Institute for Pure and Applied Mathematics
University of California, Los Angeles presents a program in

Geometric Flows: Theory and Computation

February 23 - 27, 2004

Members of the Organizing Committee include **Huai-Dong Cao,** Chair (LeHigh University), Ben Chow (UCSD), **Panagiota Daskalopoulos** (Columbia), **Richard Hamilton** (Columbia), **Gerhard Huisken** (MPI Albert Einstein Institute) and **Hong-Kai Zhao** (UC Irvine)

Scientific Overview:

The field of geometric evolution equations has seen tremendous progress in the past twenty years. Analytic, geometric, and numerical techniques are used in the setting of differential geometry to solve pure and applied problems in diverse fields which include global geometry, mathematical physics, algebraic geometry, material science, image processing and optimization. A plethora of important geometric heat flows are of current interest, including Ricci and Kaehler-Ricci flow, mean and inverse mean curvature flows, porous medium equation, Yamabe flow, and the harmonic map heat flow. These flows are characterized by the deformation of geometric objects such as metrics, mappings, and submanifolds by geometric quantities such as curvature and consist of partial differential equations of parabolic type. Via geometric evolution equations, the powerful methods of nonlinear and numerical analysis can be applied to mathematical problems that can be approached geometrically.

Geometric flows appear in many real world applications. For example, surface tension along moving interfaces in fluids and materials is proportional to mean curvature: mean curvature flow and affine mean curvature flow are useful for morphological image processing. Numerical computation of moving interfaces and geometric flows is quite challenging due to dynamic deformation of geometry, nonlinearity and possible development of singularities, especially topological changes. Recently great success has been made in computational methods for moving interfaces such as the level set method. In this workshop, numerical methods, computations and applications of geometric flows will be presented. However, rigorous convergence proofs and error estimates are needed for these numerical algorithms. Mathematical theories for geometric flows may provide useful tools and insights for these proofs. Also in many applications, numerical computations have to be continued after topological changes. So mathematical understanding of the formation of singularities and continuation past singularities can be used to verify current numerical methods or to construct more appropriate numerical schemes.

This five-day workshop at IPAM will provide a wonderful opportunity for geometric and numerical analysts to begin collaborations on open problems such as understanding singularities and global existence and convergence, which are amenable to both theoretical and numerical investigations.

Topics to be covered during the workshop include:

- Formation of singularities in geometric flows
- Global existence and convergence of solutions
- Weak solutions and continuation past singularities
- Computation and applications of geometric flows

Speakers:

Ben Andrews* (Australia National Univ.)
Sigurd Angenent (University of Wisconsin)
Hugh Bray (Columbia University)
Li-Tien Cheng (UCSD)
David Chopp (Northwestern University)
Klaus Ecker (Freie University - Berlin)
Xiaobing Feng (Univ of Tennessee)
Pengfei Guan (McMaster University)
Michael Holst (UCSD)
Ki-ahm Lee (Seoul National University)
Lei Ni (UCSD)
Grisha Perelman* (Steklov Math Institute)
Guillermo Sapiro (Univ of Minnesota)
Carlo Sinestrari (Universita' di Roma)
Peter Topping (University of Warwick)
Mu-Tao Wang (Columbia Univ.)
Xi-Ping Zhu (Zhongshan University)
* To be Confirmed

Participation:

The program is open to the entire mathematical and scientific communities. Please visit our website for more information, including an online registration form and an application for support at: ***http://www.ipam.ucla.edu/programs/gf2004***. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications.

Please visit our website at
http://www.ipam.ucla.edu/programs/gf2004
or email questions to ***gf2004@ipam.ucla.edu***

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