ematics, though many other developments in
mathematical science over the last 60 years
are on a par with it. This is partly because
mathematics is often seen as too abstruse or
specialised for “ordinary people”; and partly
because, major advances in applied math-
ematics and statistics are often sub-plots of
bigger stories in biology, physics, economics
or engineering.

In this article we want to redress this in-
visibility and stress the key international role
played by British mathematics. Mathematics
has changed enormously over the new Eliza-
bethan age, and this has been a global effort.

However, the UK has played an important
role in most of these changes – a far great-
er role than its relative size would suggest.
Thus, for the period 1998–2008, Scotland and
England were respectively second and fourth
in the world for citations per paper published
in the mathematical sciences. Although we
concentrate on research in the rest of this
article, it is worth remembering that most
researchers are also teachers, and we rely on
them to pass on the intellectual thrill of the
discipline and to create the skilled workforce
needed in the banking, computing, engi-
neering and pharmaceutical industries.

The rise of computers and the ubiquity of
smart technology form one of the greatest
changes to our lives since 1952. The early pro-
totypes of this technology were developed
by Alan Turing and others at Bletchley Park
to (decode the German ENIGMA machine) and
then at the National Physical Labora-
tory (NPL) and the University of Manchester.

Turing committed suicide in 1954, so he only
just makes it into the new Elizabethan age,
but his achievements in computing, logic and
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of the new Elizabethan age has been the renaissance of geometry. Geometry and physics have been intertwined through most of their history, but drifted apart in the 60 years leading up to 1980. However, starting from discussions between Sir Michael Atiyah and the American physicist Ed Witten, the picture has changed greatly over the last 35 years, and now the connecting road is a motorway. Atiyah is one of the six UK Fields medallists (the mathematical equivalent of the Nobel Prize) – only France and the US have more – and has been a central figure in world mathematics during the new Elizabethan age. The maths-physics motorway is not just one-way: in the striking example of mirror symmetry from string theory, Philip Candelas, now at Oxford, and his collaborators were able to use the amazing intuition of the physicists to predict the solution of a century-old problem in classical geometry (“counting the number of rational curves in the quintic”).

Mathematical physics itself (quantum theories and relativity) has also changed dramatically. Stephen Hawking and Roger Penrose, both working in mathematics departments, described the mathematical structure of black holes, stars so massive that even light cannot escape their gravitational pull. Hawking went on to show that there is a sense in which black holes actually do emit radiation! The existence of the Higgs particle that may have been observed recently and which is responsible for mass in quantum theory was predicted by Peter Higgs at the University of Edinburgh, with others including Tom Kibble at Imperial College, using mathematical arguments.

With advances in both methods and computing power, the scope of what mathematicians can model has expanded. This has led to changes in the way that weather forecasting is reported (using ideas from chaos theory) and the increasing use of mathematics in modelling financial markets. The sophistication of computer models is such that a model of the human heart at Oxford can be used to make predictions about heart treatments without using a living subject. Often, in such applications to the life sciences, mathematicians now work in teams with other scientists as equal partners. Mathematical modelling is also used to inform policy decisions: strategies for the foot and mouth outbreak of 2001, the distribution of vaccines, and the safety of air flights through volcanic ash clouds in 2010, were all assessed using mathematics.

So what lessons can we learn from the success of UK mathematical science in the jubilee years? Here are some observations from the chalk-face.

- Structures must be flexible enough to allow many flowers to bloom: nobody can predict what the next breakthrough will be, far less from where it will appear.
- The time between formulation of a seminal mathematical idea and its application may be brief (as in Cox’s 1972 work on regression analysis) or very long (as in Turing’s 1936 discussion of thinking machines, now at the heart of Artificial Intelligence). It is misguided to aim to reward only a fast pay-off. Worse, even with the best intentions this policy tends to lead to incremental research rather than real innovation, which is inherently unpredictable.
- The openness and non-hierarchical structure of British culture allows new ideas to gain a foothold, new talent to find a ready audience.
- Diversity (of scale of organisation, of mode of research – solo/team, interdisciplinary/narrow, applications-focused/blue skies) is key.

All the above features of UK mathematical science have been massively aided by the dual support system for funding research, allowing new ideas to start with small first steps, new talent to develop from a wide base (it is worth remarking that the Cambridge mathematician and Fields Medalist Sir Tim Gowers has never held a research council grant).

The key message from the last 60 years is that most progress has been through glorious surprises. No one except a few crazy science fiction writers could have predicted the way computers would come to pervade our lives, nor the way that new mathematics would be needed to facilitate this. Modern statistical methods allow information to be extracted from data in previously unimaginined ways. The deep interconnections between different areas of mathematics, and between mathematics and the sciences, that have emerged are similarly mysterious and could not have been foreseen in 1952. This does not mean that all future developments are unpredictable – it is clear that the mathematicalisation of the biological sciences will continue apace and holds some exciting prospects, and understanding climate change provides a challenge – but it does make it likely that the next real innovations will, by definition, be surprises.

The UK has been at the forefront of change over the past 60 years, and we need to ensure it remains at the cutting edge of progress for the next 60 years. Not just for the intellectual excitement of discovery, but also for its societal impact. How will the next 60 years go? All we can say is: watch this space!

Acknowledgements: We are grateful to Penny Davies, Patrick Dorey, Jerome Gauntlett, Nick Higham, Oliver Jensen, Stephen Senn, Richard Thomas and Mike Titterington for helpful guidance, some of which we ignored due to lack of space.

Ken Brown, University of Glasgow
Paul Glendinning, University of Manchester

References and notes
1. Figures from Thomson Reuters at www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=406463 Denmark were first, the USA third.
LONDON MATHEMATICAL SOCIETY
NORTHERN REGIONAL MEETING

Monday 18 March 2013
Herschel Building, Newcastle University

Programme:
2.00 pm  Opening of the meeting
          Volodymyr Mazorchuk (Uppsala)
3.15 pm  Ivan Smith (Cambridge)
4.30 pm  Tea/Coffee
5.15 pm  Bernhard Keller (Paris 7)
6.30 pm  Reception and Buffet at The Penthouse

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


The Society Meeting forms part of the workshop on Triangulations and Mutations from 18-22 March. For further details visit: www.mas.ncl.ac.uk/triangulations/index.php?p=6.

There are funds available to contribute in part to the expenses of members of the Society or research students to attend the meeting and workshop. Requests for support, including an estimate of expenses, may be addressed to the organisers (peter.jorgensen@ncl.ac.uk).
Postgraduate Education
The Higher Education Commission has published its report on Postgraduate Education. The Council for the Mathematical Sciences (CMS) responded in April 2012 to a call for evidence to inform this report. The final report calls for ‘the postgraduate sector to be brought in from the cold and fully embraced as part of an integrated education system. It identifies policy shifts which will be needed to ensure that Britain remains a competitive place to do research and do business. It also explores access to postgraduate education, “the next frontier of widening participation”, and makes recommendations on how postgraduate provision should be funded in the future’. The full report is available at http://tinyurl.com/cctcbr4.

Segregation of HE sector
A report - The Future of English Higher Education: Two Scenarios on the Changing Landscape designed specifically to look at where the coalition reforms to higher education would lead the sector over the next decade has been published. The report concludes that ‘research will be focused in just 25 universities by 2025 as the UK sector becomes more stratified’. The report concluded that ‘research will be focused in just 25 universities by 2025 as the UK sector becomes more stratified’. The full report is available at http://tinyurl.com/cctcbr4.

New plans to boost computer science teaching
‘As part of the government’s mission to ensure Britain competes and thrives in the global race, Education Secretary Michael Gove has set out plans to boost the teaching of Computer Science by training up the first generation of outstanding new teachers’. More information is available at http://tinyurl.com/c99yu5f.

The cost of the Government’s reforms of the financing of higher education
A recent Higher Education Policy Institute (HEPI) report argues that the government has seriously underestimated the cost to the public purse of its HE policies’. The report concludes that ‘the government’s assessment of the cost of its HE policies still depends on highly uncertain and optimistic assumptions and remains too low’. More information is available at http://tinyurl.com/dybec28.

SCHOOLS AND COLLEGES
Cambridge to support teaching of new mathematics A-levels
A new maths education programme is being launched by the University of Cambridge which aims to provide innovative, rich and stimulating materials to help support and inspire teachers and students of advanced post-16 mathematics. The £2.5m programme is funded by the Department for Education, initially for three years.

It will be led by Professor Martin Hyland, Head of the Department of Pure Mathematics and Mathematical Statistics, and Lynne McClure, Director of NRICH, part of the University’s Millennium Mathematics Project. More information will be available in due course.

Reinvest the 4G windfall in science and technology
The Campaign for Science and Engineering (CaSE) and the National Endowment for Science, Technology and the Arts (Nesta) have launched a new campaign called 4Growth. The campaign calls on the government to invest the proceeds from the forthcoming 4G spectrum auction. Leading figures from science and technology have signed an online petition supporting the campaign. These include:

• Brian Cox – physicist and broadcaster
• Lord Martin Rees – former President, Royal Society and Astronomer Royal
• Andre Geim – Nobel laureate (Physics 2010)
• Lesley Yellowlees – President, Royal Society of Chemistry
• Lord William Waldegrave – former Chief Secretary to the Treasury and Science Minister
• Ben Goldacre – doctor and author of Bad Science, and Bad Pharma

A report on how the proposals could be implemented is available at www.nesta.org.uk/library/documents/4GROWTH.pdf.

‘Serious deficit’ in UK quantitative skills
A position statement – Society Counts – published by the British Academy says that ‘the UK has a serious deficit in quantitative skills in the social sciences and humanities. This deficit threatens the overall competitiveness of the UK’s economy, the effectiveness of public policy-making, and the UK’s status as a world leader in research and higher education’. The full statement is available at www.britac.ac.uk/news/news.cfm/newsid/813.

Equal opportunities for boys and girls?
The new IOP report, It’s Different for Girls, shows that many schools fail to ensure equal opportunity for boys and girls in A-level physics. The report is available at http://tinyurl.com/c8k0w3z.

The National Numeracy Challenge
National Numeracy has launched a Challenge that aims to reduce the number of adults with low levels of numeracy by over one million in the five years from 2013–2018. The first phase of the Challenge will be a three-year collaborative project to improve work/life skills for 500,000 adults of working age in the UK by 2015. More information is available at http://tinyurl.com/c269dcn.

Dr John Johnston
Mathematics Promotion Unit
BRITISH MATHEMATICAL COLLOQUIUM 2013

The 65th British Mathematical Colloquium will take place at the University of Sheffield from 25 to 28 March 2013.

Plenary speakers:
- John Baez (Riverside)
- Ragni Piene (Oslo)
- Guy Henniart (Paris)
- Mikhail Kapranov (Yale)
- Laurent Saloff-Coste (Cornell)
- Thomas Schick (Göttingen)

Professor Baez’s lecture will be a public lecture on the subject of mathematics and the environment and will be a Mathematics of Planet Earth 2013 event.

Morning speakers will include:
- Konstantin Ardakov
- June Barrow-Green
- Tom Bridgeland
- Gavin Brown
- Tim Dokchitser
- Tony Dooley
- Tom Leinster
- Zinaida Lykova
- Lasse Rempe-Gillen
- Gesine Reinert
- Stuart White

Afternoon workshops:
- Category Theory
- History of Mathematics
- K-Theory and Analysis
- Mathematical Higher Education
- Noncommutative Algebra and Representation Theory
- Number Theory
- Probability
- Topology

There will be opportunities for contributed talks either by individuals or, in workshop format, by groups with a common interest. Proposals for contributed talks or workshops are particularly welcome from postgraduate students.

Anyone interested should contact Eugenia Cheng (e.cheng@sheffield.ac.uk) or David Jordan (d.a.jordan@sheffield.ac.uk).

For further information visit the website at www.sheffield.ac.uk/maths/bmc2013.

The colloquium is supported by an LMS Conference grant.
LMS INVITED LECTURERS 2013

Professor Fedor Bogolomov
(Courant Institute, NYU)

Birational Geometry and Galois Groups
10-14 June 2013
University of Edinburgh

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

There will also be supplementary lectures by:

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

University and local Guesthouse accommodation will be available.

Limited financial support is available with preference given to UK research students. Please contact the organisers for further details (i.cheltsov@ed.ac.uk, J.Martinez-Garcia@sms.ed.ac.uk). Deadline for funding: 1 May 2013.

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

VISIT OF SIMOS MEINTANIS

Professor Simos Meintanis (National and Kapodistrian University of Athens, Greece) will be visiting the Department of Mathematical Sciences at Durham University within the period February to mid-March 2013. Professor Meintanis’ recent research has focussed on the use of the empirical characteristic function (ECF) in order to tackle challenging inferential problems in Statistics. Research during this visit will particularly focus on goodness-of-fit testing for unsupervised learning techniques and on predictive inference using the ECF.

During his visit to the UK, Professor Meintanis will present three lectures (please check with the contact persons for further details):

• Newcastle University, 22 February
  Fourier-type inference for GARCH models with heavy-tailed innovations
  (contact Daniel Henderson: daniel.henderson@newcastle.ac.uk)

• Durham University, 25 February
  The probability weighted empirical characteristic function and goodness-of-fit testing (contact details below)

• University of Kent (Canterbury), 28 February
  Goodness-of-fit procedures for spherically symmetric distributions
  (contact Efang Kong: E.Kong@kent.ac.uk)

For further details contact Frank Coolen (frank.coolen@durham.ac.uk). This visit is supported in part by an LMS Scheme 2 grant.
ANALYSIS DAY

Analysis Day will be held on 7 January 2013 at the University of Bristol. The day will begin with coffee at 11 am with the first talk at 11.30 am. The last talk will end at 5.15 pm, followed by dinner. The speakers are:

• David Preiss FRS (Warwick) Do we really know what Lebesgue null sets are?
• Dorin Bucur (Université de Savoie) Isoperimetric inequalities and free discontinuity problems
• Peter Topping (Warwick) Ricci flow on non-compact surfaces
• Bernard Helffer (Orsay) On nodal domains and spectral minimal partitions: a survey

The aim of the conference is to bring Earth Scientists, Extreme Events together with Earth Sciences of fluid phenomena sparked an ever increasing interest scientifically and in the general public with subjects as climate change, weather prediction and in particular prediction of extreme and hence dangerous damaging and expensive weather events. With rare exceptions the qualitative theory of dynamical systems and the theory of extreme events developed without any contact with earth sciences and their paradigmatic and had, again with few exceptions, no influence on Earth Scientists. The aim of the conference is to bring Earth Scientists in contact with mathematicians working in the aforementioned areas. The list of speakers includes:

• Christian Beck (QMUL)
• Freddy Bouchet (Lyon)
• Ira Didenkulova (Tallinn)
• Ana Cristina Moreira Freitas (Porto)
• Jorge Miguel Milhazes de Freitas (Porto)
• Davide Gabrielli (Roma)
• Christian Maes (Leuven)
• Michael Ghil (Paris)
• Rosemary Harris (QMUL)
• Mark Holland (Exeter)
• Giovanni Jona-Lasinio (Roma)

STATISTICAL MECHANICS AND EXTREME EVENTS IN EARTH SCIENCE

A conference on Non-equilibrium Statistical Mechanics and the Theory of Extreme Events in Earth Science will take place at the University of Reading from 8 to 11 January 2013, part of the international initiative of the year of Mathematics for Planet Earth 2013. The conference will bring together mathematicians working in Non-equilibrium statistical mechanics, Random dynamical systems, Extreme events together with Earth Science.

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• Mathieu Marion (Université du Québec à Montréal)
• Mitsuhiro Okada (Keio University, Tokyo)
• Mike Price (University of Leicester)
• Harvey Rose (University of Bristol)
• Stan Wainer (University of Leeds)

Further details can be found on the web page http://www2.ie.ac.uk/departments/mathematics/legacy-of-goodstein

Everyone is free to attend although we do require people to register; please go to the web page to do this. Whilst people can register on the day, it would be very helpful if people could register in advance wherever possible.

The meeting is supported by an LMS Conference grant and co-financed by the ERC-grant NAMA T - Thermodynamics of the Climate System.

LEGACY OF GOODSTEIN

His Centennial and the Wittgenstein Connection

There will be a one day meeting at the University of Leicester on Friday 14 December 2012 to commemorate the centenary of the birth of Reuben Louis Goodstein. The meeting will focus on Goodstein’s mathematical research, particularly in logic and related areas, and the influence that this has had on subsequent research in mathematics (and related fields). The talks will be given by:

• Professor Rafael Benguria (Pontificia Universidad Católica de Chile) will be visiting London, Bristol and Reading from 19 January to 2 February 2013. He will give the following talks:
  • London Analysis Seminar, Imperial College, 24 January
  • Estimate for the indirect coulomb energy for two and three dimensional atoms
  • Bristol, 28 January

• London Analysis Seminar, Imperial College, 24 January

• Exact asymptotic behavior of the Pekar–Tomasevich functional

• Reading, 29 January

Rigorous results for the minimal speed of Kolmogorov–Petrovskii–Piscounov monotonic fronts with a cutoff

For further information contact Professor Leonid Parnovsky, University College London (leonid@math.ucl.ac.uk). The visit is supported by an LMS Scheme 2 grant.

BSHM NEUMANN BOOK PRIZE

The British Society for the History of Mathematics (BSHM) is pleased to announce the biennial Neumann Prize for 2013. The prize is awarded for a book in English (including books in translation) dealing with the history of mathematics, aimed at a broad audience and published in 2011 or later. The prize is named in honour of Peter M. Neumann, OBE, a former BSHM President and longstanding contributor to the Society. The value of the prize is £600.

Nominations for the prize are invited from individuals and publishers. Nominations should be sent to the chair of the judging panel, Norman Biggs (n.l.biggs@lse.ac.uk). Publishers should send three copies of their nominated book(s) to Professor Norman Biggs, Chair: BSHM Neumann Prize, Department of Mathematics, London School of Economics, Houghton Street, London WC2A 2AE, United Kingdom.
SUMMER SCHOOL AND WORKSHOP
15 – 19 July 2013
in association with the Newton Institute programme
Polynomial Optimisation
(15 July - 9 August 2013)

Organisers: (Chair) Adam Letchford (Lancaster University), Joerg Fliege (Southampton University), Jean-Bernard Lasserre (CNRS Toulouse) and Markus Schweighofer (Konstanz University).

Optimisation problems that involve polynomials are currently receiving a great deal of attention, due to their generality, their challenging nature and their wide range of practical applications. These two events provide an opportunity for researchers to learn more about this new, exciting and growing field.

The Summer School will begin in the morning of Monday 15 July and finish at lunchtime on Wednesday 17 July. It will consist of a series of tutorials from the following five internationally respected invited speakers:

- Emmanuel Candés (Stanford University)
- Michal Kocvara (University of Birmingham)
- Jesús De Loera (University of California, Davis)
- Tim Netzer (Leipzig University)
- Bernd Sturmfels (University of California, Berkeley)

The workshop will begin at lunchtime on Wednesday 17 July and finish in the afternoon on Friday 19 July. It will consist of a series of contributed talks, and a poster session for PhD students and post-docs.

Further information and application forms are available from the website at www.newton.ac.uk/programmes/POP/popw01.html. Closing date of the receipt of applications is 28 February 2013.
Modern nonlinear PDE methods in fluid dynamics

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

Course outline
The course aims to give the opportunity to a new generation of UK PhD students to attend high quality lectures on the analysis of PDE in fluid dynamics, delivered by leading international experts.

The four courses are broadly divided in two strands. The first, containing the courses given by Luigi Ambrosio and Yann Brenier, deals with applications in fluid dynamics of optimal transport methods, more specifically the variational approach to the incompressible Euler equations, and the monotone rearrangement and convexity theory for the Navier-Stokes and semi-geostrophic equations. The second, containing the courses of Adrian Constantin and Georg Weiss, deals with methods specific to free-boundary problems in fluid dynamics, addressing respectively the bifurcation theory approach to the existence of large-amplitude steady water waves with vorticity, and the use of blow-up techniques in the study of regularity and behaviour at singularities in free boundaries.

The four main lecture course topics are:
- Variational models for incompressible Euler equations (Luigi Ambrosio, Scuola Normale Superiore, Pisa)
- Monotone rearrangement and convexity theory (Yann Brenier, University of Nice)
- Bifurcation theory in the context of steady water waves (Adrian Constantin, King’s College, London)
- Analysis of singularities in free-boundary problems (Georg Weiss, Heinrich Heine University, Düsseldorf)

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

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

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

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

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

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

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

UK-based postdocs will be charged a registration fee of £250, plus half the subsistence costs (£125) £375 in total.

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

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

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

Computational Group Theory

LMS-EPSCC Short Course
University of St. Andrews
29 July – 2 August 2013
Organisers: Alexander Konovalov, John McDermott, Angela Miguel & Max Neunhöffer

Course outline
The course will introduce students to the four main areas of Computational Group Theory: permutation groups, soluble and p-groups, matrix groups and finitely presented groups. The course will cover typical problems and standard algorithms, along with the analysis of these algorithms and their practical use on a computer. In the practical sessions there will be some emphasis on using the computer algebra system GAP, a world wide open source project established in 1988. After this course the participants will have a good understanding of what computers can and cannot do with groups and will be able to use GAP to answer their own group theoretic questions. The course aims to appeal to a broad spectrum of students from areas such as Algebra, Topology, Combinatorics and Graph Theory.

The four main lecture course topics are:
- Permutation Groups (Alexander Hulpke, Colorado State University)
- Soluble Groups and p-Groups (Bettina Eick, Technische Universität Braunschweig)
- Matrix Groups/Constructive Recognition (Derek Holt, University of Warwick)
- Finitely Presented Groups (Max Neunhöffer, University of St Andrews)

These lecture courses will be supplemented by tutorial sessions.

For further information please visit: http://www-circa.mcs.st-andrews.ac.uk/ctg2013

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

The closing date for applications is Monday 17 June 2013. Numbers will be limited and those interested are advised to make an early application.

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

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

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LMS-EPSCC Short Courses aim to provide training for postgraduate students in core areas of mathematics. Part of their success is the opportunity for students to meet other students working in related areas as well as the chance to meet a number of leading experts in the topic.
**POPULAR LECTURES 2012**

**Report**

To mark the centenary year of Alan Turing’s birth, the 2012 LMS Popular lectures were devoted to aspects of Turing’s work.

On 29 September 2012, an excited audience of mathematicians, school students and interested members of the public gathered in the beautiful concert hall of the new Sir Paul and Lady Ruddock Performing Arts Centre, at King Edward’s School, Birmingham to listen to two distinguished mathematicians speak about aspects of Turing’s work.

Can anything be salvaged from the wreckage of Hilbert’s Dream?

Sir Timothy Gowers, FRS, Royal Society Research Professor in the Department of Pure Mathematics and Mathematical Statistics at the University of Cambridge, started from the reassuringly familiar territory of finding solutions for quadratic equations. He pointed out that for these and for other types of equation, we can describe a standard method for finding a solution and that they can therefore be solved mechanically, by a person or a computer simply following an algorithm, rather than by any mathematical understanding or intuition.

Hilbert’s dream was that it might be possible to solve any mathematical problem mechanically. More specifically, he asked whether any algorithm existed for determining whether any arbitrary diophantine equation has a solution. (A Diophantine equation is an equation where only integer solutions are allowed.) Known as the Entscheidungsproblem (from the German for decision), this can be visualised as being a “black box” for which the input is an equation and the output is a proof or disproof.

Gödel’s incompleteness theorems prove that...
there are some statements for which no proof or disproof exists. In the 1930s, Alan Turing and Alonzo Church independently decided that some functions are “non-computable”.

Professor Gowers discussed modifications to the requirements of the hypothetical black box by changing the question to whether there was a proof within a specified length. This can be achieved but only by “brute force” solutions which are of no practical interest. He suggested that the expectation that a computer should solve all problems was unfair and that it might be amended to require “reasonable proofs of interesting problems” that a human could solve.

To date no computer has passed the ‘Turing Test’ to solve a mathematical problem in the way that a human would. The human method involves inspiration and intuition based on experience and value judgements. Humans often reason visually whereas computers can only reason symbolically.

An example of a problem which is best solved visually concerned the removal of diagonal observations. Problems can sometimes be solved by making use of vague similarities. He concluded that recent advances in computing suggest that one day a computer might pass the amended Turing Test. However, no computer yet exists that can adequately understand and use natural language, learn from experience and recognise and solve interesting problems.

Professional mathematicians are not likely to become redundant in the near future! Before the second lecture there was a break in which excellent refreshments were served and the audience had the opportunity to see a little more of the Arts Centre.

On Attempting to Model the Mathematical Mind: A Tribute to A. M. Turing on his Centenary

Sir Roger Penrose, FRS, Emeritus Rouse Ball Professor of Mathematics at the Mathematical Institute, University of Oxford presented his lecture as a tribute to Alan Turing, whom he had admired ever since he had first heard of his work.

Although Alan Turing is now best known as the mathematician who cracked the Enigma code, this lecture referred to less well known aspects of his work, based on papers published in the late 1930s on computable numbers and systems of logic. A Universal Turing Machine is a theoretical concept of a finite state object with an infinite tape. A Universal Turing Machine can perform ANY computation.

Professor Penrose suggested that, when these papers were published, Turing was unhappy about trying to model the mathematical mind with a Universal Turing Machine, as the mind goes beyond the capabilities of a Turing machine. (By the 1950s he seemed to be more optimistic that a computer might one day be developed that would be powerful enough to model the human brain.)

In order to evade the limitations of Gödel’s incompleteness theorem Turing suggested a system based on ordinal logic and oracles. The oracle should be able to say whether or not a given statement was true.

Professor Penrose suggested a model based on a ‘cautious oracle’ which has, in addition to the options to reply ‘True’ or ‘False’, can reply that it does not know or might simply ‘continue pondering indefinitely without ever providing an answer at all’. Gödel’s theorem states that computational rules such as mathematical induction are not sufficient for establishing the perceivable truths of arithmetic. This was illustrated by using the example of Hercules and the Hydra quoted by Kirby and Paris.

Arguments against the possibility of using a machine to model the human mind are that:
1. Humans are fallible and make errors.
2. Algorithms for human understanding are so vastly complicated that Gödel statements are completely beyond reach.
3. We do not know the algorithmic process, so cannot construct Gödel statements.

Human intelligence depends on awareness and understanding. If awareness and understanding can be shown to be beyond computation, then intelligence is not a matter of computation. Conscious brain action must depend on a physical process that is beyond computation. Quantum mechanics may help to explain brain processes. Recent research into micro-tubules in the nerve synapses has produced some interesting results.

In his informative and inspiring lecture, Professor Penrose used diagrams and cartoons to tackle several very complex and controversial subjects in such a way as to convince the audience, at least briefly, that they could understand them.

Many thanks are due to the two distinguished speakers, to the LMS for organising the lectures and to King Edward’s School for hosting the event.

Sheila Mawby

Editorial note: The lectures were also given in London on 26 June 2012. The lectures were recorded and are available from the LMS: a useful purchase for school and university mathematics departments seeking resources that will stimulate their students (information is available at www.lms.ac.uk/content/popularelects-dvds).

REVIEWS


This is a fascinating book on the application of game theory to philosophy, politics, law, literature and even the Bible. The author, Steven Brams, shows that real insight can be obtained into optimal strategies for dealing with some famous dilemmas.

Game theory originated with John Von Neumann’s famous 1928 paper, elaborated into a classic 1944 book by Von Neumann and Oskar Morgenstern, Theory of Games and Economic Behavior. Von Neumann and Morgenstern showed that there are 78 structurally distinct 2x2 ordinal games: games in which two players are each given the option of two strategies, giving four states which can be ranked from best to worst.

There is much in this book to interest and attract. Brams is a professor of politics and does not fall into the trap of attempting to reduce complex dilemmas to oversimplified, meaningless games. Instead, he maintains the essential complexity of each situation and examines the possible moves in a commonsense manner,
revealing a richness of insight. There is plenty here to convince the sceptic that game theory is not just applied common sense, in particular the associated theory of moves (TOM), which allows players to change their strategies during a game on the basis of ‘backward induction’ (learning from initial outcomes).

Brams begins by surveying literary situations, from works such as Thelwell, Tosca and Sir Gawain and the Green Knight. Curiously, he skips lightly over detective fiction and classic games of move and counter move such as Holmes versus Moriarty. He concludes that the aspects of literature where game theory is relevant are those where a carefully constructed plot is uppermost, but that in much of literature human emotion and irrationality dominate proceedings, as in life.

The first intensive analysis is of Biblical dilemmas; specifically, Abraham’s decision to obey God and sacrifice Isaac. Should Abraham have defied God? Game theory suggests that this might have been productive. Brams later deals with Moses persuasion of God not to punish the Israelites for the golden calf. By making God a player in these games, Brams sheds a new light on God’s motives, allowing him to be scheming, manipulative, sometimes vengeful, but always a good player.

The biblical examples are followed by more complex dilemmas: the insoluble problem of achieving a fair division among competing goods, and how to resolve conflict by democratic means, including varied forms of voting.

Next up is the Law. We consider the game played between Nixon and the US Supreme Court, in the enforced disclosure of the White House tapes followed by Nixon’s resignation; then the conduct of the Supreme Court in the 1930s, when Roosevelt depended, not always successfully, on its delicate balance of votes to approve his New Deal.

Brams then turns to situations that involve frustration and anger, his literary examples being Macbeth’s dilemma as to whether to kill Duncan, and the strategy of withholding sex in Lyistrata. He looks at the aftermaths of wars including the Franco-Prussian war and the American Civil War to show that game theory generally supports Churchill’s maxim, ‘in victory, magnanimity’.

Finally, Brams looks at two-player games with incomplete information, and where each player is trying to learn more about the other. Two classic cases are the Cuban missile crisis, where Kennedy and Khurshchev managed to resolve the game satisfactorily (fortunately for the human race), while in the Iran hostage crisis Carter did not, because of his misperception of Khomeini’s motives. He finishes with Catch-22, and its many related parallels in the real world (e.g. the torture of witches to elicit confessions), and shows that 12 of Von Neumann’s games are varieties of Catch-22.

Brams ends by stating ‘Game theory and TOM will not, and should not, replace other modes of enquiry in the humanities’ but that they are ‘especially useful, and sometimes even indispensable, in elucidating the strategic role that conflict and cooperation play in human affairs’.

Peter Wadhams
DAMTP, Cambridge


If you enjoy solving sudoku-like puzzles this is the book for you, for among its pages you will find almost 100 puzzles that are sudoku-related – from traditional 9 × 9 puzzles to variations with such exotic names as Jigsaw Pi Sudoku, Worms, Just-What-I-Needed Sudoku, Argyle, Roku-Doku and Rainbow Wrap. Many of the sudoku patterns in this attractively presented book appear in full colour.

But the book is far more than an encyclopaedia of sudoku variations. After teaching the uninhibited how to solve such puzzles systematically, the authors clarify the underlying ideas and strategies in order to inspire and motivate their readers to appreciate what is meant by mathematical problem-solving. Using a range of sudoku-based puzzles as a vehicle, together with such familiar recreations as the four-colour problem, the 36 officers’ problem, and the bridges of Königsberg, they manage to introduce a whole range of related mathematical concepts, such as equivalence classes, modular arithmetic, matrices, graph colouring, polynomials, modular arithmetic, and groups of symmetries, explaining these with great clarity and persuading the reader of their relevance.

Particularly ambitious (and successful) is their chapter on counting, where their aim is to enumerate the number of different sudoku patterns. They begin with a careful analysis of the simpler problem of finding the total number of 4 × 4 sudoku patterns (called shidoku), and discover that of the 288 possible patterns, only three are ‘fundamentally different’. They then begin their attack on the 9 × 9 problem, where the notion of ‘fundamentally different’ is more tricky to explain, by finding the number of ways of filling in the first three rows, and then estimating the number of ways of completing the remaining six rows. Although the problem is too difficult to solve in full, they manage to convey a good understanding of its complexity, and their estimate of 6.6571 × 1021 is astonishingly close to the correct answer of 6,670,903,752,021,072,936,960.

The book is already slightly out-of-date. A central open question, as to whether there exist any uniquely completable sudoku patterns with only 16 given cells (there are many thousands with 17), was answered in the negative early in 2012.

The historical remarks that feature throughout the book are interesting and mainly accurate, with the exception of the Königsberg bridges problem, where the incorrect spelling ‘Königsburg’ appears throughout and where the authors fall into the common trap of claiming that Leonard Euler solved it by drawing a four-vertex graph representing the layout of the city; he didn’t – the graph didn’t appear until some 150 years later.

Apart from such infrequent lapses, this book is well written and provides an object lesson in how to present mathematical problem-solving to interested students. It can be warmly recommended.

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

“This lovely little book is one of the best the London Mathematical Society has published... This is a book that can – and should – both be read from cover to cover and dipped into... Dipping into it randomly one sees some of the quirks and oddities that make an important institution human” Peter M Neumann, Queen’s College Oxford.

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

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### CALENDAR OF EVENTS

This calendar lists Society meetings and other mathematical events. Further information may be obtained from the appropriate LMS Newsletter whose number is given in brackets. A fuller list is given on the Society’s website (www.lms.ac.uk/content/calendar). Please send updates and corrections to calendar@lms.ac.uk.

#### DECEMBER 2012

<table>
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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>3-7</td>
<td>Quantized Flux in Tightly Knotted and Linked Systems INI Workshop, Cambridge (416)</td>
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<td>11</td>
<td>From One to Many Geometries, Gresham College London</td>
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<tr>
<td>14-17</td>
<td>Thomas Harriot Seminar, St Chad’s College, Durham (412)</td>
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<tr>
<td>17-19</td>
<td>Aspects of Topology in Geometry and Physics, Oxford (419)</td>
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<td>17-20</td>
<td>Mathematics in Signal Processing IMA Conference, Austin Court, Birmingham (416)</td>
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<td>18-19</td>
<td>LMS Prospects in Mathematics Meeting, Manchester (420)</td>
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#### JANUARY 2013

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<tr>
<td>7</td>
<td>Analysis Day, Bristol (420)</td>
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<tr>
<td>7-11</td>
<td>Nonlinear Analysis UK-Japan Winter School, London (419)</td>
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<tr>
<td>7-11</td>
<td>Symmetry, Bifurcation and Order Parameters INI Workshop, Cambridge (418)</td>
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<tr>
<td>8-11</td>
<td>Statistical Mechanics and Extreme Events in Earth Science Conference, Reading (420)</td>
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<tr>
<td>16-18</td>
<td>British Postgraduate Model Theory Conference, Manchester (419)</td>
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<td>22</td>
<td>The Queen of Mathematics, Gresham College London</td>
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<td>30</td>
<td>Sheffield Probability Day, Sheffield (420)</td>
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<td>30</td>
<td>Winter Combinatorics Meeting, Open University (420)</td>
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#### FEBRUARY 2013

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<th>Date</th>
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<tr>
<td>19</td>
<td>Are Averages Typical? Gresham College, London</td>
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#### MARCH 2013

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<th>Date</th>
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<tr>
<td>1</td>
<td>LMS Mary Cartwright Lecture, London</td>
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**Christmas Offer:** 25% off & Free P&P 
(normaly £3 UK & Europe; £5 Rest of the World) 
£11.25 for LMS Members (inc P&P) 
£14.25 for non Members (inc P&P) 

Quote: "Christmas Offer": Valid for orders received by 21 December 2012. Order by 12 December In time for Christmas. Please note any orders received after 12 December will be dispatched by 1 January due to the holiday season.
LMS MEETING

LMS South West and South Wales Regional Meeting
and L-functions of Curves Workshop
held at the University of Bristol from 1 to 3 October 2012

Qing Lio (Bordeaux)
Congruence of models of elliptic curves

Abelian surfaces with Tate-Shafarevich
group of order 5 times a square