



**Speaker:** Robin PEMANTLE, U. Penn.

**Title:** ACSV (Analytic Combinatorics in Several Variables).

How I fell in love with rational functions and the asymptotics of their Taylor coefficients for combinatorial reasons, and why you should too, for their relation to beautiful mathematics.

Abstract: Counting objects that obey recursions often boils down to estimating coefficients of generating functions. The analytic behavior of these functions leads directly to asymptotic formulae for the objects being counted. In the multivariate case (counting via several parameters), coefficient estimation becomes far more interesting, because the geometry of function (for rational functions, the zero set of the denominator) plays a big role, and the algebraic topology of the complement of this variety enters the picture as well. For example, dimer configurations pictured left (size 47) have placement probabilities shown by color intensity right (size 384), and rational generating function  $P/Q$ , with the zero set of the algebraic dual curve to  $Q$  superimposed. Coincidence? I think not!

The talk will start with combinatorial examples that answer the question of why combinatorialists should care, then reformulate as a general problem about rational multivariate Taylor series, answering the question of why algebraists and analysts should care, then reformulate again as a function about singularity theory and integrals of vanishing cycles, answering the problem of why topologists and singularity theorists should care. Along the way, various parts of the answer are derived, and I tout our new (2024) book.

