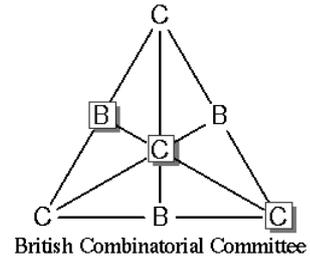




The Open University



Open University Winter Combinatorics Meeting

Wednesday 25 January 2012



Open University Winter Combinatorics Meeting

Wednesday 25 January 2012

The talks will take place in Christodoulou Meeting Room 01,
on the Open University campus in Milton Keynes.

Timetable

- 10:15 - 11:00 Tea/Coffee (in the Mathematics and Statistics Common Room)
- 11:00 - 11:40 Einar Steingrímsson (University of Strathclyde)
Permutation patterns
- 11:45 - 12:25 António Breda Dazevedo (University of Aveiro, Portugal)
Maps, hypermaps and abstract polytopes
- 12:30 - 14:00 Lunch
- 14:00 - 14:40 Peter Danziger (Ryerson University, Canada)
2-factorizations of the complete graph
- 14:45 - 15:25 Diana Piguet (University of Birmingham)
Embedding cycles of given length in oriented graphs
- 15:30 - 16:00 Tea/Coffee (in the Mathematics and Statistics Common Room)
- 16:00 - 16:40 Ian Anderson (University of Glasgow)
Homage to John T. Mitchell: some early and recent combinatorial designs

The meeting is financially supported by the British Combinatorial Committee.

Drawing of St Michael's church, on the OU campus, by Jini Williams.

Abstracts

Permutation patterns

Einar Steingrímsson (University of Strathclyde)

A pattern p in a permutation (of integers) is a subsequence of the permutation whose entries appear in the same order of size as those in p . For example, an occurrence of the pattern 123 is simply an increasing subsequence of length three. Also, the permutation 315264 has two occurrences of the pattern 231, namely 352 and 564. The permutation 312645, on the other hand, avoids the pattern 231.

The study of patterns, although implicit in work going back more than a century, has developed very rapidly in the last two decades. This is both because of the intrinsic interest of many problems in the field, and because of the many, and constantly growing, connections to other fields of mathematics, computer science, biology and physics. Examples of such connections are to sorting in computer science (which is the origin of the modern development of the subject), genome rearrangement, dynamical systems and certain models in statistical mechanics, and classification of Schubert varieties according to topological properties, in addition to a myriad connections to other combinatorial structures.

I will give some examples of current interesting problems in the field and examples of how patterns show up in other fields. To give just one example of the current (miserable :) state of the art, nobody knows how many permutations of length n avoid the pattern 1324, although I will mention some recent progress on that.

Maps, hypermaps and abstract polytopes

António Breda DAzevedo (University of Aveiro, Portugal)

While maps are cellular embeddings of connected graphs on connected compact surfaces, hypermaps are cellular embeddings of hypergraphs. Regular oriented maps/hypermaps can be chiral (if the full automorphism group contains no ‘reflections’) or not. Chiral hypermaps can appear with different chirality indices; while low chiral hypermaps are abundant, extreme high chiral maps/hypermaps (totally chiral) seems to be very rare. In this talk we speak, among other things, on several forms of regularity and chirality of maps/hypermaps, how restrict regularity can encodes a hypermap (hypermaps are restricted form of maps) and how regular direct abstract polytopes can be encoded on compact surfaces as restrictedly regular hypermaps.

2-factorizations of the complete graph

Peter Danziger (Ryerson University, Canada)

We will discuss various types and variations of 2-factorizations of the complete graph. Factorization into triples was introduced by Kirkman in 1848, though the so-called Kirkman problem was only solved in 1971 by Ray-Chadhuri and Wilson. In the 1960’s Ringel introduced the so-called Oberwolfach problem, which remains open, though many special cases are now known. Subsequently a number of variations on this problem have been suggested. We will discuss some general types of 2-factorization and give some results on these.

Embedding cycles of given length in oriented graphs

Diana Piguet (University of Birmingham)

Kelly, Kühn and Osthus conjectured that for any $\ell \geq 4$ and the smallest number $k \geq 3$ that does not divide ℓ , any large enough oriented graph G with $\delta^+(G), \delta^-(G) \geq \lfloor |V(G)|/k \rfloor + 1$ contains a directed cycle of length ℓ . We shall present an approximate solution of this conjecture for the case when ℓ is large enough compared to k and $k \geq 4$. The case when $k = 3$ was already settled by Kelly, Kühn and Osthus. This is joint work with Daniela Kühn and Deryk Osthus.

Homage to John T. Mitchell: some early and recent combinatorial designs

Ian Anderson (University of Glasgow)

John Templeton Mitchell was born in Glasgow in 1854. He emigrated to the United States, where he became President of the American Whist League. He wrote his book *Duplicate Whist* in 1891 and it was reprinted in 1897 with expanded details about whist tournament designs. Mitchell communicated with Professor Eliakim Hastings Moore, the first head of the University of Chicago mathematics department, whose 1896 paper *Tactical Memoranda* is one of the foundations of the theory of combinatorial designs. The mathematical content of Mitchell's 1897 book is fascinating. It contains details of doubles tournaments of various types including one for mixed doubles which is little known. I shall say something about Mitchell's remarkable family and discuss his work, concluding with some recent developments due to Berman and Smith.