My name is Daniel Offin and I am an Associate Professor in the Department of Mathematics and Statistics at Queen's University.

My research focuses on topics coming from Hamiltonian dynamics, calculus of variations and Celestial Mechanics to study problems in the intersection of these areas. In particular these are some of the problems I would like to solve.

Problem 1 Hyperbolic sets in Celestial Mechanics. These sets together with their stable and unstable manifolds have been found to control much of the ballistic transport mechanisms in the solar system. Relative equilibria collinear with the earth and the sun for example have this characteristic behaviour. However moving beyond such simple examples of hyperbolic behaviour is an important and ongoing research effort. Examples in the three body problem are of interest and can help to further develop our understanding of this important physical system.

Problem 2 Geometry, symmetry and dynamics. Symmetry groups have become an important tool in exploiting the variational method in Hamiltonian dynamics. In this case we study the equivariant variational problems for existence of certain trajectories and qualitative properties of these same trajectories. Do reversible minimizing periodic solutions carry additional stability information which can be deduced directly from the variational structure.

Problem 3 Geometry and dynamics. Newton's equations for kinetic plus potential Hamiltonian are reformulated into geodesic equations for fixed energy E via the Jacobi-Maupertuis [JM] metric. This metric is formed with a conformal factor times the Riemannian metric of the kinetic energy. The conformal factor vanishes on the zero velocity surface, where the potential function takes the value E. This equipotential surface is sometimes called the Hill boundary when investigating the properties of geodesics in the JM metric. The JM metric degenerates on the Hill boundary and this causes difficulties with analysis of JM geodesic flow. In particular can variational methods be used to predict existence of geodesics which intersect the Hill boundary, and do the properties of the geodesics on the boundary influence the stability properties of these geodesics.