British Combinatorial Newsletter No. 23 (September 2017)

Remember this Newsletter 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 (end of April or so) 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 (dbpenman@essex.ac.uk). The Editor reserves control of content.

Forthcoming meetings

The next BCC (the 27th) will be at Birmingham from 29 July to 2 August 2019. (Note slight shift in time from the traditional beginning of July or thereabouts slot). The main local organiser is Andrew Treglown. More details will be announced in due course.

Regular short meetings supported by the BCC:

Old Codgers meeting at Reading. The next meeting is on Wednesday 1 November 2017 at Reading. Speakers will be: Lars Andersen (Aalborg), Bill Jackson (QMUL), Curt Lindner (Auburn), Peter Keevash (Oxford), Johannes Siemons (UEA) and Andrew Thomason (Cambridge). More details will be announced later.

Scottish Combinatorics Meeting. The most recent such meeting took place on 24 and 25 April 2017. The webpage was http://turnbull.mcs.st-and.ac.uk/~nik/scm/ and it is hoped there will be a similar meeting next year.

London: The two most recent 1-day colloquia in Combinatorics at QMUL and LSE took place on 10 and 11 May 2017. It is hoped that there will be a similar meeting in 2018.

Oxford 1-day meeting in Combinatorics: The most recent one took place on 24 May 2017 and it is hoped there will be a similar meeting next year.

Postgraduate Combinatorial Conference (PCC): Details of the next PCC will be announced in due course.

You are reminded that the Editor maintains a mailing list for advertising other forthcoming UK meetings, Ph.D. student level or above courses, etc. in combinatorics (broadly interpreted). Please email him if you would like to publicise such a meeting. Remember lists of forthcoming conferences in Combinatorics and related areas can be
found in various places, including
https://britishcombinatorial.wordpress.com/conferences/
http://www.math.uiuc.edu/~west/meetlist.html
http://www.maths.lse.ac.uk/Personal/jan/conferences.html

Other Forthcoming Conferences and Meetings.

Other interesting UK meetings and/or courses coming up:

Derby Meeting on Theoretical and Computational Discrete Mathematics. This is currently planned for Friday 14 and Saturday 15 September 2018. This is a follow-up to the meeting in Spring 2016 at Derby. More details will be announced in due course.

Movements.

Birmingham: Three new postdocs will be arriving in Birmingham in October 2017:

Dr. Andrey Kupavskii from EPFL, interested in Extremal Combinatorics, Discrete and Computational Geometry, Probabilistic Methods, Ramsey Theory: current website http://kupavskii.com/
Dr. Richard Lang from Chile, interested in Extremal combinatorics, Ramsey theory and Graph colouring: current website http://www.dim.uchile.cl/~rlang/
Dr. Michelle Delcourt from UIUC, interested in extremal and probabilistic combinatorics, current website https://faculty.math.illinois.edu/~delcour2/

QMUL: Dr Felix Fischer (previously at University of Glasgow) and Dr Justin Ward (previously at EPFL) have been appointed as Lecturers in Optimisation and Operations Research. Websites http://dcs.gla.ac.uk/~fischerf/ and http://www.maths.qmul.ac.uk/~jward/ respectively.

Warwick. New arrivals at Warwick are:

Computer Science: Dr. Sayan Bhattacharya, interested in Dynamic graphs, algorithms and data structures. Website http://www.dcs.warwick.ac.uk/~u1671158/

In Mathematics: Dr Andrzej Grzesik, from Jagiellonian University Krakow, interested in extremal combinatorics, flag algebras, graph limits. Website http://www.ics.uj.edu.pl/grzesik
Dr Jon Noel, from ETH Zürich, interested in extremal and probabilistic combinatorics. Website https://people.math.ethz.ch/~noelj/
Dr. Péter Pál Pach from Budapest, interested in combinatorics, combinatorial number theory. Website https://www.cs.bme.hu/~ppp/indexen.html

Ph.D theses in Combinatorics.
Birmingham: Wei En Tan passed her viva in 2017 (external: Robert Johnson)

Glasgow: Ciaran McCreesh was awarded his Ph.D in 2017 (examiners Felix Fischer and Christian Schulte).

Leicester: Matthew Radoja was awarded a PhD at Leicester in 2017, for his thesis "Best Response Dynamics in Simultaneous and Sequential Network Design Games". The examiners were Martin Gairing (Liverpool) and Michael Hoffmann (Leicester).

Unsolved Problem

From Josh Cooper’s list of problems [http://www.math.sc.edu/~cooper/combprob.html](http://www.math.sc.edu/~cooper/combprob.html) but apparently originally due to Jim Propp.

Let \( \sigma \) be the inversion permutation of a finite field of \( p \) elements, where \( p \) is prime. That is, slightly more formally, writing the finite field as \{0,1,2, ... \( p - 1 \)\}, the permutation which sends \( x \) to \( 1/x \) for every \( x \neq 0 \) and 0 to itself.

**Problem.** Show that the longest increasing subsequence in \( \sigma \) has length about \( 2\sqrt{p} \).

For example, if \( p = 7 \), the images under \( \sigma \) of \{1,2,3,4,5,6\} are \{1,4,5,2,3,6\} and so there is an increasing subsequence \{0,1,2,3,6\} of length 5.

I have deliberately been somewhat vague concerning “about” – it will likely be some kind of asymptotic result.

Note that \( 2\sqrt{p} \) is of course the (approximate) length the longest increasing subsequence would have if the permutation \( \sigma \) were genuinely random (as opposed to “random-like” in some informal sense) - see e.g. the first few pages of [https://arxiv.org/pdf/math/9810105.pdf](https://arxiv.org/pdf/math/9810105.pdf) for history (and, after, a much more detailed result) on the genuinely random problem.