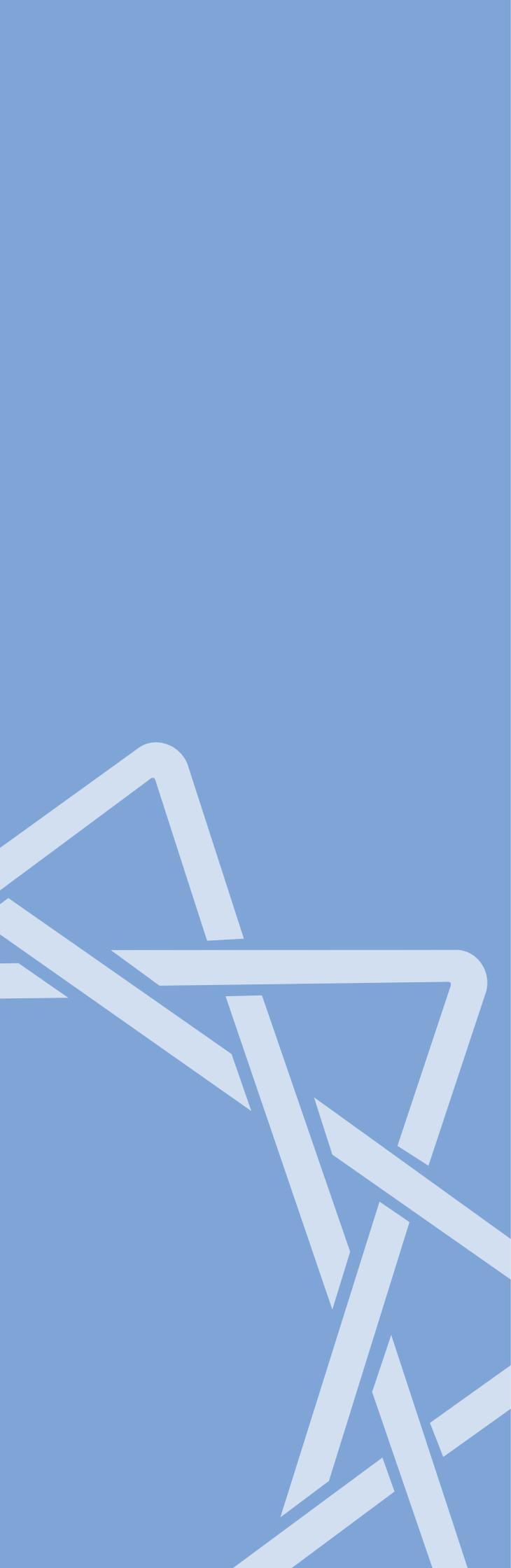
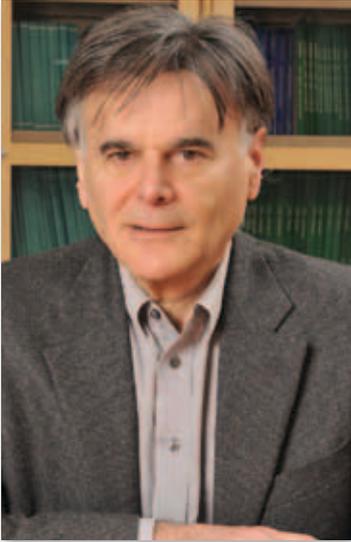


**LONDON
MATHEMATICAL
SOCIETY
ADVANCING
MATHEMATICS**



**ANNUAL
REVIEW
2012-2013**





WELCOME FROM THE PRESIDENT

Over the past year the Society has developed the foundations of its future strategy as well as continuing to engage with government, industry, academia, and the wider STEM community. We are committed to meeting the demands both of our members and of the mathematical sciences as a whole, and to do this as well as possible we have been working to formulate strategic priorities to guide us as we undertake our various activities: communicating and advancing mathematical knowledge, promoting research in all areas of mathematics, publicising its benefits, and at the same time ensuring the long-term sustainability of the mathematical research community.

We have a vital role as an influential independent voice in issues concerning both research and

education, with a new landscape for higher education and the development of a new National Curriculum dominating the agenda. Contributing the expertise of our members in these areas will always enhance the Society's reputation. The Deloitte report on the economic benefits of research in the mathematical sciences, published jointly by the Council for the Mathematical Sciences (CMS) and EPSRC, is a seminal document that has been well received by government, industry, academia and the wider mathematical sciences community. It demonstrates that the benefits of mathematical research to the economy and to society as a whole cannot be overstated; but they need constantly to be held before the public eye. To help with this, the Society is seeking to involve influential people who have an interest in mathematics but come from outside the world of academic mathematics – industrialists, entrepreneurs, and others from the cultural world.

Another major area of work for the Society has been in addressing the issues facing women in mathematics, and the loss of women from mathematics, particularly at the higher levels of research and teaching. As part of our Good Practice Scheme we published a ground breaking report on good practice in UK university departments. This, and other work by our Women in Mathematics Committee, continues to attest our commitment to helping bring about change.

In its other work the Society continues to provide substantial grants for all kinds of mathematics, with special schemes for young researchers, visiting lecturers, conferences and education. We can be very proud that once again our Popular Lectures attracted over 1000 in London and Birmingham, but we plan to extend and broaden our communication activities considerably. Part of this plan is the development and improvement of our website, the latest phase of which is well underway.

The Society has continued its work as part of the CMS, which is now seen in the world of decision-makers as the single authoritative body representing the mathematical sciences. This has been due in no small measure to its outgoing chair Frank Kelly and his brilliantly effective but sensitive work uniting the five constituent bodies on a number of major issues.

In 2015 the Society will celebrate its 150th anniversary, which is a proud moment for all those involved with it, past and present. Plans are being made for a series of events to mark this milestone in our history. One does not need to be nationalist to think that our history is illustrious, and rather humbling, and we must celebrate it with all the respect it deserves.

I have felt it an enormous honour and privilege to hold the office of President of the LMS over the past two years. The mathematics community has had to tackle quite a few important issues that will undoubtedly affect our subject in the long term, from post-16 education to research. The LMS must continue to be at the forefront in advising decision makers and securing a stable future for all who study mathematics or work in it. I have the greatest confidence that my successor Terry Lyons is the ideal person to steer the Society through the next chapter in its history, and that he will consolidate and develop further all its commitments. I wish him every success.

Graeme Segal
President, London Mathematical Society

About the LMS

The London Mathematical Society (LMS), founded in 1865, is the UK's learned society for mathematics. The Society has as its purpose the advancement, dissemination and promotion of mathematical knowledge in the UK and worldwide.

The Society's main activities include publishing journals and books, providing grants to support mathematics and organising scientific meetings and lectures. The Society also engages with government and other national policy makers on mathematics education and research, participating in international mathematical initiatives and promoting the discipline.

The Society receives its resources through publishing activities, investments and endowments. Providing funding in support of mathematical activities is one of the primary mechanisms through which the Society achieves its charitable aims, namely to 'promote and extend mathematical knowledge'. This is vital for the continued health of mathematics both as a distinct discipline and also as it impacts on other sciences and industry, and more broadly across society.



A strategy for the future

In February 2013, the LMS Council met for its biennial Retreat to review the strategic priorities of the Society. Many aspects of the Society were discussed and five main areas have since been agreed.

- To actively develop the Society's communications in its broadest sense and across all audiences.
- To undertake a review of the LMS grants portfolio.
- To further develop LMS programmes supporting young mathematicians and early career researchers.
- To undertake a review of the structure and content of Society meetings.
- To build a comprehensive database of evidence to support the Society's policy and communications work, advance discussions with government and provide resources to support and enable mathematicians and mathematics departments, making such data widely available on the Society's website.

Council will be considering how best to implement these priorities in liaison with the membership.



Impact and influencing

Mathematics is a crucial part of the infrastructure of a successful country. Its importance to industry and the economy is vast and demonstrable.

The London Mathematical Society (LMS), as part of the Council for the Mathematical Sciences (CMS), took part in the launch to mark the publication of a ground-breaking report by Deloitte on the economic benefits of mathematical science research in the UK. The CMS sponsored the prestigious launch at the House of Commons on Tuesday 4 June 2013, hosted by Andrew Miller MP, Dr Julian Huppert MP and Stephen Metcalfe MP.

The report, entitled *Measuring the Economic Benefits of Mathematical Science Research in the UK*, provides an independent study of the breadth of impact that the mathematical sciences have on the UK economy. It is the first study of its kind to provide quantitative insights into the value of mathematical research across all sectors and its far-reaching impacts. The report highlights the following key points.

- Mathematical research has facilitated around 10% of jobs in the UK (c.2.8 million) and 16% of the GVA contribution (c.£208 billion);
- the productivity of mathematical science occupations is double the UK average;
- UK mathematics accounts for 4% of world mathematics researchers, 6% of mathematical articles, 11% of mathematical citations and 14% of highly-cited articles.

As the full economic impact of a given piece of research may take many years to come to fruition, the study took into account the contribution of both contemporary and existing mathematics research.

The launch of the report brought together Members of both Houses and representatives from industry as well as key members of the mathematical sciences community in recognition of how mathematical sciences research is leading the way to UK economic growth.

The host MPs along with Professor Frank Kelly (Chair, CMS) and Professor David Delpy (Chief Executive, EPSRC) addressed the reception. The speakers reiterated the importance of mathematics research to the economy, the need to encourage the next generation of mathematicians and the value of continued dialogue between CMS, EPSRC and government.

Over 100 guests, from government, BIS, EPSRC, academia, industry (including a large representation from the financial services industry), and a range of other STEM organisations had the opportunity to engage on the issues raised in the report and other matters currently confronting the mathematics community.

The future of mathematics

As a major UK learned society it is vital that the Society's expertise and influence is brought to bear on decision making in a range of areas, from research and higher education, to schools and colleges, and the issue of open access publishing. To this end the Society continues to engage with government departments, Select Committees and other interested parties on the future development of mathematics at different levels in research and education, and other areas with respect to the discipline.

With major changes taking place in mathematics secondary education the Society has responded to a wide range of consultations – *Consultation on A-Level Reform* (Ofqual); *Reforming KS4 Qualifications*; *Reform of the National Curriculum in England*; *Reformed GCSE Subject Content Consultation* (Department for Education); *Review of A-Level Subject Content* (Joint Qualifications Council).

Open access publishing has been an area for increasing discussion over the past year and with the Society's interests

both as a publisher and also in representing its members and the wider mathematical community it is important to keep abreast of developments in this area. The Society has responded to the following consultations on the future course of open access: *Open Access* (House of Lords Science and Technology Select Committee); *Open Access* (Department of Business, Innovation and Skills); *Policy and guidance on open access* (RCUK). The Society also made a joint response with the IMA to HEFCE's invitation for advice on developing the four UK higher education funding bodies' joint policy on open access in the post-2014 Research Excellence Framework (REF). In addition to these consultation responses the Society's Research Policy Committee produced a guidance note on open access entitled *Open access: How it affects UK mathematical researchers*. This can be found at <http://goo.gl/tlv37>



Celebrating mathematics through the years

Celebrating 150 years

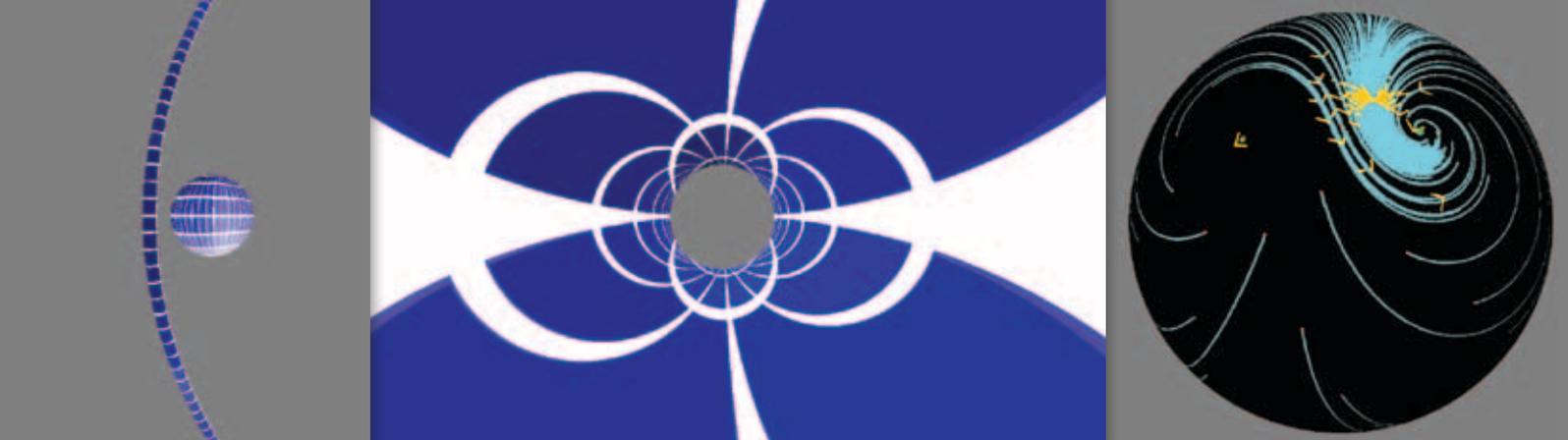
The Society was established in 1865 and in 2015 will be celebrating 150 years as the UK's learned society for mathematics. Through its publications, meetings and other charitable activities the Society has, over the years, helped to communicate historically decisive contributions in all areas of mathematics. Maxwell, Lord Rayleigh, Turing, Hodge, and other eminent mathematicians have all published in LMS journals.

A programme of events is being planned to celebrate this momentous anniversary. As part of this the Society is hosting a number of De Morgan Dinners. The purpose of these dinners is to assist the Society to formulate and elaborate its vision of how best to ensure the healthy development of the mathematical sciences in the future, for the sake of science itself as well as for the benefit of society as a whole. It is hoped that these dinners can build a community of external supporters who are willing to help the Society bring this vision to fruition. The inaugural De Morgan Dinner was held in July 2013 with further dinners planned leading up to and during the celebrations.

Maintaining a strong membership

The continued health of the LMS depends on maintaining and further developing a vibrant membership across a wide range of mathematical sciences and associated disciplines. With the changes to membership criteria the LMS is committed to broadening its membership base and ensuring the future of the Society.

Over the past year the Society has successfully introduced a network of LMS Representatives across the UK. There are now over 50 LMS Representatives, providing a link with the community at institutional level, encouraging membership of the Society, providing information on grants, and promoting the Society's many events and activities. The Representatives meet as a group each year at De Morgan House to hear information about the work of the Society from the various Officers, and to exchange ideas on how to improve communications across the network. The Society benefits from regular communications both to and from the Representatives, ensuring that the views and opinions of its members can be heard in a variety of ways.



Graphics from a student project funded by the LMS Undergraduate Research Bursary Scheme

Young mathematicians and early careers researchers

£200,000 for Postdoctoral Travel Fellowships

The Society is introducing a number of LMS 150th Anniversary Postdoctoral Mobility Fellowships to be launched in 2014-15. The Fellowships aim to assist postdoctoral mathematicians at a crucial and often difficult stage in their careers by offering support to travel and work away from their home institution, gaining valuable career experience in the process. The Society is committing £200,000 to the Fellowships over a two year period.

LMS/Clay Mathematics Institute Research Schools

During the year the Society and the Clay Mathematics Institute, together with support from the Heilbronn Institute, were pleased to announce the launch of a new programme of Research Schools, with the first School due to take place in June 2014.

The Research Schools will provide a breadth of training for young researchers in core areas of mathematics. Postgraduate students and postdoctoral researchers will have the opportunity to meet and interact with leading international experts as well as other young researchers, both from the UK and overseas, working in related areas.

Postgraduate student conference grants

The Society continues to provide support for conferences held in the United Kingdom, which are organised by and are for postgraduate research students. In 2012/13 the Society provided a total of 11 grants for conferences around the UK to the value of over £35,000. The conferences covered areas such as group theory, topology, algebraic geometry and the history of mathematics.

A presentation at the LMS South Wales and South West Regional Meeting

Young Researchers in Mathematics (YRM)

The YRM has been established as an important annual event for all UK mathematical science postgraduates. The Society supports the conference through its Postgraduate Conference Grant Scheme and each year the Society is represented at the meeting to promote membership and LMS activities. The 2013 conference was held in Edinburgh in June. The event in 2014 will be hosted by the University of Warwick.

LMS Prospects in Mathematics

The LMS Prospects in Mathematics symposium is now in its sixth year and aims to give final year undergraduate and MSc students an overview of the many and varied opportunities that exist for mathematical research at universities in the UK. The 2012 symposium was held in December at the University of Manchester and was attended by around 60 mathematics students from across the UK.

Undergraduate Research Bursaries

For the first time this year the Society ran a UK Undergraduate Research Bursary Scheme. The Bursaries offer undergraduate students the opportunity to experience what it is like to undertake a research project, in collaboration with a research supervisor, with the aim of encouraging them to consider a career in mathematics research. The Scheme this year was funded jointly with the Nuffield Foundation, and the Society will continue to solely fund the Scheme for at least a further two years.

Undergraduate receptions and meetings

Over the coming year the Society will offer funding for undergraduate mathematical societies at UK universities to host a mathematical speaker at one of their meetings and to promote awareness of Society membership to undergraduates. Those interested in these grants should contact lmsmeetings@lms.ac.uk



Delegates at the Postgraduate Combinatorial Conference, University of Warwick

Supporting the mathematical community

Over £540,000 for LMS research grants

The Society continues to support mathematics research and collaboration across the mathematical sciences community. In 2012-2013 the Society awarded £540,264 in grants, with £182,430 for mathematical conferences, £80,032 to support Joint Research Groups and Research in Pairs, and £29,293 to support academic visitors to the UK.

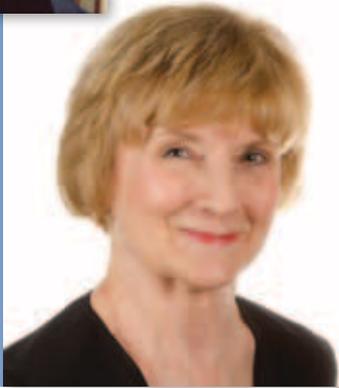
Over £72,000 for Society meetings and lectures

In 2012-2013 the Society produced a diverse programme of meetings for the mathematics community. The Mary Cartwright Lecture was presented by Professor Margaret Wright from New York University's Courant Institute of Mathematical Sciences. Professor Fedor Bogomolov (Courant Institute, NYU) was the 2013 LMS Invited Lecturer. He visited Edinburgh in June 2013 to give a series of lectures on *Birational Geometry and Galois Groups*.

Professor Robert McLachlan (Massey University) was the second holder of the LMS/NZMS Aitken Lectureship and during late September/ early October 2013 he gave talks on *Successes and Prospects of Geometric Numerical Integration* at Strathclyde, Warwick, Leeds, Cambridge and Bath universities.



LMS Invited Lecturer, Professor Fedor Bogomolov



Mary Cartwright Lecturer, Professor Margaret Wright

LMS Prizes: Celebrating success

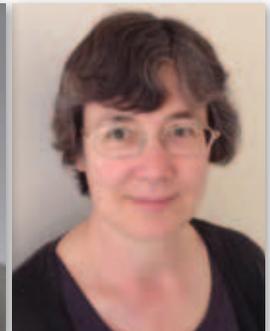
The LMS awards several Prizes each year for achievements in, and contributions, to mathematics. The Council for the Society announced the 2013 Prize winners at the Society Meeting held at De Morgan House on 5 July 2013. The awards will be presented at the Society's Annual General Meeting on 15 November 2013.



Professor John Thompson



Professor Nick Trefethen



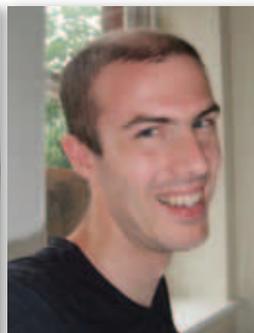
Professor Frances Kirwan



Professor Luis Alday



Dr Andre Neves



Dr Tom Sanders



Dr Corinna Ulcigrai

Congratulations go to all the prize winners.

De Morgan Medal

Naylor Prize and Lectureship

Senior Whitehead Prize

Whitehead Prize

Whitehead Prize

Whitehead Prize

Whitehead Prize

Professor John Thompson FRS, University of Cambridge

Professor Nick Trefethen FRS, University of Oxford

Professor Frances Kirwan FRS, University of Oxford

Professor Luis Alday, University of Oxford

Dr Andre Neves of Imperial College London

Dr Tom Sanders, University of Oxford

Dr Corinna Ulcigrai, University of Bristol

New journal for LMS

In March 2013, as part of its ongoing Publications strategy and in response to national initiatives on open access, the LMS launched a new open access journal, the *Transactions of the London Mathematical Society*. The new journal is on an exact par with the *Bulletin, Journal and Proceedings of the LMS* with whom it shares the same Editorial Advisory Board.

The policy of the Society is to provide as wide and varied a service as possible to the mathematics community. The belief is that open access is here to stay and the LMS must work with it in all its forms. By launching this journal the LMS is not promoting any particular cause and does not advocate one publishing payment model over another. The aim in setting up *Transactions of the LMS* is to complete a comprehensive range of options for all mathematicians: in particular to provide a service to those whose funders require them to publish in open access journals.



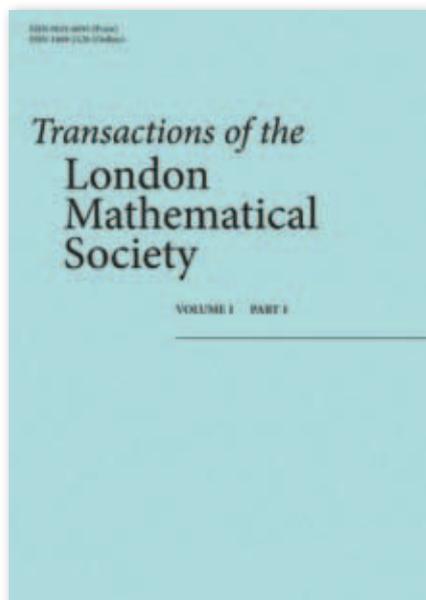
LMS members join MPs and other delegates at the launch of the LMS report, *Advancing women in mathematics: Good practice in UK university departments*

Supporting diversity

The LMS strongly supports advancing women's careers in mathematics. The LMS Women in Mathematics Committee has developed a Good Practice Scheme (GPS) with the aim of supporting mathematics departments in higher education interested in embedding equal opportunities for women within their working practices. The Scheme provides specific support for departments working towards Athena SWAN Award status.

As part of the scheme, the LMS Women in Mathematics Committee undertook a UK-wide survey of mathematics departments to collect examples of good practice and to benchmark departments on their working practices. The results of the survey were published in February in the report *Advancing Women in Mathematics: Good practice in UK university departments*, which was launched at the House of Commons – the first time the Society has hosted an event there – attended by a number of MPs, mathematicians, policy-makers and representatives of influential organisations. The launch event was hosted by Andrew Miller MP, Dr Julian Huppert MP and Stephen Metcalfe MP, with guest speaker Margaret Wright of the Courant Institute, New York University and Chair of the International Review of Mathematical Sciences 2010.

Feedback from departments involved in the survey has indicated the significance of the report in allowing them to assess themselves in relation to the national picture. This was the first report of its kind for mathematics in the UK and the Committee intends to build on the work of the survey and to continue to gather data and evidence to support the furthering of equality and diversity in mathematics.



LMS Women in Mathematics Day

The LMS Women in Mathematics Day is an annual event aimed, but not exclusively, at women mathematicians particularly students (including final year undergraduates) and those at an early stage of their career. Postgraduate students, postdoctoral researchers and research assistants are invited to participate in the event by giving a talk or presenting a poster. The event provides an opportunity to meet and talk with women who are active and successful in mathematics.

Women in Mathematics Day 2013 was a two-day event held in April at the Isaac Newton Institute in Cambridge. Sessions included talks by women mathematicians at different career stages. The Women in Mathematics Day 2013 was also supported by the Clay Mathematics Institute, the Isaac Newton Institute, and the University of Cambridge.

This year's event was enjoyed by over 100 participants, which is the best ever attendance. The participants heard presentations from mathematicians from the UK and abroad, including Professor Martin Hyland (University of Cambridge) and Professor Nalini Joshi (University of Sydney), who was funded by the Clay Mathematics Institute.

A series of discussion group also focussed on future careers in mathematics – taking the next steps, applying for funding, the working life of a mathematician. The event had very positive feedback in particular the importance of events like this in providing mentoring and networking opportunities for women.



Communications and external relations

The Society continues to promote the mathematical sciences to the wider scientific community and the public through a range of activities.

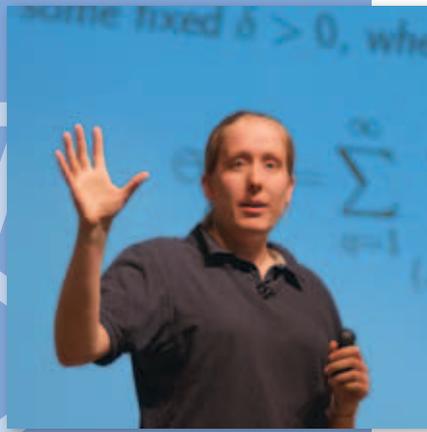
Liaising with other organisations

As part of its charitable objects the Society engages with a wide range of mathematical and other STEM organisations on areas of common interest for the STEM community, including collaborating on conferences and meetings, policy issues, careers and public engagement.

In 2012-2013 the Society has worked with, among others, the Isaac Newton Institute (INI), International Centre for Mathematical Sciences (ICMS), Heads of Departments of Mathematics (HoDoMs), British Mathematical Colloquium (BMC) (and its Scientific Committee), Joint Mathematical Council (JMC), Parliamentary & Scientific Committee, Foundation for Science & Technology, the Royal Society, Science Council, British Science Association, Campaign for Science & Engineering (CaSE), IMU Development Fund, Mathjax development and the Maths Careers website. As well as its partners in the Council for the Mathematical Sciences (CMS): the Institute of Mathematics and its Applications (IMA); the Royal Statistical Society (RSS); the Edinburgh Mathematical Society (EMS) and the Operational Research Society (ORS).



Maths Inside leaflets produced in collaboration with the Royal Society



Dr Vicky Neale and Professor Ray Hill present the Popular Lectures

LMS Popular lectures

The Society has continued to build on the previous successes of the LMS Popular Lectures with over 800 people attending the 2013 lectures at the Institute of Education in London and over 300 at the Birmingham event. The Popular Lectures present exciting topics in mathematics (and its applications) to a wide audience. Each year, two lecturers are featured who have been chosen for their mathematical distinction. The lectures are suitable for all who have an interest in mathematics and are a free annual event held during either June or July in London and repeated in late September at one other UK venue; for the past few years, this has been Birmingham.

This year's lectures were presented by Professor Ray Hill (University of Salford) – *Mathematics in the Courtroom* and Dr Vicky Neale (University of Cambridge) – *Addictive Number Theory*.



The success of the LMS Popular Lectures continues to grow

1,000 and counting

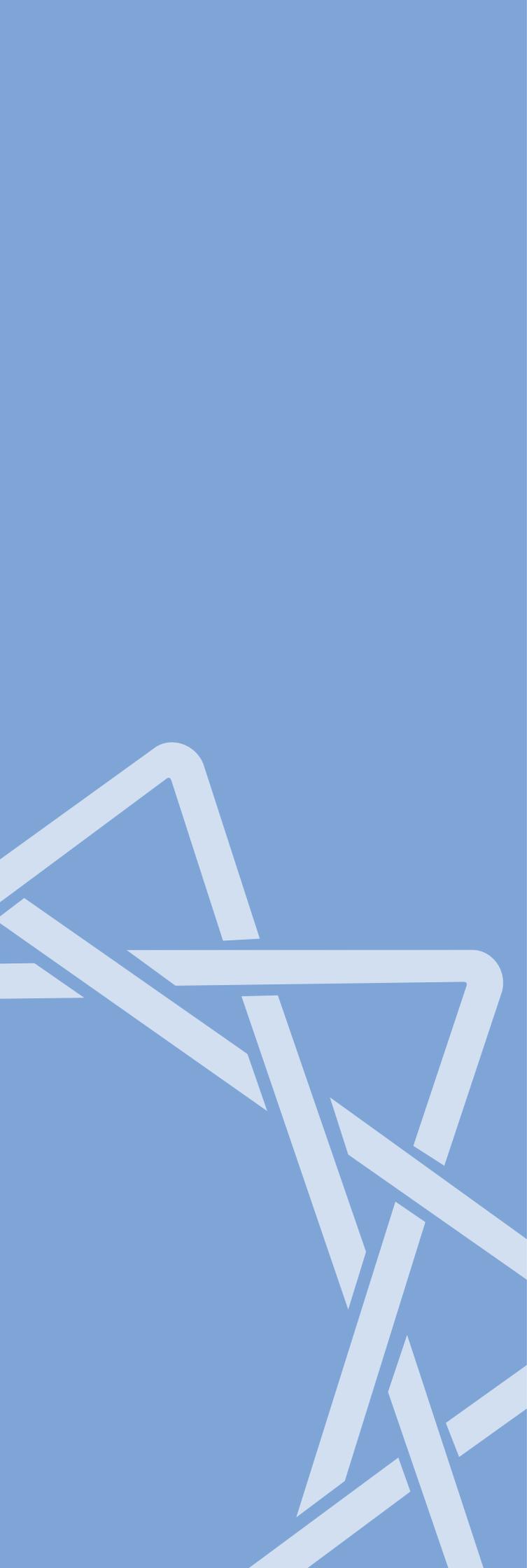
Over 300 people visited De Morgan House as part of the annual London Open House event. Since first participating in Open House over 1,000 people have visited De Morgan House, learning about the Society and mathematics more generally.

At this year's event visitors were given a short tour of selected rooms in the building by LMS staff and Open House volunteers. As well as discussing the architectural features of De Morgan House and its place in the history of Bloomsbury, the event is an opportunity to publicise LMS activities and visitors left with a range of publications including the Annual Review and information about Membership, Grants and Women in Mathematics.

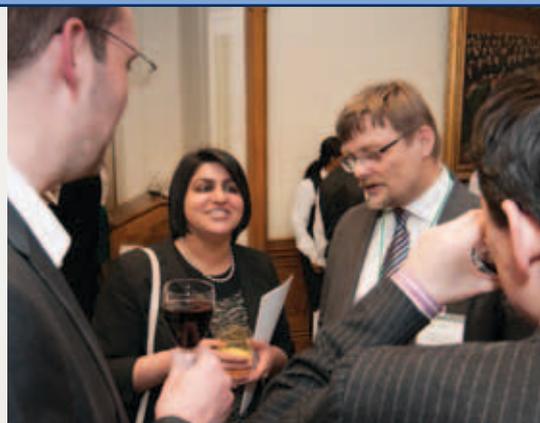
The feedback from visitors was again very positive and the LMS will continue to develop its presence at the event.



LMS headquarters: De Morgan House is a popular attraction for Open House visitors



For more information on
all LMS activities visit:
www.lms.ac.uk



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