ANNUAL ELECTIONS TO LMS COUNCIL

The Nominating Committee is responsible for proposing slates of candidates for vacancies on Council and vacancies on its own membership. The Nominating Committee actively welcomes suggestions from the membership.

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

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

Nominations should be received by Friday 2 May 2014 in order to be considered by the Nominating Committee.

In addition to the above there exists the option for members to make direct nominations for election to Council or to the Nominating Committee. Direct nominations must be sent to the Executive Secretary’s office (nominations@lms.ac.uk) to arrive before noon on 1 September 2014. Nominations can be submitted in hard copy or via email. All nominations must bear the signatures of the nominator and three seconders and of the nominee. For hard copy, a letter with the relevant names and signatures is sufficient or submissions can be made via a form available from the LMS website at http://tinyurl.com/q28lrvp. For email submissions nominations and statements from seconders must be sent from a verifiable email address to nominations@lms.ac.uk. Members considering making a direct nomination are asked to bear in mind the desirability of Council being balanced with regard to
the full range of mathematical specialisms, UK regions and gender-balance.

The slate proposed by the Nominating Committee, together with other direct

dominations received up to that time,

Further nominations will be posted onto
the website as they are received.

**MATHEMATICS POLICY ROUND-UP**

**February 2014**

**RESEARCH**

**New CEO for EPSRC**

The Minister for Universities and Science, David Willetts, has an-
nounced the ap-

pointment of Pro-

fessor Philip Nelson

as the next Chief

Executive and Dep-

uty Chair of the

Engineering and

Physical Sciences Research Council (EPSRC).

Professor Nelson is a leading figure in the

academic community and joins EPSRC on

secondment from the University of South-

ampton, where he was until recently Pro

Vice- Chancellor. Professor Nelson takes up

his role at the beginning of April for a four

year appointment. More information is avail-
able at http://tinyurl.com/nldhulf and

http://tinyurl.com/pj43t2w.

**New post for outgoing EPSRC Chief Executive**

Professor David Delpy will take up the

post of Defence Scientific Advisory Council

Chair from 1 April 2014.

The Defence Scientific Advisory Council (DSAC) is a non-departmental public body of the Ministry of Defence consisting of

world-renowned scientists and engineers from UK industry and academia. It is the main source of independent advice on non-nuclear science, technology, engineer-

ing, analysis and mathematics issues to

ministers and senior MOD officials.

**HIGHER EDUCATION**

**Inquiry into international STEM students**

The House of Lords Science and Technol-

ogy Select Committee has undertaken an

inquiry into the effect that immigra-

tion rules may be having on internation-

al students. The deadline for responses
was 20 February 2014. A report will be

published in due course. More informa-
tion is available at http://tinyurl.com/oIs50ih.

**SCHOOLS AND COLLEGES**

**National Curriculum reform at Key Stage 4**

The LMS has responded to the consult-

ation on draft programmes of study for

mathematics at Key Stage 4. The response is

available on the LMS website at http://
tinyurl.com/pbt7q4xw.

**Ofqual consultation on new A-level regulatory requirements**

The Advisory Committee on Mathemat-

ics Education (ACME) has published a

response to the Ofqual consultation. In

this response, ACME sets out:

• priorities and objectives of AS and A lev-
el qualifications in mathematics
• the need to improve the validity of as-

essment at A level
• the need for flexibility within AS/A level

Mathematics and Further Mathematics
• concerns with the timescales and trans-
parency of the A level reform process
• detrimental impacts that reform could

have upon the uptake of AS and A level

Mathematics and Further Mathematics

The full response is available at http://
tinyurl.com/4s5xwJ.

**Policy statement on post-16 core mathematics qualifications**

The Department for Education has published a policy statement on the in-

troduction of post-16 ‘Core Mathematics’ qualifications in response to ACME’s inde-

pendent Expert Panel on Core Mathemat-
ics report (October 2013). ACME welcomes the introduction of these new qualifica-
tions and in principle supports the breadth of measures outlined in this paper. In
general they are consistent with the rec-

ommendations for post-16 mathematics qualifications and their implementation that ACME proposed in two recent reports.

The time scales outlined for the develop-

ment of these qualifications are, however, ambitious. More information is avail-
able at http://tinyurl.com/pb0x3m.

**Making Education Work**

A recent report urges the government to
radically overhaul the way the current

school curriculum is developed to ensure it

better meets the needs of the future
economy. The report, Making Education

Work, follows a six-month review of

England’s education system by an inde-
pendent advisory group consisting of

prominent business leaders and chaired

by leading academic Professor Sir Roy

Anderson. The report’s key recommenda-
tions are:

• a cross-party body should ensure the

school curriculum is aligned with the fu-
ture economy;
• A-levels should be slowly replaced by a

Baccalaureate system; and
• the importance of interpersonal skills

should be recognised and evidenced.

The report is available at http://tinyurl.
.com/o9qm64h.

**OTHER**

**Aspires project: Final report**

The Science Aspirations and Career Choice: Age 10–14 project was a five year lon-
gitudinal study, funded by the Economic

and Social Research Council (ESRC) as part of their Targeted Initiative on Science and Mathematics Education (TISME). The project started in 2009 and has been based

at King’s College London. One of the main objectives of the project was to investigate some of the factors influencing the educa-
tional choices made by children in this age
group. Particular interest focused on the influence of peers, parents and schools, and on the role gender, class and ethnicity play in shaping these choices. The final report is available at http://tinyurl.com/p36ilo8.

Inequality in skills
Social class background is still exerting a powerful influence on the skills of England’s adults, according to a new study from the Institute of Education (IOE) in London.

It shows how England’s exceptionally large attainment gap carries on into adulthood and demonstrates that the gulf between the highest and lowest achievers in literacy and numeracy is wider than in the great majority of the 24 countries recently surveyed by the OECD. The only countries with more unequal scores in numeracy are France and the US. The report is available at www.llakes.org.

Dr John Johnston
Joint Promotion of Mathematics

OSTROWSKI FOUNDATION

The Ostrowski Prize for 2013 has been awarded to Yitang (Tom) Zhang, lecturer in mathematics at the University of New Hampshire, for his ground-breaking work on the Twin Prime Conjecture.

The aim of the Ostrowski Foundation is to promote the mathematical sciences. It provides a prize for recent outstanding achievements in pure mathematics or theoretical foundations of numerical mathematics.

The prize has been awarded every two years since 1989. The most recent winners are Ben Green and Terence Tao (2005), Oded Schramm (2007), Sorin Popa (2009) and Ib Madsen, David Preiss and Kannan Soundararajan (2011). Visit the website www.ostrowski.ch/index_e.php?ifile=preis for the complete list and further information about the prize.

The Leverhulme Trust

Philip Leverhulme Prizes in Mathematics and Statistics

Philip Leverhulme Prizes recognise the achievement of outstanding early career researchers whose work has already won international recognition and whose future is exceptionally promising. In 2014 there are thirty prizes available across six broad subject areas, with up to five prizes offered for researchers in Mathematics and Statistics.

Prizes offer £100,000 over two or three years and may be used for any purpose that advances the prize-winner’s research, with the following exceptions: salary costs for the prize-winner, capital costs, and institutional overheads.

To be eligible, applicants must hold a post in a UK university or research institution and must have received their highest degree no earlier than 14 May 2004 (exceptions will be considered where applicants have had a career break).

Applications must be nominated by their head of department (or equivalent). Full details of the nomination process are available on the Leverhulme Trust website.

Closing date: 4pm on 14 May 2014

Guidance and nominations: Full scheme details and the online nomination form are available on the Leverhulme Trust website: www.leverhulme.ac.uk.

LMS–CMI RESEARCH SCHOOLS
CALL FOR PROPOSALS


Up to £31,000 is available per Research School which provides training for young researchers in a core area of mathematics. The new series of courses builds on the short courses, previously supported by the Society and EPSRC, and aims at the highest international standing by allowing for support of both international lecturers and participants.

The LMS and the CMI intend to support four Research Schools in 2015.

Prospective organisers should send an outline proposal to Elizabeth Fisher (Research.Schools@lms.ac.uk) by Tuesday 1 April 2014.

Outline proposals should discuss:

- The general mathematical area of the proposed Course and its importance.
- The aims of the Course, its appropriateness to the Instructional Course programme and the likely level of demand for the Course.
- The names and affiliations of the lecturers, titles of their courses and brief syllabuses.
- The provision for tutorial support.

Outline proposals should be no more than two A4 sides in length.

For further details about the Research Schools, please visit the Society’s website: www.lms.ac.uk/events/lms-cmi-research-schools.

Before submitting: Organisers are welcome to discuss informally their ideas with the Chair of the Research Meetings Committee (RMC.Chair@lms.ac.uk).

These Research Schools are co-sponsored by the Heilbronn Institute.
LMS 150TH ANNIVERSARY POSTDOCTORAL MOBILITY GRANTS
2014-15 Awards

The London Mathematical Society is pleased to announce the launch of a new grants scheme to celebrate its 150th anniversary in 2015. Up to £19,200 will be awarded to mathematicians of excellent promise. The purpose of the grants is to support a period of study and research in mathematics between three and six months in the academic year 2014–15 at one or more institutions other than the holder’s home institution. They are intended to support promising researchers during the transitional period between having submitted their thesis and the start of their first post-doctoral employment. The value of the grant will be calculated at £1,200 per month plus a travel allowance of up to £2,000.

At the time of the closing date applicants have to be UK residents. Successful candidates must have submitted their thesis within twelve months before the start of their grant period. Grant holders are allowed to teach up to three hours a week. Otherwise they are expected to spend their working time on study and research.

Candidates are asked to provide with their application:

• a completed application form
• a cover letter;
• a CV including a list of publications (maximal two A4 pages);
• a research proposal including a rationale for the choice of institution(s) to be visited (maximal three A4 pages);
• at least two letters of reference, which should be emailed by referees directly to the LMS (to the email address below) by the closing date;
• and letter(s) of support from the host(s) at the institution(s) where the proposed visit will take place; it is expected that host institutions provide the grant holder with office space and access to computing and library facilities.

These grants have been established by the LMS to mark its 150th anniversary. They will be awarded for the academic years 2014–15 and 2015–16.

Applications should be sent by Friday 25 April 2014 preferably by email to: pmg@lms.ac.uk.

(Posted applications will be accepted and may be sent to: Katy Henderson, Postdoctoral Mobility Grants, The London Mathematical Society, De Morgan House, 57–58 Russell Square, London WC1B 4HS.)

Queries should be referred to Katy Henderson: pmg@lms.ac.uk, tel.: +44 (0)20 7927 0809.

Applicants will be notified of the outcome of their application in late May 2014.

LMS WOMEN IN MATHEMATICS DAY 2014

The Women in Mathematics Day is an annual event organised by the London Mathematical Society. This year it will be held on Friday 25 April at De Morgan House in London. As usual, sessions will include talks by women mathematicians at different career stages and a poster session. There will also be a number of practical sessions to help women get the most out of their careers in mathematics. Sessions will include advice on how to get funding for your first postdoc and beyond and discussion groups on topics such as combining family and career, working overseas and making the next step in your career.

The event provides an opportunity to meet and talk with women who are active and successful in mathematics.

The event is open to all but would be of particular interest to women mathematicians, particularly PhD students and those at an early stage of their career.

Any postgraduates, postdocs or research assistants interested in giving a talk or presenting a poster at the meeting should contact Eugenie Hunsicker (e.hunsicker@lboro.ac.uk) by 28 March 2014.

To encourage high quality posters, a £50 book token will be awarded for the poster that is judged to be the WiM Day Best Poster 2014.

Programme

10.30-11.00 Registration and Coffee
11.00-13.00 Morning Session
Welcome from LMS President
Sarah Hart (Birkbeck College) Counting in Coxeter Groups
Katia Babbar (Lloyds) Quantitative Finance in Practice: a Mathematician on the Trading Floor
Anne Juel (University of Manchester) Confining bubbles in small spaces: Instabilities and Pattern Formation on the pore scale
13.00-14.00 Lunch and Poster Session
14.00-16.00 Afternoon Session
Postgraduate/Postdoctoral speakers
Funding talk (EPSRC)
Discussion groups
16.00-16.30 Tea and end of Poster Session

Participants are invited to join us for dinner at a local restaurant after the event. If you would like to attend please confirm when you register. The dinner will be at participants’ own cost.

The event is free for students and speakers and £5 for all others, payable on the day.

Limited funds are available to help with the travel costs of students attending the event, please email womeninmaths@lms.ac.uk for further details.

Register by 11 April 2014 by emailing womeninmaths@lms.ac.uk (late registrations for places may be accepted, subject to availability).
2013 Cecil King Travel Scholarship

Report

I used the 2013 Cecil King travel scholarship to visit Mark Gross at the University of California, San Diego, from mid-September to mid-December 2013. The purpose of the trip was to mimic Mark’s expertise with a view towards solving a problem in constructing so-called ‘affine manifolds’ from degenerating Calabi-Yau manifolds, a problem which arises in mirror symmetry. It was my plan to focus especially on the relatively well-understood case of families of Calabi-Yau surfaces.

During discussions with Mark I was able to couch the problem, in dimension two, in terms of a problem in the birational geometry of algebraic limits for the degeneration. If experts in that subject are able to address this question, it will solve the problem of constructing affine manifolds and solutions thereupon to a real Monge-Ampère equation on surfaces. This approach is also suggestive of a more general relationship between ‘tropical geometry’ and the minimal model programme, a path I hope to investigate more in future.

Quite apart from any research goals that were achieved during my visit, I was able to form a friendly professional relationship with Mark Gross, a figure of substantial importance in this field. Further, I have secured the Hodge fellowship, which will fund me to work at the IHÉS with Maxim Kontsevich for the next two years. I am most grateful to the Cecil King foundation and to the LMS for having afforded me this opportunity.

Andrew MacPherson
Imperial College London

Easter School “Dynamics and Analytic Number Theory”
LMS Northern Regional Meeting Followed by Series of Minicourses

Durham University, 31 March – 4 April 2014

We invite PhD students and researchers from both areas of analytic number theory and dynamics to attend the Easter School. This event will be a good opportunity to learn methods and to exchange ideas in these two areas.

Accommodation and meals will be provided.

Invited Speakers:

Tim Austin (Courant, NYU)
Yann Bugeaud (Strasbourg)
Manfred Einsiedler (ETH Zürich)
Giovanni Forni (Maryland)
Alex Kontorovich (Yale)
Sanju Velani (York)
Trevor Wooley (Bristol)

Organisers: D. Badziahin (Durham) A. Ghosh (UEA) A. Gorodnik (Bristol)
N. Peyerimhoff (Durham) T. Ward (Durham) B. Weiss (Tel Aviv)

More information and application procedure:
http://www.maths.dur.ac.uk/users/dzmitry.badziahin/2014_Easter_school/easter_index.html
E-mail: dzmitry.badziahin@durham.ac.uk

www.demorganhouse.org.uk

De Morgan House offers 40% discount on room hire to all Mathematical charities and 20% to all not for profit organisations. Support the LMS by booking your next London event with us.

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

The LMS-WIMCS Analysis Day was held at the Cardiff School of Mathematics on 15 January 2014. The meeting, generously co-supported by the LMS, was a much-awaited opportunity by the Welsh analysts to catch up on their latest academic achievements. Analysis in Wales has seen several years of growth, thanks to the influx of researchers seeking to establish themselves as the lifeblood of the next generation in Welsh mathematics. We feel that we will reflect the mood of the day by saying that everyone was very much looking forward to something of a summary of this recent push for new heights, and to a programme for further action. The efforts of the organisers and the support of the LMS and the WIMCS (Wales Institute for Mathematical and Computational Sciences) were well rewarded by a show of unity and by the participants’ positive outlook into the future.

There were four speakers, Elaine Crooks from Swansea, Ralf Gohm and Sergey Rogosin from Aberystwyth, and our ‘overseas’ guest from Bath, Johannes Zimmer. The topics chosen for talks covered a good range of analysis disciplines: rigorous asymptotic analysis of systems of reaction-diffusion equations (Crooks), functional models and liftings of linear contracting maps (Gohm), Wiener-Hopf factorisations for matrix functions (Rogosin) and microscopic-to-macroscopic descriptions of thermodynamic systems (Zimmer). Each of the talks combined a good beginner introduction into the relevant subject and a highlight of two or three cutting-edge results, which we think all the participants much appreciated. As a result no one was feeling left out of the event: the coffee breaks and the lunch saw PhD students as well as more senior colleagues all having excited discussions about the contents of the talks. The scientific programme was followed by a dinner at the Bellini’s restaurant, where the friendly atmosphere of the day was sealed by a few toasts to the speakers, participants and the organisers.

This workshop is one of a series of three events (Cardiff in January, Aberystwyth in May, Swansea in September), where the described format will be implemented. We all very much look forward to the second meeting in May, and welcome everyone to join us. Please contact Vitaly Moroz (v.moroz@swansea.ac.uk) for further details. Finally, many thanks to the LMS for their continued support of this initiative.

Kirill Cherednichenko
Marco Marletta
Cardiff University

INTERFACES BETWEEN NUMERICAL ANALYSIS AND COMPUTATIONAL STATISTICS WORKSHOP
Report

On 15 January 2014 the University of Southampton hosted an LMS workshop on the Interfaces between Numerical Analysis and Computational Statistics. The list of attendees included numerical analysts and statisticians from various UK institutions (Imperial, Oxford, Southampton, St Andrews, UCL and Warwick) and from abroad (Geneva), with the total number of attendees being around 25.

In the last few years there has been a significant number of advances arising from research at the interface of statistics and numerical analysis. Prime examples of the results of such a synergy include both the analysis and design of improved algorithms used in the field of Markov chain Monte Carlo (MCMC) methods. The aim of this workshop was to further promote dialogue between the two disciplines. In particular, the workshop programme comprised three talks on the topics of numerical analysis of stochastic differential equations, Bayesian Inverse problems and MCMC methods, in the following order of appearance:

Konstantinos Zygalakis (University of Southampton) on Numerical Analysis on Ergodic Stochastic Differential Equations described some recent results relating to the long time behaviour of numerical solutions to ergodic SDEs and their possible connections with the behaviour of MCMC methods in high dimensions.

Andrew Stuart (University of Warwick) on Gibbs Sampling on Hierarchical Inverse Problems discussed various issues related with trying to recover a signal from indirect noisy observations using the hierarchical Bayesian approach, and the effect of the choice of the hierarchical parameters on the Gibbs sampler when the dimension of the signal to be recovered is large.

Mark Girolami (University of Warwick) on The Potential of Differential Geometric Sampling Methods for Bayesian Inverse Problems described his recent work on Riemannian manifold Langevin and Hamiltonian Monte Carlo methods and discussed their potential for improving MCMC methods for challenging problems arising from applications such as for example parameter estimation in Systems Biology.

The presentation slides from all the three talks are available to download from the organizer’s website (www.personal.soton.ac.uk/kz1e11/workshop.htm). The broad range of topics offered the attendees different viewpoints on many things that they were familiar with in their own research, while the relaxed atmosphere of the workshop allowed time for discussions not only during the coffee break but also in between talks. The end of the talks was followed by a drinks reception as well as a dinner that provided attendees with more opportunities for socializing.

We thank the LMS and the University of Southampton for their generous support, which made this event possible.

Konstantinos Zygalakis
University of Southampton
Claire Voisin  
(CNRS and École Polytechnique)  
*Points, zero cycles, and rationality questions*  

**ABSTRACT**  

A very classical question in algebraic geometry is whether a given smooth projective variety is rational, that is, birationally isomorphic to projective space, or to give necessary criteria for rationality. Assuming we work over the complex numbers, this is very restrictive on the geometry of the considered variety seen as a complex manifold. Still, if we restrict to the so-called rationally connected varieties, proving that $X$ is non rational is delicate. I will describe classical and more recent methods to approach this problem.

The British Mathematical Colloquium will take place in the School of Mathematics, Queen Mary, University of London, from 7 to 10 April 2014. The first talk will start at 15:30 on Monday 7 April, and the last talk will end at 12:30 on Thursday 10 April. To register, visit www.maths.qmul.ac.uk/bmc2014/registration.
Model theory emerged as a subdiscipline of mathematical logic around the middle of the twentieth century, but since the seminal work of Shelah in the 1970s it has come into its own, growing from strength to strength and finding applications in areas as diverse as arithmetic geometry, tame topology and integrable systems, to mention but a few. The fundamental notion of model theory is that of first-order definability. Whilst the restriction to first-order expressibility might appear a priori to be an overly burdensome restriction, it turns out to sit in the compelling zone between too little and too much strength, and the techniques developed to investigate it have yielded some very deep results, notably Hrushovski’s systematic proof of – and improvement on – the Mordell–Lang conjecture.

The annual British Postgraduate Model Theory Conference (BPGMT), which rotates each January between Leeds, Oxford and Manchester, is now firmly established in the European model-theory calendar. This, the fourth instantiation of BPGMT, saw a return to Leeds, where it began three years ago. The conference took place from 13 to 15 January 2014 and was attended by over thirty-five participants from a wealth of different countries and institutions. The majority of the talks were given by postgraduate students, but there were also three plenary talks and a short course, as well as three postdoctoral talks.

The first two postgraduate talks had a combinatorial flavour, looking at permutation groups and then indivisibility. The opening morning also saw the first of three lectures in a short course by Professor Dugald Macpherson (Leeds) on Vapnik–Chervonenkis density, a notion originally developed in statistical learning theory that has recently found applications in model theory. The rest of the day’s talks focused more on pure aspects of model theory, in particular the notion of NTP2. This topic formed the core of the first plenary talk of the conference, where Professor Martin Hils (Paris 7) spoke about the preservation of NTP2 in valued difference fields. The evening finished with a poster session and wine reception, which saw live music from some multi-talented postgraduate mathematicians, as well as Leeds’ very own maestro pianist, Professor John Truss.

The second day of the conference saw a number of algebraically and geometrically themed talks on the topics of quasiminimal pregeometry classes, K-theory, modules of semi-algebraic functions, and Cartan subgroups. The day’s talks ended with Professor Paola D’Aquino (Caserta), who spoke about exponential polynomials. After a chance to go back to the hotel, meet in the pub or even play some mathematical Pictionary, everyone reconvened for the conference dinner, which took place at Hansa’s Gujarati Restaurant, an award-winning vegetarian restaurant that lived up to its reputation for excellent food and service.

The two postgraduate talks on the final day had a field-theoretic theme, which was continued by Professor Françoise Point (Mons/Paris 7) in the final plenary talk of the conference. The meeting finished with two postdoctoral talks, one about internality and analysability in groups and the other on clones and clausal relations. The final day also saw the announcement of the award for Best Talk by a PhD Student, as judged by Dr William Anscombe (Leeds) and Dr Immanuel Halupczok (Leeds), which was awarded to Silvain Rideau (Orsay) for his talk *Analytic difference fields: Elimination of field quantifiers and the Ax–Kochen–Eršov principle.*

The conference provided a useful opportunity for students to meet one another and discuss their research. The atmosphere of the meeting was one of congeniality and optimism: model theory is a burgeoning subject and it is a very exciting time to be a model theorist!

The conference was supported by an LMS Postgraduate Research Conference Scheme 8 grant and a BLC guarantee. Slides, posters and other materials can be found on the conference’s website: www1.maths.leeds.ac.uk/~bpgmt2014/.
**BOUNDED GAPS BETWEEN PRIMES**

**LMS-CMI Research School**

**Oxford 22-26 September 2014**

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

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

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

These lecture courses will be supplemented by tutorial sessions.

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

**Applications:** Research students, post-docs and those working in industry are invited to apply. The closing date for applications is 15 June 2014. For further information, please visit the website: www.lms.ac.uk/events/lms-cmi-research-schools.

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

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

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

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**ALGEBRAIC LIE THEORY AND REPRESENTATION THEORY**

**LMS-CMI Research School**

**Glasgow 25-29 August 2014**

Organisers: Gwyn Bellamy (Glasgow) and Simon Goodwin (Birmingham)

**Course outline**

The school is aimed at PhD students and early postdocs wanting to learn about topics in algebraic Lie theory and representation theory that are currently of great interest. The three main courses are:

- *Rational Cherednik Algebras.* (Iain Gordon, Edinburgh)
- *Quiver Hecke Algebras.* (Andrew Mathas, Sydney)
- *Categorification in Lie Theory.* (Catharina Stroppel, Bonn)

These lecture courses will be supplemented by tutorial sessions. For further information please visit: www.maths.gla.ac.uk/~gbellamy/summer.

In the following week there will be a workshop at ICMS in Edinburgh with the same title, see www.icms.org.uk/workshop.php?id=299.

**Applications:** Applications should be made using the registration form available at: www.surveymonkey.com/s/GG2Y6DN. Research students and post-docs are invited to apply. Applications from those working in industry are welcome, please contact the organisers for further information. Participants are encouraged to also apply to participate in the ICMS workshop and should indicate this in their application. The closing date for applications is 11 April 2014. Numbers will be limited and those interested are advised to make an early application.

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

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

All early career researchers will be charged a registration fee of £250. There will be no charge for subsistence costs.

All UK-based participants must pay their own travel costs. For overseas-based participants, support will be available to contribute towards travel costs.

Fees are not payable until a place on the course is offered but will be due by 30 June 2014.

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

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

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

Horizon 2020

The EU’s new programme for research and innovation has been approved by the European Parliament. It will run from 2014 until 2020 with a budget of about 70 billion. More information at http://ec.europa.eu/research/horizon2020/

Under ‘Excellent Science Priority’ one can find the most suitable opportunities for mathematics. In particular, we point out the Marie Skłodowska-Curie Actions (MSC), the European Research Council (ERC) and Future Emerging Technologies (FET).

First calls of HORIZON 2020 are expected to be published either at the end of 2013 or early in 2014. The tentative deadlines for submission of proposals to MSC actions are as follows.

• Innovative training networks (ITN): 8/04/2014
• Individual fellowships (IF): 10/04/2013
• Co-funding of regional, national and international programmes (COFUND): 18/11/2014

Mathematics has its own evaluation panel. The distribution of the budget of the call over the disciplines will be proportional to the number of eligible proposals received in each panel. Hence, we strongly encourage brilliant researchers to apply.

Calls for Starting, Consolidator, Advanced and Proof of Concept Grants published by the ERC are expected to have as deadlines 25/03/2014, 3/06/2014, 21/10/2014 and 28/04/2014, respectively. [Slightly adapted from EMS e-News, 9 Nov 2013]

Meeting of EMS Presidents

The European Mathematical Society is extremely grateful to the Turkish Mathematical Society for its invitation to hold the next Meeting of Presidents in Istanbul. The meeting will take place in the Rectorate Conference Hall of Boğaziçi University. Details will be available at the website www.euro-math-soc.eu.

[Source: EMS Newsletter, Editorial, Dec 2013, p 3]

King Faisal Prize

Gerd Faltings, Director at the Max Planck Institute for Mathematics in Bonn and Professor at the University of Bonn, was awarded the 2014 King Faisal International Prize for Science for his groundbreaking contributions to algebraic geometry and number theory. This was announced by the president of the King Faisal Foundation, Prince Khaled Al-Faisal, on 14 January 2014. Previous prize-winners within mathematics are Michael Atiyah (1987), Dennis P. Sullivan (1994), Andrew J. Wiles (1998), Yuri I. Manin and Williston Shor (2002), Simon Kirwan Donaldson and Mudumbai Seshachalu Narasimhan (2006), and Enrico Bombieri and Terence Chi-Shen Tao (2010). For details see www.mpim-bonn.mpg.de/de/node/5144.


ERC Consolidator Grants

The European Research Council (ERC) has selected 312 top scientists in its first Consolidator Grant competition. These mid-career scientists are awarded a total of nearly €575 million. Grants are worth up to €2.75 million each, with an average of €1.84 million per grant. Twelve of these grants went to European mathematicians. For details see http://tinyurl.com/48k4q.


Oberwolfach Prize, John Todd Award and Heinz Gumin Award 2013

The Oberwolfach Prize 2013 for excellent achievements in Stochastics and Statistics is awarded to Hugo Duminil-Copin (Genève). The John Todd Award 2013 for excellent achievements in Numerical Analysis is awarded to Markus Bachmayr (Aachen). Stefan Müller (Bonn) has been awarded the Heinz Gumin Preis of the Carl Friedrich von Siemens Stiftung for his groundbreaking contributions to the calculus of variations and to elliptic regularity theory which were often motivated by innovative applications in the theory of solid mechanics.

VISIT OF CLAIRE POSTLETHWAITE

Dr Claire Postlethwaite (Department of Mathematics, University of Auckland, New Zealand) will be visiting the UK in late April/early May 2014. Her interests include the dynamical systems of ODEs and applications to modelling of biological systems. She will give lectures at:

• University of Leeds on 29 April host Alastair Ruckledge (A.M.Rucklidge@leeds.ac.uk)
• University of Exeter on 6 May host Peter Ashwin (P.Ashwin@exeter.ac.uk)
• University of Nottingham on 14 May host Paul Matthews (Paul.Matthews@nottingham.ac.uk)

For more details of the visit and lectures, please check the departmental websites and/or contact the hosts. The visit is partially supported by an LMS Scheme 2 grant.

VISIT OF IGOR ANDRIANOV

Professor Igor Andrianov (RWTH Aachen University, Germany) will visit the UK in March 2014. He is an expert in applications of analytical, predominantly asymptotic, techniques to the solution of problems arising in applications of structural and continuum mechanics. During his visit Professor Andrianov will give lectures at:

• Loughborough University, Wednesday 19 March at 1.30 pm
  Asymptotic methods in thin-walled composite materials
• Brunel University, Thursday 20 March at 4 pm
  Analytical homogenization approach in the theory of plates and shells
• Keele University, Wednesday 26 March at 2.30 pm
  Asymptotic homogenization and nonlinear elastic waves in periodic structures

Further details about the visit can be obtained from Aleksey Pichugin (aleksey.pichugin@brunel.ac.uk). The visit is supported by an LMS Scheme 2 grant.

ATIYAH85

A one-day meeting will be held at the Mathematical Institute in Oxford on Tuesday 22 April 2014 to celebrate the 85th birthday of Sir Michael Atiyah OM and the publication by OUP of a seventh volume of his collected works. The speakers are expected to include:

• Robbert Dijkgraaf (Princeton)
• Sergei Gukov (Caltech)
• Nigel Hitchin (Oxford)
• Graeme Segal (Oxford)

Please contact Frances Kirwan (kirwan@maths.ox.ac.uk) if you would like to attend the meeting.

THE MATHEMATICS OF BRAIN DYNAMICS

The meeting The Mathematics of Brain Dynamics will take place in the School of Mathematics at the University of Birmingham on Tuesday 8 April 2014. The focus of the meeting will be on the important role that mathematics has to play in determining the functional roles of brain oscillations and rhythms. The speakers are:

• Peter Ashwin (University of Exeter)
• Marc Goodfellow (University of Exeter)
• Jaroslav Hlinka (Academy of Sciences of the Czech Republic)
• Zoe Kourtzi (University of Cambridge)
• John Terry (University of Exeter)
• Yulia Timofeeva (University of Leeds)
• Kyle Wedgwood (University of Nottingham)

There is a £10 registration fee. Some funding is available to contribute to the travel expenses of research students. For more information, including how to register, see the meeting website http://web.mat.bham.ac.uk/R.Nicks/meeting.

or email Dr Christian Korff (Christian.Korff@glasgow.ac.uk) with subject line ‘ICFT2014’.

The meeting is supported by the Institute of Physics and an LMS Conference grant. There is some limited funding available to support PhD students. Participants with childcare responsibilities should be aware of the supplementary grants offered by the LMS and IoP.

INTEGRABLE MODELS, CONFORMAL FIELD THEORY

The 18th UK meeting on Integrable Models, Conformal Field Theory (ICFT) and Related Topics will take place at the School of Mathematics & Statistics, University of Glasgow from 11 to 12 April. The series of ICFT meetings in the UK was initiated with the following objectives in mind:

• to promote the cohesion between UK researchers working in areas related to quantum integrable models;
• to give young academics (PhD students and postdocs) the opportunity to present their results and thereby allow them to establish themselves within the community;
• to showcase recent developments within the field by inviting international speakers and, thus, to relate UK research to developments on the international level.

The meeting will start around lunch time on Friday 11 April and close on Saturday afternoon 12 April 2014. The invited speakers are:

• Olaf Lechtenfeld (Leibniz Universität Hannover)
• Neil O’Connell (University of Warwick/Trinity College Dublin)
• Vincent Pasquier (CEA Saclay)

Further details of the meeting can be found at http://abrochier.org/cqi2014/ and anyone interested is welcome to attend. Funds may be available to support the attendance of research students, please contact one of the organisers Misha Feigin (Misha.Feigin@glasgow.ac.uk), tel. 0141 330 6293. The meeting is supported by an LMS Scheme 3 grant and the Glasgow Mathematical Journal Trust.

CLASSICAL AND QUANTUM INTEGRABILITY

The next meeting of the LMS collaborative workshop series on Classical and Quantum Integrability will take place from 21 to 22 March 2014 at the University of Glasgow. The speakers are:

• Sergey Oleinik (Nottingham)
• Robbert Dijkgraaf (Princeton)
• Neil O’Connell (University of Warwick)

Moduli spaces of flat connections and quantization of Lie bialgebras

Chen homological connection for G-spaces

Reflection quantum Knizhnik-Zamolodchikov equations and Bethe vectors

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LMS NEWSLETTER http://newsletter.lms.ac.uk

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Automatic forms are present in almost every area of modern number theory. In recent decades there has been a starburst of activity and progress in this broad area, leading to many new directions, applications, and connections with other areas within mathematics and mathematical physics. The purpose of the research school is to provide graduate students and early career researchers with training on some topics that are having great impact on current research in automorphic forms, allowing them to make new connections, with areas related to their current research programs and with other researchers. The school will be comprised of three 2-day intensive mini-courses, each team-taught by a pair of experts, and supplemented by afternoon problems sessions.

- Explicit Methods for Modular Forms and L-functions (John Cremona, University of Warwick and Tim Dokchitser, University of Bristol)
- The Legacy of Ramanujan (William Duke, UCLA and Ozlem Imamoglu, ETH Zurich)
- The Langlands Program (James Cogdell, Ohio State University and Solomon Friedberg, Boston College)

For further information please visit: www.maths.bris.ac.uk/~mamjd/bb/index.html.

Applications: Research students, post-docs and those working in industry are invited to apply. The closing date for applications is 15 March 2014. Numbers will be limited and those interested are advised to make an early application. Applications should be made using the registration form available via the Society's website at: www.lms.ac.uk/events/lms-cmi-research-schools and applicants should have a letter of support sent to the organisers at: eu.us.afw.2014@gmail.com.

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

Financial support: There is some support available for travel and local costs; requests for support should be indicated on the application form.

Fees: Registration for a graduate student is £150, and for an early career researcher it is £250, although these fees may be lowered or waived as is appropriate. Fees are not payable until a place on the course is offered but will be due by 15 May 2014.

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

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

The LMS is the UK’s learned society for mathematics. Registered charity no. 252660 (www.lms.ac.uk) The CMI is charitable private operating foundation, incorporated in the USA.
LMS INVITED LECTURER 2014
Professor Jouko Väänänen
(University of Helsinki and University of Amsterdam)
14–17 April 2014
University of East Anglia

Games, trees and models: This is a new approach to mathematical properties of uncountable structures. We relate it to certain transfinite games, mathematics of trees, and a branch of model theory called stability theory.

Foundations of mathematics and second order logic: The role of second order logic is a source of a lot of debate in the area of foundations and philosophy of mathematics. In this topic we give a mathematical approach to second order logic, using methods from the first topic, and discuss a foundational and philosophical interpretation of the results.

The mathematical theory of dependence and independence: A topic introduced by Väänänen in his 2007 monograph Dependence Logic. The general methodology introduced in the previous two topics is used to analyse dependence and independence concepts throughout mathematics with applications to computer science, and a number of other fields of science, where dependence and independence concepts have a crucial role.

There will also be supplementary lectures by:
- S. Abramsky (Oxford)
- J. Bagaria (ICREA, Barcelona)
- M. Dzamonja (UEA)
- D. Isaacson (Oxford)
- P. Galliani (Clausthal University of Technology)
- P. Welch (Bristol)

Lectures on April 14 will take place in London, other lectures in Norwich. University accommodation will be available. Limited financial support is available with preference given to UK research students. Please contact the organisers for further details: M.Dzamonja@uea.ac.uk

For further details on the 2014 Invited Lectures please visit: www.uea.ac.uk/~h020/Jouko.html

GEOMETRY DAY V

Geometry Day V is a one-day conference focusing on recent results in Geometric Analysis. It will take place on Friday 9 May 2014 at King’s College London. The speakers are:
- Andrea Malchiodi (University of Warwick)
- Laurent Hauswirth (University Paris-Est Marne-la-Vallée)
- Theodora Bourni (Free University, Berlin)
- Pablo Mira (University of Cartagena)

Everybody is welcome to attend the meeting as well as the dinner scheduled to take place afterwards. If you would like to attend, contact James Mabbett (james.1.mabbett@kcl.ac.uk) with your name, email address and institution. Indicate whether you are interested in attending the dinner for which there will be a nominal fee. Further information can be obtained from the website at http://tinyurl.com/o7je8h. The meeting is supported by an LMS Conference grant.

WALES MATHEMATICS COLLOQUIUM 2014

The Wales Mathematics Colloquium is a forum for the promotion and discussion of current research in Mathematics in Wales. The principal themes of the colloquium in 2014 are codes, networks and mathematical biology, but there will be other talks covering a wide range of topics in pure and applied mathematics. The meeting will be held at Gregynog Hall, Tregynon, near Newtown, Powys, beginning with tea at 4 pm on 19 May and finishing after lunch on the 21 May 2014. Invited speakers are:
- Simon Blackburn (Royal Holloway)
- An Introduction to random network coding
- Combinatorics and network coding
- Christina Cobbold (Glasgow)
- The mathematics of biodiversity

and
- How do organisms cope with heterogeneity?

The meeting is organised by mathematics departments of universities in Wales in conjunction with the Wales Institute of Mathematical and Computational Sciences, and most participants will be staff or research students from those universities. Any others who would like to attend will be very welcome. The registration fee is about £200, to include all meals and accommodation. Please note that the organisers are unable to give financial support to outside participants. Owing to limited accommodation, places will be allocated on a first come, first served basis. If you are interested, contact S. Williamson (administrator@wimcs.ac.uk) or visit the website www.wimcs.ac.uk/gregynog.html for an application form.

The meeting is supported by an LMS Conference fund and the Gregynog Fund.

SIR DAVID WALLACE LECTURE

The Department of Mathematical Sciences at Loughborough University is launching a new series of annual lectures in Mathematics intended for a wide audience, including PhD students and mathematics undergraduates. The Sir David Wallace Lecture is named after the Vice-Chancellor of Loughborough University (1994-2006). The first Sir David Wallace Lecture will be given by:

Sir Michael Atiyah (Edinburgh)

Solitons in Analysis, Geometry and Physics

The lecture will take place in room T003 at Loughborough University on 13 March 2014 at 5.15 pm. Enquiries should be sent to Catherine Wright (C.Wright@lboro.ac.uk). For further information visit the website at www.lboro.ac.uk/departments/maths/news/sir-david-wallace-lecture.html.
CELEBRATING 50 YEARS OF THE APPLIED PROBABILITY TRUST

The Applied Probability Trust and the Royal Statistical Society present the

50th Anniversary
Journal of Applied Probability special lectures

Sir John Kingman
Applied Probability and applied probability; now, then and in the future

Dan Crisan (Imperial)
Classical and modern results in the theory and applications of stochastic filtering

Alexander Gnedin (Queen Mary)
A survey of lambda-coalescents

Wednesday 9 April 2014, 2–5pm

The lectures will take place at
The University of Sheffield
Hicks Building
Lecture Theatre 7
Hounsfield Road, UK

For further information, please contact Sue Boyles by email s.c.boyles@sheffield.ac.uk or visit
http://www.appliedprobability.org

JOINT SOCIETY MEETING
with
The Royal Meteorological Society

Blackett Laboratory, Lecture Theatre 1, Imperial College London,
South Kensington Campus, London, SW7 2BW

Wednesday 16 April 2014 at 2pm

THE MATHS OF PLANET EARTH

Speakers:
Chris Budd (University of Bath)
Tamsin Edwards (University of Bristol)
Chris Jones (The University of North Carolina)
Ted Shepherd, FRMets (University of Reading)
Emily Shuckburgh (British Antarctic Survey)
John Taylor (DAMTP, University of Cambridge)

Mathematics has always played a crucial role in modelling the weather and climate. Today, scientists and policy makers are demanding ever-more detailed information from simulations of the Earth system, and our strategy for model development requires concomitant advances in mathematics. The international programme 'Mathematics of Planet Earth 2013 (MPE2013)' is devoted to advancing research programmes in all areas of environmental and biological modelling in which maths plays a crucial role, and the organizers hope that the initiative will have a lasting impact.

In this Society Meeting of the LMS, in collaboration with the Royal Meteorological Society (www.rmets.org) presentations will be made by those who have been involved with MPE2013 in the fields of weather, climate and environmental prediction. This meeting will focus on Earth observation and Earth system modelling, and will discuss how improvements in models, and the optimal exploitation of observations, depends on advances in mathematics.

This meeting is sponsored by The Grantham Institute for Climate Change, an Institute of Imperial College London, and the London Mathematical Society. Non-members are welcome to attend these meetings. Where seating capacity is limited, priority will be given to members.
BRITISH APPLIED MATHEMATICS COLLOQUIUM 2014
Cardiff University: 28-30 April 2014

Plenary Speakers
- Martine Ben Amar (Ecole Normale Supérieure, Paris) - Morphogenesis and Embryogenesis
- Helen Byrne (University of Oxford) - Angiogenesis under the Microscope: New Mathematical Perspectives on an Old Problem
- Michael Graham (University of Wisconsin at Madison) - The Stewartson Lecture
- Drag reduction and the Dynamics of Turbulence in simple and Complex Fluids
- Ross McPhedran (University of Sydney) - Ruling the Waves: from Photonic Crystals to Metamaterials
- Alfio Quarteroni (Ecole Polytechnique Federale de Lausanne and Politecnico di Milano) - The Challenge of Complexity in Numerical Simulations

Public Lecture
- Mary Lou Zeeman (Bowdoin College) - Harnessing Math to Understand Tipping Points in Climate and Sustainability

Further details on registration and submission of abstracts may be found on the BAMC website: http://mathsevents.cf.ac.uk/bamc2014/. Deadline for Early Bird registration is 1 March 2014. The colloquium is supported by an LMS Conference grant.
Assistant Professor of Mathematical Finance

The Department of Mathematics (www.math.ethz.ch) at ETH Zurich invites applications for the above-mentioned professorship. The research activities should be related to Mathematical Finance, for example computational and/or statistical and/or probabilistic aspects of quantitative finance and risk management. Duties of this position include an active participation in the teaching of courses for students of mathematics, natural sciences and engineering. The successful candidate holds a PhD degree and has demonstrated the ability to carry out independent research. It is expected to collaborate with colleagues and industry and to teach undergraduate level courses (German or English) and graduate level courses (English).

This assistant professorship has been established to promote the careers of younger scientists. The initial appointment is for four years with the possibility of renewal for an additional two-year period.

Please apply online at www.facultyaffairs.ethz.ch

Applications should include a curriculum vitae, a list of publications, and a statement of your future research and teaching interests. The letter of application should be addressed to the President of ETH Zurich, Prof. Dr. Ralph Eichler. The closing date for applications is 15 April 2014. ETH Zurich is an equal opportunity and family friendly employer and is further responsive to the needs of dual career couples. In order to increase the number of women in leading academic positions, we specifically encourage women to apply.
OBITUARY

HEINI HALBERSTAM

Professor Heini Halberstam, who was elected a member of the London Mathematical Society on 25 November 1954, died 25 January 2014 in Champaign, Illinois, aged 87.

Harold Diamond writes: Born in Brux, Czechoslovakia, Heini came to Britain in the Kindertransport program in 1939. With the care and support of Anne Welsford, Heini attended University College, London, where he earned his PhD degree in 1952 under the direction of T. Estermann. In 1987, he was elected a Fellow of University College.

After positions in Exeter, Royal Holloway, and Dublin, Heini moved in 1964 to Nottingham, which he served as Department Head and Dean of Faculty. Heini came to the University of Illinois in Urbana-Champaign in 1980, where he served at times as Department Head and retired as an emeritus professor in 1996. He also held several visiting positions.

Heini’s research ranged over several areas of analytic number theory, most importantly, sieve theory. His conjecture with P.D.T.A. Elliott about the distribution of prime numbers in arithmetic progressions is one of the outstanding open problems in this area. Heini was an author of several influential research monographs. Sequences, with K.F. Roth, made accessible such areas as sums of integers from given sequences and the probabilistic method of Erdős and Renyi. Sieve Methods, with H.E. Richert, provided accounts (some for the first time) of important work of Brun, Selberg, Rosser-Iwaniec, and J.R. Chen. A Higher Dimensional Sieve Method grew out of his research with Richert and H. Diamond.

Heini supervised 14 PhDs and many masters students and post-docs; several of whom are now distinguished number theorists. He also was a force for mathematical education in both Nottingham and the U.S.

Heini was active in the LMS and served as a Vice President and as Secretary of the LMS Journal. Also, he was a long-time member and a Fellow of the American Mathematical Society. He was on the editorial board of several journals and wrote over 150 Mathematical Reviews. Heini edited or co-edited the collected mathematical papers of W.R. Hamilton, H. Davenport, J.E. Littlewood, and L.K. Hua, and he co-edited the proceedings of two conferences.

Heini’s first wife, Heather, died in 1971. He is survived by his second wife, Doreen, who lives in Champaign, IL; by two children living in the U.S.; by two children and two step children in Britain; and by eight grandchildren, all in Britain.

REVIEWS


The introduction of Beautiful Mathematics describes, in concise, literary, stirring prose, precisely the sorts of sentiments that any self-respecting mathematician wishes would go into a text on mathematics, and are particularly essential to a book intended for a wide audience. From the introduction:

“My approach to mathematics is as an art form, like painting, sculpture, or music.....As with other arts, mathematical ideas have an aesthetic appeal that can be appreciated by those willing to investigate.”

“Who should read this book? I believe that there is something new in it for any mathematically-minded person.”

Unfortunately, the introduction was by far the most enjoyable part of the book. The eloquence of the introduction was replaced with a dry textbook manner that at times could be quite misleading (though mostly not outright incorrect); topic selection was a hodgepodge of topics that, contrary to the claims of the introduction, were of random difficulty, and with no connection between one idea and the next; no sense of the relative importance of the mathematical concepts (deep ideas treated on equal footing with mere diversions); and only a half-hearted attempt to provide at most one additional source for each topic (and frequently no sources for additional reading were provided).

Any potential reader is cautioned not to read the book sequentially from cover to cover. This is decidedly the wrong (and a most incredibly painful) way to read this book. It would be much more pleasant as an “encyclopaedia-like” experience, where the casual mathematically sophisticated reader simply opens the book at a random page, dips in and enjoys whatever they happen to find there. And the book does contain a lot of interesting tidbits.

However, the book does not come across as a book for a wide audience. It would be a challenging book for a mathematician instructor to use as a reference as it is very hard to search for particular topics (one needs to look at the table of contents by title only, and the index is unusable as the page numbers have nothing whatsoever to do with the pages of the book), very little cross-referencing of ideas, and no way to find where the cross-referencing takes place.

Furthermore, there is a bias in problem selection toward combinatorial problems and high school Euclidean geometry, and away from probability, statistics, group theory, and applied math problems in general (which is fine if the book was being sold as what the author finds interesting, but not if the book is meant to range over the spectrum of modern day mathematical thought).

The book is also not geared for the mathematically unsophisticated reader. Descriptions were uneven in quality, and though for the most part correct, they could be misleading and frustrating to follow. In general, (and especially when the author tries to prove something as he does frequently throughout the book) the book is written with more mathematical sophistication in mind than is usually possessed by the average high school or beginning college student.

I suspect that the book (as is true alas for many books) was written with the author alone as the intended audience. Assuming this to be the case, it is best to sell the book for what it is; the author’s personal scrapbook of mathematical bits he finds interesting or exciting.

In short Beautiful Mathematics is a promising premise tripped up by lack of focus and execution.

Owen Patashnick
Bristol University

EMMY NOETHER’S WONDERFUL THEOREM

The deep relationship between the symmetries of a physical theory and conserved quantities is a cornerstone of modern theoretical physics. The fact that translational symmetries result in conservation of momentum, and rotational symmetries give rise to conservation of angular momentum was known to Jacobi, but these ideas were radically extended by Emmy Noether who in 1918 published a ground breaking paper which gave a precise and general relationship between symmetries and conservation laws for differential equations arising from critical points in the calculus of variations.

Given the wide range application of these ideas and the generality of the results obtained by Noether it is astonishing that it is only in the last 50 years that this work has taken centre stage, although even today the extent of her contribution is not always fully appreciated (see The Noether theorems. Invariance and conservation laws in the twentieth century by Yvette Kosmann-Schwarzbach [1] for more details). As someone who has taught undergraduate courses on Lagrangian mechanics and the Calculus of Variations I have always been disappointed by the absence of a suitable undergraduate
He then goes on to generalise the earlier proof of extremal and shows how this condition results in the Euler-Lagrange equations. The enthusiasm of the author for the subject matter is obvious and the style is very readable with many examples of real and interesting physical problems that can be formulated in terms of an extremal problem. Strong features of the book are the exercises at the end of each chapter together with the more wide ranging ‘questions for reflection and discussion’ which would be very useful to someone teaching this subject.

Part II looks at ‘When Functionals are Invariant’ and goes on to prove (part of) Noether’s first theorem showing that if a functional is invariant under an infinitesimal transformation then the extremal solutions give rise to conserved quantities. The natural mathematical language to describe such symmetries would involve looking at Lie groups, one-parameter subgroups, flows generated by vector fields and Lie derivatives. Presumably because of the intended audience the author adopts a direct calculation approach which avoids these concepts. In my opinion this is a pity since these ideas are central to applications of symmetry to physics and would help to clarify many of the calculations.

Section III extends the ideas of the earlier sections to the multiple-integral functionals required for field theory. The author derives the Euler-Lagrange equations for fields and explains why a space-time conservation law for fields takes the form of a conserved current and that this becomes an equation of continuity when written as an evolution equation for a conserved density in three-dimensional space. He then goes on to generalise the earlier proof of Noether’s theorem based on the Rund-Trueman identity to show that invariance of an extremal leads to the existence of a conserved current constructed from the momentum and the Hamiltonian tensor. The direct calculational approach is less effective here as the physical meaning of the Hamiltonian tensor is not explained. In Chapter 7 the concept of gauge invariance is introduced and it is shown how this naturally leads to the notion of covariant derivative and Yang-Mills fields. This is the appropriate setting for Noether’s second theorem which covers gauge invariance and leads to differential identities in the form of vanishing covariant divergences (such as the contracted Bianchi identities in General Relativity). These ideas are hinted at towards the end of the chapter but not really developed. The book ends by looking at invariance in phase space and introducing the idea of invariance and conserved quantities in quantum mechanics.

Despite the title this book does not provide a historical account of the Noether theorems, nor a comprehensive account of the underlying mathematics (for these the reader should turn to [1] and [3]). Instead it provides a very readable and concrete introduction to symmetry and invariance in physics with Noether’s (first) theorem providing a unifying theme. The transition from student lecture notes to published book has perhaps been too rapid and has resulted in a lack of precision as well as misprints and errors. However the style of writing is very engaging and conveys the enthusiasm of the author for teaching students about the calculus of variations, classical field theory, and how invariance leads to conserved quantities. The book contains many interesting examples as well as excellent exercises and used carefully would form the basis of an exciting course aimed at final year Mathematics and Physics students.

References
LMS-FUNDED MEETINGS

LMS-WIMCS Analysis Day
held at the Cardiff School of Mathematics on 15 January 2014
(report on pages 10–11)

Interfaces between Numerical Analysis and Computational Statistics Workshop
held at the University of Southampton on 15 January 2014
(report on page 11)