Finite Fields in Combinatorics I
(Chair/Président: **David Thomson** (Carleton University)
Org: **Petr Lisonek** (Simon Fraser University) and/et **David Thomson** (Carleton University))

AIDEN BRUEN, Carleton University
Dickson's theorem: applications and generalizations

Dickson's theorem (see Chapter 12 of his "Linear Groups", 1901) is a cornerstone in the classification of affinities over finite fields. We present some new applications to perspective sets, blocking sets and configurations. A new proof of the theorem is described and this paves the way for generalizations and further applications.

KENZA GUENDA, University of Victoria
The equivalency problem for cyclic combinatorial objects

A class of cyclic objects on n elements is a class of combinatorial objects on these elements. Isomorphisms of these objects are permutations of S_n and the automorphism group of each object contains a cycle of length n. Classes include circulant (di)graphs, cyclic designs and cyclic codes. Brand characterized the set of permutations by which two cyclic combinatorial objects on p^r elements, p odd, are equivalent. Huffman et al explicitly gave the set in the case $r = 2$. We extend the results of Brand and Huffman et al to $r > 2$ and present algorithms which provide a partial solution to this problem.

PETR LISONEK, Simon Fraser University
Construction X for quantum error-correcting codes

Construction X is known from the theory of classical error control codes. We present a variant of this construction that produces stabilizer quantum error control codes from arbitrary linear codes over GF(4). Our construction does not require the classical linear code that is used as an ingredient to satisfy the dual containment condition. We prove lower bounds on the minimum distance of quantum codes obtained from our construction. We give many examples of record breaking quantum codes produced from our construction. This is joint work with Vijaykumar Singh.

JANE WODLINGER, University of Victoria
Structural properties of Costas arrays

Costas arrays were introduced in 1965 for an application in sonar. Early research identified two infinite families, but it is still unknown whether there exists a Costas array of every order. We therefore wish to constrain the structure of Costas arrays in order to understand their existence pattern. In this talk, we present a short proof of a recent conjecture on Costas array structure by Russo, Erickson and Beard, by applying an old result due to Freedman and Levanon in a new context. We then introduce a new structural feature which also follows from the Freedman-Levanon result.

YUE ZHOU, Otto-von-Guericke University of Magdeburg
Planar functions over finite fields with characteristic two

Classical planar functions are functions from a finite field to itself and give rise to finite projective planes. They exist however only for fields of odd characteristic. I will introduce their natural counterparts in characteristic two, which are also called planar functions. They again give rise to finite projective planes. Then we will talk about the relation between planar functions and semifields, and propose several interesting open questions on them. Finally, we concentrate on two types of planar functions and give several recent results on their classifications.