Kernel Dynamics: Towards a combinatorial understanding of transcendental functions

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A combinatorial understanding of transcendental functions akin to those for algebraic and rational functions has been a motivating goal of enumerative combinatorics for several decades. Lattice path models regularly figure in a wide variety of classes with holonomic (aka D-finite) generating functions, from pattern avoiding permutations, to Young tableaux of bounded height. In this talk we will survey some recent methods developed to classify the generating functions of small step lattice walks, and illustrate a key principle using a non-holonomic model. I will then discuss how these techniques can be used to show the differential transcendence of other combinatorial generating functions arising in the literature.