

Newsletter

No. 10
May
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Longitude Found!

On 21 March, **Dr Rebekah Higgitt** (University of Kent), gave a wonderful public talk at INI on the theme of longitude as part of the Cambridge Science Festival. Her talk, *Longitude Found!* explained how 250 years ago, the men of the Board of Longitude sat around a table to discuss how to spend life-changing sums of government money with tales of challenges, rewards, skull-duggery and sailors lost at sea. The talk was illustrated with a variety of beautiful images from the National Maritime Museum collections (where Higgitt was a curator for 5 years).

The complete seminar is available to download or view online at <http://sms.csx.cam.ac.uk/media/1935784>.

Cambridge University Library contains over 63,000 images in its digital Longitude collection and is available to consult online at <http://cudl.lib.cam.ac.uk/collections/longitude>.



Dr Rebekah Higgitt (above) reveals the fascinating story of longitude to a packed seminar room (left)



A series of orthogonal polynomials

Between 6–14 January, Barry Simon from CALTECH (California Institute of Technology), gave a series of 8 talks during the *Periodic, Almost-Periodic, and Random Operators Instructional School* which is part of the INI programme *Periodic and Ergodic Spectral Problems*. The talks were aimed at an audience primarily consisting of graduate students and recent Ph.D recipients. The talks by Simon were so popular that an overflow space had to be set up in the adjacent seminar room in order to not disappoint those who had arrived to watch the lectures. Other mini lecture series were given by David Damanik (General spectral properties of ergodic operators), Abel Klein (Random operators: multiscale analysis), Frederic Klopp (Random operators: many body problems), Peter Kuchment (Introduction to periodic operators), Christoph Marx (One-dimensional quasi-periodic Schrödinger operators) and Alexander Sobolev (Periodic operators: the method of gauge transform). An additional public evening lecture by Barry Simon on 12 January entitled *Tales of our Forefathers* provided an historical context for the programme.

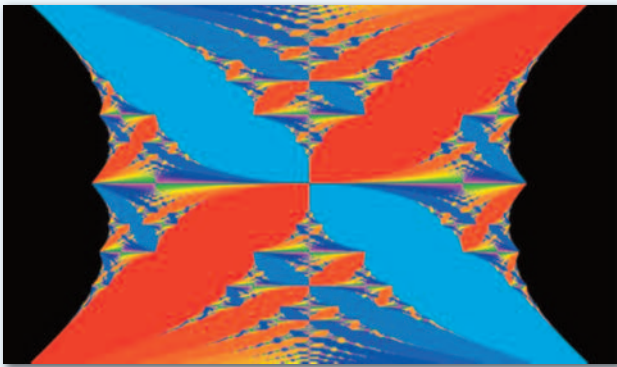


Also in this issue

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Current and recent scientific programmes update

Periodic and Ergodic Spectral Problems (Jan–Jun 2015)



The aim of this programme is to bring together researchers working on periodic, almost-periodic, or random spectral problems and related fields.

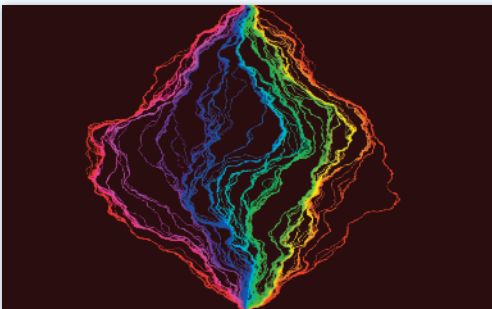
The programme started on January 5 with a well-attended introductory instructional school on ergodic operators, featuring mini-courses, each consisting of 6-8 lectures, by D Damanik, A Klein, F Klopp, P Kuchment, C Marx, B Simon and A Sobolev. The topics of these mini-courses were spread equally between periodic, almost-periodic, and random operators. An additional evening lecture *Tales of our Forefathers* by Barry Simon provided an important historical context for the programme.

Over the course of the 6-month programme INI will host over 90 scientists with backgrounds in various areas of mathematics, mostly in analysis, probability or dynamical systems. To facilitate the interaction of these scientists, there are 2 or 3 weekly informal seminars and regular social events, in addition to the instructional school and three workshops, focusing correspondingly, on periodic, almost-periodic, and random problems, two of which were already held. Several working groups have been formed for an intensive study of select topics.

The last two months, May and June are going to be the busiest. Many more participants are scheduled to visit INI with even more working groups operating during this period. We plan to organise the Rothschild lecture by Leonid Pastur in May. The programme will be finished by the workshop *Random and Other Ergodic Problems* at the end of June.

As a result of the interactions at the Institute, many of the participants are developing collaborations and starting joint research projects that are expected to last long beyond the life-span of the programme.

Random Geometry (Jan–Jul 2015)



A new frontier has emerged at the interface between probability, geometry, and analysis, with a central target to produce a coherent theory of the geometry of random structures. The principal question is the following: within a given structure, what is the interplay between randomness and geometry? More precisely, does the geometry appear to be random at every scale (i.e. fractal), or do fluctuations “average out” at sufficiently large scales? Can the global geometry be described by taking a suitable scaling limit that allows for concrete computations?

Spectacular progress has been made over the last ten years in this domain. The goal of the programme is to gather experts from probability, geometry, analysis and other connected areas, in order to study aspects of this question in some paradigmatic situations. Topics of particular relevance include the Gaussian Free Field, random planar maps and Liouville quantum gravity, in connection with conformally invariant scaling limits; spin glass models and branching random walks; percolation and random graphs; and random walks on graphs and groups in the case where the geometry is determined by some algebraic ambient structure.

So far the programme has held 4 workshops: *Instructional Workshop for Younger Researchers*; *Conformally Invariant Scaling Limits*; *Random Graphs, Random Trees and Applications in April*; *Random Planar Structures and Statistical Mechanics*.

A week-long workshop is planned for 15–19 June to celebrate the mathematics of Gregory Lawler on the occasion of his 60th birthday. The focus will be on recent developments in the areas to which Prof. Lawler has contributed, including loop-erased random walk, random walk in random environment, intersections of random walks, loop measures, and the Schramm–Loewner evolution (SLE).



Participants on the ‘Conformally Invariant Scaling Limits’ workshop

For further details on all INI scientific programmes please visit
www.newton.ac.uk/science/programmes

A meeting for all mathematicians

A Joint Meeting of the British Mathematical Colloquium (BMC) and the British Applied Mathematics Colloquium (BAMC) was held at the University of Cambridge from Monday 30 March to Thursday 2 April 2015. This was the 4th Joint Meeting following Warwick (2002), Liverpool (2005) and Edinburgh (2010). The meeting was hosted jointly by the Department of Applied Mathematics & Theoretical Physics (DAMTP), the Department of Pure Mathematics & Mathematical Statistics (DPMMS) and the Isaac Newton Institute (INI) and involved more than 600 participants from the United Kingdom and overseas, giving in excess of 300 invited and contributed talks on a vast range of topics from all across the mathematical sciences.

A sell-out public lecture, sponsored by the Institute of Mathematics and its Applications, was given on 31 March jointly by Stephen Hawking on *Quantum Black Holes* and Michael Green on *The Pointless Universe*. Full details are available online at www.bmc-bamc.org.uk.



From left to right: Tim Pedley, Stephen Hawking and Michael Green

Launch of new t-shirt design for kids

INI has launched a new children's t-shirt to complement the existing range of adult t-shirts.

The new t-shirt is emerald green (great for not showing the dirt!) and features a number of stylised images of Isaac Newton in different bright colours. The t-shirts are made from high-quality heavy weight cotton and are great value at only £8.00 each! They are available in sizes to fit age 2–4, 4–6, 6–8, 8–10, 10–12. Purchases can be made from the INI reception desk or contact 01223 335999.



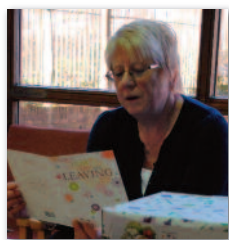
A Compulsive Gambler?

During the *Random Graphs, Random Trees and Applications* workshop in March, David Aldous (University of California, Berkeley) delivered an interesting talk on the Compulsive Gambler process. In this process, there are n agents who meet pairwise at random times (i and j meet at times of a rate- v_{ij} Poisson process) and, upon meeting, play an instantaneous fair game in which one wins the other's money. During the talk David asked members of the audience to bring £5.00 notes to the front so he could examine the serial numbers. Those that parted with their notes did get them back in the end!

The complete seminar is available to download or view online at www.newton.ac.uk/seminar/20150317100011001.



New INI Administrator



Administrator **Christine West** took early retirement from the Institute at the end of February after 15 years of service.

During her time at INI Christine worked with 4 Directors, 3 Deputy Directors and oversaw the running of 78 scientific programmes. The Director presented Christine with an album of INI photographs, together with a cake slice, cake forks, afternoon tea crockery, garden planter and Isaac the garden gnome (long cake-filled days in the garden await!). All at INI thank her for her hard work and commitment and wish her well for the future.

Samantha Skehel of the Laboratory of Molecular Biology, has been appointed as the new Administrator and will take up her post on 1 June 2015.



TGM | Turing Gateway to Mathematics

Launch of Corporate Partnership Scheme

The Turing Gateway to Mathematics (TGM) is pleased to announce the launch of a *Corporate Partnership Scheme* which aims to build relationships with organisations who seek deeper engagement with the mathematical sciences. By supporting the TGM through Corporate Partnership, an organisation will gain privileged access to international experts from mathematics and across the multiple disciplines it underpins. This is an effective way to increase an organisation's visibility to talented up-coming researchers and to various communities such as Government, business, industry and technology.

There are three levels of Corporate Partnership:

Gold – £25,000 +VAT, per year (for a 3–5 year commitment)

Silver – £15,000 + VAT, per year (for a 2 year commitment)

Bronze – £10,000 + VAT per year (for an initial 1 year commitment)

Further information on the Corporate Partnership Scheme is online at www.turing-gateway.cam.ac.uk/tgm-cps.shtml or contact the Knowledge Transfer Manager:

Jane Leeks

Email: j.leeks@turing-gateway.cam.ac.uk

Telephone: 01223 765733



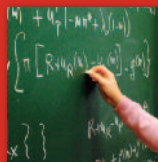
Upcoming highlights



Challenges in Dynamic Imaging Data (9–11 June 2015)

With support from BAE Systems, this workshop will seek to investigate analysis of very large and complex data streams, such as for videos, where there is a need to improve the current state-of-the-art techniques. Within this context, there is a need to understand what is currently possible and what the main technical challenges are. Three industry challenges will be presented (one on each day), covering the areas of security, medical imaging, media and creative industries.

The workshop is expected to bring together industrial and academic experts from a diverse set of backgrounds in mathematics, computer science and information engineering including: Mathematical Analysis; Computer Vision; Probabilistic Modelling/Data Fusion; Video Processing/Machine Learning; Statistics/Probabilistic Modelling. For full details and to register to attend please visit www.turing-gateway.cam.ac.uk/did_jun2015.shtml.



The Role of Inverse Problems and Optimisation in Uncertainty Quantification (17–18 June 2015)

This activity is a partnership of the Smith Institute, International Centre for Mathematical Science (ICMS), Isaac Newton Institute for Mathematical Sciences (INI), the Turing Gateway to Mathematics and the Knowledge Transfer Network and will take place at ICMS, Edinburgh. Full details are available online at www.turing-gateway.cam.ac.uk/ouq_jun2015.shtml.



Optimisation in Space Engineering (OSE) Workshop (17–18 September 2015)

The third workshop on Optimisation in Space Engineering (OSE) is an event jointly organised by the Turing Gateway to Mathematics (TGM), the University of Southampton, University of Birmingham, the European Space Agency (ESA), Airbus Defence and Space, University of Strathclyde and University of Bremen and will take place at the University Strathclyde, Glasgow. Full details are available online at www.turing-gateway.cam.ac.uk/ose_sep2015.shtml.