



# School of Mathematics Newsletter

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*It is a pleasure to write this forward for the first School of Mathematics Newsletter. These newsletters will become a regular fixture and will be used to promote the many good aspects of the School throughout the University and beyond. I am grateful to Andrew Treglown whose idea this was and who has agreed to take on this activity.*

*The session began well with the LMS-EMS Mathematical Weekend and ended with David Smith's outstanding grant success, which will no doubt be a feature of a future edition of the Newsletter. These activities do much to promote the excellent research that takes place within the School. On the education front, the Curriculum Review has reached into the final stages of our undergraduate programmes and is running very smoothly. This will no doubt enhance our already excellent NSS position.*

— Paul Flavell

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## Staff Update

This term we have welcomed a number of new academic staff to the School of Mathematics. In particular, after some excellent grant success within the School, a number of new researchers have arrived.

Dr Andrew McDowell joined the maths department in September as a Research Fellow working with Richard Mycroft. His background is largely in probabilistic combinatorics and initially has been looking at perturbation problems relating to combinations of extremal and random hypergraph structure. Extremal results give sharp boundary conditions for when some desired structure must appear but it is often possible to show that if a small number of random alterations are allowed then significantly weaker boundary conditions will suffice, allowing insight into the stability and resilience of important structural properties of hypergraphs.

Also joining the Combinatorics group is Dr Felix

Joos, as a postdoctoral researcher of Daniela Kühn. He got his PhD in June 2015 in Ulm, Germany under the supervision of Dr Dieter Rautenbach. His expertise covers structural graph theory as well as probability theory and its applications in discrete mathematics.

Dr Guillem Perarnau joined the Combinatorics group in September as a Research Fellow, working with Daniela Kühn and Deryk Osthus. In January, he will become a Lecturer in the School of Mathematics. Guillem's main research interest is in the use of probabilistic techniques to study both deterministic and typical properties of sparse discrete objects. A particular case of it, is on the analysis of non-classical random graphs models. These random structures can be used as a natural model for numerous real-world complex networks (such as social, transport or neural networks) and provide a way to understand them better.



*Dr Guillem Perarnau, Dr Andrew McDowell and Dr Andrew Morris*

Dr Jie Han is a Research Fellow from the Universidade de Sao Paulo who is visiting the University of Birmingham for the year. He will be working with Daniela Kühn and Deryk Osthus on Dirac-type problems for uniform hypergraphs, which, roughly speaking, concern the extension of classical theorems in graphs involving minimum degree conditions into hypergraphs. Being a young and emerging area in extremal (hyper)graph theory, Dirac-type problems have attracted considerable attention in the past decade.

Dr Paul Roberts started in the Mathematical Biology group in October. He'll be working with Sara Jabbari to use mathematical models to improve the efficacy of a novel antibacterial drug being developed by Dr Anne-Marie Krachler's group in the School of Biosciences. The drug works by preventing bacteria from binding to host cells and it's hoped that this new type of "anti-virulence" drug will evade some of the resistance problems associated with conventional antibiotics – mathematical models will help us to predict how likely this may be and what we can do to prevent drug resistance emerging.

Dr Andrew Morris joined the Analysis Group as a Lecturer in June. His research is concerned with the development of modern techniques in harmonic analysis and operator theory for application to partial differential equations on Riemannian manifolds and rough domains. This includes elliptic sys-

tems with rough coefficients, local  $T(b)$  techniques, holomorphic functional calculus, first-order methods, singular integrals, layer potentials, boundary value problems beyond Lipschitz domains, uniform rectifiability, and geometric measure theory. He previously held postdoctoral positions at the University of Oxford and the University of Missouri after obtaining his PhD from the Australian National University in 2010.

Also joining the School of Mathematics are two Marie Skłodowska-Curie Fellows. Dr Rieuwert Blok joins us from Bowling Green State University and will be working with Corneliu Hoffman in the Algebra group. Dr Jonathan Meddaugh joins from Baylor University and he will be working with Chris Good. Welcome to all new members of staff!



*Dr Paul Roberts*



*The LMS-EMS mathematical weekend conference photo*

## LMS-EMS Mathematical Weekend

by RICHARD ELWES

The weekend 18-20 September saw mathematicians from around the world congregate at the University of Birmingham, for a conference in celebration of two birthdays: the 150th of the venerable London Mathematical Society (LMS), and the 25th of the relatively youthful European Mathematical Society. Under the watch of the Joseph Chamberlain Memorial Clock-tower (or 'Old Joe', the world's tallest free-standing clock-tower), participants divided between parallel sessions on the themes of Algebra, Combinatorics, and Analysis, and reunited for plenary talks from some of mathematics' current leading lights.

After warm greetings from Terry Lyons and Pavel Exner, the two societies' respective Presidents, and from Prof Andrew Schofield, Head of Birmingham University's College of Engineering and Physical Sciences, the meeting got underway with a plenary talk from Noga Alon (Tel Aviv and Princeton), on the subject of Graphs, vectors and integers. His focus was Cayley Sum Graphs of finite Abelian groups, and the role they play in subjects from Graph Theory to Information Theory. Aner Shalev (Jerusalem) later delivered the day's second plenary talk, on Groups in Interaction, discussing several instances of interplay between group theory and other subjects, including probability theory, algebraic geometry, and number theory.

Away from the lecture theatres, mathematicians were spotted enjoying Balti curry (a famous Birm-

ingham creation, along with the postage stamp and the pneumatic tyre) and enjoying the outstanding collection of paintings at the Barber Institute of Fine Arts, next door to the School of Mathematics.

Stefanie Petermichl (Toulouse) delivered the first plenary session of Saturday 19th, on Optimal control of second order Riesz transforms on multiply-connected Lie groups, discussing progress on controlling the norms of certain classical operators on groups. She was followed by Béla Bollobás (Cambridge and Memphis) speaking on Percolation and random cellular automata. He paused during his talk to pay tribute to two friends who had recently passed away: Ian Cassels, Head of Mathematics during his PhD at Cambridge, and Bollobás's own graduate student Charles Read (Leeds). The day's final plenary session was from Timothy Gowers on the subject of Interleaved products in highly non-Abelian groups, an algebraic problem motivated by a question in cryptography.

The conference dinner took place on Saturday evening in Birmingham University Staff House, where delicious food was consumed, and many glasses were raised in cheerful celebration of the two societies' birthdays.

Rounding off the meeting on Sunday 20th was Keith Ball (Warwick), with an entertaining plenary talk exploring The probabilistic character of high-dimensional objects. Then with hearty thanks to the organisers, Chris Parker, Anton Evseev, Maria Carmen Reguera and Andrew Treglown, and with congratulations to Elisa Covato (Bristol) and Robert Hancock (Birmingham) winners of the graduate student poster competition, an excellent celebratory



weekend drew to a close.

*[Kindly reproduced from the EMS newsletter, December 2015, p6]*

## MathSoc Update

by SARAH GRAVES

What a start to the year!

We began by welcoming the first years in the traditional manner: after sorting them into ‘families’ they went around campus on a scavenger hunt, learning the location of their new lecture rooms in the process. Then came the family quiz and pizza afternoon which was a great success! We also had a night out to the student event Stuesdays in the city centre in the middle of October, allowing all years to mix together at the Lounge in Selly Oak beforehand. For those who prefer a quieter night, we also hosted a film night and watched ‘A Beautiful Mind’.

We have plenty coming up in the near future. November’s MathSoc Annual Bar Crawl on Broad Street was a sell out and was bigger than ever before! We also have a board games night, charity archery and a Christmas night out (of course!) along with our Careers Networking Evening coming up.

Next semester sees our annual MathSoc on Tour event and this year we are heading to Dublin! We are also teaming up with (our arch rivals) Economics to do pub golf through Selly Oak, taking a trip to Bletchley Park paired with an ‘Imitation Game’ movie night, and of course our Annual Spring Ball. We will be supporting our charity of the year ‘Teenage Cancer Trust’ by running the Coventry Half Marathon and hosting an EPS University Challenge as part of the Guild ‘Adopt a charity week’, so we can truly see who the cleverest society in the College of Engineering and Physical Sciences (EPS) is.

## News in brief

- Congratulations to Dr John Meyer and Professor David Needham for being awarded the September ‘Best paper of the month in EPS’ award for their monograph ‘The Cauchy Problem for Non-Lipschitz Semi-Linear Parabolic Partial Differential Equations’.
- On Thursday 10th December there is a graduation ceremony for a number of the School’s postgraduate students. Congratulations to all

graduands, the School of Mathematics would like to wish you every success in your future careers!

- The School of Mathematics Christmas party takes place from 6-8pm on Thursday 10th December on the Physics Bridge. All staff and students are welcome!
- Donna Testerman, a professor at EPFL (Lausanne) who is a world leading expert in the subgroup structure and representation theory of algebraic groups, visited Birmingham the week of November 22. She and Kay Magaard are working on branching problems related to the structure of the maximal subgroups of the finite classical groups. Together with Tim Burness (Bristol), and Gunter Malle (Kaiserslautern) they are organizing a workshop on “Branching Problems for Reductive Groups” in May 2016 at the Mittag-Leffler Institute in Stockholm, Sweden. For more information see: <http://www.mittag-leffler.se/workshop/branching-problems-reductive-groups>
- On Wednesday 20th January, there will be a one-day meeting in Birmingham on representations of groups, with three speakers, forming part of the LMS Triangle in group theory, which has meetings in Birkbeck, Birmingham, Manchester and Bristol throughout the academic year.
- The newly established joint research group ‘The Mathematical Ecology: Theory and Applications (META)’ is hosted by the Schools of Mathematics at the University of Birmingham, the University of Essex and the University of Leicester. The first META workshop, ‘Analytical and computational methods for multiscale ecology’, will be held on 18th December 2015 in our School. Further information about the workshop (including the programme and abstracts) is available at <http://web.mat.bham.ac.uk/N.B.Petrovskaya/BM.htm>
- Alex Beshpalov and Daniel Loghin are hosting a meeting on January 5-6 2016 here in Birmingham on ‘Adaptive Algorithms for Computational PDEs’. For more information see: [http://web.mat.bham.ac.uk/A.Beshpalov/adapt16\\_workshop/index.html](http://web.mat.bham.ac.uk/A.Beshpalov/adapt16_workshop/index.html)