British Combinatorial Newsletter No. 6 (April 2009).

Welcome to the 6th British Combinatorial Newsletter. Remember this aims to complement the Bulletin with some additional information about (e.g.) details of forthcoming meetings, summaries of recent movements of people, visitors, etc: records of “outreach” activities or recent breakthrough results in the subject: it might include a combinatorial problem or an occasional oddity. British Combinatorial Newsletters are produced at the start of the academic year (when the movements information is most useful to e.g. seminar organisers) and also at around the time of the Bulletin (in April) to let you know what is coming up over the Summer. They are on the BCB website at http://www.essex.ac.uk/maths/BCB/newsletters.htm

If you have material which you think might be suitable for inclusion, or suggestions as to how the newsletter should evolve, please contact the Editor, David Penman (dpbenman@essex.ac.uk). The Editor reserves control of content.

Forthcoming regular meetings supported by the BCC.

Two linked One-Day Meetings in Combinatorics at QMUL and LSE on 20th and 21st May 2009.

There will be two linked 1-day meetings in Combinatorics at Queen Mary on Wednesday 20 May 2009 and at the LSE on Thursday 21 May 2009.

On Wednesday at QMUL, proceedings start at 10.30 a.m. The talks will be in the Mathematics Lecture Theatre in the Mathematics Building (same as last year). The speakers will be David Ellis (Cambridge), Christian Elsholtz (RHUL), Luke Kelly (Birmingham), Rob Morris (Cambridge), Alex Scott (Oxford) and Mark Walters (QMUL). Queries relating to this day to Robert Johnson (r.johnson@qmul.ac.uk).

On Thursday at LSE proceedings begin (earlier….) at 10.00 a.m. The talks will be in the New Theatre at LSE (same venue as last year). The speakers will be Stefanie Gerke (RHUL), Leslie Goldberg (Liverpool), Peter Keevash (QMUL), Jaroslav Nešetřil (Prague), Rahul Savani (Warwick) and Angelika Steger (ETH Zürich). Queries relating to this day to Graham Brightwell (g.r.brightwell@lse.ac.uk).

More details are obtainable on the (shared) website http://www.cdam.lse.ac.uk/colloquia-in-combinatorics.html with in particular a list of titles available at http://www.cdam.lse.ac.uk/combinatorics_talks.html

More details, including a schedule, will follow shortly. The meeting is supported by the LMS and the BCC.


This year's PCC is at Royal Holloway, hosted by the Department of Computer Science, and the organisers will be Arezou Soleimanfallah (RHUL), Eun Jong Kim (RHUL) and Sian Jones (Glamorgan). The dates are 22-24 June 2009. As usual, the aim is to allow
research students to meet and discuss their research in a relaxed environment. Students will be encouraged (but not required) to give a 20 minute talk about their research at the meeting. There will be five invited speakers: Dave Cohen (RHUL), Angela Koller (from Industry), Derek Smith (Glamorgan), Andrew Thomason (Cambridge) and Anders Yeo (RHUL).

The registration fees are £195 for residents and £115 for non-residents. The first 25 UK-based research student applicants will receive a £40 LMS subsidy which then will decrease their registration fees to £155 for residents and £75 for non-residents.

The website is http://www.cs.rhul.ac.uk/PCC2009/ and the event is supported by the LMS and the BCC. More details on the website in due course.

BCC2009
The 2009 BCC (the 22nd) will be at St. Andrews, from Sunday 5-Friday 10 July 2009. The website is http://bcc2009.mcs.st-and.ac.uk/ and registration is now open. The Local Organiser is Sophie Huczynska and the other organisers are James Mitchell and Colva Roney-Dougal. Email queries to bcc2009@mcs.st-and.ac.uk

Details of how to get to St. Andrews can be found at: http://www.st-andrews.ac.uk/visiting/GettingtoStAndrews/

The invited speakers are: Arrigo Bonisoli (Università di Modena e Reggio Emilia), Peter Cameron (QMUL), Willem Haemers (Tilburg), Gholamreza Khosrovshahi (IPM Tehran), Sasha Kostochka (University of Illinois at Urbana-Champaign), Daniela Kühn (Birmingham), Marc Noy (Universitat Politècnica de Catalunya), Oliver Riordan (Oxford) and Gordon Royle (Western Australia). Abstracts for most of these talks can be found at http://bcc2009.mcs.st-and.ac.uk/invited.html

As usual, there will be an opportunity for participants to contribute 20 minute talks. The deadline for sending your title and abstract is 1 June 2009. The deadline for final receipt of all payments etc. is 15 June 2009. There will also be a special issue of Discrete Mathematics containing papers from the conference - more details later.

On the Tuesday evening at 7.45 p.m. there will be an entertainment: please contact the organiser David Penman (dbpenman@essex.ac.uk) if you have musical or other artistic talents, are reasonably likely to be coming and would like to take part, as there is still some space in the program. (Those already in touch with me please confirm that you are still willing to perform).

On the Wednesday afternoon, there will be an excursion to Falkland Palace (see http://en.wikipedia.org/wiki/Falkland_Palace). This will cost £15 including transport (leaving at approx 1 p.m.) and a tour.

The conference banquet will be on Thursday 9th of July at 7.30pm. A problem session will take place on the Friday afternoon at 3.30 and thereafter transport to the station will be available.

Local information about the town of St. Andrews can be found at http://www.saint-andrews.co.uk/staindex.html

Open University Winter Combinatorics Meeting
The most recent OU Winter Combinatorics one-day meeting took place at the OU on Wednesday 28 January 2009, details at http://wcm.open.ac.uk/ It is hoped there will be a similar meeting next year, details later.
Oxford 1-day meeting in Combinatorics
The 2009 Oxford meeting took place on **Wednesday 18 March 2009**, details are at [http://people.maths.ox.ac.uk/~scott/Pages/one-day_meeting.htm](http://people.maths.ox.ac.uk/~scott/Pages/one-day_meeting.htm) It is hoped there will be a similar meeting next year, details later.

**Movements.**

**Birmingham:** Dr. Nikolaos Fountoulakis, formerly a Research Fellow, has left to take up a post at the Max-Planck Institut für Informatik at Saarbrücken.

**Forthcoming other Meetings.**

Criteria for inclusion here include being (a) combinatorial ((very) broadly interpreted) (b) not having already started and (c) having come to the attention of the editor! For more conferences, [http://www.maths.qmul.ac.uk/~pjc/bcc/conferences.html](http://www.maths.qmul.ac.uk/~pjc/bcc/conferences.html) or [http://www.math.uiuc.edu/~west/meetlist.html](http://www.math.uiuc.edu/~west/meetlist.html) are good starting points.

**Techniques and Problems in Graph Theory, Bristol, 1-3 July 2009.**

A workshop on Techniques and Problems in Graph Theory will take place at the University of Bristol from **1-3 July 2009**. The invited speakers will be Chris Godsil (Waterloo), Brendan McKay (ANU), Gordon Royle (University of Western Australia), John Talbot (UCL), Andrew Thomason (Cambridge) and Ian Wanless (Monash). There will be an opportunity for participants to contribute 20 minute talks: if doing so, you should send a plain text or LaTeX abstract to tpgt-workshop@bristol.ac.uk by **1 June 2009**. Registration costs £25, and the closing date for registrations is also **1 June 2009**.

The website is [http://www.maths.bris.ac.uk/~marjw/workshop/](http://www.maths.bris.ac.uk/~marjw/workshop/) (where information about accommodation arrangements will appear shortly) and email should be sent to tpgt-workshop@bristol.ac.uk. The organisers are Robert Brignall, Nicholas Georgiou, Jeanette McLeod, Amarpreet Rattan and Rob Waters (all at Bristol). The meeting is supported by the Heilbronn Institute.

**Fq9: the 9th International Conference on Finite Fields and their Applications, Dublin, 13-17 July 2009.**

This conference will take place from 13-17 July at University College Dublin¹, honouring the 65th birthdays of Steve Cohen and Harald Niederreiter. It will be hosted by the Claude Shannon Institute.

Main Speakers will be: Mei-Chu Chang (California at Riverside), Steve Cohen (Glasgow), John Dillon (National Security Agency), Winnie Li (Pennsylvania State), Alfred Menezes (Waterloo) and Harald Niederreiter (National University of Singapore).

The website is [http://www.shannoninstitute.ie/fq9](http://www.shannoninstitute.ie/fq9) and this gives details of how to contribute talks, which should be emailed, in LaTeX, using the style file on the website,

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¹ Please note this meeting and the LMS course on Probabilistic Combinatorics at Cambridge (see below) clash - you can’t be at both!
to the chair of the Organising Committee, Gary McGuire (gary.mcguire@ucd.ie) by 1 May 2009. The website also gives information on registration fees and accommodation.

**Workshop in Belfast on Algebra, Combinatorics and Dynamics, August 17-21 2009.**

This workshop aims to explore various links between the areas in the title. It will take place at Queen’s University.

Speakers will include Vladimir Bavula (Sheffield), Ken Brown (Glasgow), Peter Cameron (QMUL), Evgenii Golod (Moscow), David Jordan (Sheffield), Alexander Mikhalev (Moscow), Ian Musson (Wisconsin-Milwaukee), Sergei Silvestrov (Lund), Agata Smoktunowicz (Edinburgh) and Robert Wisbauer (Dusseldorf).

The website for this meeting is [http://natalia.iyudu.googlepages.com/testlay](http://natalia.iyudu.googlepages.com/testlay) and queries should be sent to ACD2009@qub.ac.uk Please note that the deadline for registration is 30 April 2009 and early registration is appreciated. There may be limited funds to support Ph.D students from the UK.

The organisers are Natalia Iyudu and Stanislav Shkarin. The meeting is supported by the LMS and the BCC.

**Forthcoming Courses.**

Similar caveats to the other sections. Please let us know of any other such forthcoming instructional courses (broadly interpreted) at Ph.D. student (or above) level.

**LTCC intensive postgraduate course.** A (post-graduate) LTCC Intensive course entitled "From quantum algebras to total non-negativity" will take place at the University of Kent on 28-29 May 2009. For more information, please see [http://www.kent.ac.uk/ims/personal/sl261/Teaching/LTCC2009/LTCC2009.html](http://www.kent.ac.uk/ims/personal/sl261/Teaching/LTCC2009/LTCC2009.html) and for more details contact the organiser, Stephane Launois, s.launois@kent.ac.uk

**Probabilistic Combinatorics:** Recall that an LMS/EPSRC short instructional course on “Probabilistic Combinatorics” will take place in Cambridge from 13-17 July 2009, and the speakers will be Béla Bollobás (Memphis and Cambridge), Tim Gowers (Cambridge) and Assaf Naor (Courant Institute). Further information may be obtained from the website [http://www.dpmms.cam.ac.uk/site2002/probcomb1.pdf](http://www.dpmms.cam.ac.uk/site2002/probcomb1.pdf)

To register, go to the following page, which includes fee details etc.: [http://www.lms.ac.uk/activities/rmc/sc/48poster.html](http://www.lms.ac.uk/activities/rmc/sc/48poster.html)

The closing date for applications is 22 May 2009 and early application is advised, applicants will be contacted about a week after the closing date (and probably not earlier). The organiser is Imre Leader (i.leader@dpmms.cam.ac.uk).

**Current and Forthcoming Combinatorial Visitors**

2 Clashes with Fq9 in Dublin (see above) - you can’t be at both!
**Durham** (Computer Science): Prof. Fedor Fomin (Bergen), interested in algorithms and combinatorics, will still be visiting Durham until July 2009: see http://www.ii.uib.no/~fomin/ for more details of his research interests.

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**Vacancies and Forthcoming Vacancies.**

**QMUL:** Dr. Peter Keevash is looking to appoint a Postdoctoral Research Assistant to work in Extremal Combinatorics at Queen Mary, University of London. The position will be for three years starting in September 2009. A formal advertisement will appear in due course, but informal enquiries are also encouraged. These may be addressed to Dr. Keevash, p.keevash@qmul.ac.uk

**UEA:** There are two Pure Mathematics lectureships available at UEA, one permanent and one for 3 years. Candidates should have research interests complementing those of the research groups there (Logic, Algebra, Dynamical Systems, Number Theory). Further particulars at www.uea.ac.uk/hr/jobs/. The closing date is **12 noon on 5 May 2009** and starting dates are 1 August 2009 for the temporary post and 1 September 2009 for the permanent one.

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**Recent Ph.D. theses in Combinatorics.**

Again, not more accurate than the information I receive: “recent” may be ill-defined.

**Birmingham:** Ben Fairbairn had his Ph.D viva in March 2009 on a thesis entitled “On the Symmetric Generation of Finite Groups”. Robert Curtis was his supervisor.

**Essex:** Rong Gao was awarded her Ph.D in November 2008 for a thesis entitled “Some colouring problems for pseudo-random graphs”. The supervisor was David Penman, the internal examiner Gerald Williams and the external Johannes Siemons (UEA).

**Open University:** Graham Lovegrove (who studied part-time) was awarded his Ph.D in February 2009 for a thesis entitled “Combinatorial designs and their automorphism groups”. Mike Grannell and Terry Griggs were his supervisors.

**RHUL:** Laurence Rackham was awarded his Ph.D in February 2009 for a thesis entitled “Multidimensional Problems in Additive Combinatorics”. His supervisor was Christian Elsholtz and the examiners were John Talbot (UCL) and Oriol Serra (Barcelona).

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**(Unsolved) Problem.**

If you, like many of us, are frequently tempted to believe that everything about finite-dimensional linear algebra is already known, consider the following simple-to-state conjecture due to G. C. Rota. The presentation which follows is heavily indebted to that by Matt de Vos (which contains more relevant links) at http://garden.irmacs.sfu.ca/?q=op/rotas_basis_conjecture
**Problem.** Suppose $V$ is an $n$-dimensional vector space. Then suppose $B_1, B_2, ..., B_n$ are $n$ disjoint bases of $V$. Then there are $n$ disjoint bases $C_1, C_2, ..., C_n$ of $V$ such that $|C_i \cap B_j| = 1$ for all $i$ and $j$.

An equivalent formulation is: Suppose given any $n^2$ vectors in $V$, and that one can arrange them as an $n \times n$ matrix in such a way that each column is a basis. Then the entries inside the columns can be permuted in such a way that each row is also a basis.

Of course, at some level this is really a matroid conjecture, and for example Geelen and Humphries proved the conjecture for the case of paving matroids: see http://www.math.uwaterloo.ca/~jfgeelen/publications/paving.pdf

Aharoni and Berger have shown that the union of the bases can be partitioned into $2n$ partial independent transversals – twice as many as in the conjecture. The (general) result they use towards proving this has a topological flavour: see http://www.ams.org/tran/2006-358-11/S0002-9947-06-03833-5/S0002-9947-06-03833-5.pdf In the other direction, Geelen and Webb prove that there are $O(\sqrt{n})$ disjoint transversals which are bases: http://www.math.uwaterloo.ca/~jfgeelen/publications/transversal.pdf

The case $n = 1$ is trivial, and $n = 2$ is a not terribly hard exercise. However even the case $n = 3$ appears to be non-trivial: http://www-math.mit.edu/~tchow/dinitz.pdf

The case where $n$ is even and the field over which the vector space is defined has characteristic zero is a consequence of the following conjecture. For a positive even integer $n$, we consider **Latin squares** of order $n$, i.e. $n \times n$ matrices all of whose entries are from $\{1, 2, ..., n\}$ with, for each $1 \leq i \leq n$, precisely one occurrence of $i$ in each row and precisely one occurrence of $i$ in each column. A Latin square is even or odd according as the product of the signs of all the row permutations and column permutations is $1$ or $-1$. We then have the following:

**Conjecture** For even positive $n$, the number of even Latin squares of order $n$ and the number of odd Latin squares of order $n$ are not equal.

See http://iew3.technion.ac.il/~onn/Selected/AMM1.pdf for a slick proof by Shmuel Onn of the fact that this conjecture implies the first one. This link allows one to prove the original conjecture whenever $n = 2^r p$ or $2^r (p + 1)$ for an odd prime number $p$. However the general problem seems to be open. Another relevant recent paper is http://www-math.mit.edu/~tchow/rotathree.pdf

**Note:** The open problem at the end of Newsletter 4 now seems to have been solved, for large enough $n$, by Dan Hefetz and Sebastian Stich at ETH Zürich: see http://www.combinatorics.org/Volume_16/PDF/v16i1r28.pdf Basically, $n+1$ rounds ($n$ the number of vertices) rather than $n+2$ (the other remaining possibility) is the answer. The proof is much more difficult that the argument proving it is either $n+1$ or $n+2$. 