

2021 Kirkman Medal awarded to Natasha Morrison

Natasha Morrison has made significant contributions to a wide variety of topics in combinatorics including singular matrices, hypergraphs, bootstrap percolation in graphs, sum-sets and extremal graph theory. This has included settling several major conjectures and an impressive list of publications in the leading combinatorics journals. With Morris, Campos and Mattos, she made a strong contribution to a sequence of results that began in the 1990s by essentially determining the probability that a random symmetric matrix is singular. With Gruslys and Letzter, she resolved a 1989 conjecture of Frankl and Füredi concerning when the Lagrangian of an r -uniform hypergraph with m edges is maximised. The conjecture is true when $r = 3$ and false when $r \geq 4$. With Noel she proved a 2010 conjecture of Balogh and Bollobas about the behaviour of a particular discrete-time process in the hypercube. With Campos, Collares, Morris and Souza, she achieved a strong characterisation of the typical structure of almost all sets for which the set $A + A$ is “small”, improving results of Alon, Balogh, Morris, Samotij; Campos; Mazur, and Green and Morris dating from 2005. With Scott, she resolved two problems raised by Chvatal and Tuza in the 1980s about the maximum possible number of (induced) cycles in a graph with n vertices. They also determined the precise structure of the extremal graphs. These achievements have seen her regularly invited to give seminars and speak at major international conferences.