Erdős Prize 2022

August 2022

The **Anna and Lajos Erdős Prize in Mathematics** for 2022 is awarded by the Israel Mathematical Union to:

- Wojciech Samotij, Tel-Aviv University
- Tomer Schlank, The Hebrew University of Jerusalem

The committee's resolution:

Samotij is a leading expert in probabilistic combinatorics. He is one of the creators of the "container method," which revolutionized the field. Many combinatorial questions can be restated as questions about independent sets in some hypergraph, and the container method provides a deep and remarkably general approximate structure theorem in such settings. This has a wide range of applications across extremal and probabilistic combinatorics and has led to the solution of many longstanding problems. He continues to further develop the container method, recently extending it to the setting of hypergraphs with growing edge sizes (jointly with Balogh), which allows for a wider range of applications.

Samotij has many impressive works in other directions that display his breadth and vision. As an example, he resolved a 50 year old conjecture of Kleitman on the minimum number of k-chains in a poset. More recently, Samotij and his coauthors made powerful contributions towards the understanding of distributional properties of polynomials on the biased hypercube, which led to resolutions of long-standing open problems in probabilistic combinatorics, such as the upper tail problems for the number of arithmetic progressions of a fixed length in a p-random subset of the integers, and the number of cliques of a fixed size in the Erdős—Rényi random graph $G(n, p)$.

Schlank is a leading algebraic topologist. He has been developing (together with his collaborators) a "noncommutative spectral algebraic geometry" that aims to describe and explain the structure of the stable homotopy category. The chromatic point of view of algebraic topology involves (after removing rational phenomena) breaking up homotopy types associated to a given ordinary prime into infinitely many pieces of higher types. The first of these is (localization with respect to) topological K-theory, but the higher ones do not have clear geometric or analytic interpretations. With Barthel and Stapleton, he showed that the theories of type (p, n) for a fixed n can be understood purely algebraically for large enough p. Their first application of this result is to multiplicative structures on local generalized Moore spectra, but their asymptotic theory generally implies deep connections between homotopy theory and arithmetic geometry.

With Carmelli and Yanovski he proved the conjecture of Hopkins and Lurie about self-duality of the "Telescopic localization" of any spectrum with finite homotopy groups which vanish above a range, based on the theory of "higher-semi-additivity" that he has been actively developing with collaborators. As another striking example of the impact of this theory, Schlank and Ben Moshe introduced a variant of the algebraic K-theory construction, which can be applied to categories satisfying a form of higher semiadditivity. Moreover, they verify that this construction satisfies predictions of the chromatic redshift philosophy, that taking algebraic K-theory shifts chromatic filtrations up by 1.