Whitehead Prize: citation for Michael Magee

Short citation:

Dr Michael Magee of the University of Durham is awarded a Whitehead Prize for his deep contributions to a wide range of questions at the interface between number theory and mathematical physics, and in particular to random matrices and to the spectral theory of hyperbolic surfaces.

Long citation:

Dr Michael Magee of the University of Durham is awarded a Whitehead Prize for his deep contributions to a wide range of questions at the interface between number theory and mathematical physics, and in particular to random matrices and to the spectral theory of hyperbolic surfaces.

In a remarkably original work (joint with D. Puder), he established precise asymptotics for matrix integrals associated to an arbitrary family of words on high dimensional unitary groups. In a rather surprising and beautiful way his formula relates these matrix integrals to combinatorial data arising from a family of surfaces with boundary. This work makes an unexpected connection between free probability theory and surface topology.

In joint work with A. Gamburd and R. Ronan, he solved the long-standing problem of computing precise asymptotics for the number of integer points on the Markov–Hurwitz varieties. This is a beautiful piece of work that represents a culmination of several previous attempts by other people. It does so by bringing in beautifully the dynamics of a certain semigroup of matrices and by implementing transfer operator techniques to achieve the lattice point count in this non-homogeneous setting.

In another major series of works (in collaborations with F. Naud and with D. Puder), he transformed the spectral theory of random hyperbolic surfaces, establishing in particular a uniform spectral gap for random covers. These results parallel, in this geometric setting, celebrated work of J. Friedman on the spectrum of random graphs and vastly improve and complement our knowledge of the spectral properties of ``most'' hyperbolic surfaces. The methods are novel and groundbreaking. They blend together the classical spectral theory of geometrically finite hyperbolic surfaces with recent advances regarding the combinatorics arising from the representation theory of the symmetric group — matrix coefficient bounds in particular — and the study of word maps.