



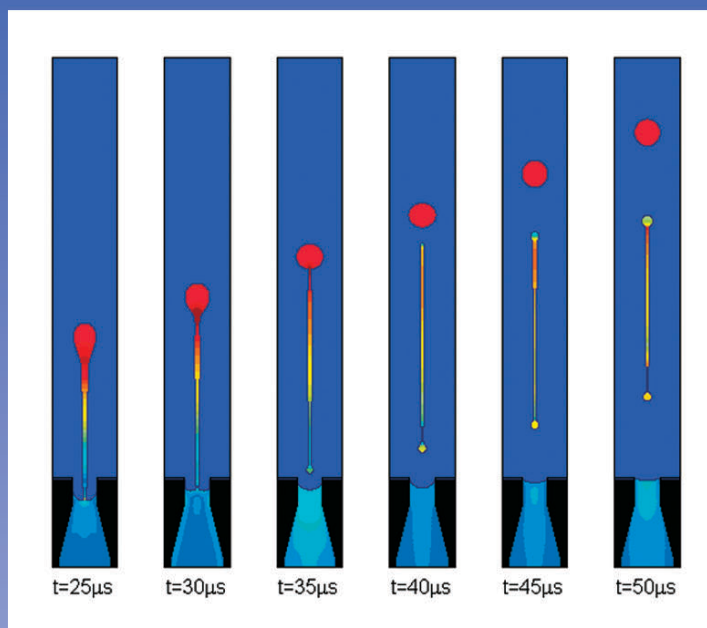
IMA

INSTITUTE FOR MATHEMATICS
AND ITS APPLICATIONS

www.ima.umn.edu

IMA Tutorial/Workshop: New Paradigms in Computation

March 28-30, 2005



Who should attend?

Industrial engineers and scientists who want to learn about modern techniques in scientific computations

Researchers from academic institutions involved in multidisciplinary collaborations

Organizer

Robert V. Kohn

Tutorial Lectures:

Weinan E

Leslie F. Greengard

James A. Sethian

The primary goal of this workshop is to facilitate the use of the best computational techniques in important industrial applications. Key developers of three of the most significant recent or emerging paradigms of computation – fast multipole methods, level set methods, and multiscale computation – will provide tutorial introductions to these classes of methods. Presentations will be particularly geared to scientists using or interested in using these approaches in industry. In addition the workshop will include research reports, poster presentations, and problem posing by industrial researchers, and offer ample time for both formal and informal discussion, related to the use of these new methods of computation.



The IMA is an NSF funded Institute



UNIVERSITY OF MINNESOTA

Schedule

MONDAY, MARCH 28

All talks are in Lecture Hall EE/CS 3-180

- 8:30 Coffee and Registration
Reception Room EE/CS 3-176
- 9:15 Douglas N. Arnold and Organizers
Welcome and Introduction
- 9:30-10:30 **James A. Sethian**
Lecture 1: Advances in Advancing Interfaces: Level Set Methods, Fast Marching Methods, and Beyond
- 10:30 Coffee
- 11:00-12:00 **Leslie F. Greengard**
Lecture 1: Fast Multipole Methods and their Applications
- 12:00 Lunch
- 1:30-2:30 **Weinan E**
Lecture 1: Overview of Multiscale Methods
- 2:30 Coffee
- 3:00-4:30 Industrial problem presentations

TUESDAY, MARCH 29

All talks are in Lecture Hall EE/CS 3-180

- 8:30 Coffee
- 9:00-10:30 More industrial problem presentations
- 10:30 Coffee
- 11:00-12:00 **James A. Sethian**
Lecture 2: Advances in Advancing Interfaces: Level Set Methods, Fast Marching Methods, and Beyond
- 12:00 Lunch
- 1:30-2:30 **Leslie F. Greengard**
Lecture 2: Fast Multipole Methods and their Applications
- 2:30 Coffee
- 3:00-4:00 **Weinan E**
Lecture 2: Problems with Multiple Time Scales
- 4:00 Reception and Poster Session
400 Lind Hall

WEDNESDAY, MARCH 30

All talks are in Lecture Hall EE/CS 3-180

- 8:30 Coffee
- 9:00-12:00 Structured discussion of industrial problem areas
- 12:00 Lunch
- 1:30-3:00 Breakout sessions

Problem Presentation

Industrial participants are encouraged to present a problem through an oral presentation and/or a poster. Problems will be discussed and worked on by teams of researchers in breakout sessions. Preliminary findings and recommendations will be presented at the end of the workshop. Industrial participants wishing to present a problem must register by March 15, 2005, and provide a problem description with the registration. Problem presenters will be charged a presentation fee of \$1,000. The presentation fee is waived for participants from IMA Participating Corporations.



Weinan E received his Ph.D. from the University of California at Los Angeles in 1989. He was visiting member at the Courant Institute from 1989 to 1991. He joined the IAS in Princeton as a long term member in 1992 and went on to take a faculty position at the Courant Institute at New York University in 1994. He is Professor of Mathematics at Princeton University since 1999. His awards include the Alfred P. Sloan Foundation Fellowship, a Presidential Faculty Fellowship, the Feng Kang Prize in Scientific Computing and the Collatz Prize awarded by the International Council of Industrial and Applied Mathematics. He serves on the editorial board of various journals including the Journal of American Mathematical Society, Acta Mathematica Sinica, Journal of Computational Mathematics, Communications of Contemporary Mathematics, and Journal of Statistical Physics.



Leslie Greengard was born in London, England, and grew up in New York, Boston, and New Haven. He received his B.A. in mathematics from Wesleyan University in 1979, his Ph.D. in computer science from Yale University in 1987, and his M.D. from Yale University in 1987. From 1987-89 he was a National Science Foundation Postdoctoral Fellow at Yale University in the Department of Computer Science. He is presently a professor of mathematics at the Courant Institute of New York University, where he has been a faculty member since 1989. In 2001, he was awarded the Leroy P. Steele Prize by the AMS Council. Much of his work has been in the development of analysis-based fast algorithms such as the Fast Multipole Method for gravitation and electromagnetics and the Fast Gauss Transform for diffusion.



James A. Sethian was born on May 10, 1954, in Washington, DC. He received a B.A. in mathematics from Princeton University in 1976 and a Ph.D. in applied mathematics from the University of California, Berkeley, in 1982. After a National Science Foundation Postdoctoral Fellowship at the Courant Institute of Mathematical Sciences, he joined the faculty at UC Berkeley, where he is now professor of mathematics as well as head of the mathematics department at the Lawrence Berkeley National Laboratory. He has been a plenary speaker at the International Congress of Industrial and Applied Mathematicians, has been an invited speaker at the International Congress of Mathematicians. He has received SIAM's I. E. Block Community Lecture Prize, and has been awarded the Norbert Wiener Prize in Applied Mathematics by the American Mathematical Society (AMS) and the Society for Industrial and Applied Mathematics (SIAM). He is an associate editor of SIAM Review, the Journal of Mathematical Imaging and Vision, and the Journal on Interfaces and Free Boundaries.



Robert V. Kohn received his A.B. from Harvard University in 1974, his M.Sc. from the University of Warwick in 1975, and a Ph.D. from Princeton in 1979. He spent two years as an NSF Postdoc at New York University's Courant Institute of Mathematical Sciences, before he joined the faculty. He has been a Professor of Mathematics at the Courant Institute since 1981. His honors include SIAM's Ralph Kleinman Prize, an Ordway Visiting Professorship at the University of Minnesota, and a Sloan Research Fellowship. His research interests include mathematical aspects of materials science, nonlinear partial differential equations, nonconvex variational problems, and mathematical finance. In addition, he is among the leaders of the Courant Institute's professional masters program in mathematical finance.

Registration is Required

The registration form is at
http://www.ima.umn.edu/docs/reg_form1.html

There is no registration fee

Deadlines: March 15, 2005, if presenting a problem
March 21, 2005, otherwise