1993 SIAM Annual Meeting

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Society for Industrial and Applied Mathematics

MEETING THEMES

- Computational Fluid Dynamics
- Materials Science
- Biotechnology
- Inverse Problems
- Optimization
- Industrial Problems
- Large Scale Computing
- Finance
- Dynamical Systems
- Nondestructive Testing
- Discrete Mathematics
- Research Opportunities

July 12 - 16, 1993
Wyndham Franklin Plaza Hotel
Philadelphia, Pennsylvania

and in conjunction with the annual meeting

SYMPOSIUM July 8-10, 1993
Inverse Problems and Optimal Design in Industry

TUTORIALS July 11, 1993
Wavelets and Applications ⋆ Continuous Time Finance ⋆ Structured Population Dynamics

WORKSHOP July 10, 1993
Making Mathematics Count: *A Workshop for High School Mathematics Teachers*

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DEADLINE DATES

Hotel Registration
Wednesday, June 16, 1993

Tour Registration
Monday, June 21, 1993

Symposium, Tutorials, Workshop and Meeting Preregistration
Thursday, June 24, 1993

ORGANIZING COMMITTEE

Gregory A. Kriegsmann, Chair
New Jersey Institute of Technology

Peter E. Castro
Eastman Kodak Company

L. Pamela Cook
University of Delaware

Joseph E. Flaherty
Rensselaer Polytechnic Institute

David M. Gay
AT&T Bell Laboratories

William E. Olmstead
Northwestern University

Linda R. Petzold
University of Minnesota, Minneapolis

William T. Trotter
Bellcore

Benjamin S. White
Exxon Research and Engineering Company

Don't forget to attend the
SIAM Business Meeting
Tuesday, July 13
2:15 PM in the Wyndham Ballroom

MAKING MATHEMATICS COUNT

A WORKSHOP FOR HIGH SCHOOL MATHEMATICS TEACHERS

July 10, 1993 • Wyndham Franklin Plaza Hotel • Philadelphia, Pennsylvania

Mathematics, common sense, and practical experience are used every day to improve the quality of the products and services of American business. How can this knowledge be transferred to the leaders of tomorrow? What can we as teachers do to provide excitement about career opportunities in mathematics? Attend this workshop and realize the excitement surrounding current applications of mathematics.

Learn about codes and ciphers, fractals and chaos, the mysteries of DNA research. Hear how workers use "hands on" math on the job. Find out how probability and statistics are used in biology, medicine, sports, law, and public opinion polls. Discover the growing importance of computational mathematics in science, engineering, and industry.

The speakers have designed their presentations for high school mathematics teachers. The goal of the workshop is for the attendees to learn new mathematical applications and introduce them into their mathematics curriculum.

PRESENTATIONS

Using Matrices to "Get the Message"
Genevieve Battisto
Mathematics Supervisor, Pocono Mountain School District

Geometry and Modern Technology
Dennis de Turck
University of Pennsylvania

Almost Everything You Wanted to Know About Fractals and Their Applications
Dwight L. Jaggard
University of Pennsylvania
Aaron D. Jaggard
Delaware County Christian School

Getting Real: Applications in the Curriculum
William G. Kolata
Technical Director, SIAM

A Minimum Cycle Problem from Bacterial DNA Research
Stephen B. Maurer
Swarthmore College

Pittsburgh Supercomputing Center: High School Initiative in Computational Science
Casey Porto
Education Liaison, Pittsburgh Supercomputing Center

Beauty in Math and Logic in the Arts: Connections Between Mathematics and the Visual and Performing Arts
Tom Rockwell
Leathers & Associates

Don't Be So Mean! How to Show Students the Many Ways Industry Uses Statistics
James M. Rubillo
Bucks County Community College

Probability in Everyday Things
Ann K. Stehney
IDA Center for Communications Research

Parallelism, Supercomputing and Applied Mathematics
Virginia Torczon
Rice University

Statistics and Sports
Jay Bennett
Bellcore

Linear Programming
Irvin Lustig
Princeton University

ORGANIZING COMMITTEE

James C. T. Pool, Drexel University
Freddie Reisman, Drexel University
Thomas H. Smith, The Association of Teachers of Mathematics, Philadelphia and Vicinity

The workshop will consist of four sessions of one hour and fifteen minutes each. Attendees will be able to select among 3-4 speakers for each session.

	Regular	Student/High School Teachers
Workshop Registration Fees	$30.00	$10.00

Attendees are advised to preregister for the workshop. On-site registration cannot be guaranteed. A box lunch is included in the registration fee. See registration form on page 59.

INVERSE PROBLEMS AND OPTIMAL DESIGN IN INDUSTRY

July 8-10, 1993 • Wyndham Franklin Plaza Hotel • Philadelphia, Pennsylvania

Inverse problems and optimal design problems are of significant interest in industry; there is also a large academic community addressing these problems. Industrial researchers and academic researchers have attacked the problems of modeling, analysis, and the creation and implementation of efficient numerical methods. A goal of this symposium is for both groups to benefit from interaction and exchange of information about problem definition and solution techniques.

The symposium is organized to broaden the contacts between universities and industry on a world-wide scale. The formal program will include the presentation by industrial researchers of their experience in modeling and solving inverse and optimal design problems, the presentation by some university applied mathematicians on their own industrially motivated research, and three organized discussion sessions to promote interaction in three specific areas.

ORGANIZING COMMITTEE

Heinz W. Engl (Co-chair), Johannes-Kepler Universität, Austria
Joyce R. McLaughlin (Co-chair), Rensselaer Polytechnic Institute
Vinicio C. Boffi, Societa Italiana di Matematica Applicata e Industriale, Italy
Guy Chavent, Institut National de Recherche en Informatique et en Automatique Maisons-Laffitte, France
David L. Colton, University of Delaware
Avner Friedman, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

PROGRAM

WEDNESDAY EVENING, JULY 7

6:00 PM-8:00 PM **Registration opens**

THURSDAY MORNING, JULY 8

7:30 AM-4:00 PM **Registration opens**

8:15 AM-8:30 AM **Opening Remarks**
Heinz W. Engl and Joyce R. McLaughlin

8:30 **Optimization Problem Formulation for Multidisciplinary Design**
Gregory R. Shubin, The Boeing Company

9:10 Break

9:25 **Multidisciplinary Computation in Aerospace Design**
Vijaya Shankar, Rockwell International Science Center

10:05 Coffee

10:35 **Computational Differentiation for Multidisciplinary Design**
Christian Bischof, Argonne National Laboratory

11:15 Break

11:30 **Symbolic Computation for Inverse Problems and Design Optimization**
Kiyoshi Yoda, Mitsubishi Electric, Japan

THURSDAY AFTERNOON, JULY 8

12:00 PM-2:00 PM **Lunch**

2:00 **Computational Fluid Dynamics in Modelling Blast Furnace Erosion**
Alfred Preuer, Voest Alpine Stahl, Austria

2:40 Break

2:55 **A Unidimensional Dynamic Model for the (Ferro) Silicon Process — A Reliable Tool for Identifying the State of the Furnace**
Svenn Anton Halvorsen, Elkem Research, Norway

3:35 Coffee

4:00-6:00 **Discussion: Optimal Design**
Discussion Leaders: Pekka Neittaänmaki, University of Jyväskyla, Finland, and Jacques Periaux, Avions Marcel Dassault, France
Discussion Participants: Tito A. Ciriani, IBM-SEMEA, Italy, Paolo Vestrucci, MIER-Bologna, Italy

The symposium will take place in the Philadelphia Ballroom; coffee will be at the Philadelphia Ballroom Foyer; and lunch in Horizon Ballroom.

FRIDAY MORNING, JULY 9

8:00 AM-4:00 PM **Registration**

8:30 **An Inverse Problem for Nonlinear Systems**
Hans-Georg Stark, Tecmath, Germany

9:10 Break

9:25 **Nonholonomic Motion Planning: Algorithms and Inequalities**
Leonid Gurvits, Siemens Corporate Research, Inc.

10:05 Coffee

10:35 **Optimal Vehicle Controllers — A Neural Network Approach**
Lee A. Feldkamp, Ford Motor Company

11:15 Break

11:30 **Dynamic Inverse Problem for Improving Automobile Interior Noise**
Ichiro Hagiwara, Nissan Motor Company, Japan

FRIDAY AFTERNOON, JULY 9

12:00 PM-2:00 PM **Lunch**

2:00 **Parameter Identification in Design of Films**
David S. Ross, Eastman Kodak Company

2:40 Break

2:55 **Inverse Problems in Particle Sizing and Confocal Microscopy**
Mario Bertero, Universitá di Genova, Italy

3:35 Coffee

4:00-6:00 **Discussion: Inverse and Optimal Design Problems in Optics**
Discussion Leaders: J. Allen Cox, Honeywell, Inc., and Maurice Maes, Philips Research Laboratories, The Netherlands

SATURDAY MORNING, JULY 10

8:00 AM-3:00 PM **Registration**

8:30 **Inverse Problems in Electromagnetism: Antenna's Application**
Ugo F. D'Elia, ALEMIA-Rome, Italy

9:10 Break

9:25 **The Determination of Cracks from Electrical Boundary Measurements**
Michael Vogelius, Rutgers University, New Brunswick, and Universite Joseph Fourier, France

10:05 Coffee

10:35 **Impedance Imaging**
David Isaacson, Rensselaer Polytechnic Institute

11:15 Break

11:30 **Monitoring of Transient Temperature Distribution in Piping**
Kinji Baba, Mitsubishi Heavy Industries, Japan

SATURDAY AFTERNOON, JULY 10

12:00 PM-2:00 PM **Lunch**

2:00 **Determination of Petrophysical Parameters by Resolving an Inverse Problem**
Catherine Chardaire-Riviere, Institut Français du Petrole, France

2:40 Break

2:55 **Inverse Problems in Petroleum Application**
Richard E. Ewing, Texas A&M University, College Station

3:35 Coffee

4:00-6:00 **Discussion: Inverse and Optimization Problems in Semiconductor Design**
Discussion Leaders: Patrick S. Hagan, Los Alamos National Laboratory, and Leonard Borucki, Motorola Advanced Technology Center

The Symposium is sponsored by ECMI and SIAM with the cooperation of IMA (Minnesota), INRIA, and SIMAI. It is conducted with partial support from the Department of Energy and the Office of Naval Research.

MINISYMPOSIA ON INVERSE PROBLEMS AND OPTIMAL DESIGN AT SIAM'S ANNUAL MEETING

A series of minisymposia at SIAM's Annual Meeting (see MS3, MS10, MS14, and MS22) has been designed to complement the themes of this Symposium. These minisymposia will be held on Monday and Tuesday, July 12 and 13. SIAM invites all attendees of the Symposium to attend our Annual Meeting. A special registration fee for the Symposium and Annual Meeting has been established.

Student Travel Support

SIAM has support from the Office of Naval Research to provide partial reimbursement of the travel and lodging expenses of graduate students who wish to attend the Symposium and the series of minisymposia at the Annual Meeting. To apply, send a letter of recommendation from your graduate advisor (include a statement of your current status and your research interests) to: SIAM, c/o Student Support IP93, 3600 University City Science Center, Philadelphia, PA 19104-2688. The letter must be received at the above address by May 15.

Registration

See pages 58 & 59 of this program to register for the Symposium, the Annual Meeting, and the Tutorials.

Wyndham Franklin Plaza Hotel • Philadelphia, Pennsylvania

INTRODUCTION TO WAVELETS AND APPLICATIONS

Organizer: *Charles K. Chui, Center for Approximation Theory, Texas A&M University, College Station*

Tutorial Description
Wavelet analysis is a very attractive subject both to mathematicians and engineers. This tutorial will cover the theory, methods, and various applications of the subject of wavelets to the general mathematics and engineering community.

Who Should Attend
Advanced undergraduate and graduate students, mathematicians and engineers in universities, government laboratories, and industries. Also, others who are curious about the popularity of this subject.

Recommended Background
Basic training in mathematical analysis (advanced calculus and Fourier analysis), willingness to accept the importance of signal and image analysis.

Lecturer
Charles K. Chui is Distinguished Professor at Texas A&M University where he holds a joint appointment with the Departments of Electrical Engineering, Mathematics and Statistics. He is the author of over two hundred papers and nine books; he is editor of two book series and several volumes; and serves on the editorial board of eight mathematics journals. His main interests of research are approximation theory and methods, wavelets and signal processing.

PROGRAM

9:00 AM	**Time-frequency Analysis and Integral Wavelet Transforms**
10:00 AM	Coffee
10:30 AM	**Lowpass Filtering and Multiresolution Analysis**
11:30 AM	**Wavelet Analysis and Orthonormal Wavelets**
12:30 PM	Lunch
2:00 PM	**Nonorthogonal Wavelets and Filter Banks**
3:00 PM	Coffee
3:30 PM	**Wavelet Packets and Other Wavelets**
4:30 PM	**Affine Frames and Wavelet Applications**
5:00 PM	Tutorial adjourns

AN INTRODUCTION TO CONTINUOUS TIME FINANCE

Organizer: *Jean-Luc Vila, Sloan School of Management, Massachusetts Institute of Technology*

Tutorial Description
This tutorial will cover a very important section of the finance industry which uses high tech mathematical techniques. It will give an introduction to modern finance at a fairly intuitive level.

Who Should Attend
This tutorial is intended for scientists (non-finance) with graduate level math who want to see how finance can be made rigorous, and finance industry practitioners with intermediate level asset pricing knowledge who want to go further.

Recommended Background
Undergraduate level probability, undergraduate level calculus, and stochastic processes (desired, if possible).

Lecturer
Jean-Luc Vila received a Ph.D. in mathematics, Paris, France and a Ph.D. in economics from Princeton University. During 1988-89, he was Assistant Professor of Finance at New York University. In 1990, he moved to Massachusetts Institute of Technology where he is at present an Assistant Professor of Finance in the Sloan School of Management.

PROGRAM

9:00 AM	**Review of Mathematical Material**
10:00 AM	Coffee
10:30 AM	**The Black-Scholes Pricing Formula**
11:30 AM	**Portfolio/Consumption Choice**
12:30 PM	Lunch
2:00 PM	**The International Capital Asset Pricing Model**
3:00 PM	Coffee
3:30 PM	**The Term Structure of Interest Rate**
4:30 PM	**The Consumption Based Capital Asset Pricing Model**
5:30 PM	Tutorial adjourns

WHAT IS STRUCTURED POPULATION DYNAMICS?

Organizer: *James N. McNair, Division of Environmental Research, Academy of Natural Sciences of Philadelphia*

Tutorial Description
Structured population models incorporate processes operating at the level of the individual organism (e.g. aging, growth), permitting study of their effects on population dynamics. These models are of considerable current interest because of their usefulness in ecological studies and because of the challenging mathematical and computational problems they pose. This tutorial will cover the basic theory of continuous and discrete models, and will survey numerical methods for continuous models.

Who Should Attend
Graduate and advanced undergraduate students, mathematicians with an interest in ecological or environmental applications, and theoretical biologists.

Recommended Background
Basic training in linear algebra, matrix theory, and ordinary differential equations; familiarity with basic principles of population dynamics is desirable but not essential.

Lecturers
J. M. Cushing and *Guillermo Uribe* are mathematicians at the University of Arizona. Dr. Cushing is a faculty member in the Department of Mathematics and the Interdisciplinary Program on Applied Mathematics. He is the author of numerous publications on mathematical aspects of population dynamics. His research areas include integrodifferential equation delay models, physiologically structured partial differential equation models, and structured models with discrete time-parameter. Dr. Uribe's research deals with mathematical relationships between discrete and continuous formulations of physiologically structured models.

PROGRAM

9:00 AM	**Continuous Model**
10:00 AM	Coffee
10:30 AM	**Continuous Model** (continued)
11:00 AM	**Discrete Models**
12:30	Lunch
2:00 PM	**Connections Between Discrete and Continuous Models**
3:00 PM	Coffee
3:30 PM	**Numerical Schemes**
5:00 PM	Tutorial adjourns

TUTORIAL REGISTRATION FEES: (APPLY TO EACH TUTORIAL)

Registration Fees*	SIAM Member	Non-Member	Student
Preregistration	$120	$135	$55
Registration	$135	$155	$55

*Preprints, coffee and lunch are included in the registration fees.

Attendees are advised to preregister for the tutorial. On-site registration cannot be guaranteed. Preprints of the lecture materials will be distributed upon check-in at the SIAM registration desk.

SPECIAL SESSIONS

Monday, July 12/1:30 PM
Special Session 1/Wyndham Ballroom

Research Support—What's in Store for Us?

The research environment in place in the United States since World War II, especially the implicit contract between the federal government and the research universities, is changing dramatically. Entitlement to research support is being challenged. In what is becoming a constrained resource environment, researchers increasingly will need to justify support for their projects and be accountable for funds expended.

The suggested requirement that federally supported research must benefit the American people, of necessity, will result in increased university/industry/government cooperation. The value of serendipitous research will not be forgotten, but mission-oriented and product-oriented research will play an increasingly important role.

What are the prospects for the various kinds of research—independent (serendipitous), mission-oriented, product-oriented—in the years ahead? Will such research be done in universities? In industry? In federal laboratories? Will it be supported by government? By industry? What role will the national laboratories play? How should individual researchers adapt to the new environment?

The panel members will discuss these questions and the likely effects of the expected changes on the research community.

Organizer
Richard Herman
University of Maryland and
Joint Policy Board for Mathematics

Panelists
William C. Harris
National Science Foundation

Fred W. Weingarten
Computer Research Association

Additional panelists to be announced.

Wednesday, July 14/1:30 PM
Special Session 3/Wyndham Ballroom

FCCSET Initiatives: Opportunities to Make a Difference

Integrated, interagency, thematic programs have become a major mode of research funding by the Federal government. They present new opportunities for mathematical and computational scientists. The Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) has identified five initiatives that have a major impact on national interests: biotechnology, global climate change, high performance computing and communications, manufacturing, and materials.

The speakers in this session will present an overview of these initiatives and highlight those aspects of particular interest to mathematical and computational scientists.

1:30 Biotechnology
David J. Galas, Associate Director of Energy Research for Health and Environmental Research, Department of Energy

1:50 Global Climate Change
Robert W. Correll, Assistant Director for Geosciences, National Science Foundation

2:10 High Performance Computing and Communications
David B. Nelson, Associate Director, Office of Scientific Computing, Department of Energy

2:30 Manufacturing
Joseph Bordogna, Assistant Director of Engineering, National Science Foundation

2:50 Advanced Materials and Processing
Lyle Schwartz, Director, Materials Science and Engineering Laboratory, National Institute of Standards and Technology

Thursday, July 15/1:30 PM
Special Session 5/Wyndham Ballroom

Linking Academe to Industry — How to Make it Work

The purpose of this session is to identify successful models and examples of academic-industrial scientific interactions and technology transfer. The session will start with four short presentations, outlining different types of interactions. The first premise of this session is that there are many different routes to the application of mathematics to problems of significance to industry. The second premise is that the problems encountered may be difficult, fascinating and even unusual. The most important part of the session will be the audience participation, following these presentations.

Organizer: James G. Glimm
State University of New York, Stony Brook

1:30 Starting an Industrial Mathematics Program
James G. Glimm, Organizer

2:00 Industrial Postdoc Program at the IMA: How it Developed
Avner Friedman, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

2:30 The Short Cut to Tech Transfer: Start Your Own Business
Stanley J. Osher, University of California, Los Angeles

3:00 From Corporate Research to the Factory Floor: A Perspective on Technology Transfer
John Papazian, Grumman Corporation, Bethpage, New York

PRIZES AND AWARDS

Monday, July 12/10:00 AM
MS7/Horizon Ballroom

Student Paper Competition: Award and Presentation

The winning student authors of the three best papers in applied and computational mathematics will present their papers. In qualifying for the competition, authors had to be students in good standing who had not received their doctorates at the time of submission, and their papers had to be singly authored.

Friday, July 16/1:45 PM
Wyndham Ballroom

The James H. Wilkinson Prize in Numerical Analysis and Scientific Computing

The Wilkinson Prize, established in 1979, is awarded for research in, or other contributions to, numerical analysis and scientific computing during the six years preceding the award. The purpose of the prize is to stimulate younger contributors and to help them in their careers. (See page 40)

Friday, July 16/3:00 PM
MS63/Horizon Ballroom

Mathematical Contest in Modeling (MCM)

SIAM co-sponsors the annual Mathematical Contest in Modeling (MCM), in which teams of three undergraduates develop a mathematical model of two applied problems. Teams devote an entire weekend to the problems, the models, and their analyses, using computers and libraries.

Two SIAM graders will select two SIAM-Award winning teams to present their solutions in this minisymposium.

This minisymposium provides an opportunity for SIAM members to recognize outstanding future applied mathematicians and to learn how to stimulate student participation on the MCM at their own institutions.

Organizer: Ben Fusaro
Salisbury State University

MATHEMATICS EDUCATION

Monday, July 12/3:30 PM
Special Session 2/Horizon Ballroom

The Interactive Mathematics Text Project

During the past few years there have been many efforts toward revitalizing mathematics instruction. Common to these efforts is the need to move away from the passive approach to teaching, in which the student is viewed as an empty vessel into which we "pour" information, toward an active approach in which the student learns by doing. Computers can play a very important role in by facilitating the creation of microworlds in which students can create their own learning environments.

The goal of the Interactive Mathematics Text Project (IMTP) is to promote the use and creation of an interactive learning environment for collegiate mathematics that will take advantage of powerful desktop computing software and hardware that supports query-driven mathematical hypertexts incorporating exploratory capabilities found in today's symbolic and numeric and graphic software tools. This is the idea of an interactive text. To achieve this goal, the Project conducts workshops, supports the development efforts of interactive text authors, and disseminates information about interactive texts to the broader mathematical community. Six regional sites have been established to support these efforts.

The speakers will describe the project and talk about their experience using interactive texts.

Organizer: Gerald J. Porter
University of Pennsylvania

Speakers:

Gerald J. Porter is the Director of the Interactive Mathematics Text Project and co-author with David Hill of an interactive text for learning linear algebra.

Horatio Porta is an author of *Calculus and Mathematica*, the seminal interactive text.

Richard Alo is chair of the Department of Applied Mathematical Sciences at the University of Houston-Downtown, one of the IMTP regional sites.

David R. Hill is a Professor in the Department of Mathematics, Temple University.

Tuesday, July 13/3:15
Professional Seminar/Horizon Ballroom

What We Should Tell Our Graduate Students About Mathematical Writing

Many graduate students in the mathematical sciences have little experience of technical writing and are daunted by the task of writing a paper or thesis. We can make their task easier by teaching them the essentials of technical writing. These include English usage, various aspects of writing mathematics (such as notation, definitions and formatting equations), the anatomy of a research paper, how to revise a draft, the publication process, and how to make use of computers in writing. I discuss some specific issues from among these topics, using real examples for illustration. For more details see my book (*Handbook of Writing for the Mathematical Sciences*) published by SIAM in 1993.

Nicholas J. Higham
Department of Mathematics
University of Manchester, United Kingdom

Wednesday, July 14/10:00 AM
MS33/Horizon Ballroom

Teaching Statistics for Applied Mathematics

With the aid of current technology, applications of statistics in the sciences, social sciences, business and medicine have grown almost exponentially in recent years. As such, the importance of the discipline to the applied mathematician has also grown. The ways of teaching the discipline are almost as varied as are its applications since the presentation must fit the audience. The speakers will relive about their own experiences in teaching and using statistics as well as appropriate expectations for different audiences. They will also help define the "kind of statistics" needed by these audiences.

Organizer: Donald E. Miller
Saint Mary's College

10:00 Statistics and Mathematics for Computational Modeling
Albert M. Liebetrau, Pacific Northwest Laboratory

10:30 Elementary Statistics Laboratory
John D. Spurrier, Don Edwards, and Lori A. Thombs, University of South Carolina, Columbia

11:00 The Use of Consulting Data in Statistical Education
R. Bruce Lind, University of Puget Sound

11:30 Building an Applied Mathematician's Arsenal for the Industrial World
Sharon P. Repik, General Motors Corporation

Wednesday, July 14/3:30 PM
MS35/Horizon Ballroom

Educating Applied Mathematicians

This minisymposium is aimed at researchers and academicians in applied mathematics and related disciplines. Materials covered will include program structure, curriculum development, and teaching techniques.

Organizers: Stefan Ehrlich, Rivier College
and C.K. Chu, Columbia University

3:30 Applied Mathematics at Columbia University
C.K. Chu, Organizer

4:00 The Applied Mathematics Program at Pennsylvania State University
William Pritchard, The Pennsylvania State University, University Park

4:30 Teaching Techniques in Applied Linear Algebra
Stefan Ehrlich, Organizer

Thursday, July 15/10:00 AM
Special Session 4/Horizon Ballroom

Symbolic Computation and Calculus Reform

Calculus reform projects are changing the content and delivery of introductory mathematics courses for science and engineering majors. These changes, such as the introduction of symbolic computation systems, will potentially produce students who have different mathematical backgrounds and expectations. The speakers will review projects with different characteristics pursued in differing academic environments. The topics addressed will include not only the introductory calculus sequence, but also implications for upper-division applied mathematics courses.

Organizer: James C.T. Pool
Drexel University

10:00 MAPLE for the Masses: Freshman Calculus at Drexel University
Loren N. Argabright and Robert C. Busby, Drexel University

10:30 The Use of Computers in Mathematics Instruction at Rensselaer
William E. Boyce, Rensselaer Polytechnic Institute

11:00 Interactive Calculus Lab Materials
David A. Smith, Duke University

11:30 MAPLE in the Classroom: A New Apprenticeship
Robert Lopez, Rose-Hulman Institute of Technology

Friday, July 16/10:00 AM
MS62/Horizon Ballroom

Preparing Doctoral Students for Junior Faculty Success with a "Proseminar"

The Joint AMS-MAA-SIAM Committee on Preparation for College Teaching recommends organized activities late in doctoral work to enhance mathematical breadth and give explicit attention to pedagogy and faculty responsibilities. These activities are encouraged for all students since it is not known which will teach. The need for good communications skills is reinforced by the national priority for good teaching at all levels.

Through a FIPSE grant, the Committee assists pilot programs at Washington University, University of Tennessee, Oregon State, Harvard, University of Delaware, Dartmouth, Clemson, and the University of Cincinnati. To meet the needs of its own students, each developed a seminar including consideration of tripartite faculty responsibilities (Proseminar). From these examples, other departments will find practical and effective ways to ease the upcoming transition for advanced doctoral students.

Organizer: Bettye Ann Case
The Florida State University

10:00 Background and Overview of the "Preparation for College Teaching" Project
Bettye Ann Case, Organizer

10:30 The College Teaching Project at the University of Cincinnati
Edward Merkes, University of Cincinnati

11:00 The College Teaching Project at the University of Delaware
Judy Kennedy, University of Delaware

11:30 A Summary of Doctoral Department Efforts and Audience Discussion
James G. Simmonds, University of Virginia

Following are subject classifications for the sessions. The codes in parentheses designate session type and number. The session types are invited presentations (IP), contributed presentations (CP), minisymposia (MS), special sessions (SS), short courses (tutorials) (SC), symposium (SI), and Professional Seminar (PS). For Poster and Video presentations, see page 30.

Biotechnology, Biology, and Medicine

Ionic Channels in Biological Membranes: Models and Analysis (MS19, page 20)
Mathematics in Biotechnology (IP2, page 13)
Mathematics and Molecular Biology (MS2 and MS9, page 13 and 16)
Mathematical and Computational Aspects of Physiologically Structured Population Models (MS42, page 29)
Simulation and Modeling in Biology and Medicine (CP14 and CP18, pages 24 and 27)
What is Structured Population Dynamics? (SC, page 4)

Computational Fluid Dynamics

Computational Aspects of Free Surface Flows, MS40, page 28)
Computational Fluids (CP21, CP24, CP28, pages 29, 33, 35)
High Order Schemes for Shock Wave Calculation (MS59 and MS65, pages 37, 40)
Numerical Methods and Analysis of Nonlinear Dispersive Partial Differential Equations (IP6, page 25)
Numerical Methods for Large-Scale Meteorological Flows (MS66, page 40)
The Gibbs Phenomenon and Scientific Computing (IP7, page 31)

Control and Signal Processing

Control and Applications (CP15, page 24)
Mathematical Methods in Time Frequency Analysis and Spectral Estimation (MS44 and MS51, pages 31, 34)

Discrete Mathematics — Computer Science and Applications

Algebraic Combinatorics (MS57, page 37)
Combinatorial Optimization (MS64, page 40)
Computer Science: Theory and Applications (CP35, page 39)
Discrete Mathematics (CP26 and CP32, pages 33, 38)
Enumerative Combinatorics (MS55, page 35)
Solving Travelling Salesman Problems (IP10, page 37)

Dynamical Systems and Applications

Computation of Global Structures in Dynamical Systems (MS49, page 33)
Dynamical Systems (CP2 and CP6, pages 15, 17)
Interfacial Waves and Symmetry (MS25, page 23)
Stochastically Perturbed Dynamical Systems in Physics and Chemistry (MS32, page 26)
Synchronization Phenomena in Populations of Nonlinear Random Oscillators (MS27, page 23)

Elasticity, Plasticity

Theory and Computation of Elastic-Plastic Deformation (MS6, page 14)
Elasticity (CP10, page 21)

Finance

Finance I and II (MS1 and MS8, pages 13 and 16)
Finance and Management Sciences (CP9, page 20)
Pricing Options on Financial Securities Subject to Credit Risk (IP1, page 13)
Tutorial on Introduction to Continuous Time Finance (SC, page 4)

Fluids and Plasmas

Applied Mathematics in Plasma Physics (MS5 and MS13, pages 14, 17)
Approximate Methods in Nonlinear Propagation (MS17, page 20)
Computation of Global Structures in Dynamical Systems (MS49, page 33)
Dynamics of Vortical Structures (MS18, page 20)

Fluids and Plasmas *(continued)*

Dynamical Systems Approach to PDEs: Applications to Fluid Mechanics (MS38, page 28)
Fluids (CP17 and CP22, pages 26, 29)
High-Order Schemes for Shock Wave Calculation (MS59 and MS65, page 37, 40)
Interfacial Waves and Symmetry (MS25, page 23)
Linear, Non-Modal Fluid Mechanics (MS31, page 26)
Numerical Methods and Analysis of Nonlinear Dispersive Partial Differential Equations (IP6, page 25)
Shock Refractions and Nonlinear Wave Interactions (MS56, page 35)
Two-Fluid Flows and Interfacial Instabilities (MS45, page 32)
Viscoelastic Fluids: Complex Flows, Instabilities and Bifurcations (MS16 and MS23, pages 19, 22)

Geometry, Visualization and Applications

Geometry and Applications (CP12, page 21)
Scientific Visualization (MS20 and MS26, pages 20, 25)

Inverse Problems

Inverse Problems (CP27 and CP29, pages 33, 35)
Inverse Spectral Problems (MS10, page 16)
Mathematical Methods in Inverse Problems (MS14, page 19)
Optimal Design (MS22, page 22)
Research Interests in DOD (MS3, page 13)
Symposium on Inverse Problems and Optimal Design in Industry (SI, page 3)

Large-Scale Computations

Large-Electronic Structure Calculations on Massively Parallel Systems (MS43, page 31)
Time Stability in Large-Scale Computing (MS39, page 28)

Linear Algebra and Numerical Methods

Linear Algebra and Applications (CP34, page 39)
Numerical Linear Algebra (CP20 and CP31, pages 27, 35)

Materials Science

Computational Problems in Liquid Crystals (MS46, page 32)
Material Microstructure (MS50, page 34)
Materials (CP3 and CP8, page 15, 17)
Motion of Phase Boundaries (MS11 and MS15, page 16, 19)
Nonclassical Effects Accompanying Diffusion in Polymers (IP5, page 25)
Nonlinear Diffusion in Polymers (MS29 and MS37, page 25, 28)
Nucleation, Phase Transitions, Coarsening (MS4, page 14)
Phase-Change Modeling (MS24, page 22)
Phase Field Models and Alloys (MS30, page 25)
The Creation and Motion of Interfaces During Phase Transitions (IP3, page 19)
Two-Fluid Flows and Interfacial Instabilities (MS45, page 32)
Viscoelastic Fluids: Complex Flows, Instabilities and Bifurcations (MS16 and MS23, pages 19, 22)

Mathematics in Industry

Computational Aspects of Free Surface Flows (MS40, page 28)
Linking Academe to Industry — How to Make it Work (SS5, page 5)
Mathematics in Biotechnology (IP2, page 13)
Mathematics of Electrophotographic Imaging (MS53, page 34)
Mathematical Modeling in Electrophotographic Imaging Systems IP8, page 31)
Optimal Design (MS22, page 22)

Mathematics Education

Educating Applied Mathematicians (MS35, page 6)
Preparing Doctoral Students for Junior Faculty Success with a Proseminar (MS62, page 6)
Symbolic Computation and Calculus Reform (SS 4, page 6)
Teaching Statistics for Applied Mathematics (MS33, page 6)
The Interactive Mathematics Text Project (SS2, page 6)
What We Should Tell Our Graduate Students About Mathematical Writing (PS, page 6)

Nondestructive Evaluation

Mathematical Modeling for Quantitative Nondestructive Evaluation (IP4, page 19)
Mathematical, Computational and Integrated Models in Nondestructive Evaluation (MS28 and MS36, pages 25, 28)

Numerical Methods

Finite Elements and Applications (CP25, page 33)
High-Order Field Propagation Techniques (MS67, page 41)
Integral Equations and Compact Fixed Point Problems (MS68, page 41)
Numerical Methods: Integrals, Sums, Transforms (CP4, page 15)
Numerical Methods, Nonlinear Equations, Numerics (CP11, page 21)
Numerical Methods, Elliptic Problems (CP16, page 24)
Numerical Methods, Diffusion and Time-Dependent PDEs (CP19, page 27)

Optimization

Design of Experiments (MS41, page 29)
Integer Linear Programming (MS47, page 32)
Large-Scale Engineering Design (MS52, page 34)
Optimization (CP23, page 29)
Optimization and Applications (CP36, page 28)
Optimization in Engineering (MS12, page 16)
Optimization Methods in Computed Tomography (MS48, page 32)
Robust Optimization (MS58, page 37)
The Many Faces of Optimization (IP9, page 37)

Reaction-Diffusion and Diffusion

Reaction-Diffusion and Diffusion (CP33, page 38)

Special Functions and Wavelets

Applications of Special Functions (MS34, page 26)
Introduction to Wavelets (SC, page 3)
Parallel Coordinates: Mathematical Foundations, Applications and Recent Results (MS61, page 38)
Wavelet Solutions to PDEs (MS21, page 22)
Wavelets (CP7, page 17)

Stochastic Processes, Probability and Statistics

Probability and Statistics (CP39, page 42)
Stochastically Perturbed Dynamical Systems in Physics and Chemistry (MS32, page 26)

Waves and Wave Propagation

Computational Ocean Acoustics (MS60, page 38)
Nearly the Nonlinear Schrodinger Equation (MS54, page 34)
Nonlinear Waves, Nonlinear Optics, NLS, and Dispersion Phenomena (CP13, page 23)
Wave Propagation: Applications and Techniques (CP1, page 14)
Wave Propagation: Numerical Methods and Applications (CP5, page 17)

SATURDAY JULY 10

6:00 PM-8:00 PM
Registration opens for Tutorial
Wyndham Foyer

SUNDAY JULY 11

7:30 AM-5:00 PM
Registration opens
Wyndham Foyer

9:00 AM-5:00 PM
Tutorial on Introduction to Wavelets and Applications
Philadelphia Ballroom

9:00 AM-5:00 PM
Tutorial on What is Structured Population Dynamics?
Conference Center Hall

9:00 AM-5:30 PM
Tutorial on An Introduction to Continuous Time Finance
Conference Center Ballroom

10:00 AM-10:30 AM
Coffee Tutorials
Conference Center Foyer

12:30 PM-2:00 PM
Lunch Tutorials
Horizon Ballroom

3:00 PM-3:30 PM
Coffee Tutorials
Conference Center Foyer

7:00 PM-9:00 PM
Welcoming Reception
Wyndam A

7:00 PM-9:00 PM
Registration for Meeting opens
Wyndham Foyer

Women Graduate Students and Postdocs in Applied Mathematics:
A Workshop Sponsored by the Association for Women in Mathematics

MONDAY JULY 12

7:00 AM
Registration opens
Wyndham Foyer

7:45 AM
Opening Remarks Gregory A. Kriegsmann
Wyndham Ballroom

8:00 AM
IP1
Pricing Options on Financial Securities Subject to Credit Risk
Robert Jarrow
Wyndham Ballroom

8:45 AM
IP2
Mathematics in Biotechnology
Polly Moore
Wyndham Ballroom

9:30 AM
Coffee
Wyndham Foyer/ Ballroom Level

10:00 AM-12:00 PM
CONCURRENT SESSIONS

MS1
Finance I
Organizer: Benjamin S. White
Philadelphia North

MS2
Mathematics and Molecular Biology (Part 1 of 2)
Organizer: De Witt L. Sumners
Philadelphia South

MS3
Inverse Problems and Optimization: Problems of Interests to DOD
Organizers: David Colton and Joyce R. McLaughlin
Wyndham Ballroom

MS4
Nucleation, Phase Transitions, Coarsening
Organizer: Antonio Fasano
Wyndham C

MS5
Applied Mathematics in Plasma Physics (Part 1 of 2)
Organizer: Kurt S. Riedel
Wyndham D

MS6
Theory and Computation of Elastic-Plastic Deformation
Organizer: E. Bruce Pitman
Salon 3

MS7
Student Paper Competition
Horizon Ballroom

CP1
Wave Propagation: Applications and Techniques
Salon 10

CP2
Dynamical Systems I
Seminar A

CP3
Materials I
Salon 5

CP4
Numerical Methods: Integrals, Sums, Transforms
Seminar B

12:00 PM-1:30 PM
Lunch

1:30 PM
Special Session 1
Research Directions
Wyndham Ballroom

3:00 PM
Coffee
Wyndham Foyer

3:30 PM-5:30 PM
CONCURRENT SESSIONS

Special Session 2
The Interactive Mathematics Text Project
Organizer: Gerald Porter
Horizon Ballroom

MS8
Finance II
Organizer: Lester Seigel
Philadelphia North

MS9
Mathematics and Molecular Biology (Part 2 of 2)
Organizer: De Witt L. Sumners
Philadelphia South

MS10
Inverse Spectral Problems
Organizer: William Rundell
Wyndham Ballroom

MS11
Motion of Phase Boundaries (Part 1 of 2)
Organizers:
Geoffrey B. McFadden and Timothy J. Burns
Wyndham C

MS12
Optimization in Engineering: Multidisciplinary Optimization
Organizer: Virginia J. Torczon
Salon 3

MS13
Applied Mathematics in Plasma Physics (Part 2 of 2)
Organizer: Kurt S. Riedel
Wyndham D

CP5
Wave Propagation: Numerical Methods and Applications
Salon 10

CP6
Dynamical Systems II
Seminar A

CP7
Wavelets
Seminar B

CP8
Materials II
Salon 5

TUESDAY
JULY 13

7:00 AM
Registration opens
Wyndham Foyer

8:00 AM
IP3
The Creation and Motion of Interfaces During Phase Transitions
John W. Cahn
Wyndham Ballroom

8:45 AM
IP4
Mathematical Modeling for Quantitative Non-Destructive Evaluation
Jan D. Achenbach
Wyndham Ballroom

9:00 AM
Exhibit Hall Opens

9:30 AM
Coffee
Exhibit Hall/Mezzanine Level

10:00 AM-12:00 PM
CONCURRENT SESSIONS

MS14
Mathematical Methods in Inverse Problems
Organizer: Victor Isakov
Wyndham Ballroom

MS15
Motion of Phase Boundaries (Part 2 of 2)
Organizers: Geoffrey B. McFadden and Timothy J. Burns
Wyndham C

MS16
Viscoelastic Fluids: ComplexFlows, Instabilities and Bifurcations (Part 1 of 2)
Organizer: David O. Olagunju
Wyndham D

MS17
Appxoximate Methods in Nonlinear Propagation
Organizer: Robert W. Cox
Philadelphia North

MS18
Dynamics of Vortical Structures
Organizer: Carlo Marchioro
Salon 3

MS19
Ionic Channels in Biological Membranes: Models and Analysis
Organizer: Malgorzata M. Klosek
Philadelphia South

MS20
Scientific Visualization (Part 1 of 2)
Organizers: Gilbert Strang and Lee Zia
Salon 5

CP9
Finance and Management Sciences
Seminar A

CP10
Elasticity
Seminar B

CP11
Numerical Methods, Nonlinear Equations, Numerics
Salon 7

CP12
Geometry and Applications
Horizon Ballroom

12:00 PM-1:30 PM
Lunch

1:30 PM-2:15 PM
Retiring President's Address
Supersensitive Boundary Value Problems
Robert E. O'Malley, Jr.
Wyndham Ballroom

2:15 PM-2:45 PM
SIAM Business Meeting
Wyndham Ballroom

2:45 PM-3:15 PM
Coffee
Exhibit Hall/Mezzanine Level

3:15 PM-5:15 PM
CONCURRENT SESSIONS

Professional Seminar
What We Should Tell Our Graduate Students About Mathematical Writing
Nicholas J. Higham
Horizon Ballroom

MS21
Wavelet Solutions to Partial Differential Equations
Organizers: Roland Glowinski, Raymond O. Wells, Jr., and John Weiss
Philadelphia South

MS22
Optimal Design
Organizer: Steven J. Cox
Wyndham Ballroom

MS23
Viscoelastic Fluids: Complex Flows, Instabilities and Bifurcations (Part 2 of 2)
Organizer: David O. Olagunju
Wyndham D

MS24
Phase-Change Modeling
Organizer: Richard J. Braun
Wyndham C

MS25
Interfacial Waves and Symmetry
Organizer: Martin Golubitsky
Philadelphia North

MS26
Scientific Visualization (Part 2 of 2)
Organizers: Gilbert Strang and Lee Zia
Salon 5

MS27
Synchronization Phenomena in Populations of Nonlinear Random Oscillators
Organizer: Renato Spigler
Salon 10

CP13
Nonlinear Waves, Nonlinear Optics, NLS, and Dispersion Phenomena
Salon 3

CP14
Simulation and Modeling in Biology and Medicine I
Seminar A

CP15
Control and Applications
Seminar B

CP16
Numerical Methods, Elliptic Problems
Salon 7

5:30 PM
Exhibit Hall Closes

5:45 PM
Dinner
Franklin Institute

WEDNESDAY
JULY 14

7:30 AM

Registration opens
Wyndham Foyer

8:00 AM

IP5
Non-Classical Effects Accompanying Diffusion in Polymers
Donald S. Cohen
Wyndham Ballroom

8:45 AM

IP6
Numerical Methods and Analysis of Nonlinear Dispersive Partial Differential Equations
James M. Hyman
Wyndham Ballroom

9:00 AM

Exhibit Hall Opens

9:30 AM-10:00 AM

Coffee
Exhibit Hall/Mezzanine Level

10:00 AM-12:00 PM
CONCURRENT SESSIONS

MS28
Mathematical, Computational and Integrated Models in Nondestructive Evaluation (Part 1 of 2)
Organizer: John G. Harris
Wyndham Ballroom

MS29
Nonlinear Diffusion in Polymers (Part 1 of 2)
Organizers: Christopher Durning and Donald S. Cohen
Wyndham C

MS30
Phase Field Models and Alloys
Organizer: Gunduz Caginalp
Wyndham D

MS31
Linear, Non-Modal Fluid Mechanics
Organizer: Lloyd N. Trefethen
Philadelphia North

MS32
Stochastically Perturbed Dynamical Systems in Physics and Chemistry
Organizer: Robert S. Maier
Philadelphia South

MS33
Teaching Statistics for Applied Mathematics
Organizer: Donald E. Miller
Horizon Ballroom

MS34
Applications of Special Functions
Organizer: Charles F. Dunkl
Salon 5

CP17
Fluids I
Salon 3

CP18
Simulation and Modeling in Biology and Medicine II
Seminar A

CP19
Numerical Methods, Diffusion and Time-Dependent PDEs
Seminar B

CP20
Numerical Linear Algebra I
Salon 10

12:00 PM-1:30 PM

Lunch

1:30 PM-3:00 PM

Special Session 3
FCCSET Initiatives: Opportunities to Make a Difference
Chair:
Wyndham Ballroom

3:00 PM-3:30 PM

Coffee
Exhibit Hall/Mezzanine Level

3:30 PM-5:30 PM
CONCURRENT SESSIONS

MS35
Educating Applied Mathematicians
Organizers: Stefan Ehrlich and C.K. Chu
Horizon Ballroom

MS36
Mathematical, Computational and Integrated Models in Nondestructive Evaluation (Part 2 of 2)
Organizer: Andrew N. Norris
Wyndham Ballroom

MS37
Nonlinear Diffusion in Polymers (Part 2 of 2)
Organizers: Christopher Durning and Donald S. Cohen
Wyndham C

MS38
Dynamical Systems Approach to PDEs: Applications to Fluid Mechanics
Organizers: Yannis G. Kevrekidis and Edriss S. Titi
Wyndham D

MS39
Time Stability in Large-Scale Computing
Organizer: Mark H. Carpenter
Philadelphia North

MS40
Computational Aspects of Free Surface Flows
Organizer: Peter E. Castro
Philadelphia South

MS41
Design of Experiments
Organizer: Marco A. Duran
Salon 5

MS42
Mathematical and Computational Aspects of Physiologically Structured Population Models
Organizer: James N. McNair
Salon 10

CP21
Computational Fluids I
Seminar A

CP22
Fluids II
Salon 3

CP23
Optimization I
Seminar B

Poster and Video Presentations
Wyndham Foyer

5:30 PM

Exhibit Hall Closes

THURSDAY
JULY 15

7:30 AM
Registration opens
Wyndham Foyer

8:00 AM
IP7
The Gibbs Phenomenon and Scientific Computing
David Gottlieb
Wyndham Ballroom

8:45 AM
IP8
Mathematical Modeling in Electrophotographic Imaging Systems
John P. Spence
Wyndham Ballroom

9:00 AM
Exhibit Hall Opens

9:30 AM-10:00 AM
Coffee
Exhibit Hall/Mezzanine Level

10:00 AM-12:00 PM
CONCURRENT SESSIONS

Special Session 4
Symbolic Computation and Calculus Reform
Organizer: James C.T. Pool
Horizon Ballroom

MS43
Large-Scale Electronic Structure Calculations on Massively Parallel Systems
Organizer: Michael Minkoff
Salon 3

MS44
Mathematical Methods in Time Frequency Analysis and Spectral Estimation (Part 1 of 2)
Organizers: Leon Cohen and Kurt S. Riedel
Philadelphia South

MS45
Two-Fluid Flows and Interfacial Instabilities
Organizers: Demetrios T. Papageorgiou and Yuriko Y. Renardy
Wyndham C

MS46
Computational Problems in Liquid Crystals
Organizer: Eugene C. Gartland, Jr.
Wyndham D

MS47
Integer Linear Programming
Organizer: Robert E. Bixby
Wyndham Ballroom

MS48
Optimization Methods in Computed Tomography
Organizer: Alvaro R. De Pierro
Salon 5

MS49
Computation of Global Structures in Dynamical Systems
Organizer: Michael Jolly
Philadelphia North

CP24
Computational Fluids II
Seminar A

CP25
Finite Elements and Applications
Salon 10

CP26
Discrete Mathematics I
Seminar B

CP27
Inverse Problems I
Salon 7

12:00 PM-1:30 PM
Lunch

1:30 PM-3:30 PM
Special Session 5
Linking Academe to Industry — How to Make It Work
Organizer: James G. Glimm
Wyndham Ballroom

3:30 PM-4:00 PM
Coffee
Exhibit Hall/Mezzanine Level

4:00 PM
Exhibit Hall Closes

4:00 PM-6:00 PM
CONCURRENT SESSIONS

MS50
Material Microstructure
Organizers: David Kinderlehrer and Robert Kohn
Wyndham Ballroom

MS51
Mathematical Methods in Time Frequency Analysis and Spectral Estimation (Part 2 of 2)
Organizers: Leon Cohen and Kurt S. Riedel
Philadelphia South

MS52
Large-Scale Engineering Design
Organizer: Layne T. Watson
Wyndham C

MS53
Mathematics of Electrophotographic Imaging
Organizer: Peter E. Castro
Wyndham D

MS54
Nearly the Nonlinear Schrodinger Equation
Organizers: David J. Muraki and Michael J. Shelley
Horizon Ballroom

MS55
Enumerative Combinatorics
Organizers: Herbert S. Wilf and Doron Zeilberger
Salon 3

MS56
Shock Refractions and Nonlinear Wave Interactions
Organizer: John W. Grove
Philadelphia North

CP28
Computational Fluids III
Salon 5

CP29
Inverse Problems II
Seminar B

CP30
Optimization II
Salon 10

CP31
Numerical Linear Algebra II
Seminar A

FRIDAY
JULY 16

7:30 AM

Registration opens
Wyndham Foyer/Ballroom Level

8:00 AM

IP9
The Many Faces of Optimization
Margaret H. Wright
Wyndham Ballroom

8:45 AM

IP10
Solving Travelling Salesman Problems
William J. Cook
Wyndham Ballroom

9:30 AM-10:00

Coffee
Wyndham Foyer/Ballroom Level

10:00 AM-12:00 PM
CONCURRENT SESSIONS

MS57
Algebraic Combinatorics
Organizers: Curtis Greene and Lynne M. Butler
Philadelphia South

MS58
Robust Optimization
Organizer: Stavros A. Zenios
Wyndham Ballroom

MS59
High-Order Schemes for Shock Wave Calculation (Part 1 of 2)
Organizers: Wei Cai, George Karniadakis, and Chi-Wang Shu
Philadelphia North

MS60
Computational Ocean Acoustics
Organizer: Michael B. Porter
Wyndham C

MS61
Parallel Coordinates: Mathematical Foundations, Applications and Recent Results
Organizer: Alfred Inselberg
Wyndham D

MS62
Preparing Doctoral Students for Junior Faculty Success with a Proseminar"
Organizer: Bettye Ann Case
Horizon Ballroom

CP32
Discrete Mathematics II
Seminar A

CP33
Reaction-Diffusion and Diffusion
Salon 3

CP34
Linear Algebra and Applications
Salon 5

CP35
Computer Science: Theory and Applications
Salon 10

12:00 PM-1:30 PM

Lunch

1:30 PM-2:30 PM

The James H. Wilkinson Prize in Numerical Analysis and Scientific Computing - Award and Presentation
Chair: Avner Friedman

Geometry and High Accuracy Algorithms
James Demmel
Wyndham Ballroom

2:30 PM-3:00 PM

Coffee
Wyndham Foyer/Ballroom Level

3:00 PM-5:00 PM
CONCURRENT SESSIONS

MS63
Mathematical Contest in Modeling (MCM)
Organizer: Ben Fusaro
Horizon Ballroom

MS64
Combinatorial Optimization
Organizer: Donald K. Wagner
Wyndham Ballroom

MS65
High-Order Schemes for Shock Wave Calculation (Part 2 of 2)
Organizers: Wei Cai, George Karniadakis and Chi-Wang Shu
Philadelphia North

MS66
Numerical Methods for Large-Scale Meteorological Flows
Organizer: David C. Bader
Wyndham D

MS67
High-Order Field Propagation Techniques
Organizer: David O. Yevich
Wyndham C

MS68
Integral Equations and Compact Fixed Point Problems
Organizer: Carl T. Kelley
Philadelphia South

CP36
Optimization and Applications
Salon 3

CP37
Modeling
Salon 5

CP38
Integral and Differential Equations
Salon 10

CP39
Probability and Statistics
Seminar A

5:00 PM

Conference Adjourns

7:45/ Wyndam Ballroom

Opening Remarks

Gregory A. Kriegsmann
New Jersey Institute of Technology

8:00/Wyndham Ballroom

IP1/Chair: Benjamin S. White, Exxon Research and Engineering Company

Pricing Options on Financial Securities Subject to Credit Risk

The speaker will present a new methodology for pricing and hedging options on financial securities subject to credit risk. In this methodology, two types of credit risk are considered. In the first, the asset underlying the option may default. In the second, the writer of the options may default, i.e. vulnerable options. The new methodology applies the foreign currency analogy of Jarrow and Turnbull [1991] to decompose the dollar payoff from a financial security with credit risk into a certain payoff and a "spot exchange rate". Risk neutral valuation techniques are utilized to price options. This methodology can be applied to corporate debt and Eurodollar deposits.

Robert Jarrow
Johnson Graduate School of Management
Cornell University

8:45/Wyndham Ballroom

IP2/Chair: De Witt Sumners, Florida State University

Mathematics in Biotechnology

Biotechnology in its broadest sense covers many different areas of application. In this presentation, the speaker will focus specifically on the creation of human pharmaceuticals and the mathematics that gets used during the various stages of development of such a product. The speaker will follow a specific example, the genetically engineered form of human growth hormone, following it from the stages of early research into the relevant DNA and protein sequences, through the development and analysis of assays for biological activity, the modeling of processes for fermentation and purification, and finally the statistical modeling and analysis of the animal and clinical trials. The sophistication of the mathematics involved ranges from standard techniques (e.g., nonlinear regression for assay standard curves) to unsolved problems (e.g., the prediction of the three-dimensional structure of a protein based on its linear sequence).

Polly Moore
Information Resources
Genentech, Inc.

10:00 AM - 12:00 PM

Concurrent Sessions

MS1/Philadelphia North

Mathematics of Finance I

Over the last few decades many mathematical methods, such as portfolio theory, the capital asset pricing model, and recent innovations in derivative markets have had an increasing impact on the theory of finance. With accelerating improvements in communications and computational power, sophisticated quantitative methods are gaining increasing practical importance as well. In these minisymposia (Mathematics of Finance I and II) leading practitioners will discuss problems of current importance.

Organizer: Benjamin S. White
Exxon Research and Engineering Company

10:00 Equilibrium Interest Rate and Liquidity Premium and the Proportional Transaction Cost
Jean-Luc Vila, Sloan School of Management, Massachusetts Institute of Technology

10:30 Toward a Nonequilibrium Theory of Stock Market Behavior
Lester Seigel, World Bank, Washington, DC

11:00 On Credit
Carlos Rovira, International Finance Corporation, Washington, DC

11:30 A Theoretical Model of Price/Earnings Ratios: The Franchise Factor Approach
Stanley Kogelman, Salomon Brothers, New York, NY

7:00/Wyndham Foyer

Registration opens

9:30/Wyndham Foyer/Ballroom Level

Coffee

MS2/Philadelphia South

Mathematics and Molecular Biology (Part 1 of 2)

Mathematics and molecular biology have recently enjoyed a surge of interaction, spurred on by a spectrum of developments in laboratory biology, including basic research on the structure and function of genes and proteins and the massive attack on mapping and sequencing the human genome. The mathematical tools required to analyze and understand the data being generated include combinatorics, geometry and topology, mechanics, differential and difference equations, statistics, algorithm and database development, molecular graphics, just to name a few! Mathematicians build models, prove theorems about these models, and do intensive computation and graphical visualization in order to gain systematic understanding of the biology and to aid scientists in the design and analysis of critical experiments. The speakers in this minisymposium will present an overview of this exciting work.

(The organizer, Professor De Witt Sumners, would like to thank Genentech, Inc. for supporting some of the participant costs for this minisymposium).

Organizer: De Witt Sumners
Florida State University

10:00 Mathematical Applications in Biotechnology
Polly Moore, Genentech, Inc.

10:30 The Topology of Circular DNA
James C. Wang, Harvard University

11:00 Mathematical Questions in Analysis of the Human Genome
Sylvia Spengler, Lawrence Berkeley Laboratory

11:30 Non-numerical Algorithms for Genome Research
Eugene W. Myers, Jr., University of Arizona

MS3/Wyndham Ballroom

Inverse Problems and Optimization: Problems of Interest to DOD

In this minisymposium, some of the research areas of interest to DOD, particularly ONR and AFOSR, will be presented. The talks will focus on inverse and optimization problems. Mathematical models for each physical problem will be presented and some current solution techniques will be described. The topics include: 1) medical imaging and the recovery of frequency and space dependent dielectric constant and conductivity in the human body from measurements made outside the body; 2)inverse problems in ocean acoustics where ocean temperature and depth variations and seabottom sediment properties are determined; 3)electromagnetic remote sensing of sea ice where the aim is to determine the thickness, salinity properties, and composition of the ice; and 4)narrow and wide band radarbased target recognition for noncooperative targets.

Organizers: David Colton, University of Delaware and Joyce R. McLaughlin, Rensselaer Polytechnic Institute

10:00 Mathematics, Microwaves, and Medical Imaging
Richard Albanese, Brooks Air Force Base

10:30 Inverse Problems in Ocean Acoustics
Michael D. Collins, Naval Research Laboratory

11:00 Electromagnetic Remote Sensing of Arctic Sea Ice
Arthur K. Jordan, Naval Research Laboratory

11:30 Extended Phase Front Derivative Imaging for Practical Radar Based Noncooperative Target Recognition
Brett Borden, Naval Air Warfare Center

10:00 AM - 12:00 PM

Concurrent Sessions

MS4/Wyndham C

Nucleation, Phase Transitions, Coarsening

The speakers in this minisymposium will cover some particular topics in phase change processes, all representing recent developments in this very important subject: nucleation in supercooled Stefan problem, the mean curvature motion approach for phase transition phenomena, carbide precipitation and growth in steel, the Bridgam technique for growing crystals. They will discuss modelling, numerical methods and nontheoretical mathematical aspects.

The presentations will illustrate the diversity and the difficulty of some recent approaches to the mathematical description of phase transition processes.

Organizer: Antonio Fasano
Universita di Firenze, Italy

10:00 On the Stefan Problem with Supercooling, Superheating, and Nucleations
Morton E. Gurtin, Carnegie Mellon University

10:30 Numerical Simulation of Surfaces Evolving by Curvature Depending Velocity
Ricardo H. Nochetto, University of Maryland, College Park, *Maurizio Paolini,* and Claudio Verdi, Universita di Milano, Italy

11:00 Mathematicam Model of Carbide Precipitation and Growth During Continuous Annealing of Deep Drawing Steel
Giuseppe Abbruzzese, Centro Sviluppo Materiali, Rome, Italy

11:30 A Numerical Study of the Stability of the Liquid Phase for the Bridgman Crystal Growth
Daniela Mansutti, IAC-CNR, Rome, Italy

MS5/Wyndham D

Applied Mathematics in Plasma Physics (Part 1 of 2)

The focus of this minisymposium is state of the art mathematical analysis of systems in plasma physics. The speakers will discuss the adaptive Kalman smoother to estimate anomalous diffusion coefficients and related numerical algorithms, turbulent plasma equilibria from a statistical physics perspective, local instabilities in fluids and plasmas, and numerical analysis of plasma shock waves with atomic physics effects in reactive ion etching in plasma processing and in Tokamak edge modelling.

Organizer: Kurt S. Riedel
Courant Institute of Mathematical Sciences, New York University

10:00 An Inverse Problem: The Identification of the Plasma Current Density Profile in Tokamak
Jacques Blum, Laboratoire de Modelisation et Calcul, France, and Michael Vogelius, Rutgers University

10:30 Optimal Estimation of Dynamically Evolving Diffusivities
Kurt S. Riedel, Organizer

11:00 A Shock—Tracking Algorithm for Surface Evolution under Reactive-Ion Etching
Satoshi Hamaguchi, IBM, Thomas J. Watson Research Center

11:30 Modelling the Tokamak Edge Plasma
Bastiaan Braams, Courant Institute of Mathematical Sciences, New York University

MS6/Salon 3

Theory and Computations of Elastic-Plastic Deformation

The permanent, plastic deformation of materials has long been of interest to applied mathematicians; Taylor studied the deformations of metals, and Reynolds studied the deformation of soils. Today, the efficient and safe building of structures and the design of materials with which to make those structures increasingly relies on an understanding of plastic deformations. In spite of the important role of plastic deformation in technology, fundamental processes are poorly understood, including rapid loading, penetration, and shear localization. Progress in any investigation of plasticity requires an interplay of materials science, mathematical science, and computational science. This minisymposium brings together scientists who bring to their work a multi-disciplinary perspective of plastic deformation. They will discuss innovative numerical and analytic techniques for solving rapid loading and shearing problems.

Organizer: E. Bruce Pitman
State University of New York, Buffalo

10:00 ALE and Free Lagrangian Methods in Plasticity Calculations
Wing K. Liu, Northwestern University

10:30 Numerical Scheme for Elasto-Plasticity
Feng Wang, John W. Grove and Bradley J. Plohr, State University of New York, Stony Brook

11:00 Shear Bands as Surfaces of Discontinuity
W. Edward Olmstead, Northwestern University

11:30 Implicit Methods and the Quasi-Static Approximation in Granular Flow
E. Bruce Pitman, Organizer

MS7/Horizon Ballroom

Student Paper Competition: Award and Presentation

(see page 5 for description)

CP1/Salon 10

Wave Propagation: Applications and Techniques

10:00 Low Frequency Active Array Calculations in a Shallow Channel
C. Scandrett and D. Canright, Naval Postgraduate School

10:15 Chaotic Scattering of Sound Waves by Thin Nonlinear Elastic Structures
I. David Abrahams, Keele University, United Kingdom

10:30 Water Waves Propagating over Large Amplitude Bottom Topographies
Andre Nachbin, New Jersey Institute of Technology

10:45 A Transmission Problem in Water Waves
Philip F. Rhodes-Robinson, Victoria University of Wellington, New Zealand

11:00 Wave Propagation in Some Chiral Composite Materials
Michel Artola, Universite Bordeaus I, France and Centre d'Etudes de Limeil, France; and Michel Cessenat, Centre d'Etudes de Limeil, France

11:15 Numerical Solution of the High Frequency Asymptotic Expansion for the Scalar Wave Equation
Emad Fatemi, Ecole Polytechnique Federale de Lausanne, Switzerland; E. Engquist and S. Osher, University of California, Los Angeles

11:30 Making Integral Equations Analogous to GTD for Wave Phenomena
Francis X. Canning, Rockwell Science Center

11:45 Resonance and Near-Resonance for a Nonlinear Wave Equation
Caspar Blom, Delft University of Technology, The Netherlands

10:00 AM - 12:00 PM

Concurrent Sessions

CP2/Seminar A

Dynamical Systems I

10:00 Homoclinic Chaos and Complex Lorenz Equations Arising in Laser-Matter Interactions
Darryl D. Holm, Los Alamos National Laboratory; Gregor Kovacic, and *Thomas A. Wettergren,* Rensselaer Polytechnic Institute

10:15 Orbits Homoclinic to Resonance Bands
Gregor Kovacic, Rensselaer Polytechnic Institute

10:30 Numerical Study on the Homoclinic Orbit of Nonlinear Schrodinger Partial Differential Equation
Chuyu Xiong, Indiana University, Bloomington

10:45 From Symplectic Integrator to Poincare Map: A Numerical Construction
J.S. Berg, *R.L. Warnock,* and R.D. Ruth, Stanford University and E. Forest, University of California, Berkeley

11:00 The Bifurcations and Basin of Attraction Structure on Noninvertible Systems
Raymond A. Adomaitis, University of Maryland, College Park; Ioannis G. Kevrekidis, Princeton University; and Rafael de la Llave, University of Texas, Austin

11:15 Chaotic and Periodic Behavior of Newton's Method
Xinzhou Guo, Angelo Lucia and *John B. McLaughlin,* Clarkson University

11:30 An Intelligent System for Research and Education of Non-Linear Dynamical Systems
Oscar Castillo, Instituto Tecnologico de Tijuana, Chula Vista, CA and Patricia Melin, CETYS Tijuana, Chula Vista, CA

CP3/Salon 5

Materials I

(This session will run until 12:30 PM)

10:00 Intrinsic Equations of Motion for Solidifying Interfaces
Andrew J. Bernoff and David C. Sarocka, Northwestern University

10:15 Mathematical Models of Phase Boundaries in Alloy: Phase Field and Sharp Interface Models
G. Caginalp and W. Xie, University of Pittsburgh

10:30 Kinematics and Force Theory for Evolving Interfaces
Reuven Segev, Ben-Gurion University, Israel and *Eliot Fried,* Pennsylvania State University

10:45 Thermodynamically-Consistent Theory of Nonisothermal Phase Transitions in Nonlocal Media
A. Umantsev, Northwestern University and A. Roytburd, University of Maryland, College Park

11:00 Heat-Trapping Regime of Interface Motion
A. Umantsev, Northwestern University

11:15 Transverse Fingering and the Laminar to Slug Flow Transition in Hele-Shaw Flow
James Glimm, *Pantaleao da Silva,* Brent Lindquist, and Quiang Zhang, State University of New York, Stony Brook; and Wei Guo, University of Toronto, Canada

11:30 Nonlinear Evolution of the Stress-Driven Morphological Instability in Strained Solid Films
Brian Spencer and Dan Meiron, California Institute of Technology

11:45 Numerical Simulation of the Dendritic Growth
A. Umantsev, Northwestern University

12:00 Cellular Model for the Phase Field Simulation of the Dendrite Growth
A. Artemev and *J.A. Goldak,* Carleton University, Canada

12:15 Dendrimer Polymer Modeling Using Mathematica
Leela Rakesh and Junko Kosugi, Central Michigan University; and Marc L. Mansfield, Michigan Molecular Institute

CP4/Seminar B

Numerical Methods: Integrals, Sums, Transforms

(This session will run until 12:30 PM)

10:00 Numerical Conformal Mapping Methods Based on Faber Series
Thomas K. DeLillo and Alan R. Elcrat, Wichita State University; and John A. Pfaltzgraff, University of North Carolina, Chapel Hill

10:15 The Computation of 3D Integrals in Potential Theory with Application to Magnetics
Leonard Berman, IBM Thomas J. Watson Research Center; Anne Greenbaum, Courant Institute of Mathematical Sciences, New York University; and *Anita Mayo,* IBM Thomas J. Watson Research Center

10:30 The Higher Recurrent Derivatives of Dawson's Integral
Emo Sajo, Louisiana State University

10:45 Computer Verification of Integral Tables
Daniel Zwillinger, Zwillinger & Associates, Newton, MA

11:00 A Renormalization Method for the Evaluation of Lattice Sums
C. Leonard Berman, IBM Thomas J. Watson Research Center and Leslie F. Greengard, Courant Institute of Mathematical Sciences, New York University

11:15 On a Fast Method for the Simulation of Many-particle Systems
Cristina I. Draghicescu, University of Michigan, Ann Arbor

11:30 Fast Fourier Transforms for Non-Equispaced Data
Alok Dutt and Vladimir Rokhlin, Yale University

11:45 An Algorithm for the Rapid Application of Laplace's Operator on the Sphere
Bradley K. Alpert, National Institute of Standards and Technology

12:00 Theorems on the Theory of Association
Joyati Debnath, Winona State University

12:15 A New FFT-Based Algorithm for Numerical Inversion of Laplace Transforms
Chyi Hwang and Rong-Yuang Wu, National Cheng Kung University, Republic of China

See page 42 for ordering information.

1:30/Wyndham Ballroom
Special Session 1
Research Support—What's in Store for Us?
See page 5 for description

3:30-5:30

Concurrent Sessions

Special Session 2/Horizon Ballroom
The Interactive Mathematics Text Project
(see page 6 for description)

MS8/Philadelphia North
Mathematics of Finance II
(For description, see MS1, Page 13)
Organizer: Lester Seigel
World Bank, Washington, DC

3:30 **Path Integrals and Option Valuation**
Jan Dash, Citibank, New York, NY

4:00 **Recent Technology-Driven Bond Structures**
Andrew Calite, Andrew Calite Associates, Inc., New York, NY

4:30 **Nonstandard Swap Structures**
Ramasastry Ambarish, World Bank, Washington, DC

5:00 **The Coherent Market Hypothesis**
Tonis Vaga, Booz, Allen and Hamilton, Tinton Falls, NJ

MS9/Philadelphia South
Mathematics and Molecular Biology (Part 2 of 2)
(For description see MS2, Page 13)
Organizer: De Witt Sumners
Florida State University

3:30 **Modeling and Simulation of DNA Coiling and Muscle Movement**
Nelson Max, Lawrence Livermore National Laboratory

4:00 **Computer Simulation of Supercoiled DNA**
Tamar Schlick, Courant Institute of Mathematical Sciences, New York University, and Wilma K. Olson, Rutgers University

4:30 **Monte Carlo Simulations of Topologically Constrained DNA**
Alexander V. Vologodskii, University of California, Berkeley, and Russian Academy of Sciences, Russia

5:00 **Spaces of RNA Secondary Structures**
Robert C. Penner and Michael S. Waterman, University of Southern California

12:00-1:30
Lunch

3:00/Wyndham Foyer/Ballroom Level
Coffee

MS10/Wyndham Ballroom
Inverse Spectral Problems
This minisymposium deals with undetermined coefficient problems for differential equations where the overposed data either consists of spectral data directly or data that can be reduced to this form. The classical problem is the recovery of a second order differential operator or its associated matrix representation, from knowledge of the eigenvalues.

Organizer: William Rundell
Texas A&M University, College Station

3:30 **(Title to be determined)**
Ole Hald, University of California, Berkeley

4:00 **Reconstruction of Some Discrete Vibrating Models from Eigendata**
Graham Gladwell, University of Waterloo, Canada

4:30 **Determination of Multipole Coefficients in a Second Order Differential Equation from Input Sources**
Bruce Lowe, Texas A&M University, College Station

5:00 **A Finite Difference Algorithm for an Inverse Sturm-Liouville Problem**
Roger A. Knobel, Texas A&M University, College Station

MS11/Wyndham C
Motion of Phase Boundaries (Part 1 of 2)
The behavior of interfaces separating different phases of a material is a subject of scientific and technological importance, involving interdisciplinary contributions from pure and applied mathematicians, physicists, and materials scientists. Current work in this area includes the derivation and analysis of models of the creation, thickness, stability, shape, and motion of phase boundaries. These sessions will expand on some of the topics covered in the invited presentation by John Cahn, "The Creation and Motion of Interfaces During Phase Transitions." Problems in solidification and other types of phase transitions will be described, and both sharp and diffuse treatments of interfaces will be discussed.

Organizers:
Geoffrey B. McFadden and Timothy J. Burns
National Institute of Standards and Technology

3:30 **Phase Field Models for the Numerical Simulation of Dendritic Growth**
Adam A. Wheeler, University of Bristol, United Kingdom, and B.T. Murray, National Institute of Standards and Technology

4:00 **Computational Crystal Growth Using Fully Facetted Interfaces**
Andrew Robert Roosen, Rutgers University

4:30 **Monte Carlo Simulation of Growth Patterns in Eutectic Systems**
J. Iwan D. Alexander, Rong Fu Xiao, and Franz Rosenberger, University of Alabama, Huntsville

5:00 **Atomistic Structures and Dynamics of Interphase-Interfaces**
U. Landman, and W. Luedetke, Georgia Institute of Technology

MS12/Salon 3
Optimization in Engineering: Multidisciplinary Optimization
Sponsored by
SIAM Activity Group on Optimization

Multidisciplinary optimization is the optimization of the performance of a large, complex engineering system composed of multiple components and the analysis of which depends on different engineering disciplines. This leads to large-scale optimization problems that typically involve multiple objective functions, a large number of explicit constraints on design, control and production as well as a large number of implicit consistency conditions -- in short, problems that exceed the state-of-the-art in optimization theory and software.

The speakers in this minisymposium will highlight the fact that the work in the individual disciplines may ultimately be subject to the optimization problem, while bringing to the attention of researchers in optimization the many opportunities for research such problems afford.

Organizer: Virginia J. Torczon
Rice University

3:30 **Planning Process Operations: An Application of Multidisciplinary Optimization**
David R. Heltne and *Emilio J. Nunez,* Shell Development Company, Houston

4:00 **Application of Alternative Multidisciplinary Design Optimization Formulations to a New Model Problem for Static Aeroelasticity**
Gregory R. Shubin, The Boeing Company, Seattle

4:30 **Recent Progress in Multidisciplinary Design Optimization at NASA Langley**
Sharon L. Padula, NASA Langley Research Center

5:00 **Alternative Approaches to Multidisciplinary Design Optimization Problems**
Robert Michael Lewis, Rice University

3:30-5:30

Concurrent Sessions

MS13/Wyndham D

Applied Mathematics in Plasma Physics (Part 2 of 2)

(For description, see MS5, Page 14)

Organizer: Kurt S. Riedel
Courant Institute of Mathematical Sciences, New York University

3:30 **Statistical Equilibria in Two-dimensional Magnetohydyrodynamics**
Bruce E. Turkington, University of Massachusetts, Amherst

4:00 **Localized Instabilities in Fluids and in Plasmas**
Eliezer Hameiri, Courant Institute of Mathematical Sciences, New York University and Alexander Lifschitz, University of Illinois, Chicago

4:30 **Magnetohydrodynamic Instabilities and Bifurcation Techniques**
Bernard Saramito, Universite Blaise Pascal, France, and E.K. Maschke, C.E.N. - Cadarache, France

5:00 **Vlasov-Fokker-Planck-Maxwell Approach to Dissipative Stationary Plasmas**
Michael K.-H. Kiessling, Rutgers University

CP5/Salon 10

Wave Propagation: Numerical Methods and Applications

3:30 **Pseudospectra of the Wave Operator with an Absorbing Boundary**
Tobin A. Driscoll and Lloyd N. Trefethen, Cornell University

3:45 **Absorbing Boundary Conditions for Finite Difference Schemes**
Hong Jiang, Queen's University Kingston, Canada

4:00 **Absorbing Boundaries for Chebyshev Pseudo-Spectral Methods**
Rosemary A. Renaut, Arizona State University and Jochen Frolich, University of Kaiserslautern, Germany

4:15 **Rapid Solution of Nonseparable Wave Propagation Problems**
Michael Collins, Naval Research Laboratory

4:30 **Efficient Solution of Nonseparable Seismic Problems**
Michael D. Collins, Naval Research Laboratory

4:45 **Finite Difference Schemes for the Temporally Dispersive Maxwell's Equations**
Peter G. Petropoulos, Armstrong Laboratory, Brooks AFB, TX

5:00 **A Hybrid Method for Propagation of Ultra-sharp Pulses in Dispersive Media**
Jonathan Luke, New Jersey Institute of Technology

5:15 **A Numerical Evaluation of the Sound Field Scattered by a Finite Fluid-loaded Cylindrical Elastic Shell**
Bo Zhang and I. David Abrahams, Keele University, United Kingdom

5:30 **Computational Acoustics in Unsteady Low Speed Flows**
Karen Pao and Christopher R. Anderson, University of California, Los Angeles

CP6/Seminar A

Dynamical Systems II

3:30 **The Argument Principle and Detection of Hopf Points in Dynamical Systems**
Willy Govaerts, University of Gent, Belgium and Alastair Spence, University of Bath, United Kingdom

3:45 **Qualitative Analysis of Non-Autonomous, Singularly Perturbed Ordinary Differential Equations**
Edward F. Aboufadel, Southern Connecticut State University

4:00 **Asymptotic Approximations and Numerics of Duck Trajectories for A van der-Pol-Like Oscillator**
Bing Liu, College of St. Scholastica

4:15 **An Inverse Problem in Nonholonomic Dynamics**
Leon Y. Bahar, Drexel University

4:30 **The Chaotic Vibration in Rectangular Thin Plates**
Yao-huan Xu, Grove City College

4:45 **The Probability Density Function Equation and Navier Stokes Simulations**
Gal Berkooz, Cornell University

5:00 **Adiabatic Invariant Change Induced by Crossing a Periodically Disappearing Separatrix**
Jacqueline D. Bridge, Georgia Institute of Technology

5:15 **Tesseral Harmonic Perturbation of State Mapping Between Near-Apogee Times**
Peter C. Kammeyer, United States Naval Observatory

5:30 **On the Physically Realizable Mathematical Models of Nonlinear Dynamical Systems of Stochastic Signals Processing**
Anatoly P. Torokhty, St. Petersburg Institute of Transportation Engineering, Russia and Inonu University, Turkey

CP7/Seminar B

Wavelets

3:30 **Short Wavelets and Matrix Dilation Equations**
Gilbert Strang, Massachusetts Institute of Technology

3:45 **Performance Comparison of Multiresolution Texture Classification Algorithms**
Yu-Chuan Lin, Tianhomg Chang and C.-C. Jay Kuo, University of Southern California

4:00 **On Connection between Continuous and Discrete-Time Signal Extrapolation in Wavelet Subspaces**
Xiang-Gen Xia, Zhen Zhang and *C.-C. Jay Kuo,* University of Southern California

4:15 **A Generalized Lapped Orthogonal Transform**
Mark E. Oxley and Bruce W. Suter, Air Force Institute of Technology

4:30 **Hierarchical Planar Curve Representation with Wavelet Transforms**
Chun-Hsiung Chuang and *C.-C. Jay Kuo,* University of Southern California

4:45 **Pseudo-Wavelet Sparsification Techniques for Discretized Integral Equations**
Michael A. Epton, The Boeing Company

5:00 **Wavelet Transform in Optics**
Nigel A. Ziyad and Mohamed F. Chouikha, Howard University

5:15 **On Infinitely Smooth Almost-wavelets with Compact Support**
Mark Z. Berkolaiko and *Igor Ya. Novikov,* Voronezh State University, Russia

CP8/Salon 5

Materials II

3:30 **Foam Calculations on Distributed Memory Machines**
Carl D. Scarbnick, San Diego Supercomputer Center; Hassan Aref, University of Illinois, Urbana; and Thomas Herdtle, KIT Corporation, St. Paul, MN

3:45 **Adaptive Chebyshev Pseudo-Spectral Computations of Shear Band Formation**
Dawn Lott Crumpler, Alvin Bayliss and Ted Belytschko, Northwestern University

4:00 **Visco-elastic Relaxation with a van der Waals Type Stress**
Yigong Ni, State University of New York, Buffalo

4:15 **Complex Parameter Viscoelastic Models and the Imaginary Counterpart of Records**
Nicos Makris, University of Notre Dame, Indiana

4:30 **Dynamic Steady-State Mode III Fracture in a Nonhomogeneous Viscoelastic Body**
Joseph M. Herrmann, Texas A&M University, College Station and Lawrence Schovanec, Texas Tech University

4:45 **On "Discontinuous" Plastic Deformation in Metals at Very Low Temperatures**
Timothy J. Burns, National Institute of Standards and Technology

8:00/Wyndham Ballroom
IP3/Chair: Paul Fife, University of Utah

The Creation and Motion of Interfaces During Phase Transitions

The creation and motion of interfaces during phase transitions on a lattice can be modelled by a large scale system of spatially discrete nonlinear ODE's, by diffusion equations with reaction terms and/or higher order difference terms, or by systems of PDE's that are similar in form. The speaker will discuss cases in which the variables are conserved (e.g., heat, mass), and cases in which they are not conserved (order, phase field parameters, or elastic displacement). He will compare the results, when possible, with the results from equivalent Stefan problems modified by interface energy considerations. (This was done with F. Larche, A. Novick-Cohen, S.-N. Chow, and E. Van Vleck.)

John W. Cahn
Materials Science and Engineering Laboratory
National Institute of Standards and Technology

8:45/Wyndham Ballroom
IP4/Chair: Andrew Norris, Rutgers University

Mathematical Modeling for Quantitative Nondestructive Evaluation

One of the most significant advances in nondestructive evaluation has been the evolution of NDE from a conglomeration of empirical techniques to a well-defined field of interdisciplinary science and engineering. It has become well-recognized that a fundamental approach to NDE must be based on quantitative (mathematical) models of the measurement processes of the various inspection techniques.

The availability of a mathematical model has many benefits. A model is helpful in the design and optimization of efficient testing configurations, and is indispensable in the interpretation of experimental data and the recognition of characteristic signal features. Parametrical studies based on a model facilitate an assessment of the probability of detection of anomalies. A model is a virtual requirement for the development of an inverse technique. Last but not least a mathematical model provides a practical way of generating a training set for a neural network or a knowledge base for an expert system.

The speaker will concentrate on an essential component of a mathematical model for quantitative ultrasonics, namely, the modeling of the interaction of ultrasound with a defect.

Jan D. Achenbach
Center for Quality Engineering and Failure Prevention
Northwestern University

10:00 AM - 12:00 PM

Concurrent Sessions

MS14/Wyndham Ballroom

Mathematical Methods in Inverse Problems

The purpose of this session is to present fundamental mathematical results and problems concerning uniqueness and stability in many dimensional inverse problems. The emphasis will be on promising and general methods related to important applied problems like impedance tomography, seismic prospecting, and inverse scattering. One numerical algorithm (layer-stripping) is under special discussion because it is promising both theoretically and numerically.

Organizer: Victor Isakov
Wichita State University

10:00 Inverse Problems for Systems
Errki Somersalo, University of Helsinki, Finland

10:30 Prospecting Discontinuities by Boundary Measurements
Victor Isakov, Organizer

11:00 d-bar Method in Inverse Boundary Problems and Inverse Scattering
Adrian Nachman, University of Rochester

11:30 The Layer-Stripping Algorithm
John Sylvester, University of Washington

MS15/Wyndham C

Motion of Phase Boundaries II (Part 2 of 2)

(For description, see MS11, page 16)

Organizers:
Timothy J. Burns and Geoffrey B. McFadden
National Institute of Standards and Technology

10:00 The Structure of the Boundary between Austenite and Twinned Martensite
Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University and Stefan Muller, Bonn University, Germany

10:30 Theories of Evolving Phase Boundaries
Morton E. Gurtin, Carnegie Mellon University

11:00 Modeling Diffusion-Induced Grain Boundary Motion
Paul Fife, University of Utah; John W. Cahn, National Institute of Standards and Technology; and O. Penrose, Harriot-Watt University, United Kingdom

11:30 Counting Stationary States for Phase-Field Type Equations
A. Novick-Cohen, Technion-Israel Institute of Technology, Israel, and M. Grinfeld, University of Bristol, United Kingdom

MS16/Wyndham D

Viscoelastic Fluids: Complex Flows, Instabilities and Bifurcations (Part 1 of 2)

The speakers in this minisymposium will discuss flows of viscoelastic fluids with emphasis on complex flows, instabilities and bifurcations. Viscoelastic fluids include many of the materials used in industry today (e.g. polymers). Thus, an understanding of their properties and behavior during complex industrial processes are of vital importance. Specifically, instabilities and bifurcations may give rise to dramatic changes in flow characteristics. This may cause unpredictable or unintended consequences in practical applications.

The speakers will present recent experimental results in which instabilities and bifurcations have been observed. They will discuss numerical, perturbation and abstract mathematical methods for solving the equations governing these flows and compare results with those obtained from experiments.

Organizer: David O. Olagunju
University of Delaware

10:00 Secondary Flows and Instabilities in the Cone-and-Plate Flow of a Viscoelastic Fluid
David O. Olagunju, Organizer

10:30 Hydrodynamic Instabilities in Von Karman Swirling Flows of Highly Viscoelastic Fluids
Gareth H. McKinley, Harvard University, and Jeffrey A. Byars, Massachusetts Institute of Technology

11:00 Linear Stability of Viscoelastic Flows
Michael Renardy, Virginia Polytechnic Institute and State University

7:30/Wyndham Foyer
Registration opens

9:00
Exhibit Hall Opens

9:30/Exhibit Hall/Mezzanine Level
Coffee

10:00 AM - 12:00 PM

Concurrent Sessions

MS17/Philadelphia North

Approximate Methods in Nonlinear Propagation

Most nonlinear propagation problems cannot be solved in closed forms. Various approximate methods are used to elucidate the behavior and structure of the possible solutions. In this session, we emphasize the interplay between the different methods: the use of whatever techniques are necessary to gain insight, and the back-and-forth synergy when more than one technique is used. Four specific problems are addressed by the speakers. Techniques that are juxtaposed include perturbation expansions, numerical solutions, and group methods.

Organizer: Robert W. Cox
Indiana University-Purdue University, Indianapolis

10:00 Transmission of Envelope Solitons Through Layered Random Media
Robert Knapp, Bowdoin College

10:30 Self-Similar Solutions of Barenblatt's Equation
Julian D. Cole, Rensselaer Polytechnic Institute, and *Barbara A. Wagner,* New Jersey Institute of Technology

11:00 Viscous Shocks of Burger's Equation
Shagi-Di Shih, University of Wyoming

11:30 Backward Wave Oscillators: A Nonlinear, High Current Approach
Robert W. Cox, Organizer, and Patrick S. Hagan, Los Alamos National Laboratory

MS18/Salon 3

Dynamics of Vortical Structures

This minisymposium is devoted to discuss some problems in fluid mechanics and, in particular, situations in which vorticity structures appear. As well known, this topic is important in many applied problems and in the turbulence theory. Moreover, some efficient numerical methods are based on point vortex dynamics. In this minisymposium, the dynamics of these structures is discussed both from a mathematical point of view using analytical and numerical methods, and from a conceptual point of view in relation to the problem of turbulence.

Organizer: Carlo Marchioro
Universita Degli Studi di Roma "La Sapienza", Italy

10:00 The Interaction of Vorticity Structures with a Solid Body
Renzo Piva and G. Riccardi, Universita Degli Studi di Roma "La Sapienza", Italy

10:30 Statistical Mechanics of Vortices and Two-Dimensional Turbulence
Mario Pulvirenti, Universita Degli Studi di Roma "La Sapienza", Italy

11:00 Free Lagrangian Vortex Methods for Incompressible Euler and Navier-Stokes Equations
Giovanni Russo, Univrsita Degli Studi di L'Aquila, Italy

11:30 Operator Splitting of the Navier-Stokes Equations
Claude Greengard, IBM Thomas J. Watson Research Center

MS19/Philadelphia South

Ionic Channels in Biological Membranes: Models and Analysis

Exchange of ions through biological membranes is the foundation of many physiological functions. Ionic channels are pore-like proteins which are the mechanism for one class of this exchange process. Modern experimental techniques can measure current through a single channel. This current is a nonlinear function of voltage across the membrane, concentration of ions in the solution, and chemical composition of the solution. Macroscopic theories cannot describe this phenomena. It is necessary to model ionic channels on a microscopic level, taking into account intermolecular interactions between the channel protein and ions. The speakers will present an overview of existing models of ionic channels followed by more detailed discussions of recent results in the field. They will include semiclassical models, large scale molecular dynamics simulations, and stochastic models.

Organizer: Malgorzata M. Klosek
University of Wisconsin, Milwaukee

10:00 A Hierarchy of Models of Biological Channels
Duapin Chin and *Robert S. Eisenberg,* Rush Medical College, Chicago

10:30 One Dimensional Model of a Channel with Induced Charge
Victor Barcilon, University of Chicago

11:00 Molecular Dynamics Simulations in the Study of Ion Channel Permeation
Danuta Rojewska-Jirik, Duapin Chin, and Robert S. Eisenberg, Rush Medical College, Chicago; and Ron Elber, The Hebrew University of Jerusalem, Israel, and University of Illinois, Chicago

11:30 Stochastic Models of an Open Ionic Channel
Robert S. Eisenberg, Rush Medical College, Chicago, and *Malgorzata M. Klosek,* Organizer, and Zeev Schuss, Tel Aviv University, Israel

MS20/Salon 5

Scientific Visualization (Part 1 of 2)

Organizers: Gilbert Strang, Massachusetts Institute of Technology and Lee Zia, University of New Hampshire

10:00 Visualization with MATLAB
Cleve Moler, The MathWorks, Inc.

10:30 (Title to be determined)
Laurie Potratz, Visual Numerics, Inc.

11:00 Scientific Visualization Using Explorer
David Foulser, Silicon Graphics, Inc.

11:30, Visualization versus Visual Programming: Adventures with Axiom and Explorer
John Zurawski, NAG, Inc.

CP9/Seminar A

Finance and Management Sciences

10:00 Deriving Derivatives of Derivative Securities
Peter Carr, Cornell University

10:15 Market Oscillations Induced by the Competition Between Value-Based and Trend-Based Investment Strategies
Gunduz Caginalp, University of Pittsburgh, Pittsburgh and D. Balenovich, Indiana University of Pennsylvania

10:30 Network Formalism and Algorithm for the Equilibrium of Dynamic Oil Stockpiling Game in Unstable Market
David Ho, Brian Moses and *Lan Zhao,* State University of New York, College at Old Westbury

10:45 Numerical Analysis of 1-Dimensional Immersed-Boundary Method
Eline S. Kowalewski, Columbia University; Stanley J. Poreda, Hubb Systems, Hubbardston, MA; and David E. Tepper, Baruch College, City University of New York

11:00 An Annual Per Unit Cost Estimate Update Algorithm
Timothy Hall, GTE Laboratories, Waltham, MA

11:15 A Nonlinear Programming Application to Hospital Management
Frank H. Mathis, Baylor University

11:30 Solving Economic Scheduling Problem of Cascade Hydropower Stations by Expert Systems Combined with Methods of Operations Research
Yurong Duan, Yong Wang and Dan Yang, Chongqing University, People's Republic of China

10:00 AM - 12:00 PM

Concurrent Sessions

CP10/Seminar B

Elasticity

10:00 Derivation and Asymptotic Properties of Some Two Dimensional Plate Models
Stephen M. Alessandrini, General Electric Corporation and *Richard S. Falk,* Rutgers University, New Brunswick

10:15 On the Numerical Stability of Necked States of Plates in Tension
Pablo V. Negron-Marrero, University of Puerto Rico, Rio Piedras and *Barbara L. Santiago-Figueroa,* InterAmerican University, Puerto Rico

10:30 Homogenization of Corner Contact Elastic Composites with Strongly Differing Moduli
L. Berlyand, Pennsylvania State University and Universite Paris-Sud, France; and *K. Promislow,* Pennsylvania State University State College

10:45 Regularly and Singularly Perturbed Cracks
Chien H. Wu, University of Illinois, Chicago

11:00 The Numerical Computation of Singular Minimizers in Two Dimensional Elasticity
Pablo V. Negron-Marrero, University of Puerto Rico, Rio Piedras and Octavio Betancourt, City University of New York-City College

11:15 A State Space Formulation for Piezoelectricity
Horacio Sosa and Marco Castro, Drexel University

11:30 Singular Perturbations and the Coupled/Quasi-Static Approximation in Linear Thermoelasticity
B.F. Esham, Jr., State University of New York, Geneseo and R.J. Weinacht, University of Delaware

11:45 On Ideal Materials in Thermodynamics
Adriano Montanaro, Universita di Padova, Italy

CP11/Salon 7

Numerical Methods, Nonlinear Equations, Numerics

10:00 Nonlinear SOR and ADI Methods for Free Boundary Value Problems
Robert E. White, North Carolina State University; Bolindra N. Borah and Archimedis J. Kyrillidis, North Carolina A&T State University

10:15 Detailed Examination of Global Newton Breakdown in the Hydrodynamic Model for Semiconductor Devices
Carl L. Gardner, *Li-Ling Huang,* Paul J. Lanzkron, and Donald J. Rose, Duke University

10:30 Enclosing a Simple Root of a Continuous Function
G. Alefeld, Universitat Karlsruhe, Germany; F. Potra, University of Iowa; and *Yixun Shi,* Bloomsburg University

10:45 Analysis of Approximate Nonlinear Elimination
Paul J. Lanzkron and Donald J. Rose, Duke University

11:00 A Robust Extension of the Newton-Raphson Root Finding Algorithm with Strong Global Convergence Properties
Michael G. Haralambous, Paul Godfrey, Haihong Qiu, University of Central Florida

11:15 Systems of Nonlinear Polynomial Equations for Engineering Applications
Ronald F. Gleeson, Trenton State College and *Robert M. Williams,* Naval Air Warfare Center

11:30 Row Update ABS Methods for Systems of Nonlinear Equations
Zhijian Huang, Fudan University, People's Republic of China

11:45 Quasi Newton Updates for Bounded Matrices
Chaya Gurwitz, Brooklyn College

CP12/Horizon Ballroom

Geometry and Applications

10:00 Some Basic Concepts and Problems on Discrete Surfaces
Li Chen and Jianping Zhang, Utah State University

10:15 Parabolic Visibility Region Inside a Simple Polygon
Shuo-Yan Chou and Lin-Lin Chen, Iowa State University

10:30 Computing Implicitly Defined Surfaces
Michael E. Henderson, IBM Thomas J. Watson Research Center

10:45 Optimization of the Random Surface Code for RISC Processors
Paul Coddington, Geoffrey Fox, *Leping Han,* Geoffrey Harris, and Enzo Marinari, Northeastern Parallel Architectures Center and Syracuse University

11:00 Design and Implementation of Functions Smoothly Join Two Surfaces by Computer Graphics Techniques
Sam F. Tannouri and Vojislav J. Stojkovic, Morgan State University

11:15 Boundary-Fitted Grid Generation by Multigrid Computation
Rosa Maria Spitaleri, Istituto per le Applicazioni del Calcolo-CNR, Italy

11:30 Discrete Functionals for Generation and Smoothing of Grids
Pablo Barrera Sanchez, Universiedad Nacional Autonoma de Mexico, Mexico

11:45 Polynomia Multivariata et Polytopia Multidimensa
Bruce Jeffrey Layman, Westinghouse Hanford Company, Richland, WA

See page 42 for ordering information

1:30/Wyndham Ballroom
Retiring President's Address

Supersensitive Boundary Value Problems

We consider the initial-boundary value problem for Burgers' equation with small viscosity, and for generalizations to other parabolic singularly perturbed problems, when the solution converges to a steady-state with an interior shock layer. The shock will be shown to evolve over an exponentially long time scale such that a variety of asymptotically exponentially small perturbations can change the final location substantially. A novel asymptotic analysis provides us the solution and demonstrates why shock computations are so challenging. (Joint work with Jacques G.L. Laforgue).

Robert E. O'Malley, Jr.
Department of Applied Mathematics
University of Washington

2:15/Wyndham Ballroom

SIAM Annual Business Meeting

The annual business meeting of SIAM will be held on Tuesday, July 13, 1993 at 2:15 PM. This annual meeting is held for YOU, the members of SIAM, to provide you with the opportunity to meet face-to-face with the officers you have elected to serve you. You will be apprised of SIAM's financial status, hear about our past successes, and be asked for your ideas regarding future directions of our Society.

This meeting will benefit all of us. We urge you to attend.

Avner Friedman, President

3:15-5:15

Concurrent Sessions

Professional Seminar/Horizon Ballroom

What We Should Tell Our Graduate Students About Mathematical Writing

Nicholas J. Higham

See page 6 for description

MS21/Philadelphia South

Wavelet Solutions to Partial Differential Equations

Due to the multiscale nature of the wavelet representation of functions and other aspects of wavelet theory, it has proven to be quite useful to use wavelets in numerical analysis. This minisymposium will bring together some of the leading researchers who have been investigating the use of wavelets as a tool in numerical solutions of differential equations.

(This minisymposium will run until 6:15 PM)

Organizers: Roland Glowinski, University of Houston; Raymond O. Wells, Jr., Rice University; and John Weiss, Aware, Inc., Cambridge, Massachusetts

3:15 **Fictitious Domain Techniques for Elliptic Boundary Value Problems**
Roland Glowinski, Organizer

3:45 **Wavelets and Partial Differential Equations on Nonsmooth Domains**
Bjorn Jawerth, University of South Carolina

4:15 **Wavelets, Turbulence and Boundary Value Problems for Partial Differential Equations**
John Weiss, Organizer

4:45 **Wavelet-Based Methods for Linear Evolution Equations**
Bjorn Engquist, University of California, Los Angeles

5:15 **Multiscale Analysis in Engineering**
John Williams, Massachusetts Institute of Technology

5:45 **Wavelet-Based Multigrid Solutions to Elliptic Boundary Value Problems**
Raymond O. Wells, Jr., Organizer

12:00-1:30

Lunch

2:45/Exhibit Hall/Mezzanine Level

Coffee

MS22/Wyndham Ballroom

Optimal Design

The speakers in this session will continue a number of the themes addressed in the pre-conference symposium. In particular, they will address design under random loads, the suppression of automotive body vibrations, interfaces that minimize reflected energy, and the manufacturability of optimal composites.

Organizer: Steven J. Cox
Rice University

3:15 **Optimal Design in a Random Environment**
Robert Lipton, Worcester Polytechnic Institute

3:45 **Optimal Topology Design for Structural Vibrations and Eigenvalue Problems**
Noboru Kikuchi, University of Michigan

4:15 **Optimal Design of Periodic Antireflective Structures for Time-Harmonic Waves**
David Dobson, University of Minnesota, Minneapolis

4:45 **Topology Design for Manufacturability Using a Self-Adaptive Material Model**
Robert B. Haber, C.S. Jog and M.P. Bendsoe, University of Illinois, Urbana

MS23/Wyndham D

Viscoelastic Fluids: Complex Flows, Instabilities and Bifurcations (Part 2 of 2)

(For description, see MS16, Page 19)

Organizer: David O. Olagunju
University of Delaware

3:15 **Experimental Studies of Viscoelastic Instabilities in Rotational Shearing Flows**
Susan J. Muller, University of California, Berkeley

3:45 **Pattern Formation and Bifurcations in the Viscoelastic Taylor-Couette Flow**
Antony M. Beris, University of Delaware, and Marios Avgousti, Stevens Institute of Technology

4:15 **Injection Molding with Polymers**
Robert P. Gilbert, University of Delaware

MS24/Wyndham C

Phase-change Modeling

Phase change, and in particular solidification from a melt, has important technological applications, for example in casting metals and laser surface treatment of metal alloys. Classical solidification modeling allows diffusion of heat and solute with a zero-thickness free boundary separating melt and solid. Recent research has included electrical effects, non-equilibrium solute segregation at the interface, flow in the melt, and a finite-thickness interface between the solid and melt. Approximate solutions to the appropriate nonlinear PDEs are found using analytical (regular and singular perturbation theory) and computational methods (finite difference and boundary integral methods). The front dynamics help determine the final phase(s) properties. The speakers in the minisymposium will present recent results concerning the application of a range of applied mathematics techniques to technologically-relevant problems. Phase, change, and solidification in particular, are very much in line with the materials science and industrial problems themes of the meeting.

Organizer: Richard J. Braun
National Institute of Standards and Technology

3:15 **Electrical Effects During Directional Solidification**
Geoffrey B. McFadden, Richard J. Braun, and S.R. Coriell, National Institute of Standards and Technology

3:45 **Oscillatory- and Cellular-Mode Interaction in Rapid Directional Solidification**
Douglas A. Huntley and Stephen H. Davis, Northwestern University

4:15 **Interface Dynamics with Weak Flow: Spatio-temporal Intermittency**
Ann K. Hobbs and Philippe Metzener, Swiss Federal Institute of Technology at Lausanne, Switzerland

4:45 **A Regularization of the Cahn-Hilliard Gradient Expansion**
Kirk E. Brattkus, California Institute of Technology

3:15-5:15

Concurrent Sessions

MS25/Philadelphia North

Interfacial Waves and Symmetry

Interfacial waves can be generated by vibrating a fluid layer at a fixed frequency and amplitude, as first studied by Faraday. Novel and intriguing dynamical phenomena have recently been found experimentally, including both ordered patterns with surprising symmetries, and spatiotemporally chaotic states. During the past few years the importance of symmetry considerations in the analysis of bifurcations of the Faraday system has become clear. In this minisymposium, the speakers will focus on recent progress made in theory, numerical analysis, and experiment.

The speakers will showcase new experimental observations and theoretical and numerical analysis of the Faraday system. One central issue concerns the ways in which our understanding can benefit from recent work in dynamical systems theory, the dynamics of pattern formation, and bifurcation theory with symmetry, The minisymposium is concerned with a number of different methods that are brought to bear on a common experimental problem.

Organizer: Martin Golubitsky
University of Houston

3:15 Bifurcation of Surface Waves with Hidden Euclidean Symmetry
John David Crawford, University of Pittsburgh

3:45 Dynamics and Time-Averaging of Chaotic Wave Patterns
Jerry P. Gollub and Bruce J. Gluckman, Haverford College

4:15 Faraday Waves in 2:1 Internal Resonance
Diane M. Henderson, The Pennsylvania State University, University Park

4:45 Floquet Analysis of Faraday Instability in Nonideal Fluids
Laurette S. Tuckerman, University of Texas, Austin, and Ecole Normale Superieure de Lyon, France; K. Kumar and W.S. Edwards, Ecole Normale Superieure de Lyon, France

MS26/Salon 5

Scientific Visualization (Part 2 of 2)

Organizers: Gilbert Strang, Massachusetts Institute of Technology and Lee Zia, University of New Hampshire

3:15 Scientific Data Models and Visualization
Lloyd Treinish, IBM Thomas J. Watson Research Center

3:45 Visualizing the Universe
Margaret Geller and *Emilio Falco,* Harvard Smithsonian Center for Astrophysics

4:15 Visualization of Second Order Tensor Fields and Matrix Data
Bert Hesselink, Stanford University

4:45 Scientific Visualization of Complex Fluid Flow
Paul Woodward, AHPCRC, University of Minnesota, Minneapolis

MS27/Salon 10

Synchronization Phenomena in Populations of Nonlinear Random Oscillators

A variety of phenomena, from biology, solid state physics, statistical physics, vision, neural networks, can be modelled by the interaction of many nonlinear, possibly noisy oscillators. In the recent years, it has become clear that transition from incoherence to collective synchronization is an ubiquitous phenomenon occurring in many fields of science. For example, biological organization, synchronization of pacemaker cells and of pancreatic beta-cells, lightening of fireflies and singing of crickets, e.g. in solid state physics, arrays of Josephson junctions, and in chemistry, chemical processes can all be modelled by interactions of populations of nonlinearly coupled oscillators. The speakers in this minisymposium will present an account of the state-of-the-art of the subject, presenting the most recent results achieved by leading scholars who have been working in the field.

Organizer: Renato Spigler
Universitá di Padova, Italy

3:15 Synchronization Phenomena in Populations of Random Oscillators
Luis Lopez Bonilla, Universidad Carlos III de Madrid, Spain

3:45 Dynamic Behavior of Networks of Neural Oscillators
Conrado J. Perez Vicente, Universidad de Barcelona, Spain

4:15 Title to be determined
David Kleinfeld, AT&T Bell Laboratories

4:45 Synchronization in Populations of Spatially Distributed Oscillators
Hidetsugu Sakaguchi, Kyushu University, Japan

5:15 Hierarchical Dynamics in Distributed Information Processing
Erik Lumer, Universite Libre de Brussels, Belgium

CP13/Salon 3

Nonlinear Waves, Nonlinear Optics, NLS, and Dispersion Phenomena

3:15 Light Beam Propagation in A Nonlinear Tapered Waveguide
P. Varatharajah, New Jersey Institute of Technology and A.B. Aceves, University of New Mexico

3:30 Modeling of Diffractive Optics in Nonlinear Media
Gang Bao, University of Minnesota, Minneapolis

3:45 Phase Jumps in the Laser with Injected Signal
Peter A. Braza, University of North Florida

4:00 On the Forced Nonlinear Schrodinger Equation (NLS)
Charles Bu, Wellesley College

4:15 Group Clasification Problem
M.L. Gandarias-Nunez, Universidad de Cadiz, Spain

4:30 The Small Dispersion Limit of the Generalized Korteweg-de Vries Equation with Riemann Initial Data
A. Bathi Kasturiarachi, University of North Carolina, Chapel Hill and Stephanos Venakides, Duke University

4:45 The Polynomial and Rational Solitary Wave Solutions to Polynomial Nonlinear PDEs and ODEs
Chuntao Yan, Kansas State University

See page 42 for ordering information

3:15-5:15

Concurrent Sessions

CP14/Seminar A

Simulation and Modeling in Biology and Medicine I

3:15 **Efficient 3-D Pattern Recognition for the Binding of Proteins on DNA**
Yuefan Deng, James Glimm, Qiqing Yu and Moises Eisenberg, State University of New York, Stony Brook

3:30 **A Minimum Cycle Problem from Bacterial DNA Research**
Stephen B. Maurer, Swarthmore College

3:45 **Finding the Critical Shapes**
H. Westcott Vayo, University of Toledo

4:00 **Singular Perturbation Theory Applied to Markov Models for DNA Damage Caused by Ionizing Radiation**
Pei-Li Chen, Southern Illinois University, Carbondale

4:15 **Semi-Analytic Solutions to Forward-Rate Equations**
Richard I. Shrager, National Institutes of Health

4:30 **Conduction in Excitable Fibers with Nonuniform Diameter**
Y. Zhou, Rhode Island College and *J. Bell,* State University of New York, Buffalo

4:45 **Modeling the Flow Field and Particle Motion in NASA's Rotating Bioreactor**
Ernest Boyd, Mankato State University and David Tsao, Krug Life Sciences, Houston

5:00 **Asymptotic Moving Pulse Solution for One Model of Calcium- Induced Calcium Release**
Leonid V. Kalachev, University of Washington

5:15 **An Integrated Theoretical-Experimental Approach for Metabolic Control Analysis**
Asok K. Sen, Purdue University School of Science, Indianapolis

CP15/Seminar B

Control and Applications

3:15 **Heating and Cooling Control of Temperature Distributions Along Boundaries of the Container of Fluid Flows**
Max D. Gunzburger and *Hyung-Chun Lee,* Virginia Polytechnic Institute and State University

3:30 **Control of Steady State Navier-Stokes Channel Flow**
John Burkardt, Max Gunzburger, and Janet Peterson, Virginia Polytechnic Institute and State University

3:45 **Control of a Multiple Component Structure Using Piezoceramic Patch Actuators**
Belinda B. King, North Carolina State University

4:00 **Linear-Quadratic Distributed Optimal Control System with Point Sensors**
Link Ji and Jianxin Zhou, Texas A&M University, College Station

4:15 **Hot Rolling Metal Ingots and an Associated Optimal Control Problem**
Richard Goldthwait, Youngstown State University and Michael Szakacs, Copperweld Steel Company, Warren, OH

4:30 **An Extended Kalman-Bucy Filter for Vessel Traffic Control**
Peter J. Costa, University of St. Thomas

4:45 **Improved Solutions for Problems in Industrial Process Control**
Arun Mulpur and Charles Thompson, University of Massachusetts, Lowell

5:00 **Aerodynamic Control of Spinning Missiles**
Ned J. Corron and David Williams, Dynetics, Inc., Huntsville, AL

5:15 **NONACODE: A Software Package for Analysis and Design of Adaptive Control of Nonlinear Systems using Computer Algebra**
J.C. Gomez, Universidad Nacional de Rossario, Argentina

5:30 **A Study on the Riccati Differential Equations with All Coefficients Indefinite and its Applications to H^{∞}-Optimization and L-Q Games**
Shuping Chen and Pingjian Zhang, Zhejiang University, People's Republic of China

CP16/Salon 7

Numerical Methods, Elliptic Problems

3:15 **Multiscale Solvers for Electrostatics**
Michael J. Holst, Richard Kozack, *Faisal Saied,* and Shankar Subramaniam, University of Illinois, Urbana

3:30 **A Numerical Solution for Laplace's Equation on Non-Simply Connected Regions in Three Dimension**
Jorge I. Saavedra, Stockton State College

3:45 **A Fast Second Order Accurate Method for Solving Three Dimensional Potential Problems in Irregular Regions**
C. Leonard Berman, IBM Thomas J. Watson Research Center; Leslie F. Greengard, Courant Institute of Mathematical Sciences, New York University; and Anita A. Mayo, IBM Thomas J. Watson Research Center

4:00 **Electromagnetic Scattering for Dielectrics: Iterative Methods for Solving Boundary Integral Equations**
B. Bielefeld, Yuefan Deng, James Glimm and F. Tangerman, State University of New York, Stony Brook; J.S. Asvestas, Grumman Corporation, Bethpage, NY

4:15 **Following Paths of Transcritical Bifurcations**
John H. Bolstad, Lawrence Livermore National Laboratory

4:30 **The Immersed Interface Method for Elliptic Equations with Discontinuous Coefficients and Singular Sources**
Randall J. LeVeque and Zhilin Li, University of Washington

4:45 **Treating Geometric Singularities in Elliptic Problems**
Dimpy Pathria and George Em Karniadakis, Princeton University

5:00 **The Mean Value Theorem Approach for Linear Elliptic Dirichlet Problem**
J.B. Ribeiro do Val and M.G. Andrade Filho, Universidade Estadual de Campinas, Brazil

5:15 **Pointwise a Posteriori Error Estimators for Elliptic Problems on Highly Graded Meshes**
Ricardo H. Nochetto, University of Maryland, College Park

5:30 **A-Posteriori Error Analysis for Linearization of Nonlinear Elliptic Problems and Their Discretizations**
Weimin Han, University of Iowa

5:00

Exhibit Hall Closes

5:45

Dinner
Franklin Institute

8:00/Wyndham Ballroom
IP5/Chair:

Non-Classical Effects Accompanying Diffusion In Polymers

Diffusive transport in modern polymeric materials often involves phenomena that do not occur in classical diffusion, and the technological uses of the materials are based on these non-classical properties. For example, diffusion with sharp (shock-like) fronts propagating with constant speed at the interface corresponding to the glass-rubber phase change is the basis for many revolutionary pharmaceuticals. Other types of anomalous behavior form the basis for new adhesives, bonding materials, sheet molding compounds, and the aging and controlled failure of composites. The speaker will present a model for use with many of these polymer-penetrant systems. The dominant effect arises from the coupling of diffusive and mechanical processes through a viscoelastic response where the strain and strain rate depend upon concentration and temporal and/or spatial gradients of the diffusing penetrant. He will discuss analysis of the model and comparison with observations.

Donald S. Cohen
Division of Applied Mathematics
California Institute of Technology

8:45/Wyndham Ballroom
IP6/Chair:

Numerical Methods and Analysis of Nonlinear Dispersive Partial Differential Equations

Understanding the role of solitons has proved crucial to analyzing the evolution of general initial data for quasilinear dispersive PDEs, such as the Korteweg-de Vries, nonlinear Schrodinger and the Kadomtsev-Petviashvili equations. These equations have linear dispersion and the solitons have infinite support.

The speaker will describe a new class of solitons for similar equations with nonlinear dispersion and present numerical calculations of their properties. In joint research of the speaker, Roberto Camassa, Darryl Holm and Philip Rosenau, the remarkable discovery was made that the solutions of these nonlinear dispersive equations are also described by the evolution of solitons. Furthermore, the solitons for many of these equations have compact support and are identically zero away from the soliton core. These compact solitons form from arbitrary initial data, are nonlinearly self-stabilizing and maintain their coherence after multiple collisions, even though most of these fully nonlinear equations are nonintegrable. The equations are Hamiltonian and a subclass is biHamiltonian and, hence, possess an infinite number of conservation laws.

James M. Hyman
Theoretical Division
Los Alamos National Laboratory

10:00 AM-12:00 PM

Concurrent Sessions

MS28/Wyndham Ballroom

Mathematical, Computational and Integrated Models in Nondestructive Evaluation (Part 1 of 2)

A fundamental approach to nondestructive evaluation must be based upon quantitative models of the measurement processes of the various inspection techniques. A model's principal purpose is to predict, from first principles, the measurement system's response to specific anomalies in a given material. A measurement model includes the configuration of the probe and the component being inspected, as well as a description of the generation, propagation and reception of the interrogating energy. In developing such a model the challenge lies in making approximations that permit numerical and analytical calculations to be tractable, while retaining sufficient detail that applications are not compromised. The minisymposium will explore several aspects of these problems.

Organizer: John G. Harris
University of Illinois, Urbana-Champaign

10:00 Energy Localization in a Layered System with Defects
Alexander F. Vakakis and Cetin Cetinkaya, University of Illinois, Urbana-Champaign; and Michael El Raheb, The Dow Chemical Company, Midland, Michigan

10:30 Nondestructive Evaluation Using Synthetic Aperture Radar
Mark T. Lusk, Iowa State University

11:00 Numerical BIE Methods for High Frequency Ultrasonic NDE Modeling Using A Priori Phase Information
Ronald A. Roberts, Iowa State University

11:30 Micromechanics of Thin Films and Interfaces
Hyung-Chul Choi and K.S. Kim, IBM Corporation

MS29/Wyndham C

Nonlinear Diffusion in Polymers (Part 1 of 2)

The speakers in this minisymposium will address mathematical modeling of diffusion processes in nonlinear elastic and hereditary media. Such models arise in the description of polymer-fluid or polymer-polymer inter-diffusion, and in thermo-viscoelasticity. The proper formulation and solution of such models would supply an invaluable design tool for a wide variety of technological applications, including microlithography, electronics packaging, drug delivery systems, and automotive fuel-systems engineering.

Currently, there is considerable focus on properly formulating tensorial models via non-equilibrium theormodynamics. However, even relatively simple, one-dimensional models pose considerable numerical and analytical challenges since, for most practical applications, the models are nonlinear. Consequently, there is active research on both properly formulating and solving such problems.

Organizers:
Christopher J. Durning, Columbia University
and Donald S. Cohen,
California Institute of Technology

10:00 Developments in the Mechanics of Interaction between a Fluid and a Highly Deformable Solid: Steady Flows
Alan Wineman, University of Michigan, Ann Arbor and K.R. Rajagopal, University of Pittsburgh

10:30 Unsteady Diffusion Through Solids Undergoing Large Deformations (tentative)
K.R. Rajagopal, University of Pittsburgh

11:00 Stress Assisted Diffusion in Glassy Polymers
Kenneth N. Morman, Jr., Ford Motor Company, Dearborn, MI

11:30 Solvent Transport in Swellable, Glassy Polymers
Steven R. Lustig, E.I. duPont de Nemours & Co., Inc.

MS30/Wyndham D

Phase Field Models and Alloys

The phase field equations are a system of parabolic differential equations describing dynamic phase transitions in which the interface is determined by level sets rather than additional conditions. In various distinguished limits they are governed by a spectrum of (sharp) free boundary problems in the limit as the interface thickness vanishes.

The speakers will begin by dicussing detailed stability of the interface and the computations involving these limiting problems. Subsequently, this approach will be applied to the alloy problem in which the phase diagram is more complicated. The issue of impurities in phase transitions, which is crucial in industrial problems, leads to very interesting questions in the analysis of nonlinear diffusion equations.

Organizer: Gunduz Caginalp
University of Pittsburgh

10:00 Mathematical Analysis of Phase Field Alloys
Weiqing Xie, University of Pittsburgh

10:30 Mathematical Models of Alloys: Phase Field and Sharp Interface
Gunduz Caginalp, Organizer

11:00 Phase Field Computations of Single-Needle Crystals, Crystal Growth and Motion by Mean Curvature
E. Socolovsky, Hampton University

11:30 Linear Stability of Phase Field Plane Waves
James W. Jones, University of Pittsburgh

7:30/Wyndham Foyer
Registration opens

9:00
Exhibit Hall Opens

9:30/Exhibit Hall/Mezzanine Level
Coffee

10:00 AM - 12:00 PM

Concurrent Sessions

MS31/Philadelphia North

Linear, Non-Modal Fluid Mechanics

The equations of fluid mechanics are nonlinear. For some fluids problems linear analysis has proved successful, but more often it has failed. The canonical example is flow through a pipe, where standard linear analysis predicts a stable laminar flow at all Reynolds numbers, yet in fact, flows at high Reynolds numbers are invariably turbulent.

In the past five years it has been discovered that some of the apparent failures of "linear analysis" in fluid mechanics are actually failures of eigenvalue analysis. If one linearizes a fluids problem but does not diagonalize the result, a very different picture emerges. Many phenomena of hydrodynamic stability, transition to turbulence, and even fully-developed turbulence can now be seen as dominated by essentially linear mechanisms. The speakers in this minisymposium will discuss current developments in this fast-moving area.

Organizer: Lloyd N. Trefethen
Cornell University

10:00 Historical Introduction
Lloyd N. Trefethen, Organizer

10:30 Transient Growth and Subcritical Transition in Circular Pipe Flow
Kenneth S. Breuer, Massachusetts Institute of Technology and Peter L. O'Sullivan, Brown University

11:00 Transient Growth and Subcritical Transition in Plane Poiseuille and Couette Flows
Satish Reddy, Courant Institute of Mathematical Sciences, New York University and Dan Henningson, Massachusetts Institute of Technology

11:30 Spatial Transient Growth of Energy Density
Peter Schmid, Massachusetts Institute of Technology

12:00 Development of Coherent Structures in Turbulent Shear Flow
Kathryn Marie Butler, Harvard University

MS32/Philadelphia South

Stochastically Perturbed Dynamical Systems in Physics and Chemistry

Many phenomena in physics and chemistry can be described by stochastic differential equations. Some examples are chemical reactions and other rate processes, and particle diffusion. Relaxation to equilibrium, due to escape from a metastable state, is a unifying theme.

In this session, the speakers will discuss a variety of new approaches to this problem. They will discuss techniques that relate relaxation phenomena in physical systems to the dynamics of associated, non-stochastic dynamical systems.

Organizer: Robert S. Maier
University of Arizona

10:00 The Escape Problem for Irreversible Systems
Robert S. Maier, Organizer, and Daniel L. Stein, University of Arizona

10:30 Large Occasional Fluctuations in Systems Driven by High-Frequency Narrow-Band Noise
Mark Dykman, Stanford University

11:00 Resonant Escape Over a Fluctuating Barrier
Charles R. Doering, J.C. Gadoua, and U. Zuercher, Clarkson University

11:30 Transition-rate Theory for Transitions Through Unstable Equilibrium Points
Daniel L. Stein, University of Arizona

12:00 Diffusion Theory of Multidimensional Activated Rate Processes: The Role of Anisotropy
Malgorzata M. Klosek, University of Wisconsin, Milwaukee

MS33/Horizon Ballroom

Teaching Statistics for Applied Mathematics

Organizer: Donald E. Miller
Saint Mary's College
(See page 6 for description)

MS34/Salon 5

Applications of Special Functions

Sponsored by
SIAM Activity Group on Orthogonal Polynomials and Special Functions

The talks in the minisymposium will present applications of special functions in partial differential equations, astrophysics, combinatorics and tomography. There are two talks on special functions and wavelets related to partial differential equations, with an application to astrophysics. An approach to computing the two-dimensional radon transform based on harmonic analysis of locally compact abelian groups will be presented. Combinatorics is another area in which special functions are important. Applications to extremal set theory, random walks on graphs and enumeration will be described.

Organizer: Charles F. Dunkl,
University of Virginia

10:00 Quasiregular Sampling and Computed Tomography
Adel Faridani, Oregon State University

10:30 Special Functions Applied in Astrophysics and Cosmology
Hans J. Haubold, The United Nations, and A.M. Mathai, McGill University, Canada

11:00 Special Functions, Boundary Value Problems and Linear Elliptic Partial Differential Equations
Peter A. McCoy, U.S. Naval Academy

11:30 Basic Hypergeometric Orthogonal Polynomials and Combinatorics
Dennis Stanton, University of Minnesota, Minneapolis

CP17/Salon 3

Fluids I

10:00 Singularities in Surface Tension Driven Flows
Andrea Bertozzi, Michael Brenner, and Leo Kadanoff, University of Chicago

10:15 Bubble Growth and Release from a Needle
H.N. Oguz and A. Prosperetti, Johns Hopkins University

10:30 Calculation of the Initial Motion of a 2D Bubble using a Modified Volume of Fluid Method
Emad Fatemi, Ecole Polytechnique Federale de Lausanne, Switzerland

10:45 Motion of Two Bubbles in Viscous Fluids
H. Yuan and A. Prosperetti, Johns Hopkins University

11:00 Vorticity Dynamics on a Fluid-Fluid Interface
J.Z. Wu, University of Tennessee Space Institute

11:15 Asymptotic Stability of Solitary Waves
Robert L. Pego, University of Maryland, College Park and Michael I. Weinstein, University of Michigan, Ann Arbor

11:30 Electrohydrodynamic Instability of Two Superposed Fluids in Normal Electric Fields
K. Abdella and H. Rasmussen, University of Western Ontario, Canada

11:45 Nonlinear Interaction of Shear Flow with A Free Surface
Athanassios A. Dimas and George S. Triantafyllou, City College of City University of New York

10:00 AM - 12:00 PM

Concurrent Sessions

CP18/Seminar A

Simulation and Modeling in Biology and Medicine II

10:00 Modeling Aspects of the Sense of Touch
J. Bell, State University of New York, Buffalo and *M. Holmes,* Rensselaer Polytechnic Institute

10:15 Parameters for Kidney Models
Raymond Mejia and Mark A. Knepper, National Institutes of Health

10:30 A Course on Mathematical Models in Physiology Using Spreadsheets
Emanuel Levitan, University of Pennsylvania and Technion Faculty of Medicine, Israel

10:45 Numerical Diagnosis of Pathoanatomy in the Human Forefoot
Philip H. Demp, Rutgers University, Camden

11:00 A Biomechanical Model for the Determination of the Forearm Muscular and Articular Forces
Diego Pigozzi and Adriano Montanaro, Universita di Padova, Italy

11:15 Using Markov Chains to Model Chain Migration
Jie Pan, Saint Joseph's University and Anna Nagurney, University of Massachusetts, Amherst

11:30 Turing Bifurcations in Predator-Prey Models with Delay
S. Roy Choudhury, University of Central Florida

11:45 Algorithms for Epidemic Forecasting
Wei-min Liu, Indiana University-Purdue University, Indianapolis

12:00 Controlled Release of Reagent from an Inwardly Tappered Disk with a Central Releasing Hole
Jyh-Ping Hsu and Ron-Jen Su, National Taiwan University, Republic of China

CP19/Seminar B

Numerical Methods, Diffusion and Time-Dependent PDEs

10:00 Hybrid Solutions for Semiconductor Models
Ilan Efrat, IBM Thomas J. Watson Research Center and Moshe Israeli, Technion-Israel Institute of Technology, Israel

10:15 A Numerical Method for A Mathematical Model in Electroplating
Y.S. Choi and Xun Yu, The University of Connecticut, Storrs

10:30 On the Numerical Solution of the Heat Equation in Unbounded Domains
Leslie F. Greengard and *Patrick Lin,* Courant Institute of Mathematical Sciences, New York University

10:45 An Improved Version of the Control Volume Finite Element Method for Solving Convection Diffusion Equations
Tom V. Eldredge, University of Tennessee, Knoxville and Tennessee Valley Authority; and Tony A. Rizk, Tennessee Valley Authority

11:00 On a Singular Diffusion Equation: Well-Posedness and Large Time Behavior
Hongfei Zhang, Ball State University

11:15 A Numerical Scheme to Solve Non-Linear Integral Equations Arising in Controllability
Luciano Barbanti, Universidade de Sao Paulo, Brazil and Virginia Polytechnic Institute and State University

11:30 On Mesh Adaptivity for Time-Dependent Problems
Peter K. Jimack, University of Leeds, United Kingdom

11:45 Analysis of Waveform Multigrid Method
Shlomo Ta'asan, ICASE, NASA Langley Research Center and *Hong Zhang,* Clemson University

CP20/Salon 10

Numerical Linear Algebra I

10:00 Fast Direct Preconditioners for Nonsymmetric Problems on MIMD Parallel Computers
Michael Ham and <s>Faisal Saied, University of Illinois, Urbana

10:15 Projective Methods in Data Parallel Programming Model
Nahid Emad, Universite Versailles St. Quentin, France

10:30 Data Parallel GMRES on the CM-5
Serge G. Petiton, Site Experimental en Hyperparallelisme, ETCA, France and Yale University; Antoine Petitet, Site Experimental en Hyperparallelisme, ETCA, France and University of Tennessee, Knoxville; and Vincent Laubie, Site Experimental en Hyperparallelisme, ETCA, France

10:45 Parallel Methods for Second Order Time Dependent PDEs
D.A. Voss and A.Q.M. Khaliq, Western Illinois University

11:00 Parallel Computation of the Polar Decomposition
Nicholas J. Higham and Pythagoras Papadimitriou, University of Manchester, United Kingdom

11:15 Sparse Preconditioned Conjugate Gradient Method on the CM5
Serge G. Petiton, Site Experimental en Hyperparallelisme, ETCA, France and Yale University and Christine J. Weill-Duflos, Site Experimental en Hyperparallelisme, ETCA, France and Universite Pierre et Marie Curie, France

11:30 Improved Parallel Computations with Band Matrices
Victor Pan, Lehman College, City University of New York, Bronx; Isdor Sobze and Antoine Atinkpahoun, City University of New York Graduate Center

11:45 Some New Approaches to the General Eigenvalue Problem
Gary Howell, Florida Institute of Technology

12:00 Toeplitz and Circulant Matrices in Boundary Value Problems
Mohammad Saleem, San Jose State University

12:15 Numerical Algorithm for Solving the Generalized Eigenvalue Problem for Toeplitz Matrices
George Grossman, Central Michigan University

1:30/Wyndham Ballroom
Special Session 3
FCCSET Initiatives: Opportunities to Make a Difference
(See page 6 for description)

3:30-5:30
Concurrent Sessions

MS35/Horizon Ballroom
Educating Applied Mathematicians
Organizers: Stefan Ehrlich, Rivier College and C.K. Chu, Columbia University
(See page 6 for description)

MS36/Wyndham Ballroom
Mathematical, Computational and Integrated Models in Nondestructive Evaluation (Part 2 of 2)
(For Description, see MS28, Page 25)
Organizer: Andrew N. Norris
Rutgers University, Piscataway, New Jersey

3:30 **Modeling Acoustic Microscopy for QNDE**
Douglas A. Rebinsky, Rutgers University, Piscataway, New Jersey

4:00 **Modeling of Ultrasonic Transducer Fields by Gaussian Beams and Propagation Through Layered Media**
Sergio Kostek, Schlumberger-Doll Research, Ridgefield, Connecticut; Andrew Norris, Organizer; and Fred E. Stanke, Schlumberger-Doll Research Ridgefield, Connecticut

4:30 **Diffraction of Ultrasound by Near-Surface Crack Tips**
Gerry R. Wickham, University of Manchester, United Kingdom

5:00 **Scattering by an Infinite Array of Randomized Coplanar Cracks**
Yozo Mikata, Old Dominion University

MS37/Wyndham C
Nonlinear Diffusion in Polymers (Part 2 of 2)
(For description, see MS29, page 25)
Organizers:
Christopher J. Durning, Columbia University and Donald S. Cohen, California Institute of Technology

3:30 **Stefan-Type Moving Boundary Models for Diffusion in Polymers**
Donald S. Cohen, Organizer

4:00 **Thermodynamic Analysis of Some Rate Type Models for the Diffusion in Polymers**
Giulio Sarti, Universita Degli Studi di Bologna, Italy

4:30 **An Analysis of Thomas and Windle's Model for Case II Transport**
Christopher J. Durning, Organizer

5:00 **On the Heat Conduction with the Effect of Memory**
Hong Min Yin, University of Notre Dame

12:00-1:30
Lunch

3:00/Wyndham Foyer/Ballroom Level
Coffee

MS38/Wyndham D
Dynamical Systems Approach to PDEs: Applications to Fluid Mechanics
This session will focus on recent results on the dynamical systems approach to Partial Differential Equations, with particular emphasis on fluid mechanics applications (both amplitude equations and the Navier-Stokes equations). The study of low-dimensional behavior has provided the motivation and the ground for the development of a wide variety of techniques (including theoretical, numerical, and experimental) bridging dynamical systems and PDEs. The speakers in this session will present a balanced set of recent results from both the theoretical and numerical experiments side. Of particular interest is the interface between theory and modern numerical methods (including new discretizations for the Navier Stokes equation, the revisiting of established numerical methods in the light of new PDE-theoretical developments, and stability and bifurcation calculations exploiting these approaches).

Organizers:
Yannis G. Kevrekidis, Princeton University and Edriss S. Titi, University of California, Irvine

3:30 **Title: To Be Announced**
Jonathan Goodman, Courant Institute of Mathematical Sciences, New York University

4:00 **Stokes Eigenfunctions for CFD in Complex Geometries**
George M. Karniadakis, Princeton University

4:30 **On the Number of Determining Nodes to the Complex Ginzburg-Landau Equation**
Igor Kucavica, Indiana University, Bloomington

5:00 **Dynamical Systems Methods for Nonlinear Waves**
David McLaughlin, Princeton University

5:30 **Low-Dimensional Projections for Stability Calculations**
Laurette S. Tuckerman, University of Texas, Austin, and Ecole Normale Superieure de Lyon, France

MS39/Philadelphia North
Time Stability in Large-Scale Computing
The development of stable and accurate boundary conditions has always been a major problem for high-order methods. Conventional boundary condition analysis based on GKS stability theory does not guarantee time asymptotic stability. Stronger stability definitions are required for large-scale computations which involve long times. Recent developments in classical energy methods provide a means of establishing time stability for high order finite difference schemes. A broad investigation of useful numerical techniques for the long time simulation of hyperbolic systems is proposed. The principal focus of the minisymposium is the practitioner of large-scale simulations, including direct simulations and simulations of engineering interest. The goal is to establish formal methods of guaranteeing numerical time stability for problems of practical interest.

Organizer: Mark H. Carpenter
NASA Langley Research Center

3:30 **Time-Stable Boundary Conditions for Finite Difference Schemes Solving Hyperbolic Systems**
Mark H. Carpenter, Organizer; David Gottlieb, Brown University; and Saul Abarbanel, Tel Aviv University, Israel

4:00 **Energy Estimates for High-Order Finite-Difference Methods on Nonsmooth Domains**
Pelle Olsson, RIACS-NASA Ames Research Center

4:30 **On the Boundary Treatment for High-Order Difference and Finite Element Methods**
Bertil Gustafsson, Uppsala University, Sweden

5:00 **Stability Considerations for High-Order Accurate Essentially Non-Oscillatory Schemes**
Jay Casper, NASA Langley Research Center

MS40/Philadelphia South
Modeling and Computational Aspects of Free Surface Flows
Coating of thin films, rapidly and accurately, onto solid substrates is critical to many products in everyday consumer and industrial use. Sometimes a thin fluid curtain, whose flow is subject to air currents and evaporation from both sides, is laid on a rapidly moving sheet of substrate, in other processes only one surface is free but rheology changes with flow and evaporation. Accuracy required in predicting final dried coating characteristics leaves little room for mathematical simplification and raises difficult problems in formulation of the fluid dynamics and computation of the resulting flow models. The speakers in this session will highlight approaches to these real world modeling issues.

Organizer: Peter E. Castro
Eastman Kodak Company
(Titles and speakers to be determined)

3:30-5:30

Concurrent Sessions

MS41/Salon 5

Design of Experiments

The Design of Experiments is an interdisciplinary topic in mathematics, statistics and engineering, with applications in manufacturing, agriculture, biology, medicine, etc. The objective is to design an optimal series of experiments for a given situation so as to gain maximal useful information at minimal expense. The techniques used include modeling, combinatorics, probability, optimization theory, mathematical programming, computing and information theory. This minisymposium is intended to bring together academic and industrial researchers and practitioners in optimal experimental design to discuss recent progress and current problems in the subject.

Organizers: Marco A. Duran, Exxon Research and Engineering Company and Neil J.A. Sloane, AT&T Bell Laboratories

3:30 **Report on Two Years Experience in Constructing Optimal Designs with GOSSET**
Neil J.A. Sloane, Organizer and R. H. Hardin, AT&T Bell Laboratories

4:00 **A Mathematical Programming Approach to Optimal Design of Experiments**
David A. Straub, Exxon Research and Engineering Company, and *Marco A. Duran,* Organizer

4:30 **Nonlinear Experimental Design Techniques**
Timothy D. Rey, The Dow Chemical Company

5:00 **Some Combinatorial Problems in Experimental Design**
Ching-Shui Cheng, University of California, Berkeley

MS42/Salon 10

Mathematical and Computational Aspects of Physiologically Structured Population Models

Structured population models incorporate processes operating at the level of the individual organism (e.g. aging, growth), permitting study of their effects on population dynamics. These models are of considerable current interest because of their usefulness in ecological studies and because of the challenging mathematical and computational problems they pose. Papers in this minisymposium illustrate the variety of contemporary approaches, including continuum versus individual-based models, discrete- versus continuous-time models, and analytical versus computational methods.

Organizer: James N. McNair
Division of Environmental Research,
Academy of Natural Sciences of Philadelphia

3:30 **The Dynamics of Hierarchically Structured Populations**
J.M. Cushing, University of Arizona

4:00 **Fish Cohort Dynamics: Application of Complementary Modeling Approaches**
D. DeAngelis, Oak Ridge National Laboratory

4:30 **Dynamics of a Physiologically Structured Predator-prey System**
T. Hallam, University of Tennessee, Knoxville

5:00 **On the Convergence of Discrete Models to Continuous Models of Size-Structured Population Dynamics**
Guillermo Uribe, University of Arizona

CP21/Seminar A

Computational Fluids I

3:30 **A Fourth-Order Accurate Method for the Incompressible Navier-Stokes Equations on Overlapping Grids**
William D. Henshaw, IBM Thomas J. Watson Research Center

3:45 **Solving the Compressible Navier-Stokes and Euler Equations on Overlapping Grids**
William D. Henshaw, IBM Thomas J. Watson Research Center and *Donald W. Schwendeman,* Rensselaer Polytechnic Institute

4:00 **The Curved Detonation Riemann Problem**
Bruce G. Bukiet, New Jersey Institute of Technology

4:15 **Implicit Numerical Schemes for Hyperbolic Conservation Laws with Stiff Relaxation Terms**
Shi Jin, Courant Institute of Mathematical Sciences, New York University

4:30 **A Numerical Study of the Linear Theory of Shock-Contact Interactions**
Yumin Yang, State University of New York, Stony Brook; David H. Sharp, Los Alamos National Laboratory; and Qiang Zhang, State University of New York, Stony Brook

4:45 **Nonoscillatory High Order Accurate Self-Similar Maximum Principle Satisfying Shock Capturing Schemes**
Xu-Dong Liu and Stanley Osher, University of California, Los Angeles

5:00 **Weighted Essentially Non-Oscillatory Schemes**
Xu-Dong Liu, Stanley Osher, and Tony Chan, University of California, Los Angeles

5:15 **A Class of Non-Interpolation Type Essentially Non- Oscillatory Schemes for Shock Capturing**
Shu-rong Xu, Zhongshan University, People's Republic of China

5:30 **A Pseudo-Time Iteration Technique for the Solution of Incompressible Navier-Stokes Equations**
Mehdi Golafshani, Sharif University of Technology, Iran

CP22/Salon 3

Fluids II

3:30 **Boundary Conditions for Linearized Models of Slightly Compressible Flow**
Michael G. Stoecker, Air Force Institute of Technology

3:45 **Flow of an Oldroyd-B Fluid Due to a Stretching Sheet with Uniform Free Stream Velocity**
G. Gupta, University of Pittsburgh, Pittsburgh; *R. Bhatnagar,* University of Pittsburgh, Greensburg; and K.R. Rajagopal, University of Pittsburgh, Pittsburgh

4:00 **Flow of an Oldroyd-B Fluid Due to a Streching Sheet**
G. Gupta and K.R. Rajagopal, University of Pittsburgh, Pittsburgh and *R. Bhatnagar,* University of Pittsburgh, Greensburg

4:15 **Stability of Free Surface Sediment Flow**
Poul G. Hjorth, The Technical University of Denmark, Denmark

4:30 **Oldroyd's Viscosity Result Extended to Circular Disk Particles of Finite Thickness**
George Grossman, Leela Rakesh and James Angelos, Central Michigan University

4:45 **A Model for the Defluidization Velocity in a Fluidized Bed**
James L. Moseley, West Virginia University

5:00 **Isothermal Dissolution of Spherical Particles in Liquids**
Shiojenn Tseng, Tamkang University, Republic of China

CP23/Seminar B

Optimization I

3:30 **On Large-scale Optimization with Bound Constraints**
Thomas F. Coleman and Yuying Li, Cornell University

3:45 **Using Directions of Negative Curvature in Newton-type Methods for Nonlinear Optimization**
Stephen Nash, Ariela Sofer, and *Meena Srinivasan,* George Mason University

4:00 **Multilevel Optimization Algorithms for Nonlinear Equations and Equality Constrained Optimization**
Natalia Alexandrov and J.E. Dennis, Jr., Rice University

4:15 **A New Trust Region Method for Nonlinear Minimization Subject to Bounds**
Thomas F. Coleman and *Yuying Li,* Cornell University

4:30 **Creating Good Random Starts for Neural Network Training**
Roger L. Crane and *Scott A. Markel,* David Sarnoff Research Center and Charles Fefferman, Princeton University

4:45 **Counting Local Minima in Neural Network Training**
Roger L. Crane and *Scott A. Markel,* David Sarnoff Research Center and Charles Fefferman, Princeton University

5:00 **Enhanced Training of the Multilayer Perceptron and Applications to Chemical Process Control**
Luke E.K. Achenie, University of Connecticut, Storrs

5:15 **On Approximate Antigradients**
Xiao-Xiong Gan, Morgan State University

3:30-5:30

Concurrent Sessions

Wyndham Foyer/Ballroom Level

Poster and Video Presentations

A Parameter Estimation Method Using Integral Inner Products
Deborah Sturm, City University of New York, Staten Island

A Mixed Finité Element Approximation for Nonlinear Degenerate Equations
Wenbin Liu and John W. Barrett, University of London, United Kingdom

Radiative Hydrodynamic Instability: Use of a Modified Tau Method to Investigate the Stability of a Thermally Radiating System with Radiative Heating from Above
John Baker, Shiva N. Singh, and Kozo Saito, University of Kentucky

Stationary Shape of a Viscous Fluid Layer on a Rotation Bar
Erik B. Hansen, Technical University of Denmark, Denmark and Mark Kelmanson, University of Leeds, United Kingdom

Genetic Algorithms for Composite Laminate Plate Design
Nozomu Kogiso, Raphael T. Haftka, Zafer Gurdal, and *Layne T. Watson,* Virginia Polytechnic Institute and State University

Parameter Estimation for Systems of Weakly Singular Volterra Equations
Dennis W. Brewer, University of Arkansas, Fayetteville

Stable Periodic Solutions of the Reaction - Diffusion Equations with a Small Diffusion
Arnold Dikansky, St. John's University

Mathematical Modelling of Pulse Wave Propagation in Arterial Trees
Bo Duan, University of Western Ontario, Canada

Computing Convergence of the Inner Iteration in Affine Invariant Newton Methods
Paul J. Lanzkron and Donald J. Rose, Duke University

Limit Equilibrium of Plates under Action of Plain Stress and Bending Forces
Mark Varvak, Brooklyn, NY

The Homogenized Spaces in the Theory of Rotating Stratified Flows
V.M. Kharik, Moscow State University, Russia

Investigation of Structure Preserving Algorithms for Linear-Quadratic Optimization Problems Solving
Vasile Sima, Research Institute for Informatics, Romania

The Variable Metrics Proximal Point Algorithm: Application to Optimization
Maijian Qian, California State University, Fullerton

On the Unique Solvability of the Nonlinear Systems in Numerical Ordinary Differential Equations
Jiaoxun Kuang, Shanghai Normal University, People's Republic of China

Minimal Parameter Homotopies for the Combined Model Order Reduction Problem
Yuzhen Ge, Virginia Polytechnic Institute and State University; Emmanuel G. Collins, Jr., Harris Corporation, Melbourne, FL; *Layne T. Watson,* Virginia Polytechnic Institute and State University; and Dennis S. Bernstein, University of Michigan, Ann Arbor

Multi-Parameter Continuation and Interactive Graphics
John H. Maddocks, University of Maryland, College Park

Spiral Waves in Excitable Media
Dwight Barkley, University of Texas, Austin

5:30

Exhibit Hall Closes

Upcoming SIAM Conferences and Tutorials

1993

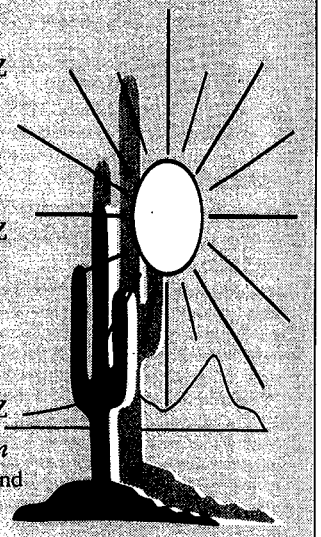
August 4-6, 1993
SIAM Conference on Simulation and Monte Carlo Methods
Hotel Nikko, San Francisco, CA
Organizer: Peter W. Glynn, Stanford University

August 15, 1993
Tutorial on Numerical Methods in Control, Signal and Image Processing
University of Washington, Seattle, WA
Organizer: Biswa N. Datta, Northern Illinois University

August 16-19, 1993
Third SIAM Conference on Linear Algebra in Signals, Systems, and Control
University of Washington, Seattle, WA
Sponsored by SIAM Activity Group on Linear Algebra
Organizer: Biswa N. Datta, Northern Illinois University

October 31, 1993
Tutorial on NURBS
Radisson Tempe Mission Palms Hotel, Tempe, AZ
Organizer: Gerald Farin, Arizona State University

Tutorial on Data Reduction and Decomposition Techniques for Curves and Surfaces
Radisson Tempe Mission Palms Hotel, Tempe, AZ
Organizer: Tom J. Lyche, University of Oslo, Norway



November 1-5, 1993
Third SIAM Conference on Geometric Design
Radisson Tempe Mission Palms Hotel, Tempe, AZ
Sponsored by SIAM Activity Group on Geometric Design
Co-organizers: Robert E. Barnhill, Arizona State University, and Rosemary E. Chang, Silicon Graphics Computer Systems

1994

January 23–25, 1994
Fifth Annual ACM-SIAM Symposium on Discrete Algorithms
Key Bridge Marriott Hotel Arlington, VA
Abstract deadline: 7/13/93
Organizer: Daniel D. Sleator, Carnegie-Mellon University

For information on these and other conferences sponsored by SIAM, please contact:
SIAM Conference Coordinator
Call: 215-382-9800 Fax:215-386-7999 E-mail: meetings@siam.org

8:00/Wyndham Ballroom
IP7/Chair:

The Gibbs Phenomenon and Scientific Computing

The Gibbs phenomenon, discovered in 1898 by A. Michelson, occurs when approximations of formal high order accuracy are applied to non-smooth phenomena. For example, the Fourier expansion of a non-periodic function displays oscillations. The Gibbs phenomenon is a major issue in many areas of applications, notably signal processing and application of high order methods to shock waves.

In this talk, the speaker we will describe the history of the Gibbs phenomenon and show its resolution .It will be shown that the (formal) high accuracy approximation contains highly accurate information about the solution, such that it can be reconstructed with the same accuracy as in the smooth case.

The above theory is applied to the numerical simulations of interactions of shock waves and jets. We will present numerical studies in the posibility of enhancing mixing in the combustor of a SCRAMJET , by creating a vortical motion through interactions of shockwaves and hydrogen jets. This is a type of problem that necessitates the use of high order schemes to resolve details of the flows. Numerical results obtained by spectral methods as well as ENO fourth order methods will be presented.

David Gottlieb
Division of Applied Mathematics
Brown University

8:45/Wyndham Ballroom
IP8/Chair: Peter E. Castro, Eastman Kodak Company

Mathematical Modeling in Electrophotographic Imaging Systems

The goal of modeling imaging systems such as office copiers or laser printers is to provide rapid prototyping, accurate performance predictions, and process insight. Creation of physical prototypes is time and resource intensive, requiring complex hardware and novel materials. Moreover, intermediate states that drive system performance are often inaccessible to direct observation.

Simple models of imaging systems rely on cascading one-dimensional mathematical or empirical subsystem models to predict system performance. They often fail to adequately predict image quality or reveal fundamental limitations. However, the use of models that attend to image structure and process fundamentals promises to shorten and enhance the product development cycle.

The speaker invites you on a guided tour of an office copier to experience and understand the challenge of modeling image formation and development.

John P. Spence
Computational Science Laboratory
Eastman Kodak Company

10:00 AM-12:00 PM

Concurrent Sessions

Special Session 4/Horizon Ballroom

Symbolic Computation and Calculus Reform

Organizer: James C.T. Pool
Drexel University
(See page 6 for description)

MS43/Salon 3

Large-Scale Electronic Structure Calculations on Massively Parallel Systems

The speakers in this minisymposium will address the solution of large-scale electronic structure calculations by the use of massively parallel computer architectures. In the past several years, the production use of massively parallel systems has provided the capability for materials scientists and chemists to study large-scale systems by using first principles electronic structure techniques which previously could not be performed due to a lack of computational resources. Inherent in these methods is the solution of a set of Schrodinger-like equations which is used to calculate the physical properties of the system. The models, including full configuration interaction, self-consistent fields, and the KKR method, each have limitations and advantages that will be discussed in this minisymposium. In all of them the role of distributed data and parallel computations is central to the solution of large-scale problems.

Organizer: Michael Minkoff
Argonne National Laboratory

10:00 Electronic Structure Calculations on Massively Parallel Computers
Robert J. Harrison and Ricky A. Kendall, Pacific Northwest Laboratory

10:30 The Development of the SCF-KKR-CPA Electronic Structure Method Within a Heterogeneous Distributed Computing Environment
William A. Shelton, Jr., G.A. Geist, and G.M. Stocks, Oak Ridge National Laboratory

11:00 Large-Scale Electronic Structure Calculations on Massively Parallel Systems
Brond E. Larson, Thinking Machines Corporation; K.D. Brommer, Lockheed Sanders, Hudson, New Hampshire, and Massachusetts Institute of Technology; T.A. Arias and J.D. Joannopoulos, Massachusetts Institute of Technology

11:30 Parallelization of a Gaussian Electronic Structure Code
Mark P. Sears, Sandia National Laboratories, Albuquerque

MS44/Philadelphia South

Mathematical Methods in Time Frequency Analysis and Spectral Estimation (Part 1 of 2)

In this minisymposium, the speakers will review the mathematical aspects of signal processing using mixed time-frequency and time-scale methods. Many classes of signals are best represented as a sum of slowly evolving, partially coherent sinusoids in a noisy background. The mixed time-frequency/scale representations produce a parcimonious estimation problem. Cohen's generalization of the Wigner distribution can be thought of as a class of kernel smoothers in the ambiguity plane. We examine optimal estimators of the signal using minimal expected loss and maximum information criteria. Similar estimators of stationary and nonstationary spectral densities are given.

Organizers: Leon Cohen
Hunter College, CUNY Graduate Center
and Kurt S. Riedel
Courant Institute of Mathematical Sciences, New York University

10:00 A Generalization of the Wiener-Khinchin Theorem to Arbitrary Variables
Leon Cohen, Organizer

10:30 Information Theory and Proper Time-Frequency Distribution
Les Atlas, University of Washington

11:00 Information Invariance in Time-Frequency Distributions
William J. Williams, Mark L. Brown and Alfred O. Hero III, University of Michigan, Ann Arbor

11:30 Statistical Properties of Time-Frequency Distributions
Moeness G. Amin, Villanova University

7:30/Wyndham Foyer
Registration opens

9:00
Exhibit Hall Opens

9:30/Exhibit Hall/Mezzanine Level
Coffee

10:00 AM - 12:00 PM

Concurrent Sessions

MS45/Wyndham C

Two-Fluid Flows and Interfacial Instabilities

Two-phase flows arise in numerous applications and their study is a rich and challenging interdisciplinary science. Applications include formation of bicomponent fibers, oil recovery and transport, coating, materials processing in space, separations and emulsions. Theoretically, there are many possibilities for the fluid interfaces (static or dynamic), and the selection mechanisms require investigation with the aim of lessening the gap between theory and experiment. Due to the complexity of the problems current research utilizes physical modeling, analytical and computational techniques in order to provide quantitative predictions. The speakers in this minisymposium will present such approaches applied to different applications.

Organizers: Demetrios T. Papageorgiou
New Jersey Institute of Technology,
and Yuriko Y. Renardy, Virginia Polytechnic Intitute and State University

10:00 Sideband Instability for Two-Layer Channel Flows
Michael Renardy, Virginia Polytechnic Institute and State University and *Yuriko Y. Renardy,* Organizer

10:30 The Axisymmetric Thermocapillary Motion of a Fluid Particle in a Tube
Charles Maldarelli, Jinnan Chen and Zeev Dagan, City College of the City University of New York

11:00 Influence of Material of Construction on Water Lubrication of Viscous Materials
Daniel D. Joseph, University of Minnesota, Minneapolis

11:30 Nonlinear Evolution of Waves on a Vertically Falling Film
H.-C. Chang, University of Notre Dame, Indiana, E.A. Demekhin and D.I. Kopelevich, Krasnodar Polytechnic Institute, Russia

12:00 Ordered and Disorder Dynamics of Core-Annular Film Flows
Demetrios T. Papageorgiou, Organizer; George C. Papanicolaou, Courant Institute of Mathematical Sciences, New York University; and Yiorgos S. Smyrlis, University of Manchester, United Kingdom

MS46/Wyndham D

Computational Problems in Liquid Crystals

Liquid crystals are capable of existing in phases of matter characterized by properties both of liquids (they are fluid) and of solid crystals (their long "rod-like" molecules possess orientational order). Such materials are important in commercial applications (display devices, television monitors, and the like) primarily because of their optical properties. They transmit and reflect light in different ways depending on the orientations of these molecules. And so a basic problem in this area is to determine the preferred directions of orientation of the liquid-crystal molecules (as a function of position) in a particular physical situation. In this minisymposium, the speakers will discuss computational difficulties and approaches for continuum models involving problems of static equilibrium (in fixed, finite containments as well as with free boundaries) and also problems of liquid-crystal flows.

Organizer: Eugene C. Gartland, Jr.
Kent State University

10:00 Numerical Minimization of the Landau-deGennes Free Energy for Liquid Crystals
Eugene C. Gartland, Jr., Organizer

10:30 H1 Gradient Methods for Computing Liquid Crystal Configurations
Francois Alouges, Ecole Normale Superieure de Cachan, France, and Laure Quivy, Universite Paris-Nord, France

11:00 Computations of Liquid Crystal Droplet Equilibria
Robert A. Cohen, University of North Carolina, Chapel Hill, and Carroll Nunn, Texas Tech University

11:30 Simulation of Polymeric Liquid Crystal Flows Using an Order Parameter Tensor Model
Robert Guenette, Universite Laval, Canada

MS47/Wyndham Ballroom

Integer Linear Programming

Sponsored by
SIAM Activity Group on Discrete Mathematics

There will be three talks in this minisymposium, all dealing with computational aspects of integer programming. The first of the talks will examine recent computational experience with the MIPLIB test set. The second talk will discuss a new and promising class of cutting-plane method called "lift-and-project." The final talk will be concerned with the MINTO integer-programming tool, which provides a computational framework for researchers working on hard combinatorial optimization problems.

Organizer: Robert E. Bixby, Rice University

10:00 Computational Experience with the MIPLIB Mixed-Integer Programming Library
E. Andrew Boyd, Texas A&M University, College Station; Robert E. Bixby, Rice University; and William Cook, Bellcore

10:30 Specialization of the Lift-and-Project Algorithm
Sebastian Ceria, Egon Balas and Gerard P. Cornuejols, Carnegie Mellon University

11:00 Solving Hard Combinatorial Optimization Problems Using MINTO, a Mixed INTeger Optimizer
Martin W.P. Savelsbergh, Georgia Institute of Technology

MS48/Salon 5

Optimization Methods in Computed Tomography

The mathematical problem in computed tomography consists of reconstructing a function (representing tissue attenuation or emission densities inside the human body) from its known line integrals. In some situations (high noise levels, few data), for example in emission tomography, the optimization approach provides better results than the analytic inversion. This gives rise to very large ill-posed problems that should be solved using special purpose iterative methods. Some of the main drawbacks faced when dealing with these methods are: speed-up, handling of regularization terms and stopping criteria. The speakers will present different points of view for eliminating these drawbacks in this minisymposium.

Organizer: Alvaro R. De Pierro
University of Pennsylvania

10:00 Least Squares and Adaptive Gridding for PET
Linda Kaufman, AT&T Bell Laboratories

10:30 A New Smoothing-Regularization Approach for a Maximum Likelihood Estimation Problem
Alfredo N. Iusem, Instituto de Matematica Pura e' Applicada, Rio de Janeiro, Brazil

11:00 Sequential and Parallel Image Reconstruction Algorithms Using Generalized Distances
Yair Censor, University of Haifa, Israel

11:30 Accelerating the EM Algorithm for Emission Tomography via Relaxation
Alvaro R. De Pierro, Organizer

12:00 Experimental Comparison of Early Behavior of Iterative Optimization Algorithms for Emission Tomography
Gabor T. Herman, University of Pennsylvania

10:00 AM - 12:00 PM

Concurrent Sessions

MS49/Philadelphia North

Computation of Global Structures in Dynamical Systems

Physical models undergo their most dramatic changes in global bifurcations. Underlying these bifurcations are structures such as global (un)stable manifolds, connecting orbits, and invariant tori. Applications for connecting orbits include traveling wave and soliton solutions of partial differential equations: Recently connecting orbits have been computed both directly, and as the intersection of stable and unstable manifolds. Visualization, especially in the case where the dimension of the manifolds is two, can be quite revealing of the geometric mechanism by which the connection is made. The speakers will present several approaches to the computation and visualization of invariants objects for dynamical systems. (This session will run until 1:00 PM)

Organizer: Michael Jolly
Indiana University, Bloomington

10:00 Computing Two-Dimensional Stable Manifolds: A Case Study
John Guckenheimer and *Allen H. Back,* Cornell University

10:30 Geometric Methods for Computing Invariant Manifolds
Gerald Moore, Imperial College, United Kingdom

11:00 Numerical Computation of Invariant 2-TORI
Luca Dieci, Georgia Institute of Technology

11:30 The Successive Continuation Method for Obtaining Homoclinic and Heteroclinic Orbits
Mark Friedman, University of Alabama, Huntsville, and Eusebius J. Doedel, California Institute of Technology

12:00 Computation of Heteroclinic Orbits and Applications in Dynamic Phase Transitions
Fengshan Bai, Stanford University, and University of Bath, United Kingdom; Alastair Spence, University of Bath, United Kingdom; and Andrew M. Stuart,, Stanford University

12:30 Solitary Waves with Spin
Henry Warchall, University of North Texas

CP24/Seminar A

Computational Fluids II

10:00 Convergence of Approximation Methods for Hyperbolic Conservation Laws
Philippe Le Floch, University of Southern California

10:15 Uniform and Variable Order Spatial Approximations in the Method of Lines Solution of Advective PDEs
M.B. Carver, Atomic Energy of Canada, Canada and *W.E. Schiesser,* Lehigh University

10:30 An Alternative to CFL Timestepping for Hyperbolic Equations
Martin Berzins, University of Leeds, United Kingdom

10:45 An Iterative Scheme with Local Boundary Condition for Vorticity
Xiaohui Wu, University of Tennessee Space Institute

11:00 Vortex Ring Formation at the Edge of a Tube
Monika Nitsche, University of Colorado, Boulder and Robert Krasny, University of Michigan, Ann Arbor

11:15 Computational Vorticity Confinement: Three-Dimensional Results
John Steinhoff, University of Tennessee Space Institute

11:30 Spiral Formation in a Periodic Vortex Sheet
Robert Krasny, University of Michigan, Ann Arbor, and Richard Pelz, Rutgers University, Piscataway

11:45 Computational Investigation of Vortex Shedding
Marc B. Reider, Los Alamos National Laboratory, and Christopher R. Anderson, University of California, Los Angeles

12:00 Upwind Finite Difference Schemes for Linear Conservation Law with Memory
Yanping Lin, University of Alberta, Canada

CP25/Salon 10

Finite Elements: Applications and Theory

10:00 Analysis of an Optimal Shape Control Problem for the Steady—State Navier Stokes Equations
Max D. Gunzburger and *Hong-Chul Kim,* Virginia Polytechnic Institute and State University

10:15 A Random Element Method for Thermal Boundary Layer Flows
Wing Kwong Chui, Tulane University

10:30 Balancing Domain Decomposition for Mixed Finite Elements
Lawrence C. Cowsar and Mary F. Wheeler, Rice University; and Jan Mandel, University of Colorado, Denver

10:45 A Recursive Textured Decomposition for the Parallel Implementation of the p-version
Yimin Zhu and I. Norman Katz, Washington University

11:00 A Multi-p V-cycle Method Accelerated by a Nested Multi-p Procedure
Ning Hu and I. Norman Katz, Washington University

11:15 An A Posteriori Finite Element Error Estimator for Fourth Order Problems
Shirley B. Pomeranz, University of Tulsa

CP25 continued →

CP25 Continued

11:30 L^p Exponential Stability for the Equilibrium Solutions of the Navier-Stokes Equations
Chaoshun Qu, Yunnan University, People's Republic of China and *Ping Wang,* Pennsylvania State University

11:45 An Adaptive Finite Element Method for Variational Inequalities
Jinn-Liang Liu, National Chiao Tung University, Republic of China

CP26/Seminar B

Discrete Mathematics I

10:00 The Number of Hamiltonian Paths in a Rectangular Grid
Karen L. Collins, University of Kentucky and Wesleyan University; and Lucia Krompart, Rochester, MI

10:15 Generalized Pyramidal Tours for the Traveling Salesman Problem
Richard H. Warren, Temple University

10:30 A New Graph Planarity and Straight Line Edge Drawing Algorithm
Robert Bumcrot, *Jerome Epstein,* and Darrin Lewis, Hofstra University

10:45 Lattices and Graphs
Dayanand S. Rajan, University of Delaware and *Anil M. Shende,* Bucknell University

11:00 New Constructions of Bipartite Graphs on *m*, *n* Vertices, with Many Edges, and Without Small Cycles
Felix Lazebnik, University of Delaware; V.A. Ustimenko, University of Kiev, Ukraine; and A.J. Woldar, Villanova University

11:15 Sign-Nonsingularity, Sign-Solvability and Metabolic Control
Asok K. Sen, Purdue University School of Science

CP27/Salon 7

Inverse Problems I

10:00 Numerical Impedance Imaging
Alan J. Witten, Oak Ridge National Laboratory and John E. Molyneux, Widener University

10:15 Inverse Solutions for Electric Field Imaging in Medicine
Christopher R. Johnson and Robert S. MacLeod, University of Utah

10:30 Diffuse Tomography: Imaging of Media that Scatter Radiation
Jorge P. Zubelli, Institute for Pure and Applied Mathematics, Brazil

10:45 On Inversion and the Range of One Transform Arising in Emission Tomography
Peter Kuchment, Wichita State University

11:00 Exact Scattered Field Generation for Time-Domain Approach of Ultrasound Tomography
Y. Wang, University of Maryland, Baltimore County

11:15 Three-Dimensional Imaging by Inverse Scattering
Michael V. Klibanov, University of North Carolina, Charlotte

11:30 A Regularization Approach for Inverting the Exponential Radon Transforms
Zheng Kewang, Hebei Institute of Light Industry & Chemical Technology, People's Republic of China

1:30/Wyndham Ballroom
Special Session 5

Linking Academe to Industry — How to Make it Work

Organizer: James G. Glimm, State University of New York, Stony Brook
(See page 5 for description)

4:00-6:00

Concurrent Sessions

MS50/Wyndham Ballroom

Material Microstructure

This minisymposium highlights recent methods for the study of material microstructure. Understanding the role of microstructure and, in particular, how it affects macroscopic behavior leads to the development of improved materials such as shape-memory materials, piezo-electric or magnetostrictive materials, and composites. The variety of new analytical and computational methods under development include bounds for effective moduli, improved treatments of hysteretic phenomena, and modelling of surface effects. How good are these methods? What can they do? The speakers will highlight the important issues in this minisymposium.

Organizers: David Kinderlehrer, Carnegie Mellon University and Robert Kohn, Courant Institute of Mathematical Sciences, New York University

4:00 **The Modeling and Computation of Magnetostrictive Materials**
Ling Ma, Carnegie Mellon University

4:30 **Delamination Instabilities in Thin Films**
G. Gioia and *M. Ortiz,* Brown University

5:00 **On Three-phase Boundary Motion and the Singular Limit of a Vector-valued Ginzburg-Landau Equation**
Lia Bronsard, McMaster University and *Fernando Reitich,* Carnegie Mellon University

5:30 **Optimal Design of Composite Microstructure**
Leonid Gibiansky, Courant Institute of Mathematical Sciences, New York University

6:00 **Non-Convex Optimization and Computation of Microstructure**
Noel J. Walkington, Carnegie Mellon University

MS51/Philadelphia South

Mathematical Methods in Time Frequency Analysis and Spectral Estimation (Part 2 of 2)

(For description see MS44, Page 31)

Organizers: Leon Cohen
Hunter College, CUNY Graduate Center
and Kurt S. Riedel, Courant Institute of Mathematical Sciences, New York University

4:00 **Optimal Data-based Kernel Estimation of Evolutionary Spectra**
Kurt S. Riedel, Organizer

4:30 **Wavelets as a Regularization Technique for Spectral Density Estimation**
Pierre Moulin, Bellcore

5:00 **On Time-Frequency Subspace Decomposition for Transient Signal Detection in Colored Noise**
Nenad M. Marinovich, City College-CUNY Graduate Center

5:30 **Optimal Boundary Kernels**
Alexander Sidorenko, Courant Institute of Mathematical Sciences, New York University, and Kurt S. Riedel, Organizer

MS52/Wyndham C

Large-Scale Engineering Design

Sponsored by
SIAM Activity Group on Optimization

The design of large systems such as aircraft, automobiles, computers, or ships involves many engineering disciplines and many different aspects of mathematics and optimization. The optimization component is a crucial but small fraction of the overall design effort. The formulation and approximate solution of the optimization problem seldom resemble the textbook formulation and algorithms. The speakers in this minisymposium represent three different areas of large-scale engineering where optimization plays an important role: structural analysis and design, electronic circuit design, and control system analysis and design. Their presentations will illustrate how optimization is viewed and used by different engineering areas, and suggest some problems to which optimization researchers could profitably turn their attention.

Organizer: Layne T. Watson

Virginia Polytechnic Institute and State University

4:00 **Numerical Optimization in Integrated Circuit Design**
Peter Feldmann, AT&T Bell Laboratories, Murray Hill, New Jersey

4:30 **Modern Methods for Structural Optimization**
Garret N. Vanderplaats, VMA Engineering, Goleta, California

5:00 **Computational Issues in "Black Box" Approaches to Optimal Design with Applications to Optimal Flows**
John A. Burns, Virginia Polytechnic Institute and State University

MS53/Wyndham D

Mathematics of Electrophotographic Imaging

Electrophotographic imaging (xerography) depends upon the interplay of electrostatics, electrodynamics, small particle technology, surface phenomena, mechanics, and a host of other disciplines. Each subsystem of the overall process has been the subject of intensive modeling efforts aimed at understanding and optimizing system performance. This session will highlight modeling and computational issues involved in coupling airflows to ion flow in charging of surfaces; forces on, and dynamics of small charged particles in electric fields; electrostatic image formation; and stochastic issues in quantifying image quality.

Organizer: Peter E. Castro
Eastman Kodak Company

Titles and speakers to be determined

MS54/Horizon Ballroom

Nearly the Nonlinear Schrödinger Equation

As a canonical wave evolution, the (cubic) Nonlinear Schrodinger (NLS) equation represents a fundamental balance between dispersion an nonlinearity. In other situations, the natural balance of effects may lead to wave equations that resemble the NLS, but behave in markedly different ways. For this mini-symposium, there are assembled several variants of NLS-type equations — each system embodying some characteristic behavior of the NLS, but with modifications that lead to new challenges in the understanding of nonlinear wave evolutions.

Two of the systems to be presented — they arise naturally from optical and fluid dynamical applications — concern NLS-type equations with spatial nonlocality. Also from an optical setting is a higher-order equation whose temporal evolution resembles a twice-iterated NLS operator. Finally, studies of the effects of adding linear potentials into the NLS are included — the first considers the interaction of randomness and nonlinearity, and the second considers questions of nonlinear scattering and asymptotic stability in systems with bound states.

Organizers: David J. Muraki, Princeton University and Michael J. Shelley, Courant Institute of Mathematical Sciences, New York University

4:00 **Undulation and Filamentation of Self-Focussed Light in a Liquid Crystal**
Michael J. Shelley and David J. Muraki, Organizers, and David W. McLaughlin, Princeton University

4:30 **Non-Local Self-Stretching of Vortex Filaments in a Background Flow Field**
Rupert Klein, Institut fur Technische Mechanik-RWTH, Germany; Andrew J. Majda, and *Richard M. McLaughlin,* Princeton University

5:00 **Parametric Amplification of Pulses in Optical Fibers**
J. Nathan Kutz, Cheryl Hile, and William L. Kath, Northwestern University

5:30 **One-Dimensional Localization in an NLS Equation with Randomness**
Jared C. Bronski and David W. McLaughlin, Princeton University, and Michael J. Shelley, Organizer

6:00 **Multi-Dimensional NLS with a Linear Potential (tentative)**
Michael I. Weinstein, University of Michigan, Ann Arbor; and Avy Soffer, Princeton University

12:00-1:30

Lunch

3:00/Wyndham Foyer/Ballroom Level

Coffee

4:00

Exhibit Hall Closes

4:00-6:00

Concurrent Sessions

MS55/Salon 3

Enumerative Combinatorics

The objective of this minisymposium is to make the attendees aware of some recent developments in the methods and applications of (enumerative) combinatorics. The speakers will discuss various applications, including proof theory for hypergeometric identities, extremal codes, and combinatorial structures.

Organizers: Herbert S. Wilf, University of Pennsylvania and Doron Zeilberger, Temple University

4:00 **Generating Combinatorial Structures**
Carla Savage, North Carolina State University

4:30 **A Simple and Effective Algorithm for Proving Hypergeometric Identities**
Lily Yen, University of Pennsylvania

5:00 **Multiple Weight Enumerators of Codes**
Ilan Vardi, Stanford University

5:30 **Generating Trees and Restricted Permutations**
Julian West, Universite Bordeaux I, France

MS56/Philadelphia North

Shock Refractions and Nonlinear Wave Interactions

This minisymposium will focus on two dimensional shock wave interactions and their role in the behavior of nonlinear waves. The classical theory of shock polars provides the framework for the description of highly supersonic shock wave interactions, but the analysis of such waves in transonic flows is much more complicated and must be investigated using a combination of experiment, computer simulation, and mathematical analysis. The speakers will present an overview of the current state of the art in the study of nonlinear wave refractions and their role in the production of complex flows.

Organizer: John W. Grove
State University of New York, Stony Brook

4:00 **Wave Propagation and Numerical Errors**
Klaus Lackner, Los Alamos National Laboratory

4:30 **Anomalous Refractions of Shock Waves at Material Interfaces**
E. G. Puckett, University of California, Davis

5:00 **Refraction and Edge Effects in Shocked Contained Liquids**
Greg Miller, University of Chicago

5:30 **Applications of the Method of Front Tracking to Nonlinear Wave Interactions**
John W. Grove, Organizer

CP28/Salon 5

Computational Fluids III

4:00 **A New Viscous-flow Animation Scheme Applied to Unsteady Separation at High Reynolds Number**
Vallorie J. Peridier, Temple University

4:15 **Tracking of Shear Layers and Contacts**
Stephen F. Davis, Mississippi State University

4:30 **Solving the Incompressible Navier-Stokes Equation on KSR-1 Parallel Computers**
Jianping Zhu, Mississippi State University

4:45 **Towards an Efficient Iterative Method for Solving the Navier-Stokes Equations Using the 3D Crouzeix-Raviart Element**
F.H. Bertrand and P.A. Tanguy, Laval University, Canada and D. Pelletier, Ecole Polytechnique de Montreal, Canada

CP28 continued →

CP28 Continued

5:00 **Error Analysis of Least-squares Methods for Stokes Equations in 2-D**
Pavel B. Bochev and Max D. Gunzburger, Virginia Polytechnic Institute and State University

5:15 **Comparison of the Solution of Model PDEs on a Sphere using Numerically Generated Grids versus Standard Cartesian Grids**
William S. Russell, Columbia University and NASA GISS

5:30 **Finite Difference Approximations of Navier Stokes Equations for 1-D, Nonisentropic, Compressible Flow**
Jennifer Zhao, University of Michigan, Dearborn

5:45 **On the Design of Computing Schemes for Scalable Memory Architectures**
Xian-He Sun and John Van Rosendale, ICASE, NASA Langley Research Center

6:00 **Numerical Solution of a Riccati-type PDE Arising in Nonlinear Optimal Control**
Luhan Chuang and I. Norman Katz, Washington University

6:15 **Supersonic Turbulent Flow Modeling and Calculation**
Mohammad Farshchi, Sharif University of Technology, Iran

CP29/Seminar B

Inverse Problems II

4:00 **A Fast Abel Inversion Algorithm**
Shay Gueron, Cornell University and Moshe Deutsch, Bar-Ilan University, Israel

4:15 **Derivation of the Variability of Pavement Materials from Non-Destructive Testing**
David G. Zeitoun, Hydrological Service, Israel

4:30 **Vector Velocity Inversion using Diffraction Tomography**
Kraig B. Winters and Daniel Rouseff, University of Washington

4:45 **Wave Splitting and Green's Function Approach to Solve Two Inverse Problems**
Zhiming Sun, Iowa State University

5:00 **Generalized Curved Ray Algebraic Inversion for Tomography in Two Dimensions**
Ping Fang and *Allan T. Dolovich,* University of Saskatchewan, Canada

5:15 **Application of the Contraction Mapping Theorem to Tomographical Reconstruction of Strongly Refracting Two-Dimensional Fields**
Ping Fang and *Allan T. Dolovich,* University of Saskatchewan, Canada

5:30 **An Inverse Problem for an Unknown Source in a Heat Equation**
Wei Suhua, Hebei Normal University, People's Republic of China and *Zheng Kewang,* Hebei Institute of Light Industry & Chemical Technology, People's Republic of China

5:45 **A Regularization Approach for Determining an Unknown Source in a Heat Equation**
Zheng Kewang, Hebei Institute of Light Industry and Chemical Technology, People's Republic of China

CP30/Salon 10

Optimization II

4:00 **Constrained Optimization and Shape Preserving Parametric Splines**
Avi Vardi, Drexel University

4:15 **A New Algorithm for Strictly Convex Quadratic Program and Nonparametric Data Smoothing**
Richard P. Beyer, Jr., *W. Li,* and J. Swetits, Old Dominion University

4:30 **A Variational Inequality Motivated by Rivest's Coin Tossing Problem**
Frank J. Massey, III, University of Michigan, Dearborn

4:45 **The Optimal Factorization and Decomposition of Control Automata**
S. Baranov and *Lev Bregman,* Ben Gurion University of the Negev, Israel

5:00 **Local Convergence Rate of Infeasible Interior-Point Methods for HLCP**
Detong Zhang and *Yin Zhang,* University of Maryland, Baltimore County

5:15 **Ill-Posedness of Polyhedra and The Computation of Analytical Centers Under Rounding Error**
Jorge R. Vera, Universidad de Chile, Chile

CP31/Seminar A

Numerical Linear Algebra II

4:00 **The Role of the Inner Product in Stopping Criteria for Conjugate Gradient Iterations**
Steven F. Ashby, Lawrence Livermore National Laboratory; Michael J. Holst, University of Illinois, Urbana; Thomas A. Manteuffel, University of Colorado, Denver; and Paul E. Saylor, University of Illinois, Urbana

4:15 **Iterative Solution of Incomplete Least Squares Problems**
W.D. Curtis, Boeing Computer Services

4:30 **Accelerating the Computation of the Nearest Point Mapping onto the Intersection of Closed Subspaces**
Christopher C. Perkins, Pennsylvania State University

4:45 **Convergence of Intersecting Block Iteration**
Paul J. Lanzkron and Donald J. Rose, Duke University

5:00 **Comparison of Iterative Methods for Nonsymmetric Fredholm Integral Equations of Second Kind**
Jose D. Flores, University of South Dakota

5:15 **An Algorithm that Gives Approximate Solutions to Systems of Linear Inequalities Specified with Approximate Data**
Sharon Filipowski, Cornell University

5:30 **A Renumbering Scheme for Keeping and in the Same Sparse Configuration**
Jenn-Ching Luo, National Chiao Tung University, Republic of China

5:45 **Regions of Convergence of the Rayleigh Quotient Iteration Method**
Ricardo D. Pantazis, Duke University and *Daniel B. Szyld,* Temple University

6:00 **Acceleration of Tridiagonal Symmetric Eigenvalue Computation**
Victor Pan, City University of New York, Lehman College and Akimou Sadikou, City University of New York Graduate School and University Center

6:15 **On Matrix Inverse Eigenvalue Problems**
Xingzhi R. Ji, University of Waterloo, Canada

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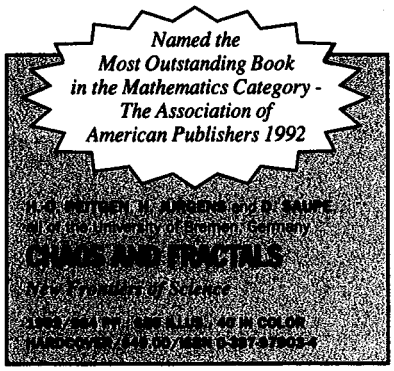

E. DIBENEDETTO, Northwestern University, Evanston, IL

DEGENERATE PARABOLIC EQUATIONS

Mathematicians have only recently begun to understand the local structure of solutions of degenerate and singular parabolic partial differential equations. The problem originated in the mid '60s with the work of DeGiorgi, Moser, Ladyzenskajia and Uraltzeva. This book is an account of the developments in this field over the past five years. It evolved out of the 1990-Lipschitz Lectures given by Professor DiBenedetto at the *Institut für angewandte Mathematik of the University, Bonn.*

1993/APP. 365 PP., 11 ILLUS./SOFTCOVER
$35.00(TENT.)/ISBN 0-387-94020-0
UNIVERSITEXT

L. CARLESON, Mathematics Institute, Royal Institute of Technology, Stockholm, Sweden and **T. GAMELIN**, University of California, Los Angeles, CA

COMPLEX DYNAMICS

Complex Dynamics discusses the properties of conformal mappings in the complex plane, a subject that is closely connected to the study of fractals and chaos. Indeed the culmination of the book is a detailed study of the famous Mandelbrot set, which describes very general properties of such mappings. The book focuses on the analytic side of this contemporary subject. The text was developed out of a course taught over several semesters; with a focus on helping students and instructors to familiarize themselves with complex dynamics. Topics covered include: conformal and quasi-conformal mappings, fixed points and conjugations, basic rational iteration (the Julia set), classification of periodic components, critical points and expanding maps, some applications of conformal mappings (e.g. Hermann rings), the local geometry of the Fatou set, quadratic polynomials, and the Mandelbrot set.

1993/APP. 184 PP., 28 ILLUS./SOFTCOVER/$29.00
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Third Edition
A.J. CHORIN and **J.E. MARSDEN**, both of the University of California, Berkeley, CA

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From the reviews of the Second Edition-
"...The book contains some of the basic ideas of fluid mechanics in a mathematically attractive manner...has the very advantage of providing the solution of the differential equations using new and modern techniques ...the material is very well presented both the mathematical arguments as well as the physical input." -PHYSICALIA

The third edition has incorporated a number of updates and revisions and has been retypeset, but the spirit and scope of the original book remains unaltered.

1993/170 PP., 87 ILLUS./HARDCOVER/$34.00
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TEXTS IN APPLIED MATHEMATICS, VOLUME 4

T. BECKER and **V. WEISPFENNING** in cooperation with **H. KREDEL**, all of Universität Passau, Germany

GRÖBNER BASES

A Computational Approach to Commutative Algebra

Gröbner bases, defined by Buchberger in 1965, and the Buchberger algorithm extend the euclidean algorithm for computing the greatest common divisor to polynomials in several variables. Algorithms using Gröbner bases lead to exact conclusions concerning the solutions of systems of nonlinear equations, such as the number of solutions or the dimension of the solution set, and the computation of the solutions to arbitrary precision. This book on Gröbner bases, assuming the mathematical background of an advanced undergraduate, will be both a reference manual for the working mathematician or computer algebraist as well as an introductory textbook.

1993/600 PP., 50 TABS./HARDCOVER/$49.00
ISBN 0-387-97971-9
GRADUATE TEXTS IN MATHEMATICS, VOLUME 141

F. STENGER, The University of Utah, Salt Lake City, Utah

NUMERICAL METHODS BASED ON SINC AND ANALYTIC FUNCTIONS

Many mathematicians, scientists, and engineers are familiar with the Fast Fourier Transform, a method based upon the Discrete Fourier Transform. Perhaps not so many mathematicians, scientists, and engineers recognize that the Discrete Fourier Transform is one of a family of symbolic formulae called Sinc methods. Sinc methods are based upon the Sinc function, a wavelet-like function replete with identities which yield approximations to all classes of computational problems. Such problems include problems over finite, semi-infinite, or infinite domains, problems with singularities, and boundary layer problems. Written by the principle authority on the subject, this book introduces Sinc methods to the world of computation. It serves as an excellent research sourcebook as well as a textbook which uses analytic functions to derive Sinc methods for the advanced numerical analysis and applied approximation theory classrooms. Problem sections and historical notes are included.

1993/APP. 616 PP., 12 ILLUS./HARDCOVER/$69.00/
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8:00/Wyndham Ballroom
IP9/Chair: David M. Gay, AT&T Bell Laboratories

The Many Faces of Optimization

It can be argued, not entirely facetiously, that "every" problem involves some form of optimization. Optimization plays an enormously important role in real-world applications—all branches of science, engineering, medicine, business, economics, and manufacturing. Interesting numerical optimization methods for difficult problems of reasonable size typically involve an interdependent combination of mathematics, computer science, modeling, and application-specific details. The speaker will sketch a view that conveys the overall flavor of modern large-scale optimization methods, and then describe some practical problems that have been solved with great success. In conclusion, she will offer some speculation about future developments and some likely areas for improvement.

Margaret H. Wright
Mathematical Sciences Research Center
AT&T Bell Laboratories

8:45/Wyndham Ballroom
IP10/Chair:

Solving Travelling Salesman Problems

The speaker will present some new ideas for solving travelling salesman problems with linear programming methods, and report on computational experience with the algorithms, including the exact solution of a 3038 city instance. (This work was done together with David Applegate, Robert Bixby, and Vasek Chvatal).

He will also present new parallel methods for obtaining approximate solutions to very large travelling salesman problems, together with bounds showing that the proposed solutions are not far from optimality. As an example, he will present a solution to a 10,907,064 city problem (arising from a VLSI application and implemented on a network of Unix workstations) and proof that the length of the solution is no more than 4 percent from the optimal length. (This work was done with David Applegate, Bernhard Korte, and Mike Schaefer).

William J. Cook
Bellcore

10:00 AM-12:00 PM

Concurrent Sessions

MS57/Philadelphia South

Algebraic Combinatorics

This minisymposium brings together young researchers in algebra and combinatorics whose work exemplifies the rich interaction between these two subjects. Combinatorics allows one to give concrete descriptions of algebraic objects, for example, symmetric functions, group characters, Hall polynomials, and Schubert polynomials. Such descriptions facilitate study of the algebraic objects and suggest far-reaching generalizations. This approach has had fruitful application in diverse fields including group theory, representation theory, and the theory of convex polyhedra. The talks are intended for conference participants interested in enumerative and algebraic combinatorics, as well as any of the above fields.

Organizers: Curtis Greene and Lynne M. Butler
Haverford College

10:00 The Associahedron
Victor S. Reiner, University of Minnesota, Minneapolis

10:30 Schubert Polynomials
Sara C. Billey, Massachusetts Institute of Technology

11:00 Weyl Group Symmetric Functions
Arun Ram, University of Wisconsin, Madison

11:30 Hall Polynomials for Symplectic Groups
Eva Zabric, Loyola University of Chicago

MS58/Wyndham Ballroom

Robust Optimization

Optimization problems with noisy, uncertain or incomplete data are prevalent in applications from engineering, the sciences and business. The speakers will address diverse aspects of the framework of robust optimization for dealing with such problems. They will discuss modeling issues, algorithms and applications.

Organizer: Stavros A. Zenios
University of Pennsylvania

10:00 Robust Optimization: General Modeling Framework and Applications
John M. Mulvey, Princeton University, and *Stavros A. Zenios,* Organizer

10:30 Extending a Modeling Language to Support Stochastic Programming
Robert Fourer, Northwestern University, and David M. Gay, AT&T Bell Laboratories, Murray Hill, New Jersey

11:00 Robust Optimization Via Spreadsheets
Leon Lasdon, University of Texas, Austin, and *John M. Mulvey,* Princeton University

11:30 Massively Parallel Algorithms and Robust Optimization
Ruijin Qi, University of Pennsylvania, *Stavros A. Zenios,* Organizer, and Matthew Saltzman, Clemson University

MS59/Philadelphia North

High-Order Schemes for Shock Wave Calculation (Part 1 of 2)

In recent years, a number of high order schemes have been developed and applied to problems containing shocks and high gradient reaction regions in such diverse applications as fluid mechanics, detonation waves, plasma physics and microfabrication processes. In many of these applications, shocks and high gradients co-exist and interact with smooth structures of the solutions, and thus a very wide range of scales has to be resolved accurately. High order methods are especially suited to be used in such applications. In this minisymposium, the speakers will present a variety of discretization techniques, i.e. finite difference, finite element, spectral and spectral element schemes, and high order shock tracking methods. They will address algorithm development issues and applications.

Organizers: Wei Cai, University of North Carolina, Charlotte; George Karniadakis, Princeton University; and Chi-Wang Shu, Brown University

10:00 Discontinuous Finite Elements for Multidimensional Hyperbolic Systems
Bernardo Cockburn, University of Minnesota, Minneapolis and Chi-Wang Shu, Organizer

10:30 A Comparison of Two Basic Formulations for High-Order Accurate Essentially Non-Oscillatory Schemes
Jay Casper, ViGYAN, Inc. Hampton, Virginia; Chi-Wang Shu, Brown University; and H.L. Atkins, NASA Langley Research Center

11:00 Recent Development and Application of Essentially Non-Oscillatory Schemes
Chi-Wang Shu, Organizer

11:30 Highly-Accurate Numerical Methods for Problems of Shock-Interaction
You-lan Zhu and Xiao-nan Wu, University of North Carolina, Charlotte

7:30/Wyndham Foyer
Registration opens

9:30/Wyndham Foyer/Ballroom Level
Coffee

10:00 AM - 12:00 PM

Concurrent Sessions

MS60/Wyndham C

Computational Ocean Acoustics

One of the most challenging areas in wave propagation is that of treating sound propagation in the ocean. Much new research has centered on acoustical systems for imaging ocean features (such as the Gulf Stream) or seabed features. The speakers in this session will discuss various new developments in computational acoustics for treating such problems. This includes 3D sound propagation modeling on parallel computers and full 3D inversion of ocean structures.

Organizer: Michael B. Porter
New Jersey Institute of Technology

10:00 A Computationally Intensive Inverse Technique for the Determination of Ocean Environmental Parameters
Alexandra Tolstoy, Naval Research Laboratory

10:30 Three-Dimensional Finite Difference Modeling of Geoacoustic Interaction at the Seafloor
Ralph Stephen and C. R. Bradley, Woods Hole Oceanographic Institute

11:00 Parallelizing FOR3D, a 3D Parabolic Wave Equation Solver for Underwater Acoustics
Ding Lee, Naval Underwater Systems Center; Diana C. Resasco, Yale University; Faisal Saied, University of Illinois; and Martin Schultz, Yale University

11:30 Common Grid Acoustics: Fusing Acoustic Tomography and Ocean Circulation Modeling
Michael B. Porter, Organizer, William Kuperman, and Colin Shen, Naval Research Laboratory

MS61/Wyndham D

Parallel Coordinates: Mathematical Foundations, Applications and Recent Results

Using a multidimensional system of parallel coordinates, Euclidean N-Dimensional space can be visualized. For any positive integer N, a 1-1 mapping between N-dimensional and 2-dimensional subsets is constructed recursively on the dimensionality on the subset being represented. So relations in N variables are represented by planar diagrams with properties analogous to the corresponding N-Dimensional hypersurface. Lines in N-dimensions are represented by N-1 indexed planar points and in general p-dimensional flats in N-space are represented by (N-p)p indexed points. From these representations, ("pencil and paper") geometrical construction algorithms for translations, rotations, hyperplane intersections, and point membership queries and others as well as the representation of N-Dimensional polytopes can be obtained. The speakers in this mini-symposium will discuss representation of a class of hypersurfaces an algorithm for constructing and displaying any point interior or exterior and applications to statistics, collision avoidance in air traffic control, computational geometry, computer vision, process control and optimization.

Organizer: Alfred Inselberg
IBM Scientific Center, Los Angeles, University of Southern California, and University of California, Los Angeles

10:00 Mathematical Foundations of Parallel Coordinates and some Applications
Alfred Inselberg, Organizer

10:30 Representing Polytopes, Developable and Ruled Hypersurfaces in Parallel Coordinates
A. Chatterjee, University of Southern California

11:00 Interpreting EOSAT Data using Parallel Coordinates and Parallel Computing
M.R. Smith, Cornell University

11:30 Production Efficiency Representations in Parallel Coordinates
A. Desai, Ohio State University and L. Walter, Brigham Young University

MS62/Horizon Ballroom

Preparing Doctoral Students for Junior Faculty Success with a "Proseminar"

Organizer: Bettye Ann Case
The Florida State University
(See page 6 for description)

CP32/Seminar A

Discrete Mathematics II

10:00 Heat Conduction on Graphs
David L. Powers, Clarkson University and Nafiz Abu-Jaradeh, University of Jordan, Jordan

10:15 The Ehrenfest Model, Electric Networks and Sums of Binomial Coefficients
Jose Luis Palacios, New Jersey Institute of Technology

10:30 Commuting Equivalence of Reduced Decompositions
Victor S. Reiner, University of Minnesota, Minneapolis

10:45 Maximum Number of Turns in a Nonintersecting p-tuples of Paths
Devadatta M. Kulkarni, Oakland University

11:00 On The Equivalent Relationship Between the Knapsack Problem and Group Knapsack Problem
Nan Zhu, Victoria University of Wellington, New Zealand and Southwestern University of Finance and Economics, People's Republic of China

11:15 On the Integral Dicycle Packings and Covers and the Linear Ordering Polytope
Zeev Nutov and *Michal Penn,* Technion-Israel Institute of Technology, Israel

CP33/Salon 3

Reaction-Diffusion and Diffusion

10:00 Stability of a Premixed Flame Under Confinement
Jennifer L. McGreevy, NASA Langley Research Center and Moshe Matalon, Northwestern University

10:15 Volterra Equations which Model Explosion in a Diffusive Media
Catherine A. Roberts, University of Rhode Island and W.E. Olmstead, Northwestern University

10:30 Numerical Treatment of Large Reaction-Diffusion Systems, with Applications
Renato Spigler and Marco Vianello, Universita di Padova, Italy

10:45 Parallel Solution of Reaction-Diffusion Systems by a Random Choice Method
Yu Song, Indiana University, South Bend

11:00 Multi-Phase Flow in Three-Dimensional Heterogeneous Porous Media
Steven F. Ashby, *Robert D. Falgout,* Steven G. Smith, and Andrew F.B. Tompson, Lawrence Livermore National Laboratory

11:15 Solution of a Free Boundary Problem Describing the Interaction between Flow and Chemical Reaction
Angela Pawell, Oregon State University and Klaus-Dieter Krannich, Technische Universitat Cottbus, Germany

11:30 Convergence of a Crystalline Algorithm for the Heat Equation in One Dimension and for the Motion of a Graph by Weighted Curvature
Pedro Martins Girao and Robert V. Kohn, Courant Institute of Mathematical Sciences, New York University

11:45 The Modulation of a Subsonic Flame
Michael Booty, Southern Methodist University

10:00 AM - 12:00 PM

Concurrent Sessions

CP34/Salon 5

Linear Algebra and Applications

10:00 From the Buffon Needle Problem to the Kreiss Matrix Theorem
Lloyd N. Trefethen, Cornell University and Elias Wegert, Bergakademie Freiberg, Germany

10:15 On A Conjecture of Pierce for Permanents of Singular Correlation Matrices
C.L. Frenzen and I. Fischer, Naval Postgraduate School

10:30 Decomposition Theorems for Frobenius-Perron Operators and Koopman Operators
Jiu Ding, University of Southern Mississippi

10:45 Computer Drawings of the Quark-Mixing Matrix Manifold
Jerome Epstein, Hofstra University and E.L. Schucking, New York University

11:00 Separability Condition of Some Matrices Over F
Kai Sheng Lu and Jia Ning Wei, Wuhan University of Water Transportation Engineering, People's Republic of China

11:15 On the Translativity and Absolute Equivalence of Infinite Matrices
Husamettin Coskun, Inonu University, Turkey

11:30 The Levitzki Radical and Koethe Radical of Generalized Matrix Rings
Shouchuan Zhang, HengYang Medical College, People's Republic of China

CP35/Salon 10

Computer Science: Theory and Applications

10:00 Modified Gaussian Elimination for Adaptive Beamforming Using RNS Arithmetic
Barry J. Kirsch, NAWC-AD, Warminster, PA and *Peter R. Turner,* US Naval Academy

10:15 Complex SLI Arithmetic: Representation, Algorithms and Analysis
Peter R. Turner, U S Naval Academy

10:30 C++ for Scientific Computation: A Comparison with FORTRAN
Philip T Keenan, Rice University

10:45 INTLIB: A Modern, Transportable Fortran 77 Library for Interval Arithmetic
R. Baker Kearfott, University of Southwestern Louisiana

11:00 PaPOSM — A Parallel Nonlinear Optimization Package
ShaoWei Pan and Yu Hen Hu, University of Wisconsin, Madison

11:15 A Relational Algebra for Concurrency
Yahia Slimani, Faculty of Science, Tunisia

11:30 Optimal Scheduling for the 2 Steps DAG
Mounir Marrakchi, Faculte des Sciences de Sfax, Tunisia

11:45 Transitive Independence Number of a DAG
Zaher Mahjoub, University of Tunisia, Tunisia

1:30-2:30/Wyndham Ballroom

The James H. Wilkinson Prize in Numerical Analysis and Scientific Computing Award and Presentation

Chair: Avner Friedman, University of Minnesota, Minneapolis

Geometry and High Accuracy Algorithms

By systematically understanding the geometry of ill-posed problems, we have been able not just to predict when accuracy is likely to be lost in numerical algorithms, but design more accurate algorithms. Depending on the metric one imposes on the space of problems, the set of ill-posed problems can change, and this in turn changes the kind of algorithm we use. We survey applications of these ideas to linear equation solving, eigenvalue problems, the singular value decomposition, and more generalized problem arising in control theory. We discuss both theoretical characterizations of attainable accuracy and new algorithms, in particular those in the LAPACK library.

James Demmel
University of California, Berkeley

3:00-5:00

Concurrent Sessions

MS63/Horizon Ballroom

Mathematical Contest in Modeling (MCM)

(For description, see page 5)

Organizer: Ben Fusaro
Salisbury State University

3:00 An Introduction to the Mathematical Contest in Modeling (MCM)
Ben Fusaro, Organizer

(Winners to be announced)

MS64/Wyndham Ballroom

Combinatorial Optimization

Sponsored by
SIAM Activity Group on Discrete Mathematics

Network flow problems have served as the cornerstone of combinatorial optimization for several years. The basic problem is that of finding a minimum-cost flow in a network satisfying capacity and conservation constraints. The assignment problem and the maximum flow problem arise as special cases. Despite the years of study, fundamental advances continue to be made. These advances includes new algorithms and theory, improvements to old algorithms, efficient implementations, and novel applications. The speakers in this session will highlight some of these advances.

Organizer: Donald K. Wagner
Office of Naval Research

3:00 Solving a Trillion Arc Assignment Problem
Yusin Lee and *James B. Orlin*, Massachusetts Institute of Technology

3:30 Complexity Analysis of Nonlinear Network Optimization Problems
Dorit S. Hochbaum, University of California, Berkeley

4:00 Strongly Polynomial Dual Simplex Algorithms for the Maximum Flow Problem that Require at Most O(nm) Pivots
Donald Goldfarb, Columbia University

4:30 The Disjoint Cut Problem
Donald K. Wagner, Organizer

MS65/Philadelphia North

High-Order Schemes for Shock Wave Calculation (Part 2 of 2)

(For description, see MS59, Page 37)

Organizers: Wei Cai, University of North Carolina, Chapel Hill; George Karniadakis, Princeton University; and Chi-Wang Shu, Brown University

3:00 High-Order Numerical Methods for Flame and Detonation Simulations
Wei Cai, Organizer

3:30 Efficient Spectral Algorithm for Shock Wave Computation
Wai Sun Don, Brown University

4:00 Spectral Element-FCT Method for High-Speed Compressible Viscous Flows
John Giannakouros, Princeton University, and *George Karniadakis*, Organizer

4:30 Solution of Supersonic Viscous Flows by a Spectral Multidomain Method
David A. Kopriva, Florida State University

MS66/Wyndham D

Numerical Methods for Large-Scale Meteorological Flows

(Improved Numerical Methods for General Circulation Modeling Developed under the Department of Energy's CHAMMP Program)

The development of new massively-parallel scientific supercomputers coupled with improvements in algorithmic design can lead to greatly improved accuracy and efficiency in models of the global atmospheric and ocean general circulation. This session is intended to illustrate some of the recently developed algorithms to improve general circulation models (GCM) that will be applied to future climate models used in the U.S. Department of Energy's Computer Hardware, Advanced Mathematics and Model Physics (CHAMMP) program. The speakers in this minisymposium will focus on: the development of a more accurate model of transport, alternative basis functions in atmospheric models, changes in model formulation and boundary conditions designed to make an ocean model more efficient and accurate, and a suite of problems that can be used to test new algorithms.

Organizer: David C. Bader
US Department of Energy, Washington, DC

3:00 Performance of The Local Spectral Method in Spherical Geometries
John R. Anderson, University of Wisconsin, Madison

3:30 Forward-in-Time Differencing for Fluids in an Arbitrary Curvilinear Framework
Piotr Smolarkiewicz, National Center for Atmospheric Research, and Len Margolin, Los Alamos National Laboratory

4:00 Reformulation and Parallel Implementation of the Bryan-Cox Global Ocean Circulation Model
R. D. Smith and J. K. Dukowicz, Los Alamos National Laboratory

4:30 Solutions to Date for the "Standard Test Set for Numerical Approximations to the Shallow Water Equations in Spherical Geometry
James J. Hack, Ruediger Jakob, and David L. Williamson, National Center for Atmospheric Research

12:00-1:30
Lunch

2:30/Wyndham Foyer/Ballroom Level
Coffee

3:00-5:00

Concurrent Sessions

MS67/Wyndham C

High-Order Field Propagation Techniques

Recently a number of research groups have employed the fundamental properties of free Lie algebras to generate and investigate approximate representations for the exponential of the sum of two noncommuting operators
in terms of products of exponentials of the individual operators. These products are constructed to be valid to a given order in terms of Taylor expansions of the exponentials. Numerical propagation methods such as the split-step fast Fourier transform or split-operator finite difference/finite-element algorithms incorporating the above formalism appear to hold great promise in a variety of fields including optics, accelerator design, quantum-chemistry, celestial mechanics and solid-state physics. The speakers in this minisymposium will examine both the mathematical foundation and the practical application of the high-order techniques.

Organizer: David O. Yevich
Queen's University, Canada

3:00 **Generalized Propagation Techniques and Generalized Pade Expansions-Applications to Integrated Optics**
Moses Glasner, The Pennsylvania State University, University Park, and David Yevich, Organizer

3:30 **General Decomposition Theory of Exponential Operators and Its Application to Condensed Matter Physics**
Matsuo Suzuki, University of Tokyo, Japan

4:00 **Solution of Coupled Time Dependent Linear and Nonlinear Schrodinger Equations by Higher-Order Split Operator Techniques**
Andre D. Bandrauk, Universite de Sherbrooke, Canada

4:30 **Symplectic Methods in Circular Accelerators**
Etienne Forest, Lawrence Berkeley Laboratory

MS68/Philadelphia South

Integral Equations and Compact Fixed Point Problems

Many problems can be formulated as fixed point equations for compact maps. Examples include the drift-diffusion equations for semiconductor modeling, the linear Boltzmann equation for radiative transport, boundary element methods for partial differential equations, a wide variety of problems in potential theory and optimal control, and the classical example of integral equations.

There are significant advantages, both analytical and algorithmic, in such a formulation. Existence and regularity theory, convergence analysis of iterative methods, such as GMRES for linear equations and Newton-like methods for nonlinear equations, and the design and analysis of fast multilevel algorithms for both linear and nonlinear equations, can all be developed more effectively in the setting of compact fixed point problems. Techniques such as the fast multipole method and preconditioning by fast elliptic solvers often allow one to evaluate the fixed point map rapidly, which in connection with multilevel solvers allow for solution times proportional to the number of fine mesh unknowns.

The speakers in this minisymposium will discuss topics in formulation, multilevel algorithms, fast evaluation, and applications.

Organizer: C.T. Kelley
North Carolina State University

3:00 **Collective Compactness and the Pseudospectrum**
C.T. Kelley, Organizer, and Z. Xue, North Carolina State University

3:30 **An Asymptotically Linear Fixed Point Generalization of the Inf-Sup Theory of Galerkin Approximation**
Joseph W. Jerome, Northwestern University

4:00 **Boundary Integral Equation Methods for Laplace's Equation with Nonlinear Boundary Conditions**
Kendall E. Atkinson, University of Iowa

4:30 **On the Numerical Evaluation of Electrostatic Fields in Composite Materials**
Leslie Greengard and M. Moura, Courant Institute of Mathematical Sciences, New York University

CP36/Salon 3

Optimization and Applications

3:00 **A Parallel Build-up Algorithm for the Global Energy Minimization of Large Molecular Clusters Using the Effective Energy Simulated Annealing Method**
Thomas F. Coleman, David Shalloway, and Zhijun Wu, Cornell University

3:15 **Global Optimization of Lennard-Jones Clusters**
Robert H. Leary and Jennifer Harris, San Diego Supercomputer Center

3:30 **Optimization in Low Vibration Helicopter Design**
Joel E. Hirsh, Boeing Helicopters Computing Services

3:45 **Application of Nonlinear GMRES to Shape Optimization in Aerodynamics**
Q.V. Dinh and *B. Stoufflet,* Dassault Aviation, France; and Andreas Vossinis, INRIA, Rocquencourt, France

4:00 **Rationale for Subgradient Deflection Strategies in Preventing Jamming**
Anton Gecan, E-Systems, St. Petersburg, FL and *Arthur David Snider,* University of South Florida

4:15 **Application of the Simulation Theory in Integer - Optimization Problems**
Ahlam El-Hage Tannouri, Morgan State University

4:30 **A Fast Algorithm for the Optimization of Two-Dimensional Material Cutting**
Boris Levin, Poul Costinsky and *Abraham Meidan,* Rational Ltd. (Hashavshevet), Israel

4:45 **On Flexible Flow Lines**
Mohamed Mehbali, Institute of Mathematics, U.S.T.H.B., Algeria

5:00 **Optimal Control Approach to Scheduling Flow Shops**
Eugene Khmelnitsky and Konstantin Kogan, Tel-Aviv University, Israel

3:00-5:00

Concurrent Sessions

CP37/Salon 5

Modeling

3:00 **On the Exponentially Slow Motion of a Viscous Shock**
Luis G. Reyna, IBM Thomas J. Watson Research Center, and Michael J. Ward, Courant Institute of Mathematical Sciences, New York University

3:15 **Dynamics of a Lamella in a Capillary Tube**
Michael P. Ida and Michael J. Miksis, Northwestern University

3:30 **Advection of a Passive Scalar by a Dipolar Vortex Couple**
Joseph F. Lingevitch and Andrew J. Bernoff, Northwestern University

3:45 **Modeling Exhaust-Gas Oxygen Sensors**
Daniel R. Baker and Mark W. Verbrugge, General Motors Research Laboratories

4:00 **Semiclassical Equations for Electron Transport in Semiconductor Devices**
Tetsuji Ueda and Patrick S. Hagan, Los Alamos National Laboratory

4:15 **Localized Microwave Heating in Thin Ceramic Rods**
Gregory A. Kriegsmann, New Jersey Institute of Technology

4:30 **A Study of Optimal Critical Lifting Airfoils**
J.D. Cole, *M.C.A. Kropinski,* and D.W. Schwendeman, Rensselaer Polytechnic Institute

4:45 **A Quasi-Steady Approach to Micromagnetic Computations**
Alex Solomonoff, University of Minnesota, Minneapolis

5:00 **Analytical Design of Cassagrain and Gregorian Type Spherical Mirror Optical Systems: A New Approach**
Yang Gao and William R. Lawrence, University of Houston, Clear Lake

CP38/Salon 10

Integral and Differential Equations

3:00 **Stepsize Reduction in Explicit Runge-Kutta Methods When Solving Stiff Constant-Coefficient Linear ODEs Having Nonnormal Coefficient Matrices**
Ken Jackson, University of Toronto and Bryn Owren, University of Trondheim, Norway

3:15 **Order Increasing Grid Adaption for Runge-Kutta Methods Applied to 2-pt BVPs (Systems)**
Wojciech L. Golik, University of Missouri, St. Louis

3:30 **Numerical Methods for Constrained Mechanical Systems**
Joseph F. McGrath, Mechanical Dynamics, Inc., Ann Arbor, MI

3:45 **Novel Finite-Difference Techniques for Nonlinear Two-Point Boundary Value Problems**
S. Roy Choudhury, University of Central Florida

4:00 **A Fast Algorithm for Singular-smooth Integral Operators**
Ya Yan Lu, Rensselaer Polytechnic Institute

4:15 **On Nonlinear Variation of Parameter Methods for Summary Difference Equations**
Qin Sheng and Ravi P. Agarwal; National University of Singapore, Singapore Republic

4:30 **Asymptotic Integration of Second Order Ordinary Differential Equations with Impulse Effect**
Manuel Pinto, University of Chile, Chile

CP39/Seminar A

Probability and Statistics

3:30 **Head-of-the-Line Processor Sharing for Many Symmetric Queues With Finite Capacity**
John A. Morrison, AT&T Bell Laboratories, Murray Hill

3:45 **A Time-Dependent Processor System With Task-Split and Feedback**
Aliakbar Montazer-Haghighi, Benedict College

4:00 **Simplified Formulas for Multichannel Queues**
Haig E. Bohigian, John Jay College of Criminal Justice, City University of New York

4:15 **Estimation of Long- and Short-term Correlations using ARand Discrete Fractional Noise Models**
Lance M. Kaplan and *C.-C. Jay Kuo,* University of Southern California

4:30 **On Perturbation Bounds for Linear Regression Problems**
Bert W. Rust, National Institute of Standards and Technology

4:45 **Residual Trend Surface Analyses of Borehole Databases: Applications and Case Study**
Alan D. Smith, Robert Morris College

5:00 **Invertibility Properties of the Periodic Moving Average Models**
Mohamed Bentarzi, Institut de Mathematiques, U.S.T.H.B., Algeria

5:15

Conference Adjourns

SPEAKERS' PREPARATION ROOM

The Franklin Room, located on the Mezzanine Level of the hotel, has been set up as a Speakers' Preparation Room. Speakers can access this room:

Sunday, July 11
6:00 PM - 8:00 PM

Monday - Friday, July 12-16
7:00 AM - 4:00 PM

The room will be equipped with slide projectors, overhead and VCR/VHS player and monitor.

We advise speakers to test slides and tapes prior to their presentation.

SPEAKER INDEX

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MS = Minisymposia
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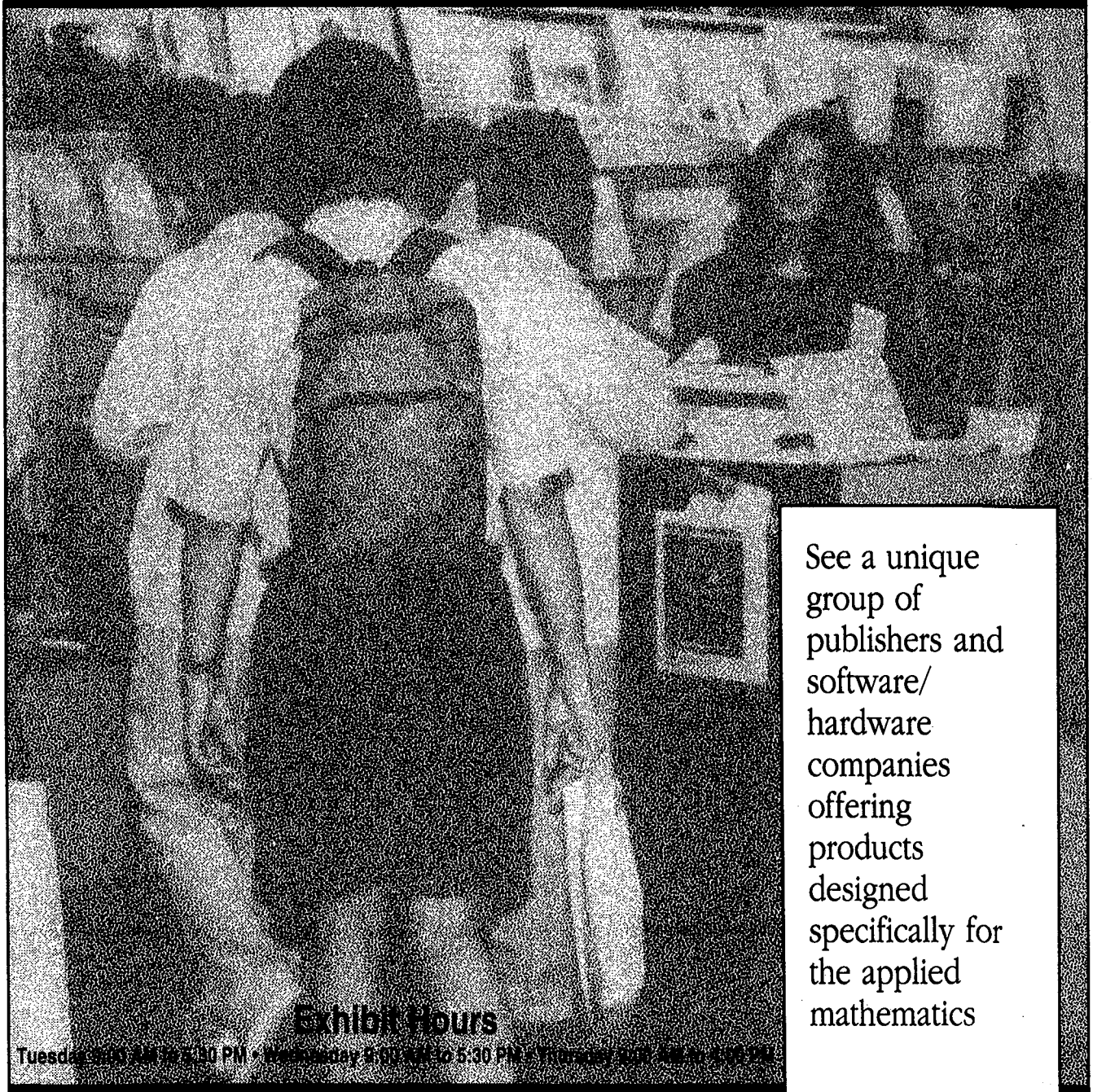

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Thursday, July 15
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100 Trade Center Drive
Champaign, IL 61821

Mathematica, now shipping version 2.2, is a general system for doing numerical, symbolic, and graphical computation. *Mathematica* is used as an interactive calculation tool and as a programming language. Its numerical capabilities include arbitrary-precision arithmetic and matrix manipulation. *Mathematica* generates two- and three-dimensional graphics in PostScript form, which can be converted to Encapsulated PostScript, raster, and Adobe Illustrator formats. On some systems, *Mathematica's* front end supports "Notebooks," interactive documents that combine *Mathematica* input and output with text, graphics, and sound.

BY AIR

OFFICIAL CARRIERS FOR CONTINENTAL USA AND CANADA

SIAM has selected Continental Airlines and USAir as the official carriers for the 1993 SIAM Annual Meeting. In a special arrangement for this meeting, you can fly to Philadelphia at a discounted rate (Continental only) from July 6 - July 18, 1993, inclusive.

- ★ For those attendees traveling from points in the United States, Continental is offering a 45% discount off regular coach fares. For those in Canada, the discount is 35%. Each rate requires seven (7) days advance purchase.
- ★ You may be able to obtain an even lower fare. Continental Airlines is offering a 5% discount off any published airfare (including First Class and Ultra Saver fares) for which you qualify, i.e., you must satisfy all rules and restrictions for the fares quoted.
- ★ USAir is the major carrier into the Philadelphia area. At the time of program production, USAir was not offering discounts, but does have the most flights and times into Philadelphia.

SIAM has selected Get-A-Way Travel agency to assist attendees in making travel arrangements. Get-A-Way Travel can make your reservations for discounted flights on Continental Airlines. They also can make your reservation on USAir or the airline of your choice. To qualify for the Continental Airlines discount, you must call Get-A-Way Travel and mention that you are an attendee of the 1993 SIAM Annual Meeting. You can call Get-A-Way at 1-800-223-3863 or 215-379-6800. Ask for Glenn Geary at the SIAM Conference Desk. Get-A-Way will make your reservation and mail your ticket.

TRANSPORTATION FROM THE AIRPORT

SHUTTLE SERVICE

Limelight Limousine Service is offering a discount on transportation to attendees of the 1993 SIAM Annual Meeting. Limelight Limousine is located in the Baggage Claim Area (Ground Transportation) of the airport. Attendees either can make reservations in advance by calling 1-800-327-5466 or by going directly to the Limelight counter and signing up for the next shuttle. A limousine driver will come in to the airport to assist you to the vans. Shuttle service at the airport is on a pick-up schedule of 15 minutes before and 15 minutes past the hour. The shuttle service is approximately $7.00 each way. (See attached coupon for discount.) The hotel is about a 30-minute ride from the airport. (The Wyndham Franklin Plaza does not provide complimentary shuttle service to or from the airport.)

TAXI SERVICE

Taxi cabs are available at the airport. The approximate one-way cost to the hotel is $18 to $20.

TRAIN SERVICE (AIRPORT EXPRESS)

SEPTA (SOUTHEASTERN PENNSYLVANIA TRANSIT AUTHORITY)

The SEPTA airport rail line (R1) connects the airport with center city Philadelphia. This service operates daily, every half-hour. The cost is $5-$6 one way. Get off at the Suburban Station stop, and follow signs to 17th St. Exit to ground level from the subway, and walk north on 17th St. about five blocks (past Race Street). The hotel is located between 16th and 17th Sts and between Race and Vine Sts. The front entrance faces Vine St.

BY TRAIN

Philadelphia is served by Amtrak, which operates rail service along the Northeast Corridor stretching from Boston, MA to Washington, DC; Atlantic City, NJ to Harrisburg, PA; New Haven, CT to Springfield, MA. Attendees have access to a full schedule of high-speed Metroliners running between New York City and Washington, DC. Intercity service also is provided to many points south and west, as well as to Montreal, Canada. Amtrak's 30th Street Station is a short cab ride (20 blocks) from the Wyndham Franklin Plaza Hotel.

SIGHTSEEING INFORMATION ABOUT PHILADELPHIA

Special interest brochures are available for attendees needing further information prior to the conference about activities and events in the Philadelphia area. Attendees can obtain these brochures by calling the Philadelphia Visitors Center at 215-636-1666 or 1-800-537-7676. Brochures are complimentary and will be mailed to you.

BY CAR

DOLLAR RENT A CAR

Dollar Rent A Car has been selected as the official car rental agency for this meeting. Cars can be rented at the Philadelphia International Airport. The following unlimited rates will apply between July 1 - 22, 1993.

TYPE OF CAR	DAILY RATE	WEEKLY RATE
Compact	$32.00	$160.00
Intermediate	$33.00	$165.00
Luxury	$41.00	$205.00
MiniVan	$41.00	$205.00

RESERVATIONS

We encourage you to make advance reservations, as on-site availability cannot be guaranteed. Make reservations by calling **1-800-800-0044.** When making reservations, be sure to mention the rate code: **CCSIA8**. You also should mention that you are attending the 1993 SIAM Annual Meeting and/or Symposium, July 8-16, in Philadelphia, in order to receive the discounted rates.

- ☆ Cars must be picked up and returned to the same location.
- ☆ You must be at least 25 years of age and have a valid U.S. or International Drivers License.
- ☆ You must have one of the following credit cards to rent a car: American Express, MasterCard, or VISA.
- ☆ Refueling charges, collision insurance, and taxes are not included in the above rates.

On occasion, the car rental agency may offer special rates that are lower than rates quoted above. As an attendee, you are still eligible for the lower of the two rates. In most instances, the conference discounted rates are lower than those quoted to the general public.

DRIVING DIRECTIONS TO
WYNDHAM FRANKLIN PLAZA HOTEL
16TH AND VINE STREETS, PHILADELPHIA, PA

FROM PHILADELPHIA INTERNATIONAL AIRPORT AND POINTS SOUTH

Follow I95 North to Exit 17, which is the 676 West (Central Philadelphia) exit. At that exit, follow 676 West to the first exit, which is Broad Street (Central Philadelphia). That exit will bring you onto 15th Street. Take 15th Street (one way) two blocks to Cherry Street, and make a right. Go one block to 16th Street, and make a right. The hotel is 1-1/2 blocks on the left, lobby and garage entrances from 16th St.

FROM NORTH (NEW JERSEY, NEW YORK)

Follow I95 South to Exit 17, which is the 676 West (Central Philadelphia) exit. At that exit, follow 676 West to the first exit which is Broad Street (Central Philadelphia). That exit will bring you onto 15th Street. Take 15th Street (one way) two blocks to Cherry Street, and make a right. Go one block to 16th Street, and make a right. The hotel is 1-1/2 blocks on the left, lobby and garage entrances from 16th St.

FROM WEST (PENNSYLVANIA TURNPIKE, HARRISBURG)

Take the Pennsylvania Turnpike to Exit 24 which is the Valley Forge exit. At the exit, take 76 East to Exit 38 which is 676 East (Central Philadelphia) exit. At end of exit, stay in the right lanes, and follow signs for Broad Street (Central Philadelphia) exit. Take the 15th Street (Central Philadelphia) ramp. Make a right onto 15th Street. Go two blocks to Cherry Street, and make a right. Go one block to 16th Street, and make a right. The hotel is 1-1/2 blocks on the left, lobby and garage entrances from 16th St.

FROM EAST (NEW JERSEY)

Take the New Jersey Turnpike to Exit 4. Take Route 73 North to Route 38 West. Take Route 38 West to Route 30 West. Stay on Route 30 over the Benjamin Franklin Bridge to Vine Street. Stay in the local traffic lanes (to the left) on Vine Street to 17th Street. At 17th Street, make a left (south) about one block to Race St. Turn left on Race St. one block to 16th St. Turn left on 16th St. The hotel is one block on the left, lobby and garage entrances from 16th St.

SIAM BOOKS FOR 1993

Ten Lectures on Wavelets

Ingrid Daubechies

CBMS-NSF Regional Conference Series in Applied Mathematics 61

"The book by Daubechies, who is one of the main developers of the (wavelet) theory, is the result of an intensive short course. The presentation is completely engrossing; it is like reading a good, thick Russian novel. Daubechies has a real knack for making the material appealing and lively, and there is a definite 'slowing down for details' at the points that require further elucidation . . . This book can be used for many different purposes, from individual reading to graduate-level course-work, and it will likely become a classic."

- F. Alberto Grünbaum, Science, August 7, 1992

Wavelets are a mathematical development that may revolutionize the world of information storage and retrieval according to many experts. They are a fairly simple mathematical tool now being applied to the compression of data--such as fingerprints, weather satellite photographs, and medical x-rays--that were previously thought to be impossible to condense without losing crucial details.

Contents

Introduction; Preliminaries and Notation; The What, Why, and How of Wavelets; The Continuous Wavelet Transform; Discrete Wavelet Transforms: Frames; Time-Frequency Density and Orthonormal Bases; Orthonormal Bases of Wavelets and Multiresolutional Analysis; Orthonormal Bases of Compactly Supported Wavelets; More About the Regularity of Compactly Supported Wavelets; Symmetry for Compactly Supported Wavelet Bases; Characterization of Functional Spaces by Means of Wavelets; Generalizations and Tricks for Orthonormal Wavelet Bases; References; Indexes.

1992 / xix + 357 pp. / Soft / ISBN 0-89871-274-2
List $37.50 / SIAM/CBMS Member $30.00 / **Code CB61**

Wavelets

Algorithms and Applications

Yves Meyer

translated by Robert D. Ryan

Wavelet analysis, an exciting new theory on the forefront of scientific thought, is a unifying concept that interprets a large body of scientific research. For example, the application of wavelet-based techniques to image compression has major economic implications. In the expanding field of signal and image processing, this book provides a clear set of concepts, methods, and algorithms adapted to a variety of nonstationary signals and numerical image processing problems.

Professor Meyer, one of the world's leading experts in wavelet research, presents with equal skill and clarity the mathematical background and the major wavelet applications, ranging from the digital telephone to galactic structure and creation of the universe. Never before have the historic origins, the algorithms, and the applications of wavelets been discussed in such detail, providing a unifying presentation accessible to scientists and engineers across all disciplines and levels of training.

Contents

Part I: Signals and Wavelets; Part II: Wavelets from an Historical Perspective; Part III: Quadrature Mirror Filters; Part IV: Pyramid Algorithms for Numerical Image Processing; Part V: Time-frequency Analysis for Signal Processing; Part VI: Time-frequency Algorithms Using the Wavelets of Henrique Malvar; Part VII: Time-frequency Analysis and Wavelet Packets; Part VIII: Computer Vision and Human Vision; Part IX: Wavelets and Fractals; Part X: Wavelets and Turbulence; Part XI: Wavelets and the Study of Distant Galaxies.

Available May 1993 / Approx. 130 pp. / Soft / ISBN 0-89871-309-9
List $19.50 / SIAM Member$15.60 / **Code OT38**

TO ORDER

Use your credit card (AMEX, MC, and VISA):
Call toll free in USA: 800-447-SIAM
Outside USA call: 215-382-9800
Fax: 215-386-7999 / E-mail: service@siam.org

Or send check or money order to:
SIAM, Dept. BC1993, P.O. Box 7260, Philadelphia, PA 19101-7260

Shipping and Handling
USA: Add $2.75 for first book and $.50 for each additional book.
Canada: Add $4.50 for first book and $1.50 for each additional book.
Outside USA/Canada: Add $4.50 per book.

siam®

GUEST/SPOUSE/FAMILY TOURS

TOUR #1
A DAY IN HISTORY
MONDAY, JULY 12
9:00 AM - NOON

Your day will begin by boarding a deluxe motorcoach accompanied by an experienced guide. During your three-hour tour of "America's most historic square mile," you will visit more than a dozen attractions that mark the emergence of western democracy including Carpenters', Congress and Independence Halls; the Todd and Betsy Ross Houses; and, of course, the Liberty Bell Pavilion. Your guide will share with you some of the historical events and facts related to these sights.

Your guide also will distribute detailed maps and information on the significant museums within "the mile" for those who wish to spend time visiting the Afro-American Historical and Cultural Museum, the Atwater Kent Museum, the Balch Institute for Ethnic Studies, the National Museum of American Jewish History, the Norman Rockwell Museum, or the Pennsylvania Horticultural Society.

On your return trip to the hotel, you will be provided a "Uniquely Philadelphia" treat.

Cost per person: $13.50

TOUR #2
LONGWOOD GARDENS
TUESDAY, JULY 13
1:00 PM - 5:00 PM

Just a 30-minute drive from Philadelphia is one of America's garden treasures. Longwood Gardens is 1,050 acres of gardens, woodlands, and meadows. Its conservatories shelter 20 indoor gardens. There is an indoor Children's Garden with a maze, an Idea Garden for the home gardeners, and the historic Peirce-du Pont House just to name a few of the sights you can see.

After viewing the gardens, relax as you enjoy an English High Tea in the Terrace Restaurant.

After the High Tea, there will be time allotted to browse through Longwood's Idea Garden and Gift Shop before returning to the hotel. On the way back, you will receive a "Uniquely Philadelphia" complimentary treat.

Cost per person: $36.00

TOUR #3
A DAY AT THE ZOO
TUESDAY, JULY 13
10:00 AM - 2:00 PM

You will board school-type buses for a short 15-minute ride from the hotel. The Philadelphia Zoo, America's first, houses 1,700 mammals, birds, reptiles, and amphibians, many living in specially-designed habitats. You will enjoy a variety of animal encounters in the Children's Zoo and The Treehouse, from live animal shows to previously only-imagined experiences--climb a giant beehive, emerge from a cocoon, investigate life inside a blossom, and explore a four-story tropical tree to look at life as an animal does.

Spend some time in the World of Primates, Bear Country, and the Bird House.

For lunch or just a snack, you can enjoy a real zoo feast in one of several eateries, including the Impala Fountain Cafe, Tiger Terrace, the Picnic or Pizza Groves, the Ice Cream Parlor, the Funnel Cake Factory or the Hop Stop and Polar Den. Lunch and zoo snacks are not included.

Strollers can be rented at the zoo.

Tour includes entrance to zoo and transportation. There is an extra charge for the Children's Zoo and The Treehouse.

Cost per person: $10.00

TOUR #4
PENNSYLVANIA DUTCH ADVENTURE
WEDNESDAY, JULY 14
8:30 AM - 4:30 PM

Spend the day in the Amish countryside. You will travel to Lancaster County via deluxe motorcoach, accompanied by a guide. Upon arrival in the city of Lancaster, you will be greeted by an Amish country guide, an expert in the culture, language, traditions, and history of the Amish in Pennsylvania. You will visit an Amish farmhouse, and the Farmers' Market in the village of Bird-in-Hand for a hands-on experience of Amish daily life and an opportunity to shop and sample the goods and crafts of the Amish.

Included in this tour is a Pennsylvania Dutch luncheon featuring traditional Amish foods.

On your way back to the hotel, you can indulge in a complimentary Philadelphia treat provided to you by your guide.

Cost per person: $34.00

TOUR #5
A DAY AT SESAME PLACE
WEDNESDAY, JULY 14
9:00 AM - 3:00 PM

You will board school-type buses for a 45-minute ride to Sesame Place. Sesame Place is a unique action-oriented family entertainment facility, featuring your child's favorite Sesame Street characters. A day at Sesame Place blends creative physical play and water activities with stimulating science exhibits, challenging computer games, live entertainment, and wholesome foods.

Bring your swimsuit or a change of clothing for the water activities. Lunch is not included, and an adult must accompany children.

Sesame Place is geared toward children ages 3 to 13.

Cost per person (over 2 years of age): $22.00.
Children under age two: free.

TOUR #6
AN EVENING IN ATLANTIC CITY, NEW JERSEY
WEDNESDAY, JULY 14
5:00 PM - MIDNIGHT

The evening begins at 5:00 PM when you will board the buses in front of the hotel. You will arrive in Atlantic City at approximately 6:00 PM. On the bus, you will be served a non-alcoholic beverage, and your guide will provide maps and information on the many restaurants and eateries that abound the "Boardwalk". You will be on your own for dinner.

After dinner, you will have ample time to test your luck in the casinos, from the slot machines to the gaming tables, or stroll along the "boards", enjoying the varied ambiance of New Jersey's most famous resort area.

At 11:00 PM, you will board the bus for the return trip back to the hotel. On your way back from Atlantic City, your guide will serve a small dessert. The estimated time of arrival at the hotel is midnight.

You must be 18 years of age to join this tour and 21 years of age to enter the casinos.

Cost per person: $18.50

GET-TOGETHERS

SIAM HEADQUARTERS TOURS

SIAM will be hosting guided tours of the SIAM office on Tuesday, July 13 through Thursday, July 15. Those interested in joining the tours can sign up on site at the SIAM Registration Desk located on the Ballroom Level.

Transportation will be provided by SIAM.

SIAM WELCOMING RECEPTION

7:00 PM - 9:00 PM • Sunday, July 11, 1993 • Wyndam A

Cash bar and assorted mini hors d'oeuvres.

THE FRANKLIN INSTITUTE SCIENCE MUSEUM AND PHILADELPHIA-STYLE BUFFET

5:45 PM - 9:00 PM • Tuesday, July 13, 1993 • Franklin Institute Science Museum

Following a short walk to The Franklin Institute at 5:45 PM, the evening will begin with your choice of beer, wine or assorted sodas and a buffet featuring the "flavors of Philadelphia" — Philadelphia cheese steaks, Italian hoagies, soft pretzels, Tastykakes®, Italian waterice, potato chips, and coleslaw.

From 7:00 PM to 7:45 PM, the doors to the Mandel Futures Center will be open, where you can "explore scientific visions of the future." At 8:00 PM, the Tuttleman Omniverse Theater will have a 45-minute viewing of the film, "Speed" shown on a four story 180 degree screen. "Speed" accelerates through the history of technology until "you've walked, run, pedaled, driven, flown, blown, rocketed, and blasted through time at ever increasing velocities" to the edge of the universe. *Cost $36.00 per person*

WYNDHAM FRANKLIN PLAZA HOTEL

TWO FRANKLIN PLAZA • PHILADELPHIA, PA 19103
215-448-2000 • 800-822-4200 (USA) • 800-631-4200 (CANADA)

The Wyndham Franklin Plaza Hotel is located in the heart of downtown Philadelphia, within walking distance of many of America's historic landmarks.

ROOM RATES

$ 95.00 Single Room
$115.00 Double Room

RESERVATION DEADLINE

Wednesday, June 16, 1993

TO MAKE A RESERVATION

Use reservation card in back of this program, or call the hotel at (215) 448-2000. Identify yourself as an attendee of the 1993 SIAM Annual Meeting. Be sure to request a confirmation number.

DEPOSIT

A deposit in the amount of one night's room rate or the use of a major credit card number is required to confirm your reservation.

CANCELLATION

To obtain a refund, reservations must be canceled by 6:00 PM the day prior to your scheduled arrival. Please allow 4-6 weeks to get a refund.

ARRIVALS AND DEPARTURES

Check in after 3:00 PM.
Check out by 12:00 Noon.

HOTEL FACILITIES

The hotel is equipped with an indoor pool, fully-equipped health club with racquetball and squash courts; one tennis court; a Nautilus room; and a 1/8-mile jogging track. The pool, sauna, and jogging track are complimentary. There is a $10 per day fee for use of the health club.

DINING

The hotel has two restaurants, The Terrace and Between Friends. The Terrace serves American cuisine. Between Friends specializes in gourmet French and American cuisines. Room service is available 6:30 AM - 11:00 PM. Philadelphia is well known for its "street vendors," where attendees can get all types of sandwiches, salads, and ethnic foods. Many vendors are located around the hotel and usually operate from 7:00 AM -4:00 PM daily.

WITHIN WALKING DISTANCE

The hotel is located eight blocks from the Philadelphia Museum of Art, three blocks from The Franklin Institute, and ten blocks from the Liberty Bell, Independence Mall, and the Academy of Music. Some of the many other attractions within walking distance are City Hall, the Academy of Natural Sciences, the Rodin Museum, the Gallery (large inner-city mall), and many specialty shops along Chestnut and Walnut Streets.

BABYSITTING SERVICE

Babysitting service is available through the hotel's Concierge Desk. SIAM does have a list of babysitting services. You can acquire this list by contacting the SIAM Conference Department. Service includes individual in-room care as well as group care. Rates range between $10 and $12 per hour. SIAM is not liable for any service that attendees choose to use.

CHILD ACTIVITY ROOM

SIAM will make available an unsupervised children's activity room with toys and videos. Parents have total responsibility for the care of their child in this activity room. The location of the room will be posted at the SIAM Registration Desk. There will be no charge for the use of this room.

TOURS AND SIGHTSEEING

(other than those arranged by SIAM)
There are a variety of tours available in the Philadelphia area. The hotel's Concierge Desk is a good source of information for local tours. Please note that SIAM has special tours set up for meeting attendees, spouses, and children.

PARKING

Following are the daily rates for parking at the Wyndham:

Valet Parking	$17.00
Self Parking	$13.00

Entrance to the parking garage is located on 16th and Spring Garden Streets, one-half block south of the Vine Street Expressway (Route 676). Alternative parking is available at the Gateway parking lot. The Gateway is located between South Vine and Spring Garden Streets. The approximate cost for parking at the time of program publication was $7.00-$11.00 per day. This parking lot is one block from the hotel.

HOTEL RESERVATION FORM

1993 SIAM ANNUAL MEETING
JUNE 8-16 1993
WYNDHAM FRANKLIN PLAZA HOTEL

Specially discounted rooms are being held for SIAM's exclusive use until Wednesday, June 16, 1993. After that date, reservations will depend on availability. Your reservation is not confirmed until acknowledged in writing by the hotel or verified by telephone. A deposit in the amount of one night's room rate is required to confirm your reservation. When making reservations by telephone, identify yourself as an attendee of the 1993 SIAM Annual Meeting. The Wyndham Franklin Plaza Hotel's telephone number: 215-448-2000 or 1-800-822-4200.

Please send me a confirmation

Please Print

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Please reserve a ❑ $95/Single Room ❑ $115/Double Room

Arrival Date _____ Arrival Time _____ Departure Date _____

❑ I am a disabled participant and require appropriate accommodations

I am enclosing my deposit for the first night's room rate. I choose to pay by ❑ AMEX ❑ MC ❑ VISA ❑ Personal Check

Credit Card Number _____ Exp. Date _____ Deposit $ _____

Signature _____

Detach this card and enclose it in an envelope with postage and mail to: Reservations, Wyndham Franklin Plaza Hotel, Two Franklin Plaza, Philadelphia, PA 19103.

SIAM USE ONLY

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SOCIETY for INDUSTRIAL and APPLIED MATHEMATICS

Individual Membership Application 1993

(Please print or type)

Name First Initial Last

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City/State/Zip

Country/Internet E-mail Address

Business Phone

Employer Name and Address or College/University if student

Telephone and E-mail Listing in Combined Membership List

I hereby authorize my telephone number and e-mail address to be listed in the Combined Membership List of AMS, MAA, and SIAM.
Yes_____ No_____ Signature_____

Type of Employer check one

- ❑ University
- ❑ College (4-year)
- ❑ College (2-year)
- ❑ Government
- ❑ Industry/Corporation
- ❑ Consulting
- ❑ Nonprofit
- ❑ Other

Type of Work check two

	Primary	Secondary
Research	❑	❑
Adm./Mgmt.	❑	❑
Teaching	❑	❑
Consulting	❑	❑
Other	❑	❑

Salutation

- ❑ Dr.
- ❑ Mr.
- ❑ Ms.
- ❑ Prof.
- ❑ Other

Gender: ❑ Male ❑ Female

Education (Highest degree)

Institution	Major / Degree / Year

Primary Professional Interests (Check no more than 3)

❑1. Linear algebra and matrix theory.
❑2. Real and complex analysis including approximation theory, integral transforms (including Fourier series and wavelets), integral equations, asymptotic methods, and special functions.
❑3. Ordinary differential equations including dynamical systems.
❑4. Partial differential equations including inverse problems.
❑5. Discrete mathematics and graph theory including combinatorics, combinatorial optimization, and networks.
❑6. Numerical analysis (theory).
❑7. Computational mathematics including scientific computing, parallel computing, and algorithm development.
❑8. Computer science including computer architecture, computer hardware, computational complexity, applied logic, database, symbolic computation.
❑9. Applied probability including stochastic processes, queueing theory, and signal processing.
❑10. Statistics including data analysis and time series analysis.
❑11. Control and systems theory including optimal control.
❑12. Optimization theory and mathematical programming including discrete and numerical optimization and linear and nonlinear programming.
❑13. Communication theory including information theory and coding theory.
❑14. Applied geometry including computer-aided design and related robotics.
❑15. Image processing including computer graphics, computer vision, related robotics, and tomography.
❑16. Classical mechanics of solids including elasticity, structures and vibrations, and constitutive models.
❑17. Fluid mechanics including turbulence, aeronautics, and multiphase flow.
❑18. Quantum physics, statistical mechanics, and relativity.
❑19. Geophysical sciences including reservoir modeling, seismic exploration, and petroleum engineering.
❑20. Atmospheric and oceanographic sciences.
❑21. Chemical kinetics, combustion theory, thermodynamics, and heat transfer.
❑22. Biological sciences including biophysics, biomedical engineering, and biomathematics.
❑23. Environmental sciences.
❑24. Economics.
❑25. Social sciences.
❑26. Functional analysis and operator equations, and integral and functional equations.
❑27. Management sciences including operations research.
❑28. Applied mathematics education (K-12, undergraduate curriculum, graduate study and modeling courses).
❑29. Astronomy, planetary sciences, and optics.
❑30. Simulation and modeling.
❑31. Materials science, polymer physics, and structure of matter.
❑32. Electromagnetic theory, semiconductors, and circuit analysis.
❑Other _____

SIAM use only
F/M _____
CR# _____
Inv.# _____
Sub ____ Logged _____
Lts/Chron _____

please complete reverse side

Society Memberships
(Check all that apply)

ACM_____	AIAA_____	AMS_____	APS_____	ASA_____	ASME_____
IEEE_____	IMS_____	MAA_____	ORSA_____	TIMS_____	Other_____

Membership Benefits

Dues cover the period January 1, 1993 through December 31, 1993. Members will receive all issues of *SIAM Review* and *SIAM News*. Members are entitled to purchase one each of no more than four SIAM journals, for their personal use only, at member discount prices. Members can join any of the SIAM Activity Groups at $10 per group. Members are entitled to 20% off list prices on all SIAM books, and receive member discounted registration at SIAM sponsored meetings.

Student members have the same benefits as regular members. Students receive one activity group membership free; additional activity group memberships are $10 each.

Associate members are spouses of regular members and are entitled to all privileges of regular members except that they do not receive *SIAM Review*. Associate members should indicate the full name of their spouse on their application.

Fees and Subscriptions

Compute payment as follows:

Dues (Regular Members): $79.00 _____

Dues (Student Members): $15.00 _____

Dues (Associate Members): $18.00 _____

Dues (Activity Groups): $10.00 per group checked below: _____

Control and Systems Theory _____ Discrete Mathematics _____ Dynamical Systems _____

Geometric Design _____ Geosciences _____ Linear Algebra _____ Optimization _____

Orthogonal Polynomials and Special Functions _____ Supercomputing _____

SIAM Journal on . . .	Member Prices: USA, Canada, Mexico/Elsewhere	
Applied Mathematics (bimonthly)	$54/$59	_____
Computing (bimonthly)	$54/$59	_____
Control and Optimization (bimonthly)	$54/$59	_____
Discrete Mathematics (quarterly)	$44/$47	_____
Mathematical Analysis (bimonthly)	$54/$59	_____
Matrix Analysis and Applications (quarterly)	$44/$47	_____
Numerical Analysis (bimonthly)	$54/$59	_____
Optimization (quarterly)	$44/$47	_____
Scientific Computing (bimonthly)	$54/$59	_____
Theory of Probability and Its Applications (quarterly)	$99/$102	_____
1992-93 Combined Membership List	$9	_____
	TOTAL $	_____

Application for Membership

I apply for membership in SIAM:

Signature _____

Spouse's Name (If applying for Associate Membership) _____

Student Status Certification

CERTIFICATION (student members only)

I hereby certify that the applicant is actively engaged in a degree program and is a full-time student, teaching/research assistant, or fellow:

Name of College or University _____

Department Chair (signature please) _____ Date _____

Please enclose payment with this application and mail to: SIAM, P.O. Box 7260, Philadelphia, PA 19101-7260

MEMBERS OUTSIDE THE USA

For SIAM members residing outside the USA, SIAM will accept payment of membership dues and subscription fees by American Express, MasterCard, and VISA. Because SIAM incurs considerable cost in obtaining payment via credit cards, please use credit cards only when other methods of payment are difficult to arrange.

❑ American Express ❑ MasterCard ❑ VISA

Credit Card # _____ Expiration date _____

For further information, please contact SIAM Customer Services:
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E-mail: service@siam.org / Address: 3600 University City Science Center, Philadelphia, PA 19104-2688

SIAM Books for 1993

siam

Identification and Control in Systems Governed by Partial Differential Equations

Edited by H. T. Banks, R. H. Fabiano, and K. Ito

Proceedings in Applied Mathematics 68

Conference held at Mount Holyoke College, South Hadley, Massachusetts, July 1992

Written on a graduate research level, this collection of invited papers presented at the 1992 AMS/IMS/SIAM Joint Summer Research Conference focuses on issues related to modeling (including design), parameter estimation and system identification, and feedback control for problems described by partial differential equations. It includes applications of flow control (in high pressure vapor transport reactors, airfoil design, and noise suppression) as well as control of structures (beams, plates, robot arms and smart material structures).

Summer 1993 / Approx. 272 pp. / Soft / 0-89871-317-X / List $48.50 / SIAM Member $38.80 / **Code PR68**

Computational Learning & Cognition

Proceedings of the Third NEC Research Symposium

Edited by Eric B. Baum

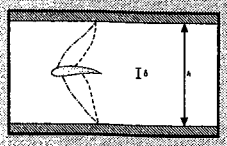
Proceedings in Applied Mathematics 64

Symposium held in Princeton, New Jersey, May 1992

The papers in this volume represent the work of a unique mix of researchers from strongly related fields not usually found in the same forum. Top scientists in the areas of computational learning theory, artificial intelligence, machine learning, cognitive science, and neural networks give in-depth discussions of their views.

1993 / xii + 276 pp. / Hard / 0-89871-311-0 / List $42.50 / SIAM Member $34.00 / **Code PR64**

Transonic Aerodynamics
Problems in Asymptotic Theory



Edited by L. Pamela Cook

Frontiers in Applied Mathematics 12

Transonic aerodynamics, the study of the aerodynamics of flight at speeds near the speed of sound, warrants a great deal of attention from industry and science. As an airplane approaches Mach one, the drag steeply increases. This has prompted scientists to study transonic range of flight and to design reduced wing drag. Asymptotic theory of transonic aerodynamics forms the basis for this monograph. The equations governing transonic flow are inherently nonlinear and must ultimately be solved numerically. Asymptotic analysis simplifies and enriches both the theory and the computations of these flows. It reduces the number of parameters involved, can simplify the geometry, and clarifies near and fluid conditions.

1993 / x + 90 / Soft / 0-89871-310-2 / List $26.50 / SIAM Member $21.20 / **Code FR12**

Knot Insertion and Deletion Algorithms for B-Spline Curves and Surfaces

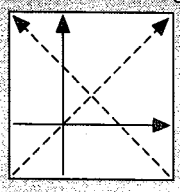
Edited by Ronald N. Goldman and Tom Lyche

New approaches to knot insertion and deletion are presented in this unique, detailed approach to understanding, analyzing, and rendering B-spline curves and surfaces. Computer scientists, mechanical engineers, and programmers and analysts involved in CAD and CAGD will find innovative, practical applications using the blossoming approach to knot insertion, factored knot insertion, and knot deletion, as well as comparisons of many knot insertion algorithms. This book also serves as an excellent reference guide for graduate students involved in computer aided geometric design.

1993 / xiii + 197 pp. / Soft / 0-89871-306-4 / List $43.50 / SIAM Member $34.80 / **Code OT36**

Pitman's Measure of Closeness
A Comparison of Statistical Estimators

Jerome P. Keating, Robert L. Mason, and Pranab K. Sen



". . . a comprehensive survey of recent contributions to the subject. It discusses the merits and deficiencies of PMC, throws light on recent controversies, and formulates new problems for further research. Finally, there is a need for such a book, as PMC is not generally discussed in statistical texts. Its role in estimation theory and its usefulness to the decision maker are not well known. . . The contributions by the authors of this book have been especially illuminating in resolving some of the controversies surrounding PMC." -- C.R. Rao, from the foreword.

1993 / xv + 226 pp. / Soft / 0-89871-308-0 / List $26.50 / SIAM Member $21.20 / **Code OT37**

Proceedings of the Second International Conference on Numerical Aspects of Wave Propagation

Edited by Ralph E. Kleinman, Thomas Angell, David Colton, Fadil Santosa, and Ivar Stakgold

Proceedings in Applied Mathematics 69

Conference held at University of Delaware, Newark, June 1993

June 1993 / Approx. 488 pp. / Soft / 0-89871-318-8
List $69.50 / SIAM Member $55.60 / **Code PR69**

Proceedings of the Sixth SIAM Conference on Parallel Processing for Scientific Computing

Edited by Richard F. Sincovec, David E. Keyes, Michael R. Leuze, Linda R. Petzold, and Daniel A. Reed

Proceedings in Applied Mathematics 67

Conference held in Norfolk, Virginia, March 1993

For those who could not attend the meeting, here is your opportunity to learn of the most recent accomplishments on various grand challenge problems set forth in the U.S. High Performance Computing and Communications Program. Recently, major new scalable parallel computers and distributed networked computing have become available and new algorithms and computational methodologies have emerged; currently, software tools emphasizing generic multiarchitecture capability are being perfected.

1993 / xix + 1041 pp. / Soft / 0-89871-315-3
List $95.00 / SIAM Member $76.00 / **Code PR67**
Two volumes (not sold separately; shipping charged as two books)

Proceedings of the Fourth Annual ACM-SIAM Symposium on Discrete Algorithms

Proceedings in Applied Mathematics 66

Symposium held in Austin, Texas, January 1993

Designed for computer scientists, engineers, and mathematicians interested in the use, design, and analysis of algorithms, this volume places special emphasis on questions of efficiency. Themes and areas of application include combinatorial optimization, geometry and graphics, numerical and scientific computing, combinatorics and graph theory, algebra and number theory, symbolic computation, mathematical programming, and more.

1993 / xiv + 506 pp. / Soft / 0-89871-313-7
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Please complete the preregistration form found on the back of this program. We urge attendees to register in advance to get the lower registration fee. The preregistration deadline is June 24, 1993. The registration desk will be located on the Ballroom Level and will be open as listed below:

Symposium Registration

Wednesday, July 7	6:00 PM - 8:00 PM
Thursday, July 8	7:30 AM - 4:00 PM
Friday, July 9	8:00 AM - 4:00 PM
Saturday, July 10	8:00 AM - 3:00 PM

Workshop Registration

Saturday, July 10	8:00 AM - 10:15 AM

Tutorial Registration

Saturday, July 10	6:00 PM -8:00 PM
Sunday, July 11	8:00 AM -4:00 PM

Meeting Registration

Sunday, July 11	6:00 PM - 9:00 PM
Monday, July 12	7:00 AM - 4:00 PM
Tuesday, July 13	7:00 AM - 4:00 PM
Wednesday, July 14	7:30 AM - 4:00 PM
Thursday, July 15	7:30 AM - 4:00 PM
Friday, July 16	7:30 AM - 2:00 PM

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REGISTRATION FEES		*SIAM Member	Non-Member	Student
Symposium	Preregistration	$135	$165	$25
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High School Teachers Workshop	Preregistration	$ 30	$ 30	$10
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**Tutorial on Wavelets	Preregistration	$120	$135	$55
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**Tutorial on Continuous Time Finance	Preregistration	$120	$135	$55
	Registration	$135	$155	$55
**Tutorial on What is Structured Population Dynamics?	Preregistration	$120	$135	$55
	Registration	$135	$155	$55
Meeting Only	Preregistration	$130	$170	$24
	Registration	$160	$205	$24

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Non-SIAM members are encouraged to join SIAM to obtain the member rate for meeting registration and enjoy all the other benefits of SIAM membership. Join SIAM by sending your completed membership form (see page 55 & 56) along with your meeting registration form. Be sure to include both membership dues and registration fees in your payment.

This offer applies to preregistrants only; application and preregistration must be received by SIAM no later than Thursday, June 24, 1993. Offer expires after June 24, 1993.

NOTICE

There will be no prorated fees. No refunds will be issued once the meeting has started. If your preregistration form and payment are not received at the SIAM office by Thursday, June 24, 1993, you will be asked to register and pay the full registration fee at the conference.

CREDIT CARDS

SIAM accepts VISA, MasterCard, and American Express for payment of registration fees, special functions, memberships, and book orders. When you complete the preregistration form, please indicate the type of credit card, the account number, and the expiration date.

CANCELLATION POLICY

Full refunds will be given to attendees who cancel prior to June 24, 1993. Cancellation after June 24, 1993 will receive a refund payment less a $25.00 cancellation fee. No refund of registration fees will be given once the meeting starts. Special function fees are not subject to refund

TELEPHONE MESSAGES

The telephone number at the Wyndham Franklin Plaza Hotel is 215-448-2000. The hotel will either connect you with the SIAM registration desk or forward a message to the attendee's room.

ELECTRONIC MAIL

Access to e-mail will be available at the 1993 SIAM Annual Meeting. SIAM will provide two computers that attendees can use to gain access to the e-mail system. Computers will be located behind the registration desk on the Ballroom Level of the hotel. Hours of operation will be the same as the registration desk hours (see meeting registration hours above left). Computers will be running a Telnet-based VT100 terminal emulation connected to the Internet. FTP will not be available. We ask that those who wish to utilize these computers limit themselves to ten minutes. You must sign up at the SIAM registration desk to gain access to the computers.

PREREGISTRATION FORM

1993 SIAM ANNUAL MEETING
JULY 12-16, 1993
WYNDHAM FRANKLIN PLAZA HOTEL
PHILADELPHIA, PENNSYLVANIA 19103

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High School Teachers Workshop	Preregistration	$ 30	$ 30	$10
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**Tutorial on Continuous Time Finance	Preregistration	$120	$135	$55
	Registration	$135	$155	$55
**Tutorial on What is Structured Population Dynamics?	Preregistration	$120	$135	$55
	Registration	$135	$155	$55
Meeting Only	Preregistration	$130	$170	$24
	Registration	$160	$205	$24
SIAM Get-Togethers The Franklin Institute and Philadelphia Style Buffet	Tuesday	$36	$36	$36
	TOTAL	$ _____	$ _____	$ _____

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TOUR REGISTRATION

JULY 12-16, 1993
1993 SIAM ANNUAL MEETING
WYNDHAM FRANKLIN PLAZA HOTEL

Tours are being set up on a first-come, first-serve basis at the prices and times listed below. Registration with payment in the form of a check must be received at the Uniquely Philadelphia office by June 21, 1993. ***Return this card with payment to: Vivienne Ehret, Uniquely Philadelphia, Inc., 267 S. Ninth Street, Philadelphia, PA 19107. Telephone: 215-885-8585.***

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You will receive confirmation via mail prior to meeting dates.

Cancellations after July 2 are not subject to refunds.

Tour #1	A Day in History Monday, July 12	$13.50 x _____	$ _____
Tour #2	Longwood Gardens and High Tea Tuesday, July 13	$35.00 x _____	$ _____
Tour #3	A Day at the Zoo Tuesday, July 13	$10.00 x _____	$ _____
Tour #4	Pennsylvania Dutch Adventure Wednesday, July 14	$34.00 x _____	$ _____
Tour #5	A Day at Sesame Place Wednesday, July 14	$22.00 x _____	$ _____
Tour #6	An Evening in Atlantic City Wednesday, July 14	$18.50 x _____	$ _____
		TOTAL	$ _____