

University of Oregon
Department of Mathematics

2005 MOURSUND LECTURES

April 25 – April 27, 2005

Richard Schoen

Stanford University

A tea will precede lectures at 3:30 p.m

A reception will follow the Monday lecture in 219 Fenton Hall

Lecture 1: The Yamabe problem revisited

4:00 p.m., Monday, April 25, 2005 - 106 Deady Hall

Abstract: In this lecture we will give a description of the Yamabe problem (concerning constant scalar curvature Riemannian metrics) aimed at a general audience. We will give an account of the progress which has been made on the problem, and describe an old conjecture of ours concerning the full set of solutions of the problem on higher dimensional manifolds. We will state a recent joint theorem of ours with Marcus Khuri which largely solves this conjecture. Typically there are many high energy solutions with high Morse index for this variational problem. The problem is intimately connected with positive energy theorems of General Relativity, and we will describe this connection and the recent progress on these theorems in the generality needed for the Yamabe application. We will also give an account of recent work on the convergence of the Yamabe flow which has parallels with the variational theory.

Lecture 2: Global compactness theorems for constant scalar curvature metrics

4:00 p.m., Tuesday, April 26, 2005 – 106 Deady Hall

Abstract: In this lecture we will describe in more detail the recent joint work with Marcus Khuri announced in our first lecture. The main new theorem is a proof that a point of blow-up for a sequence of (locally defined) constant scalar curvature conformal metrics on a manifold of dimension $n > 5$ is necessarily a point at which the Weyl curvature tensor of the manifold vanishes to order higher than $(n-6)/2$. This is the order of vanishing required to define the energy, and to carry over the speaker's earlier methods developed for proving compactness theorems for Yamabe solutions.

Lecture 3: Sharp isoperimetric inequalities for minimal surfaces in Euclidean space

4:00 p.m., Wednesday, April 27, 2005 – 110 Willamette Hall

Abstract: A longstanding conjecture concerning the geometry of minimal surfaces is that the sharp isoperimetric inequality (relating the area of the surface and its boundary length) should hold in general. In this talk we will survey this problem and present some new methods of attack which solve the problem in general situations. The methods involve a careful analysis of flat cone metrics which are related in a natural way to the minimal surface