Mahler measures of elliptic surfaces

Michael Neururer
University of Nottingham

The (logarithmic) Mahler measure of a polynomial P in n variables is defined as the mean of $\log|P|$ on the n-torus. In 1997 Deninger noticed a remarkable connection between the Mahler measure of a polynomial and L-values of the associated algebraic variety. I will discuss joint work with François Brunault in which we study the case of elliptic surfaces and develop a new method to calculate Mahler measures of such surfaces in terms of L-values of modular forms. We express the Mahler measure as a Deligne period of the surface and use work of Brunault on the regulator of Beilinson/Deninger-Scholl elements in motivic cohomology to evaluate the period. We show several explicit relations between Mahler measures of elliptic surfaces and $\Lambda(f,3)$, where f is a weight 3 newform associated to the surface.