

Citation for Emmanuel Breuillard (Fröhlich Prize)

Short citation

Professor Emmanuel Breuillard of the University of Oxford is awarded the Fröhlich Prize for his landmark work on groups and their actions, masterly combining in ingenious ways algebraic groups, combinatorics, number theory, Diophantine approximation, topology and C^* -algebras. His work is notable for its originality, conceptual clarity, elegance and depth.

Long citation

Professor Emmanuel Breuillard of the University of Oxford is awarded the Fröhlich Prize for his landmark work on groups and their actions, masterly combining in ingenious ways algebraic groups, combinatorics, number theory, Diophantine approximation, topology and C^* -algebras. Breuillard has been able to shine light on many problems in a surprisingly broad set of directions. His work is notable for its originality, conceptual clarity, elegance and depth.

Many of Breuillard's spectacular achievements relate to the combinatorial properties of groups. A famous result of Tits says that a linear group is either virtually solvable or it contains a (non-abelian) free subgroup. In an impressive series of papers (in part joint with Gelfander), Breuillard has proved spectacularly uniform versions of this results. To be able to get uniformity in the field of definition, Breuillard invented a beautiful and novel height gap principle for finite subsets of a linear group that is important on its own.

Also stunning is Breuillard's proof, with Green and Tao, of a conjecture of Helfgott and Lindenstrauss about subsets in arbitrary groups that have small doubling, finding seemingly out of nowhere inside such groups nilpotent subgroups of rank related to the doubling coefficient. Their work manages to relate this combinatorial question to the classical but intricate solution of Hilbert's 5th problem. Breuillard, Green and Tao also studied sets of small doubling in linear groups, where they were able to prove sharper results using a remarkably elegant argument giving a far-reaching generalisation of a result of Helfgott.

Breuillard and Varju have remarkable results on dimension of self-similar measures on the line, specifically Bernoulli convolutions, leading to spectacular advances. In Breuillard's typical style, these results combine analytical ideas and ideas from the theory of heights of algebraic numbers. Also with Varju, Breuillard has been able to settle (assuming the Riemann hypothesis for Dedekind zeta functions) a 30-year-old conjecture of Odlyzko and Poonen that a random polynomials with 0,1 coefficients are with high probability irreducible and have Galois group either A_n or S_n .

In these works, as well as in his other works, Breuillard has been able to shine light on many problems in a surprisingly broad set of directions. He finds unexpected connections, not just solving problems but also placing them in the proper conceptual framework.