Maximal solution of the Liouville equation in doubly connected domains.

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Abstract

In this talk I will discuss a new existence result for the widely studied Liouville problem $\Delta u + \lambda 2e^u = 0$ in a bounded, two dimensional, doubly connected domain with Dirichlet boundary conditions. I will show that for a sequence of $\lambda_n \to 0$ this equation has solutions that blow-up in the whole domain. Profiles of the blowing-up solutions are related to a free boundary problem which gives a solution to an optimal partition problem for the given domain. I will also describe the role of the free boundary problem in other classical equations such as the mean field model or the prescribed Gaussian curvature equation.