JACOPO DE SIMOI, University of Toronto
Dynamical spectral rigidity and determination

Given a planar domain with sufficiently regular boundary, one can study periodic orbits of the associated billiard problem. Periodic orbits have a rich and quite intricate structure and it is natural to ask how much information about the domain is encoded in the set of lengths of such orbits. The quantum analog of this question is the celebrated Laplace inverse problem, or "Can one hear the shape of a drum?"

For a class of smooth convex domains we prove dynamical spectral rigidity: in this class it is not possible to deform a domain without perturbing the length of at least one orbit. In a class of analytic dispersing open billiards we show marked spectral determination: knowing all lengths of all periodic orbit of such systems together with some combinatorial information allows to completely reconstruct the domain.

Such results are part of an ongoing joint project with V. Kaloshin and other collaborators (Q. Wei, M. Leguil and P. Bálint)