Title: Loops, Spheres and Scalar Curvature

Abstract: The relationship between curvature and topology is one of the central themes of modern geometry. It is well known that the topology of a manifold can prevent it from admitting certain geometric structures. For example, a torus can not be made to have everywhere positive curvature no matter how we deform it. In higher dimensions, there are several curvature notions one may consider; the sectional, Ricci and scalar curvatures being the most commonly studied.

This talk will mostly focus on the scalar curvature. Since the 1970s, significant progress has been made in understanding whether or not a given manifold admits positive scalar curvature. In more recent years focus has shifted to understanding the topology of the space of such geometric structures, i.e. the space of metrics of positive scalar curvature on a given manifold. We will discuss this problem, paying particular attention to the case where the underlying manifold is a sphere. In this case, some very delicate extra structure of an algebraic nature, involving something called a "loop space", may be unearthed.