Bay Area Differential Geometry Seminar
Saturday December 5, 2015
MSRI, Berkeley

Seminar participants and their significant others are invited to dinner at the home of David Hoffman, 37 Hill Road, Berkeley, CA 94708 (tel: 510 649-1641). Directions will be provided at the meeting. Please use the **signup list** *to indicate your participation and dietary restrictions if any. (Click on the boldfaced text in the previous sentence to get to the signup list.) It is important that we have an accurate count of people coming for dinner. If you are coming, please do tell us in advance.*

- 10:00–11:00 **Reception, Morning Coffee**

- 11:00-12:00 **Ved Datar, UC Berkeley**: *Kähler-Einstein metrics on Fano manifolds*

It follows from the classical uniformization theorem that any compact Riemann surface admits a constant curvature metric. In higher dimensions, one can consider an ample line bundle L on a compact Kähler manifold, and ask for conditions under which there are constant scalar curvature metrics in the first Chern class of L. Motivated by the study of Hermitian-Einstein metrics on holomorphic vector bundles, it has been conjectured that existence of such metrics is related to some form algebro-geometric stability. While the general case is still wide open, in the case of Fano manifolds, where the problem is equivalent to the existence of Kähler-Einstein metrics with positive scalar curvature, the conjecture was settled very recently.

In my talk, I will review these new developments. I will then discuss some joint work Gábor Székelyhidi on an equivariant version of the above conjecture, strengthening some results of Chen-Donaldson-Sun. Combined with the recent results of Ilten-Süß, this yields new examples of Kähler-Einstein manifolds.

- 12:00–2:00 **Lunch**

Lunch will be available for purchase at MSRI. Orders will be taken before the first talk.

There will be a brief organizational meeting at 1:45.

- 2:00–3:00 **Brian White, Stanford**: *Controlling area blowup for sequences of minimal surfaces.*

I will show that, given a sequence of minimal surfaces, the set of points where the areas blow up behaves in some ways like a minimal surface. In particular, the area blowup set satisfies the same maximum principles that are satsified by smooth minimal surfaces. I will also also discuss various applications.

- 3:00–4:00 **Afternoon Tea**

- 4:00-5:00 **Marco A. M. Guaraco, IMPA - Brazil**: *Min-max, phase transitions and minimal hypersurfaces*

We present a new min-max method for constructing embedded minimal hypersurfaces in an arbitrary closed manifold [1]. The first min-max construction of minimal hypersurfaces was initiated by the work of Almgren and completed by Pitts in the 70s [2]. They applied min-max techniques to the space of closed hypersurfaces to find critical points for the area functional. Our approach is also

variational, but it is substantially different since it is based on the theory of phase transitions [3]. Roughly speaking, we show that level sets of phase transitions constructed by min-max methods converge to a minimal hypersurface. In order to do this, we prove several estimates for solutions of the phase transition equation using ideas motivated by Almgren-Pitts work. We also compare our results with other min-max theories.

[1] Guaraco, Marco A. M. "Min-max for phase transitions and the existence of embedded minimal hypersurfaces." arXiv preprint arXiv:1505.06698 (2015).

[2] Pitts, Jon T. "Existence and regularity of minimal surfaces on Riemannian manifolds." Bulletin of the American Mathematical Society 82.3 (1976): 503-504.

[3] Tonegawa, Yoshihiro, and Neshan Wickramasekera. "Stable phase interfaces in the van der WaalsCahnHilliard theory." Journal für die reine und angewandte Mathematik (Crelles Journal) 2012.668 (2012): 191-210.

- 6:00 **Dinner** *Please see the invitation and signup link at the top of this announcement.*