Hamiltonian Lens Rigidity

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Abstract

Consider M, a manifold with boundary. The Boundary Rigidity Problem asks whether a Riemannian metric g on M can be recovered from knowledge of the lengths of the geodesics on M. More generally, a function H on phase space T^*M determines characteristic curves on which one can define a notion of length, called action. In this talk, I ask what can be determined of H given knowledge of the action of all its characteristics at the energy level k. I find that under some hypotheses, given two such Hamiltonian functions $H_i, i = 1, 2$ with corresponding characteristics having equal action, the hypersurfaces $\{H_i = k\}$ are related to each other by a family of diffeomorphisms $\{\Phi_f\}$ each of which preserves characteristics and their actions. The Boundary Rigidity Problem could then be solved if one could show that by some choice of f, the mapping Φ_f preserves the fibers of the projection $\pi : T^*M \to M$.

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