



QUANTUM AND KINETIC TRANSPORT: ANALYSIS, COMPUTATIONS, AND NEW APPLICATIONS

March 9 - June 12, 2009

ORGANIZING COMMITTEE: Eric Carlen (Georgia Institute of Technology), Pierre Degond (Université de Toulouse III (Paul Sabatier)), Irene Gamba (University of Texas at Austin), Frank Graziani (Lawrence Livermore National Laboratory), Shi Jin (University of Wisconsin-Madison), Karl Kempf (Intel Corporation), David Levermore (University of Maryland), Peter Markowich (Universität Wien Institute of Mathematics), Stanley Osher (UCLA), Christian Ringhofer (Arizona State University), Marshall Slemrod (University of Wisconsin-Madison)

Scientific Overview

We are at the dawn of the nanotechnology era, where scientific and technological advancements in many fields strongly demand the investigation of problems involving small or multiple scales. In such problems, the hydrodynamic theory is often invalid, and one has to apply the more fundamental laws of physics, such as kinetic theory (Boltzmann equation), molecular dynamics (Newton's second law or the Liouville equation), or even quantum mechanics (Schrodinger equation). This requires the development of new mathematical and computational methods for physical laws at these scales, or a mixture of them, which is facilitated by the improvements of modern computers. Mathematical understanding of the scaling limit from one scale to another plays an important role, and interweaves with the development of new multiscale computational methods. This program will focus on the mathematical analysis, computational challenges and new applications of quantum and kinetic transport theory. It will invite both senior leading figures and young researchers in these directions. Besides applied mathematicians, special attention will be paid to invite researchers in other fields in science and engineering, representing academic, national lab and industrial research. .

Workshop Schedule

- Tutorials, March 10 – 13, 2009
- Workshop 1: Computational Kinetic Transport and Hybrid Methods, March 30 – April 3, 2009
- Workshop 2: The Boltzmann Equation: DiPerna-Lions Plus 20 Years, April 15 – 17, 2009
- Workshop 3: Flows and Networks in Complex Media, April 27 – May 1, 2009
- Workshop 4: Asymptotic Methods for Dissipative Particle Systems, May 18 – 22, 2009
- Culminating Workshop at Lake Arrowhead Conference Center, June 7 – 12, 2009

Participation

This long program will involve a community of senior and junior researchers. The intent is for participants to have an opportunity to learn about mathematical and computational aspects of quantum and kinetic transport, and to meet a diverse group of people and have an opportunity to form new collaborations.

Full and partial support for long-term participants is available. We are especially interested in applicants who intend to participate in the entire program (March 9 – June 12, 2009), but will consider applications for shorter periods. Funding is available for participants at all academic levels, though recent PhDs, graduate students, and researchers in the early stages of their careers are especially encouraged to apply. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission and we welcome their applications. More information and an application is available online.

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IPAM is an NSF funded institute

