

# Spring Lecture Series N.26

## Solutions of Partial Differential Equations in Periodic Media (2001)

Principal Lecturer: Luis Caffarelli and Rafael de la Llave (University of Texas, Austin)

[A list of open problems presented: "Solutions of PDE's in Periodic Media" \(PDF file\)](#)

### Invited Speakers:

Renato Iturriaga

*Title: Burgers Turbulence and Random Lagrangian Dynamics*

**Abstract:** We consider a random Lagrangian system on the  $n$  dimensional torus and the Hamilton Jacobi equation related to it. We prove that with probability one there exists a unique minimizing trajectory for the Lagrangian system and a unique solution for the Hamilton Jacobi equation.

Jeff Viaclovsky

*Title: Monge-Ampere equations on Hessian manifolds*

**Abstract:** We study the regularity of solutions to Monge-Ampere equations on a particular class of affine flat manifolds.

Alberto Candel

*Title: On the geometry of leaves*

Sigurd Angenent

*Title: Elliptic PDEs with periodic nonlinearities*

Yanyan Li

*Title: Extensions to a theorem of Jorgens, Calabi, and Pogorelov*

Victor Bangert

*Title: Minimizing currents and the stable norm in codimension one*

**Abstract:** It will be shown how existence and properties of laminations by minimal hypersurfaces in compact Riemannian  $n$ -manifolds  $M$  follow naturally from a structure theory for locally minimizing closed (normal)  $(n-1)$ -currents. This depends on ideas by Arnoux/Levitt on codimension one singular foliations. The results are used to investigate the stable norm on the real  $(n-1)$ -homology of  $M$ .

Fang Hua Lin

*Title: Ginzburg-Landau approach to the curve shortening flow*

**Abstract:** Formally it is not hard to see that one can use the Ginzburg-Landau heat flow to study the (high codimensional) motion by mean curvature. However, there are analytical difficulties. Though it is believed that the method may work for arbitrary dimensions, I shall explain only how problem can be handled in the 3-D space.

L. C. Evans

*Title: Homogenization and effective Hamiltonians*

D. Burago

*Title: On the geometry of periodic metrics*

J. Mather

*Title: Differentiability properties of the Beta Function*

**Contributions by:**

Ivan Blank (Rutgers University), (Joint with Henrik Shahgholian)

*Title: A Criteria for Compactness in Some Overdetermined Problems and Its Application to the Boundary Regularity of Contact Sets*

Tiziana Giorgi (Towson University)

*Title: Vortex structures for a model of high temperature superconductivity and antiferromagnetism*

Diogo Gomes (IAS)

*Title: Viscosity Solutions and Aubry-Mather Theory*

Michael Korey (Potsdam, Germany)

*Title: Forbidden Symbols without Fear: Weak Continuity and Interpolation Theory in Besov Spaces*

Marianne K. Korten (Kansas State University)

*Title: "Nontangential convergence to initial data for the one-phase Stefan problem"*

Ruediger Landes (University of Oklahoma)

*Title: One-sidedness-condition versus angle condition for perturbations of elliptic systems*

Alexei Novikov (IMA University of Minnesota)

*Title: Stability of modulational perturbations of cellular flows*

Panayotis Panayotaros (University of Colorado at Boulder)

*Title: Amplitude equations for surface elastic waves*

Mahmoud Qafsaoui (LAMFA-CNRS Amiens, France)

*Title: Equivalence between the De-Giorgi estimates and heat kernel estimates for higher order elliptic operators or systems under divergence form*

Enrico Valdinoci (University of Texas at Austin)

*Title: Times of diffusion via Mather Theory*

Claudia Valls (University of Texas at Austin)\

*Title: Existence of smooth quasiperiodic solutions in the Boussinesq equation*

Changyou Wang (University of Kentucky)

*Title: Weighted Sobolev Inequality and Removable Singularity for Some Variational PDEs*

Qi Zhang (University of Memphis)

*Title: Existence of ground states for semilinear elliptic equations with decaying mass: a parabolic approach*

Meijun Zhu (University of Oklahoma)

*Title: Some inequalities related to isoperimetric inequalities with partial free boundary*