BAY AREA DIFFERENTIAL GEOMETRY SEMINAR
PACIFIC NORTHWEST GEOMETRY SEMINAR
Joint Meeting at Stanford University
February 4-5, 2012

Richard Bamler, Stanford

Long-time analysis of 3 dimensional Ricci flow

Abstract. It is still an open problem how Perelman's Ricci flow with surgeries behaves for large times. For example, it is unknown whether surgeries eventually stop occurring and whether the geometric decomposition is exhibited by the flow as $t \to \infty$.

In this talk, I will present new tools to treat this question. Moreover, I will give a thorough analysis under the pure topological condition that the initial manifold only has hyperbolic or non-aspherical components in its geometric decomposition (i.e. prime and torus-decomposition). It will turn out that in this case, surgeries do in fact stop occurring after some time and the curvature is globally bounded by Ct^{-1}. Finally, I will explain how to treat more general cases.

Nicos Kapouleas, Brown University

Gluing constructions for minimal surfaces and self-shrinkers

Abstract. In the first part of the talk I will discuss doubling constructions. In particular I will discuss technical aspects of recent doubling constructions for an equatorial two-sphere in the round three-sphere, and also potential generalizations to higher dimensions and constructions for self-shrinkers of the Mean Curvature Flow. In the second part of the talk I will briefly discuss the current understanding of desingularisation constructions for minimal surfaces and self-shrinkers. In the third and final part I will discuss open uniqueness questions for closed embedded minimal surfaces in the round three-sphere inspired by the above constructions.

Francisco Martin, University of Granada, Spain

Properly embedded area-minimizing surfaces in hyperbolic three-space.

Abstract. We prove that, given S an open oriented surface, then there exists a complete, proper, area minimizing embedding $f : S \to H^3$. The main tool in the proof of the above result is a sort of bridge principle at infinity for properly embedded area minimizing surfaces in hyperbolic three space. This is a joint work with Brian White.

Yanir Rubinstein, Stanford

Einstein Metrics on Kahler Manifolds

Abstract. The Uniformisation Theorem implies that any compact Riemann surface has a constant curvature metric. Kahler-Einstein (KE) metrics are a natural generalization of such metrics, and the search for them has a long and rich history,

going back to Schouten, Kahler (30's), Calabi (50's), Aubin, Yau (70's) and Tian (90's), among others. Yet, despite much progress, a complete picture is available only in complex dimension 2.

In contrast to such smooth KE metrics, in the mid 90's Tian conjectured the existence of KE metrics with conical singularities along a divisor (i.e., for which the manifold is 'bent' at some angle along a complex hypersurface), motivated by applications to algebraic geometry and Calabi-Yau manifolds. More recently, Donaldson suggested a program for constructing smooth KE metrics of positive curvature out of such singular ones, and put forward several influential conjectures.

In this talk we will try to give an introduction to Kahler-Einstein geometry and briefly describe some recent work mostly joint with R. Mazzeo that resolves some of these conjectures. One key ingredient is a new $C^{2,\alpha}$ *a priori* estimate and continuity method for the complex Monge-Ampere equation. It follows that many algebraic varieties that may not admit smooth KE metrics (e.g., Fano or minimal varieties) nevertheless admit KE metrics bent along a simple normal crossing divisor.

Jeff Streets, UC Irvine

The gradient flow of the L^2 curvature energy

The L^2 norm of the Riemannian curvature tensor is a natural intrinsic analogue of the Yang-Mills energy in purely Riemannian geometry. To understand the structure of this functional, it is natural to consider the gradient flow. I will give an overview of the analytic theory behind this flow, and discuss some long time existence results in low dimensions. Finally I will mention some natural conjectures for this flow and their consequences.

Jeff Viaclovsky, University of Wisconsin

TBA