Coherent configurations with few fibers - Part I
(Org: **Alyssa Sankey** (University of New Brunswick))

STEFAN GYURKI, Slovak University of Technology
The Paulus-Rozenfeld-Thompson graph on 26 vertices

Strongly regular graphs (SRGs) correspond to homogeneous coherent configurations of rank 3. In finding the smallest feasible parameter set on which no vertex-transitive SRG appears was already interested N. Biggs, one of the fathers of the Algebraic graph theory. In fact, the smallest order, on which this happens, is 26, and the corresponding parameter set is (26,10,3,4). This parameter set is realized by 10 non-isomorphic graphs and the most symmetric among them is called the Paulus-Rozenfeld-Thompson graph T, having automorphism group of order 120 isomorphic to $A_5 \times C_2$, acting on the vertex set with two orbits of lengths 20 and 6.

The talk will provide a gentle introduction to a recently published comprehensive tutorial focusing on the graph T and putting it into the context of classical combinatorial objects.

(This work is joint with Mikhail Klin and Matan Ziv-Av.)

BOHDAN KIVVA, University of Chicago
Robustness of the Johnson scheme under fusion and extension

We show that if a coherent configuration X on n vertices or its fission contains a Johnson scheme $J(s, d)$ as a subconfiguration on $(1 - c)n$ vertices for a sufficiently small constant $c > 0$ and $s > 100d^4$, then X itself is a Johnson scheme.

Our result simplifies the conclusion of the Split-or-Johnson lemma, which is one of the key ingredients of Babai's quasipolynomial-time algorithm for the Graph Isomorphism problem.

Additionally, the result can be seen as a strengthening of a 1972 theorem of Klin and Kaluzhnin that corresponds to the case of $c = 0$.

Based on a joint work with László Babai.

MIKHAIL MUZYCHUK, Ben-Gurion University of the Negev
On Jordan schemes

In 2003 Peter Cameron introduced the concept of a $Jordan\ scheme$ and asked whether there exist Jordan schemes which are not symmetrisations of coherent configurations ($proper$ Jordan schemes). In my talk I'll present several constructions of infinite series of proper Jordan schemes and present first developments in the theory of Jordan schemes - a new class of algebraic-combinatorial objects. This is a joint work with M. Klin and S. Reichard.

GRIGORY RYABOV, Novosibirsk State University
Infinite family of nonschurian separable association schemes

It is known that there exist infinite families of coherent configurations which are: (1) schurian and separable; (2) schurian and nonseparable; (3) nonschurian and nonseparable. The following question was asked, in fact, in [1].

Question. Whether there exists an infinite family of nonschurian separable coherent configurations?

We give an affirmative answer to this question. More precisely, we prove the following theorem.

Theorem. For every prime $p \geq 5$, there exists a nonschurian association scheme of degree $4p^2$ which is separable.

References

[1] *G. Chen, I. Ponomarenko*, Coherent configurations, Central China Normal University Press, Wuhan (2019).