All talks will take place in the Mathematics building, Room 520.

November 30th

8:45 – 9,15 Breakfast Cantor Lounge

9:30 – 10,20am *Joel Spruck*, Johns Hopkins

Rigidity of nonnegatively curved surfaces relative to a curve.

We prove that any properly oriented $C^{2,1}$ isometric immersion of a positively curved Riemannian surface M into Euclidean 3-space is uniquely determined, up to a rigid motion, by its values on any curve segment in M. A generalization of this result to nonnegatively curved surfaces is presented as well under suitable conditions on their parabolic points. Thus we obtain a local version of Cohn-Vossen's rigidity theorem for convex surfaces subject to a Dirichlet condition. The proof employs in part Hormander's unique continuation principle for elliptic PDEs. Our approach also yields a short proof of Cohn-Vossen's theorem via Hopf's maximum principle. This is joint work with Mohammad Ghomi.

10,45–11,35am *Yifeng Yu*, UC Irvine

Optimal rate of convergence in periodic homogenization of Hamilton-Jacobi equations.

In this talk, I will present some recent progress in obtaining the optimal rate of convergence $O(\epsilon)$ in periodic homogenization of Hamilton-Jacobi equations.

Our method is completely different from previous pure PDE approaches which only provides $O(\epsilon^{1/3})$. We have discovered a natural connection between the convergence rate and the underlying Hamiltonian system. This allows us to employ powerful tools from the Aubry-Mather theory and the weak KAM theory. It is a joint work with Hiroyashi Mitake and Hung V. Tran.

2:00–2:50pm *Jessica Lin*, McGill

Stochastic Homogenization of Reaction-Diffusion Equations.

I will present several results concerning the stochastic homogenization of reaction-diffusion equations. We consider heterogeneous reaction-diffusion equations with stationary and ergodic nonlinear reaction terms. Under certain hypotheses on the environment, we show that the typical large-time, large-scale behavior of solutions is governed by a deterministic front propagation. The front propagation can be described as the unique discontinuous viscosity solution of a deterministic convex Hamilton-Jacobi equation. Our arguments rely on analyzing a suitable analogue of first passage times for solutions of reaction-diffusion equations. In particular, under these hypotheses, solutions of heterogeneous reaction-diffusion equations with front-like initial data become asymptotically front-like with a deterministic speed. This talk is based on joint work with Andrej Zlatos.

3:00-3,25 Coffee Break Cantor Lounge

3:30-4,20pm *Henrik Shahgholian*, Royal Institute of Technology, Sweden

From fluid flow in cones to boundary Harnack for PDEs with RHS

A simple home-made experiment shows interesting behaviour of fluid flow on a table close to corners of the table. The experiment reveals a new Boundary Harnack Principle for PDEs, with right hand sides.

(Based on a recent work with Mark Allen.)

December 1st

8:45 – 9,15 Breakfast Cantor Lounge

9:30–10,20am *Hui Yu,* Columbia

Regularity of optimal transport between planar convex domains

In this talk we discuss a W2p estimate for the potential of optimal transport between two convex domains in the plane, which improves Caffarelli's C1alpha estimate. Some of the new ideas developed are an obliqueness result for rough convex domains and a growth control of the eccentricity of sections of solution to the Monge-Ampere equation.

10,45 – 11,35 *Pengfei Guan,* McGill

Interior C^2 estimates for σ_2-Hessian equation.

It is well known that interior C^2 estimate holds for solutions to Monge-Ampere equation in dimension $n = 2$. This is a classical result of Heintz proved in 1960s. Such interior estimate is false if $n > 2$ by counter-examples of Pogorelov. This is also false for convex solutions of σ_k-Hessian equations $k > 2$ in general. Whether interior C^2 estimate is true for solutions of $\sigma_2(\nabla^u) = f$ is a longstanding problem in fully nonlinear PDE. We discuss some recent progress and different approaches to this problem, namely works of Warren- Yuan, Mcgonagle-Song-Yuan , Qiu and Guan-Qiu.

2:00–2:50pm *Marta Lewicka,* U Pittsburgh

Prestrained elasticity: problems in pattern formation and incompatibility of Riemannian metrics.

We propose the quantitative approach to measure the immersibility of a Riemannian manifold into a flat space of the same dimension, derived through the variational models of prestrained elasticity. For thin films, we analyze the hierarchy of possible scalings of the energy minimizers in terms of the film's thickness. The singular limits in this hierarchy are differentiated by the embeddability properties of the target metrics and, a-posteriori, by the emergence of isometry constraints with low regularity.

3:00-3,25 Coffee Break Cantor Lounge

3:30–4,20pm *Giuseppe Mingione,* University of Parma, Italy

Recent progresses in nonlinear potential theory.

Nonlinear potential theory is the nonlinear counterpart of the classical potential theory for linear elliptic equations. It aims at studying the fine properties of solutions to nonlinear elliptic and parabolic equations and deriving sharp nonlinear analogs of the classical linear potential theory statements. The main difference is that, for obvious reasons, it cannot rely on the use of fundamental solutions. Different and intrinsic paths must be therefore taken. A crucial role is played by so called nonlinear Wolff potentials, a sort of nonlinear analog of Riesz potentials originally introduced by Mazya and Havin. I will present a series of recent results from nonlinear potential theory including a new set of gradient estimates allowing to unify many classical results from regularity theory and solving a few open questions. Both scalar and vectorial cases will be considered. Time permitting, I will mention parabolic problems.