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## Design Theory

(Organizer and Chair / Responsable et président: **Ian Wanless** (Monash University))

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**DANIEL HORSLEY**, Monash University

*Embeddings of partial Steiner triple systems with few triples*

It is known that every partial Steiner triple system of order  $u$  has an embedding of order  $v$  for each admissible  $v \geq 2u + 1$ , and that this bound cannot be improved in general. Many partial Steiner triple systems do have embeddings of order smaller than  $2u + 1$ , but much less is known about when such embeddings exist. In this talk I will present a result showing that any partial Steiner triple system with few triples has an embedding of order  $v$  for each admissible  $v \geq \frac{8u+17}{5}$ .

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**HADI KHARAGHANI**, University of Lethbridge

*Biangular lines in  $\mathbb{R}^n$*

Let  $V$  be a set of unit vectors in  $\mathbb{R}^n$ .  $V$  is said to consist of *biangular lines* if  $|\langle u, v \rangle| \in \{0, \alpha\}$  for all  $u$  and  $v$  in  $V$ , where  $\langle \cdot, \cdot \rangle$  is the standard Euclidean inner product in  $\mathbb{R}^n$  and  $0 < \alpha < 1$ . Mutually unbiased Hadamard matrices form special classes of biangular lines. Biangular lines seem to have very nice combinatorial properties. The talk is about the construction and applications of some classes of biangular lines. This is a joint work with Darcy Best and Wolf Holzmann.

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**JOY MORRIS**, University of Lethbridge

*Generalised  $n$ -gons with symmetry conditions*

A generalised  $n$ -gon is an incidence structure whose bipartite incidence graph has diameter  $n$  and girth  $2n$ . Many of the known examples are highly symmetric, and in fact arise naturally from particular group actions.

I will give an overview of some things that are known about symmetries of generalised  $n$ -gons, leading toward classification of these objects, or at least to understanding the symmetry they can have. My contributions to this problem are based on joint work with John Bamberg, Michael Giudici and Gordon Royle of the University of Western Australia, and Pablo Spiga of the University of Milan.

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**DAVID PIKE**, Memorial University of Newfoundland

*Cycle Extensions in PBD Block-Intersection Graphs*

A cycle  $C$  in a graph is said to be extendable if the graph also has a cycle  $C'$  that contains each vertex of  $C$  plus one more vertex. A graph  $G$  is said to be cycle extendable if every non-Hamiltonian cycle of  $G$  is extendable. New results concerning cycle extensions in block-intersection graphs of pairwise balanced designs will be discussed. This is joint work with Robert Luther.

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**DOUG STONES**, Dalhousie University

*Enumeration and symmetries of partial Latin rectangles*

In this talk, I will give a review of recent work by Falcón and myself on (a) the enumeration of partial Latin rectangles and (b) symmetries (autoparatopisms) of partial Latin rectangles. I'll also discuss some interesting open problems on these topics.