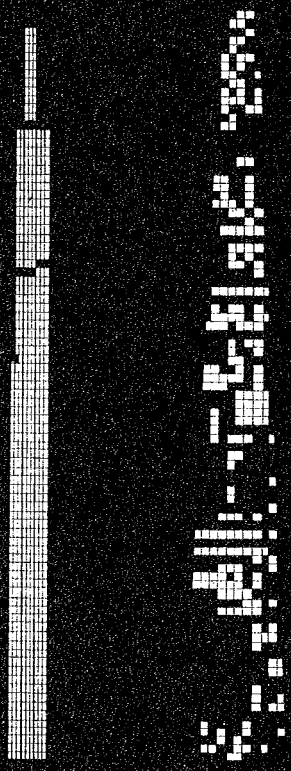
Society for Industrial and Applied Mathematics
Preliminary Program



siam ANNUAL MEETING

July 16-20, 1990

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Short Course on Chaotic Dynamics, An Emerging Science

July 15, 1990

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Hyatt Regency Hotel
Illinois Center
Chicago, Illinois

SUBJECTS OF THE MEETING ■ ■ ■

For session titles by subject, see "Program Overview" on pages 2 and 3.

Algebraic and Symbolic Computing
Computer Science
Control and Systems Theory
Discrete Mathematics
Dynamical Systems and Chaos
Fluid Mechanics
Free Boundary Problems
Integer Programming
Interior Point Methods
Inverse Problems
Mathematical Biology
Mathematics Education
Numerical Methods and Computing
Optimal Design
Optimization
Parallel Computing
Probability and Statistics
Semiconductor Device Simulation
Solid Mechanics
Special Functions
Wave Equations
Wavelets and Applications

■ ■ ■

Prize Awards
Special Sessions

CONTENTS

DEADLINE DATES

Hotel Reservations
June 25, 1990
Please note *that hotel rooms will be difficult to acquire after June 25, 1990 as there is another convention in the hotel over the same days as the SIAM conference.*

Advance Conference Registration
July 9, 1990

PROGRAM COMMITTEE

SHORT COURSE

Chaotic Dynamics, an Emerging Science

July 15, 1990
Hyatt Regency Hotel
Chicago, Illinois

Organizers:
Celso Grebogi, Laboratory for Plasma Research, and James A. Yorke, Institute for Physical Science and Technology, University of Maryland, College Park.

Even relatively simple deterministic systems can behave in an apparently unpredictable and chaotic manner. This type of behavior is one of the attributes of chaotic dynamics. Within the last decade there have been an explosion of interest and major developments in chaotic dynamics.

The organizers will review the field of chaotic dynamics of dissipative systems and will present some examples of some recent developments. Topics to be covered include strange attractors, how chaos comes about with variation of a system parameter, transient chaos, fractal basin boundaries and their effect on predictability. These phenomena will be illustrated with examples. Videos demonstrating the computer imaging of chaotic dynamics will also be shown.

PROGRAM

9:00 AM	**Introduction and Basic Concepts**
10:30 AM	Coffee and Discussion
11:00 AM	**Strange Attractors**
12:30 PM	Lunch and Discussion
2:00 PM	**Bifurcations to Chaos**
3:30 PM	Coffee and Discussion
4:00 PM	**Fractal Basin Boundaries**
5:30 PM	Discussion
6:00 PM	Adjournment

Registration Fees*

	SIAM Member	Non-Member	Student
Advance	$115	$140	$75
On-Site	135	150	95

*Registration fee for the Short Course includes preprints, coffee and lunch. Please use the registration card found at the inside back cover of this program brochure.

Attendees should preregister for the Short Course, as on-site registration can not be guaranteed. Preprints of the lecture materials will be distributed upon check-in at the registration desk.

PROGRAM OVERVIEW

Following are subject classifications of titles of invited presentations and minisymposia. (Codes in parentheses designate session numbers for invited presentations (IP) and minisymposia (MS) or day and time of sessions in the pages that follow).

Algebraic and Symbolic Computing

Algebraic Computation Comes of Age (IP1)
Theory and Algorithms for Symbolic Computing (MS5)
Symbolic Computing in Science and Engineering (MS11)

Computer Science

Geometric Bounds for Eigenvalues (IP6)
Parallel Coordinates: A Tool for Visualizing Multidimensional Problems (MS4)
Communication Complexity and Lower Bounds (MS6)
DIMACS — The Center for Discrete Mathematics and Theoretical Computer Science (MS10)
Graph Algorithms (MS18)
Solving Large Integer Programming Problems (MS39)
Computational Integer Programming (MS55)
Fortran 90: The Language, Numerical Applications, and Implementation Issues (MS59)
Mathematics in Neurocomputing (MS60)
Parallel Computation Networks (MS61)

Control and Systems Theory

The Matrix Sign Function and Large-Scale Ricatti Equations (IP7)
Control of Systems Arising in Flexible Structures (IP8)
Numerical Methods in Control (MS19)
Chaos in Control Systems (MS28)
New Methods in Control of Distributed Parameter Systems (MS36)
Views on Robustness of Control Systems (MS37)
Control and Identification of Distributed Parameter Systems (Part 1: MS46; Part 2: MS52)
Extreme-Point Results in Robust Control (MS53)

Discrete Mathematics

Geometric Bounds for Eigenvalues (IP6)
DIMACS — The Center for Discrete Mathematics and Theoretical Computer Science (MS10)
Coding Theory (MS12)
Graph Algorithms (MS18)
Cryptography (MS29)
Integer Programming (MS49)
Computational Integer Programming (MS55)

Dynamical Systems and Chaos

Recent Mathematical Developments in Chaotic Dynamics (MS1)
Disorderly Growth (MS8)
Analysis of Chaotic Experimental Data (MS15)
Dynamics of Nonlinear Waves (MS24)
Chaos in Control Systems (MS28)
Granular Flow (MS51)
Nonlinear Patterns and Dynamical Behavior of Biological Reaction Diffusion Systems (MS54)

(Program Overview continued)

Fluid Mechanics

Fingers, Dendrites, and Cracks: Modelling Unstable Growth Processes (IP3)
Ill-Posed Problems in Granular Flow (IP11)
Fluid Dynamic Stability (Part 1: MS25; Part 2: MS35)
Numerical Vortex Methods (MS26)Vorticity, Turbulence, and Acoustics in Fluid Flow (Thursday, 2:00 PM)
Granular Flow (MS51)

Free Boundary Problems

Nonlinear Morphologies in Directional Solidification (IP10)
Interface Instabilities During Solidification (Part 1: MS20; Part 2: MS27)
Dynamics of Pattern Formation (MS23)
Free Boundary Problems in Fluid Mechanics (Part 1: MS45; Part 2: MS50)
Vorticity, Turbulence, and Acoustics in Fluid Flow (Thursday, 2:00 PM)

Integer Programming

Solving Large Integer Programming Problems (MS39)
Integer Programming (MS49)
Computational Integer Programming (MS55)

Interior Point Methods

Interior Point Methods for Linear Programming — State-of-the-Art (IP12)
Interior Point Methods for Linear Programming (MS48)
Interior-Point Algorithms for Nonlinear Programming (MS56)
Interior Point Methods in Optimization (MS64)

Inverse Problems

Multidimensional Inverse Problems (MS9)

Mathematical Biology

Networks in Neurophysiology (IP4)
Wanted: Applied Mathematicians to Try the Fruit Fly Challenge (IP5)
Spatio-Temporal Patterns in Neural Systems (MS21)
The Geometry and Topology of DNA (MS30)
Application of Dynamic Programming to Problems of Optimal Habitat Choice and Optimal Timing of Metamorphosis (Wednesday, 11:30 AM)
Algorithms for DNA Sequence Matching and Analysis (MS38)
Moving Ions Through Channels in Biological Membranes (MS47)
Nonlinear Patterns and Dynamical Behavior of Biological Reaction Diffusion Systems (MS54)

Mathematics Education

Mathematical Contest in Modeling — Modeling at the Undergraduate Level (MS13)
New Directions in Mathematical Sciences Education (Wednesday, 10:30 AM)

Numerical Methods and Computing

Numerical Solution of Wave Problems in Unbounded Domains (MS3)
Numerical Methods in Control (MS19)
Recent Developments on Newton's Method (MS34)
Reliability of Finite Element Computations; Part 1: A Posteriori Error Estimation and Adaptive Computational Methods of Transient Problems (MS44);
Part 2: Control of Idealization and Discretization Errors in Computational Solid Mechanics (MS58)

Optimal Design

Optimal Design of Structures and Materials (Part 1: MS32; Part 2: MS41)
Application of Dynamic Programming to Problems of Optimal Habitat Choice and Optimal Timing of Metamorphosis (Wednesday, 11:30 AM)

Optimization

Solving Large-Scale Combinatorial Optimization Problems in Practice (IP13)
Nonlinear Optimization 1 (MS33)
Solving Large Integer Programming Problems (MS39)Parallel Optimization Methods (MS40)
Linear Programming — Theory and Practice (MS42)
Nonlinear Optimization 2 (MS57)
Combinatorial Optimization (MS62)
Network Optimization (MS63)

Parallel Computing

The Matrix Sign Function and Large-Scale Ricatti Equations (IP7)
Parallel Computation Networks (MS61)
Scientific Computing on Shared Memory Multiprocessors (MS66)

Probability and Statistics

Geometric Bounds for Eigenvalues (IP6)
Sampling Theory and Practice (MS7)
Analysis of Chaotic Experimental Data (MS15)
Analysis of Queueing Models (MS17)

Semiconductor Device Simulation

The Hydrodynamic Model for Semiconductor Device Simulation (MS65)

Solid Mechanics

Fingers, Dendrites, and Cracks: Modelling Unstable Growth Processes (IP3)
Crystal Microstructure Via Elasticity Theory (IP9)
Reliability of Finite Element Computations; Part 2: Control of Idealization and Discretization Errors in Computational Solid Mechanics (MS58)

Special Functions

Orthogonal Polynomials and Special Functions (MS14)

Wavelets and Applications

Wavelets Making Waves in Mathematics and Engineering (IP2)
Applications of Wavelets; Part 1: Numerical Analysis (MS2); Part 2: Signal Processing (MS16)

Wave Equations

Numerical Solution of Wave Problems in Unbounded Domains (MS3)
Dynamics of Nonlinear Waves (MS24)
Geometric Singular Perturbation Methods with Applications to Travelling Waves (Part 1: MS31; Part 2: MS43)

Prize Awards

Mathematical Contest in Modeling — Modeling at the Undergraduate Level (MS13)
Student Paper Competition Award and Presentation — The Three Best Papers in Applied and Computational Mathematics (Tuesday, 3:15 PM)
The John von Neumann Lecture (Thursday, 2:00 PM)

Special Sessions

AWM-SIAM Women in Applied Mathematics (MS22)
Success in Industry-What Does It Take? (Tuesday, 3:15 PM)
From Manuscript to Bound Book — Becoming a Published Author (Wednesday, 3:15 PM)
1990 SIAM Annual Business Meeting (Thursday, 3:15 PM)
Writing, Speaking, Communicating to Get Acceptance — Are We Doing A Good Job? (Thursday, 4:15 PM)

INVITED PRESENTATIONS

Monday, July 16/8:30 AM
Invited Presentation 1

Algebraic Computation Comes Of Age

Algebraic computation is the science and technology that aims to automate a wide range of the computation involved in mathematical problem solving. It emphasizes discrete computation on symbols representing mathematical objects. Although it has played an important part in many scientific calculations, its role has so far been limited. A recent report to the United States National Science Foundation, however, concludes that this field is now at a turning point. Improvements in computer hardware and new algorithms and software create exciting new possibilities for the future. The speaker will review the conclusions of this report, and discuss in detail its recommendations for making algebraic computation even more effective than it is today.

Anthony C. Hearn
The RAND Corporation
Santa Monica, CA

Monday, July 16/9:15 AM
Invited Presentation 2

Wavelets Making Waves in Mathematics and Engineering

The basic idea of wavelet theory is to decompose functions (e.g. time-dependent signals) into elementary building blocks that have good localization in both time and frequency with the additional feature that their localization is proportional to their scale (fine scale wavelets are very much localized, coarse scale wavelets are more spread out). Such decompositions can be done in various ways (continuous, discrete but redundant, orthonormal). Orthonormal wavelet bases are related to subband coding with exact reconstruction, as used in electrical engineering. They have also led to exciting new developments in numerical analysis. The speaker will present an overview of wavelets and their applications.

Ingrid Daubechies
AT&T Bell Laboratories, Murray Hill, NJ and
Department of Mathematics
University of Michigan, Ann Arbor

Monday, July 16/2:00 PM
Invited Presentation 3

Fingers, Dendrites, and Cracks: Modelling Unstable Growth Processes

The growth and propagation of viscous fingers in flow processes, dendrites in directional solidification, and cracks in solids manifest similar geometrical characteristics. This suggests some physical phenomena in common between these as well as other growth processes. In this presentation, the speaker will demonstrate this geometrical similarity with a number of visualizations, and illustrate that the common physical processes involve front propagation into a diffusion field. In the singular limit of zero surface energy, some connections can be made with diffusion limited aggregation. A substantial complication involves the influence of the surface energy, usually very small, on the global growth characteristics. The speaker will discuss some of these complications from both a mathematical and physical perspective.

George M. Homsy
Department of Chemical Engineering
Stanford University

Tuesday, July 17/8:30 AM
Invited Presentation 4

Networks in Neurophysiology

Real neurons are complicated, and networks of them are even more complicated. In many cases of interest, the detailed organization of the network is unknown and is not likely ever to become completely known. This talk describes a strategy for the use of mathematics in this context. The aim is to help sort out which details of the physiology are important to the observed behavior of the networks and their ability to carry out their designated tasks. Examples include work on networks responsible for the organization of rhythmic motor behavior. The mathematics objects are large or small collection of ordinary differential equations, each modelling at some level a neuron or subnetwork of neurons. The speaker will present work, which is joint with G.B. Ermentrout, explores how the properties of the units and their connections affect the emergent behavior of the network.

Nancy Kopell
Department of Mathematics
Boston University

Tuesday, July 17/9:15 AM
Invited Presentation 5

Wanted: Applied Mathematicians to Try the Fruit Fly Challenge

Developmental biologists and molecular geneticists have recently made astonishing breakthroughs in probing how spatio-temporal patterns of gene expression arises in the fruit fly egg, and how these patterns prefigure the larva's segmented body plan. Result: an experimental data base that all biological pattern formation enthusiasts should covet. Half the talk will be a picture show and narrative sketching the extent and significance of this data base. Half will concern mathematical models that characterize simultaneously embryological cell determination (what bifurcation mechanism impells originally "identical" cells to make different tissues?) as well as the mechanisms that create the spatio-temporal patterns of gene expression that developmental biologists recently discovered. The idea is that the patterns of gene expression are also patterns of incipient cell determination. A model of one must also be a model of the other.

Garrett M. Odell
Department of Zoology
University of Washington

Tuesday, July 17/2:00 PM
Invited Presentation 6

Geometric Bounds for Eigenvalues

A variety of problems in probability, computer science, graph theory, and other areas require bounds on the second largest eigenvalue of a positive matrix. A variety of new techniques borrowed from differential geometry (Cheeger-like inequalities) have emerged to give good results in discrete problems. The speaker will review these ideas and focus on some new methods developed with Dan Stroock and Jim Fill that allow sharp results in messy problems.

Persi Diaconis
Department of Mathematics
Harvard University

Wednesday, July 18/8:30 AM
Invited Presentation 7

The Matrix Sign Function and Large-Scale Riccati Equations

The speaker will give an overview of the matrix sign function and its application to the numerical solution of matrix Riccati equations. The Riccati equation plays a fundamental role throughout modern control and filtering and its reliable solution is crucial to a wide variety of commonly used design and analysis algorithms.

A new family of rational iterations for the matrix sign function based on Padé approximations of a certain hypergeometric function will be described. These algorithms are particularly attractive for the solution of large-scale problems because they have exploitable features for implementation on vector supercomputers and parallel computing machines. The main diagonal and first subdiagonal Padé recursions, which include Newton's and Halley's methods as special cases, can be shown to be globally convergent and can be implemented in a "multiplication-rich" fashion which is computationally competitive with polynomial recursions (which are not globally convergent).

Alan J. Laub
Department of Electrical and Computer Engineering and Department of Computer Science
University of California, Santa Barbara

Wednesday, July 18/9:15 AM
Invited Presentation 8

Control Of Systems Arising in Flexible Structures

Recent applications in such areas as large space flexible structures, robotic manipulators, and flutter suppression, have brought forth the need to control and stabilize dynamical equations which are of hyperbolic or Petrovski type (they model waves, beams, plates, etc.). A key limitation for these models is that uniform stabilization cannot be achieved if the feedback operator is of finite rank (as in the case of finitely many actuators) and relatively bounded with respect to the basic operator of the free dynamics. Thus, the successful stabilizing feedback of this sort must possess a degree of unboundedness higher than that of the original operator of the free dynamics. This leads to boundary feedback operators (which act on the boundary of the spatial domain) or point feedback operators (concentrated at a point).

The speaker will describe recent developments, theoretical as well as numerical, in the area of boundary/point control and stabilization of these dynamics which are originally unstable (for instance, conservative) as free systems. In particular, stabilizing feedbacks based on Riccati operators will be discussed. Mathematical difficulties related to the inherent "high" unboundedness of the stabilizing feedback will be pointed out, as well as implications on practical realization aspects.

Irena Lasiecka
Department of Applied Mathematics
University of Virginia, Charlottesville

Wednesday, July 18/2:00 PM
Invited Presentation 9

Crystal Microstructure Via Elasticity Theory

When cooled below a critical temperature at which a phase transformation occurs, crystals typically develop characteristic patterns of microstructure, consisting in the simplest case of many fine parallel bands (microtwinning). Why does such microstructure form, and how can its geometric features be predicted? The speaker will describe a new theory which is providing some answers to these questions.

The main ingredients of the theory are (1) the use of finite elasticity to model the crystal, and (2) techniques of the calculus of variations (such as the Young measure, and special properties of Jacobians). The crucial observation is that the total elastic energy, though bounded below, may not attain a minimum.

John M. Ball
Department of Mathematics
Heriot-Watt University
Edinburgh, Scotland

Thursday, July 19/8:30 AM
Invited Presentation 10

Nonlinear Morphologies in Directional Solidification

Unidirectional solidification of a binary mixture is a means of studying the controlled phase transformation of a liquid into a crystalline solid. The solid/liquid interface is a free boundary that is the site of the liberation of latent heat, the rejection of solute, and the presence of surface energy.

These three factors couple to determine the conditions for morphological instability that lead to a transition from a planar to a cellular interface.

Cellular interfaces signal the presence of lateral segregation, the solute variations in the solid that produces irregularities in the mechanical and electrical properties of the crystals.

The speaker will identify various cellular phenomena, discuss those mathematical methods necessary to describe them, and identify various open questions. Some of the methods that will be discussed are bifurcation theory, long-wave evolution theory, and direct numerical simulation.

Stephen H. Davis
Department of Engineering Sciences and Applied Mathematics
Northwestern University

Thursday, July 19/9:15 AM
Invited Presentation 11

Ill-posed Problems in Granular Flow

The flow of granular materials such as sand, coal, food products, and ores, is important for materials handling equipment used by industry and in various geological processes such as beach erosion. In this presentation the speaker will focus on continuum models using ad hoc constitutive relations based on experiment. Such models seem invariably to lead to ill-posed value problems. This ill-posedness appears to correspond to an observed physical process, the formation of shear bands; i.e., a sort of breakdown of the continuum model in which all deformation of the material becomes localized in a band of infinitesimal thickness.

The speaker will survey the constitutive relations used in various models, derive ill-posedness in one particular case, and report on work seeking numerical solutions.

David G. Schaeffer
Department of Mathematics
Duke University

Friday, July 20/8:30 AM
Invited Presentation 12

Interior Point Methods for Linear Programming—State-of-the-Art

Since the introduction of Karmarkar's projective ! algorithm, there has been substantial research into interior point methods for linear programming. The speaker will present an overview of a variety of methods that have been proposed. A more detailed presentation of primal-dual logarithmic barrier methods will be given, along with the relationship to simplex methods. Full algorithmic details, including handling of simple bounds, free variables, and ranges will be discussed. Extensive computational experience will be documented, including comparison with contemporary simplex codes.

David F. Shanno
Rutgers Center for Operations Research
Rutgers University

Friday, July 20/9:15 AM
Invited Presentation 13

Solving Large-Scale Combinatorial Optimization Problems in Practice

In this presentation, the speaker will describe a number of hard and large-scale combinatorial optimization problems that come up in various industrial applications, and will outline methods to cope with them. Problems arising in flexible manufacturing, VLSI-design, control of machines and the design of survivable fiber optic networks will be discribed. The mathematical theory behind successful exact and heuristic algorithms to solve such problems will be presented and computational experiecne with such methods will be reported. The algorithms range from cutting plane methods based on polyhedral combinatorics to heuristics that use ideas from computational geometry.

Martin Grötschel
Lehrstuhl fur Angewandte Mathematik
Universitat Augsburg, West Germany

SPECIAL PRESENTATIONS

Wednesday, July 18/10:30 AM

New Directions in Mathematical Sciences Education

The quality of the U.S. educational system is now a major concern of policy makers in government, industry and academia, and reform is starting at various places within the educational enterprise. Because of its fundamental role in a wide variety of disciplines, the mathematical sciences occupy a special position in the reform movement. The mathematics community has responded to this challenge and currently has various reform activities underway. Individuals and institutions are initiating new and innovative mathematics programs, and the federal agencies are supporting projects that could impact instruction across a broad front. There is a need to expand these activities and to have a coordinated course of action that involves the community as a whole.

Under the auspices of the National Research Council, the Mathematical Sciences Education Board, the Board on Mathematical Sciences and the project Mathematical Sciences in the Year 2000, a strategic plan for mathematical sciences education at all levels is being developed. A portion of the plan is already in place with the publication of "Everybody Counts" and the Update of the David Report. The third and final element, the report of the MS 2000 Committee on college and university mathematical sciences education, will appear this fall. The issues that MS 2000 has identified are complex, and the goals and recommendations it will make are dramatic and far reaching.

The focus of this presentation will be the scope of the MS 2000 report and the role of the mathematics community in carrying out the report's recommendations.

William E. Kirwan
President, University of Maryland, College Park
Chairman, MS 2000 Committee

Thursday, July 20/2:00 PM

The John von Neumann Lecture: Vorticity, Turbulence, and Acoustics in Fluid Flow

The speaker will discuss current research directions in understanding phenomena in fluid flow through modern applied mathematics. First, the role of vorticity amplification in the generation of small scales for incompressible flow will be elucidated. Then, the important practical problem of determining effective diffusivities in turbulent transport will be discussed. Finally, new mechanisms for instability in supersonic shear layers involving the nonlinear interaction of acoustics and vorticity will be described. The role of highly interdisciplinary research involving the interaction of ideas from large and small scale computing, asymptotic methods, and rigorous mathematical theory will be emphasized.

Andrew J. Majda
Department of Mathematics
Princeton University

Wednesday, July 18/11:30 AM

Application of Dynamic Programming to Problems of Optimal Habitat Choice and Optimal Timing of Metamorphosis

The field of behavioral ecology has been infiltrated by ideas from the calculus of variations and optimal control theory. Most of the previous theory has been for stochastic models, and has relied upon numerical methods. The present work deals with deterministic problems, and produces analytical solutions which may be interpreted graphically. Specific applications are habitat choice when there is a tradeoff between rapid growth and predation risk, a similar tradeoff between early and late metamorphosis for amphibians, and the timing of fledging in birds.

Donald A. Ludwig
University of British Columbia, Canada

PRIZE AWARDS

Monday, July 16/3:15 PM

Mathematical Contest in Modeling Awards

The Sixth Mathematical Contest in Modeling, cosponsored by SIAM, was held in February, with teams of three undergraduates devoting a weekend to modeling either of two applied problems. From among the teams judged outstanding, two of the graders selected one for a SIAM award in special recognition of the quality of the team's solution. The award honors three students for excellence in collaborative mathematical modeling.

Tuesday, July 17/3:15 PM

Annual SIAM Student Paper Competition

The student authors of the three best papers in applied and computational mathematics submitted to SIAM by April 2, 1990, will present their papers. In qualifying for the competition, authors had to be students in good standing who had received their doctorates at the time of submission and their papers had to be singly authored.

Thursday, July 19/3:15 PM

1990 SIAM Annual Business Meeting

The annual business meeting of SIAM will be held on Thursday, July 19 at 3:15 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.

Ivar Stakgold, President

PROFESSIONAL SEMINARS

Tuesday, July 17/3:15 PM
Professional Seminar 1

Success in Industry—What Does It Take?

What is "industrial mathematics?" For many, it is a way of life, not a branch of mathematics. Success in an industrial environment depends in part on having a strong mathematical foundation built with materials from an appropiate curriculum.

Just as important, however, are the right attitudes, good communication skills, a willingness to listen, and a healthy curiosity. Mathematical life in industry involves working with people in other fields and capacities—technical workers, managers and planners, and sales people, and learning about a wide variety of products and processes.

The speakers will present their views of mathematical careers in industry the various aspects of the industrial environment, the mathematical preparation needed for mathematical work in industry, and some guidelines for success.

Chair: Peter E. Castro, Eastman Kodak Company, Rochester, NY

Speakers and topics to be announced

Wednesday, July 18/3:15 PM
Professional Seminar 2

From Manuscript to Bound Book—Becoming a Published Author

You've made the decision to write that book you've been thinking about for years. How do you find the publisher who will do the best job for you? What are your rights and responsibilities as an author? What is the production process all about? How will your book be marketed?

These and other questions will be answered by publishers' representatives who have worked closely with mathematicians for many years. You will be given suggestions that will make the publication of your book an enjoyable and exciting experience.

Chair: Vickie Kearn
SIAM, Philadelphia

Selecting a Publisher
Klaus Peters
Academic Press, Inc., Cambridge, MA

The Review Process
Edwin Beschler
Birkhauser Boston, Inc.

The Production Process
Maria C. Taylor
John Wiley & Sons, Inc. New York

Promotion and Marketing
Speaker to be announced
Springer-Verlag New York, Inc.

Thursday, July 19/3:15 PM
Professional Seminar 3

Writing, Speaking, Communicating to Get Acceptance—Are We Doing A Good Job?

Most applied mathematicians want their work recognized and used. Presenting that work effectively is essential to their success. While doing the "right" research and obtaining important results is paramount, it is almost as important to present the right material to the targeted audience in a style that is clear and easily understood.

Most mathematical presentations conform to a traditional style that has been adequate in a world where support for research and other mathematical work was readily obtained. Little attention has been given to presentations that win support. But, there is increasing competition for support and a proliferation of proposals, conferences, and publications where good work can be buried.

Presentations to win support are becoming an increasingly important component of the research effort, even more so for the "industrial mathematician" who must interact with engineers, scientists, and management. The speakers will examine some of the shortcomings in mathematical communications, and suggest some ways to improve them.

Chair: Donald E. Miller
Saint Mary's College, Notre Dame

It's Not an Art, But a Problem of Attitude and Training
To be presented by Chair

Visual Aids—A Catalyst for Effective Presentations
Robert Nicholson, Boeing Computer Services, Seattle

Plain Writing—What's Needed and Why
I. Edward Block, SIAM, Philadelphia

GET-TOGETHERS

SIAM Welcoming Reception

Sunday, July 15, 1990, 7:00 PM–9:00 PM
Cash Bar

SIAM Idea Exchange $18

Monday, July 16, 1990, 6:00 PM–7:30 PM

This is a great time to get together with your colleagues. The party will consist of three stations where the chefs are creating th dishes right before your eyes. Snacks will consist of chicken and steak fajitas, freshly made rottini, tortellini and fettucini with marinara and alfredo sauce, and oriental stir fry consisting of shrimp, scallops, chicken and chinese vegetables. Domestic beer and assorted sodas will also be available.

Western Dinner Theater/Play $36.00

Tuesday, July 17, 1990, 6:00 PM–10:30 PM

High steppin' dance hall girls, toe tappin' fiddler, guitar and banjo pickin' slick card tricks and lots of cold beer, wine and apple cider is only part of this two and a half hour western adventure. After boarding the buses at the Hyatt Regency, you'll arrive at Dry Gulch, a western dinner theater where you'll be greeted with a ½ hour cocktail reception followed by a feast consisting of a six course dinner of assorted cheeses and breads, a fresh vegetable tray and dip, soup of the day, tangy beef ribs, cornish hens, corn on the cob, and dessert. All this while experiencing a musical comedy revue featuring Sheriff Bob and his Band, Miss Kitty and her Dance Hall Girls and Slippery Sam the Magic Man. This promises to be a fun-filled casual evening.

Exhibit Hours:

Please be sure to visit the computer and book exhibitors located in East Wacker Exhibit Hall. The hours for book purchases and computer demonstration will be as follows:

Monday, July 16	9:30 AM–7:30 PM
Tuesday, July 17	8:00 AM–6:00 PM
Wednesday, July 18	8:00 AM–4:00 PM
Thursday, July 19	8:00 AM–4:30 PM
Friday, July 20	8:00 AM–11:00 AM

MINISYMPOSIA

Please note that for presentations with more than one author, the names of the presenters are in *italics*.

Monday, July 16/10:30 AM
Minisymposium 1

Recent Mathematical Developments in Chaotic Dynamics

An understanding of the mathematical basis for chaotic dynamics is a central problem in the study of dynamical systems. The speakers in this minisymposium will examine conditions which cause complicated dynamics, quantitative properties of chaotic systems, and the manner in which they arise from regular behavior as the system evolves.

Organizer: Timothy Sauer
George Mason University

Forced Coexistence of Periodic Orbits in Dimension Two
Philip Boyland, Mathematical Sciences Research Institute, and University of Minnesota, Minneapolis

Bifurcation to Horseshoes and Attractor
Clark Robinson, Northwestern University

Decay of Correlations for Maps and Flows
Marek Rychlik, University of Arizona

Monday, July 16/10:30 AM
Minisymposium 2

Applications of Wavelets Part I: Numerical Analysis

Several recent results involving wavelet decompositions as the basic tool have led to a number of major developments in numerical analysis and signal processing. A number of large-scale computational problems have been made tractable by the appearance of fast algorithms for multiplying a vector by a dense matrix, multiplying two dense matrices, and finding the generalized inverse of a dense matrix. These algorithms are applicable to matrices that arise from wide classes of operators, such as Calderon-Zygmund or Pseudodifferential Operators. Algorithms involving wavelets for image and sound processing achieve remarkable compression rates and permit manipulation of compressed data. These new developments will be presented by the speakers of this minisymposium.

Organizer: Gregory Beylkin
Schlumberger-Doll Research, Ridgefield, CT

Fast Wavelet Transforms
To be presented by organizer

Fast Evaluation of Functions of Dense Matrices
Vladimir Rokhlin, Yale University

Non-Interacting Wavelets for Adaptive Numerical Algorithms
Bradley Alpert, Yale University

Fast Numerical Algorithms for Nonlinear Operator Valued Functionals
Ronald R. Coifman, Yale University

Monday, July 16/10:30 AM
Minisymposium 3

Numerical Solution of Wave Problems in Unbounded Domains

The numerical solution of wave problems in an unbounded domain usually requires the introduction of an artificial boundary in order to make the computational domain finite. On this artificial boundary one has to impose a boundary condition which would absorb all the waves that reach the boundary and would not give rise to spurious reflections. Interest in non-reflecting boundary conditions has been growing constantly in the last several years. Both local and nonlocal conditions have been proposed in conjunction with different numerical schemes. The speakers in this minisymposium will focus on recent developments related to nonreflecting boundaries in various fields of application.

Organizer: Dan Givoli
Technion-Israel Institute of Technology, Israel

A-posteriori Error Estimate for the Acoustic Wave Equation in Heterogeneous Media
Alain Bamberger, Alain Sei and Lionel Jannaud, Institut Francais du Petrole, France

Absorbing Boundary Conditions for Acoustic and Elastic Waves
Robert L. Higdon, Oregon State University

Numerical Solution of Helmholtz Problems in Unbounded Domains
Charles I. Goldstein, Brookhaven National Laboratory

The Coupling Method Between Variational Formulation and Integral Representation Applied to the Scattering of Electromagnetic Waves
Marc Lenoir, Laboratoire de Mecanique et Energetique, France

Numerical Experiments for Absorbing Boundaries
J. Bielak, Loukas Kallivokos, and *Richard MacCamy,* Carnegie-Mellon University

A Non-Reflecting Boundary Condition for Elastic Waves
Dan Givoli, Technion-Israel Institute of Technology, Israel and Joseph B. Keller, California Institute of Technology

Monday, July 16/10:30 AM
Minisymposium 4

Parallel Coordinates: A Tool for Visualizing Multidimensional Problems

By means of a multidimensional system of parallel coordinates, subsets of R^N are represented by (i.e., mapped nonprojectively onto) subsets of R^2. A duality between point $\leftarrow\rightarrow$ line, and a new duality for convex sets are induced for $N = 2$ giving rise to optimal convexity algorithms. Representations of lines and hyperplanes in R^N are obtained enabling some geometrical constructions and the representation of polyhedra. The representation of certain convex and non-convex hypersurfaces is known. There is an algorithm for constructing and displaying interior/exterior or surface points (together with proximity information) for this class of hypersurfaces, with potential applications to process control.

The speakers in this minisymposium will describe mathematical foundations and the applications of this methodology to automatic conflict resolution in air traffic control, computer vision, exploratory data analysis in statistics and phase-space analysis of multidimensional bifurcations and chaos.

Organizer: Alfred Inselberg
IBM Scientific Center, and University of Southern California, Los Angeles

Mathematical Foundations of Parallel Coordinates and Some Applications
To be presented by organizer

Finding in Data Sets Using Parallel Coordinates
E. Weyman, George Mason University

Phase-Space Analysis for Multidimensional Chaos and Bifurcations Using Parallel Coordinates
D. J. Rivero, IBM Scientific Center, Venezuela

Monday, July 16/10:30 AM
Minisymposium 5

Theory and Algorithms for Symbolic Computing

Algorithmic research is one of the components that has made modern symbolic computation possible. In this minisymposium, the speakers will present several important aspects of current algorithmic research including work necessary to do a complete and effective implementation of the Risch algorithm for integration in finite terms, uses of probabilistic methods to speed up computations, the budding area of symbolic approximations, and some new research on the ubiquitous problem of algebraic simplification.

Organizer: B.F. Caviness
University of Delaware

Symbolic Integration in Computer Algebra
Manuel Bronstein, IBM T.J. Watson Research Center, Yorktown Heights

Approximating Solutions of Ordinary Differential Equations Symbolically
Robert Grossman, University of Illinois, Chicago

Simplification of Nested Radicals
Susan Landau, University of Massachusetts, Amherst

Probabilistic Methods in Symbolic Mathematical Computation
B. David Saunders, University of Delaware

Monday, July 16/10:30 AM
Minisymposium 6

Communication Complexity and Lower Bounds

Since its introduction about ten years ago, communication complexity has become an established field of study within theoretical computer science. It has generated beautiful and interesting combinatorial problems, and has found applications in areas as diverse as VLSI theory, lower bounds on computation time, and circuit complexity. The minisymposium will consist of a survey talk, and several new results: an algebraic characterization of symmetric communication complexity, communication-space tradeoffs, and space-bounded communication complexity.

Organizer: Janos Simon
University of Chicago

Multiparty and Symmetric Communication Complexity
Laszlo Babai, University of Chicago, and Eotvos University, Hungary

Communication Complexity and Overview
To be presented by organizer

Resource Tradeoffs for Universal Hashing
Prasoon Tiwari, IBM T.J. Watson Research Center

Communication Space Tradeoffs
Paul Beam and Martin Tompa, University of Washington, and *Pei-Yuan Pan,* Lycoming College

Monday, July 16/10:30 AM
Minisymposium 7

Sampling Theory and Practice

The speakers in this minisymposium will present new developments in the theory of reconstruction of signal recovery from nonuniform samples or uniform samples when some of the samples are lost. Besides the theory, the speakers will describe the applications to speech processing, filtering signal from noise, and applications to coding theory.

Organizer: Farokh A. Marvasti
Illinois Institute of Technology

Reconstruction of a Speech Signal from Missing Samples
Peter Clarkson, Illinois Institute of Technology

Recovery of Signal from Noise Using Non-Uniform Samples
I. Plotkin, Concordia University, Canada

A Real Analysis Approach to the Irregular Sampling Problem
Hans F. Feichtinger, University of Vienna, Austria, and University of Maryland, College Park; and Karlheinz Grochenig, University of Connecticut, Storrs

Nonuniform Sampling Theory as an Alternative to Error Correction Codes
To be presented by organizer

MINISYMPOSIA

Monday, July 16/3:15 PM
Minisymposium 8

Disorderly Growth

Many simple models for growth under non-equilibrium conditions lead to the formation of complex, often disorderly patterns that closely resemble those seen in nature. Our understanding of these pattern formation processes has advanced substantially in recent years but even simple models such as DLA (Diffusion-Limited Aggregation) pose major theoretical challenges. It has been suspected for some time that a close relationship exists between the spatially chaotic structures generated by disorderly growth processes and the deterministic chaos associated with non-linear systems. However, a precise relationship between these phenomena has not yet been found.

The objective of this minisymposium is to review recent progress, indicate where understanding is lacking and identify promising research directions. The growth of complex (often fractal) structures will be emphasized as well as the physical properties of these structures. It is hoped that this will stimulate a productive exchange of ideas concerning the relationship between chaos and disorderly growth.

Organizer: Paul Meakin
E.I. du Pont de Nemours and Company, Wilmington

Random Walks and the Double-Layer Impedence
T.C. Halsey, University of Chicago

Dendrites-Round and Facetted
David A. Kessler, University of Michigan

The Growth of Fractal Aggregates
To be presented by organizer

Thin Film Growth and Erosion and the Shadow Instability
Joseph Rudnick, University of California, Los Angeles

Monday, July 16/3:15 PM
Minisymposium 9

Multidimensional Inverse Problems

The speakers in this minisymposium will present analytical and numerical strategies for solving multidimensional inverse problems. A review of new results in nonlinear equations and solutions of one- and two-dimensional inverse-scattering problems by nonlinear equations is presented. Stability of an exact formula for recovering the potential from three-dimensional fixed-frequency scattering data is investigated. A relaxed least-squares algorithm based on event coherency is examined for seismological inverse scattering. Inversion of band-limited, aperture-limited data obtained from common shot experiments is discussed. New algorithms for finding material parameters from eigenvalues and nodal position data in one- and two-dimensional problems are discussed. Linear algorithms for computing electrical conductivity from finitely many limited-precision measurements are presented.

Organizer: John Lavery
Office of Naval Research

Nonlinear Wave Equations and Inverse Scattering in Multidimensions
Mark J. Ablowitz, University of Colorado, Boulder

Stability of the Inversion of 3D Fixed Frequency Scattering Data
Alex G. Ramm, Kansas State University

Coherency-based Algorithms for Reflection Seismology
William W. Symes and Robert M. Lewis, Rice University

Velocity Analysis from Band-Limited, Aperture-Limited Data
Norman Bleistein, and Jack K. Cohen, Colorado School of Mines

Inverse Spectral Results for Bounded Domains
Joyce R. McLaughlin, Rensselaer Polytechnic Institute and University of California, Berkeley

Effects of Measurement Precision and Finite Numbers of Electrodes on Linear Impedance Imaging Algorithms
Margaret Cheney and David Isaacson, Rensselaer Polytechnic Institute

Monday, July 16/3:15 PM
Minisymposium 10

DIMACS

DIMACS, the Center for Discrete Mathematics and Theoretical Computer Science, is a science and technology center of the National Science Foundation. It is a project of four institutions — AT&T Bell Laboratories, Bell Communications Research, Princeton University and Rutgers University. The speakers will present an overview of the kinds of scientific issues that are of interest to DIMACS as well as of its other activities, including its programs in discrete mathematics for high school techers and students. Each year a substantial research activity at DIMACS revolves around a special year theme. The speakers will survey the research questions of the 1989-90 special year (discrete and computational geometry) and the 1990-91 special year (complexity theory of interactive computation). We will also highlight two areas of recent research at DIMACS' industrial partners (probabilistic approaches to packing and partitioning problems and different weight spanning trees).

Organizers: Daniel Gorenstein, Rutgers University, and Robert Tarjan, Princeton University

DIMACS Programs for High School Teachers and Students
Joseph G. Rosenstein, Rutgers University

Order Types in Discrete and Computational Geometry
Jacob E. Goodman, City College of New York

Complexity Theory of Interactive Computation
Andrew C. Yao, Princeton University

Probabilistic Analysis of Packing and Partitioning Problems
Edward G. Coffman, Jr., AT&T Bell Laboratories, Murray Hill, NJ

Spanning Trees of Different Weight
Paul Seymour, Bellcore, Morristown, NJ

Monday, July 16/3:15 PM
Minisymposium 11

Symbolic Computing in Science and Engineering

Symbolic computation has played an important but limited role in the twentieth century advancement of science and engineering. However the emergence of inexpensive but powerful workstations has made such techniques available to a much wider audience. In this minisymposium, the speakers will present some applications of these techniques. These include the use of window-based symbolic tools for engineering design, the solution of non-linear polynomial equations, the design of error-correcting codes and the preparation of numerical programs for parallel supercomputers.

Organizer: Anthony C. Hearn
The RAND Corporation, Santa Monica, CA

Symbolic Computing in Engineering Design Environments
Terry B. Cline, Hewlett Packard Laboratories, Palo Alto, CA

Symbolic Computation of Error Control Codes on Algebraic Curves
Martin Hassner, IBM Almaden Research Center, San Jose, CA

Solution of Polynomial Systems of Equations by Groebner Bases
Herbert Melenk, Konrad-Zuse-Zentrum fuer Informationstechnik, W. Germany

Automatic Production of Parallel Supercomputer Codes by Symbolic Computation
Paul S. Wang, Kent State University

Monday, July 16/3:15 PM
Minisymposium 12

Coding Theory

The speakers in this minisymposium will present recent results in several active areas of coding theory. The areas include the covering radius, relations between codes and designs, and algebraic geometric codes.

Organizer: Vera Pless
University of Illinois, Chicago

Orphan Structure of the First Order Reed-Muller Code
Richard A. Brualdi, University of Wisconsin, Madison

Hadamard Matrices, Their Designs and Their Codes
Edward Assmus, Jr., Lehigh University

On the Covering Radii and Optimality of Algebraic Geometic Codes
Heeralal Janwa, Michigan State University

On Extremal Quaternary Codes with Automorphisms of Order a Power of Three
W. Cary Huffman, Loyola University of Chicago

Covering Radius of Shortened Codes and Applications
Gerard D. Cohen, Telecom Paris, France

Monday, July 16/3:15 PM
Minisymposium 13

Mathematical Contest in Modeling: Modeling at the Undergraduate Level

There will be a presentation by the SIAM winners of the Mathematical Contest in Modeling. This will be followed by presentations by practitioners in applied mathematics. The program will be of interest to anyone who is interested in seeing the output from a weekend contribution of three undergraduates or is interested in introducing an undergraduate course in modeling.

Organizer: Ben Fusaro
Salisbury State University, Salisbury, MD

Presenters and titles of presentations will be included in the Final Program

Monday, July 16/3:15 PM
Minisymposium 14

Orthogonal Polynomials and Special Functions

(Sponsored by the SIAM Activity Group on Orthogonal Polynomials and Special Functions)

The newly established SIAM Activity Group on Orthogonal Polynomials and Special Functions has chosen this minisymposium as one of the first of its organized events.

The speakers in this minisymposium will present an overview of some of the work in this field and its wide range of applications. Examples from computer algebra, computed tomography, topological dynamics, physics, optics and statistics will be presented.

Organizer: Charles F. Dunkl
University of Virginia

Computer Algebra, Positivity, and the Riemann Hypothesis
George Gasper, Northwestern University

Orthogonal Polynomials, Limit Periodic Jacobi Matricesw and Julia Sets
Jeffrey S. Geronimo, Georgia Institute of Technology

The Role of Orthogonal Polynomials in Computed Tomography
Eric Todd Quinto, Tufts University

Symmetry and Orthogonal Polynomials in Several Variables
To be presented by organizer

Tuesday, July 17/10:30 AM
Minisymposium 15

Analysis of Chaotic Experimental Data

Ideas from the mathematics of nonlinear chaotic dynamics have been successfully applied to the study of irregular physical processes. Most of the dynamical behavior complex enough to be interesting occurs in a multi-dimensional phase space. Yet most often a physical experiment monitors only a single scalar variable, and furthermore this measurement process introduces inevitable small errors. The successful reconstruction of the original dynamics of the system is thus a fundamental problem, and it requires a variety of techniques. The speakers in this minisymposium will examine topics relevant to a realization of an accurate and efficient reconstruction of the dynamical system.

Organizer: Stephen M. Hammel
Naval Surface Warfare Center, Silver Springs, MD

Low Dimensional Chaos in Laboratory Experiments
Eric Kostelich, Arizona State University

Local Geometric Analysis for Topological Dimensions
Guan-Hsong Hsu, University of Missouri, and Robert Cayley, Naval Surface Warfare Center

Methods for Analyzing Experimental Data: Noise Reduction, Reconstruction and Prediction
Reggie Brown
University of California, San Diego

Noise Amplification and Takens' Embedding Theorem
Martin Casdagli, Los Alamos National Laboratory

Tuesday, July 17/10:30 AM
Minisymposium 16

Application of Wavelets Part II: Signal Processing

See description for Part I, Minisymposium 2 on July 16 at 10:30 AM

Organizer: Gregory Beylkin
Schlumberger-Doll Research, Ridgefield, CT

Reconstruction of Functions from the Wavelet Transform Local Maxima
Stephane Mallat and *Sifen Zhong*, Courant Institute of Mathematical Sciences, New York University

Compression of Wavelet Decompositions and Applications
B. Jawerth, University of South Carolina

Acoustic Signal Compression with Wave Packets
Victor Wickerhauser, Yale University and University of Georgia

Multiscale Stochastic Models and Signal Processing
Alan S. Willsky, Kenneth C. Chou, Massachusetts Institute of Technology; Albert Benveniste and Michelle Basseville, Institut de Recherche en Informatique et Systemes Aleatoires, France

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Tuesday, July 17/10:30 AM
Minisymposium 17

Analysis of Queueing Models

Queueing models play an important role in the performance evaluation of systems, e.g. computer, communications and manufacturing, in which users contend for the limited number of system resources. Performance measures, such as throughputs, delays and utilizations, are used to characterize the system behavior. These measures are obtained from solutions of equations, such as difference and differential-difference equations, which often prove difficult to solve.

The speakers in this minisymposium will focus on several different approaches, both exact and approximate, for obtaining formulas for the performance measures of systems using queueing models.

Organizer: Charles Tier
University of Illinois, Chicago

Heavy Traffic Analysis of the Sojourn Time in a Three-Node Jackson Network with Overtaking
Charles Knessl, University of Illinois, Chicago and *John A. Morrison*, AT&T Bell Laboratories, Murray Hill

Sojourn Time Distribution in the Finite Capacity M/M/1-PS Queue
Charles Knessl, University of Illinois, Chicago

Multidimensional Residues, Generating Functions, and Their Applications to Queueing Networks
Andrea Bertozzi, Princeton University, and *James McKenna*, Bellcore

Approximate Analysis of a Voice-Data Communications Model
Margo L. Mankus and *Charles Tier*, University of Illinois, Chicago

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Tuesday, July 17/10:30 AM
Minisymposium 18

Graph Algorithms

(Sponsored by the SIAM Activity Group on Discrete Mathematics)

Algorithmic graph theory has developed into an area marked by a richness and diversity of research results, of both fundamental interest and practical application.

The speakers in this minisymposium will explore several current research directions in graph algorithms. These include the design of parallel algorithms for searching undirected graphs and for determining reachability in directed graphs, the design of algorithms to recognize families of graphs characterized by finite obstruction sets under well-partial-orders, and the design of efficient graph algorithms through the use of parametric search.

Organizer: Greg N. Frederickson
Purdue University

A Framework for Parallel Algorithm Design for Undirected Graphs
Vijaya Ramachandran, University of Texas, Austin

Towards Overcoming the Transitive-Closure Bottleneck: Efficient Parallel Algorithms for Planar Digraphs
Ming-Yang Kao, Duke University and Philip N. Klein, Brown University

On Recognizing Graphs of Bounded Width
Michael A. Langston, University of Tennessee, Knoxville and M. R. Fellows, University of Idaho

The Role of Parametric Search in the Design of Efficient Graph Algorithms
To be presented by organizer

Tuesday, July 17/10:30 AM
Minisymposium 19

Numerical Methods in Control

The speakers in this minisymposium will present some recent developments on computational methods for control. This includes applications of optimization techniques such as conjugate gradient method for numerical solution of the algebraic Riccati equations and Broyden's quasi-Newton method for optimal control problems. Implementation issues arising in numerical approximations of distributed parameter systems include preconditioning techniques and moving grids strategies will be discussed. In addition, the control of fluid flow problems and discrete-time systems will be presented.

Organizers: H. Tran and K. Ito
North Carolina State University

Finite Element Methods In Control Design
John A. Burns, Virginia Polytechnic Institute and State University, and University of Southern California

Control of Navier-Stokes Equations
Mihir Desai, University of Southern California

Fast Quasi-Newton Methods for Control
Carl T. Kelley, North Carolina State University

Conjugate Gradient Methods for Algebraic Riccati Equations
Ali R. Ghavimi, *Charles S. Kenney*, and Alan J. Laub, University of California, Santa Barbara

Approximation in the Identification and Control of Degenerate Distributed Parameter Systems
I. Gary Rosen, University of Southern California

Tuesday, July 17/10:30 AM
Minisymposium 20

Interface Instabilities During Solidification Part 1 of 2

Situations involving a change in the phase of a material, such as the growth of a crystal from its molten state, lead to a wide variety of interesting free boundary problems. For many important applications, it is necessary to generalize the classical Stefan problem by including such effects as solute diffusion, fluid flow in the liquid phase, elastic effects in the solid phase, or body forces from applied electric or magnetic fields.

In this first of two sessions, the speakers will describe instabilities of the solid-liquid interface arising from the effects of solute diffusion and undercooling of the liquid phase.

Organizer: Geoffrey B. McFadden
National Institute of Standards and Technology

The Phase Diffusion of Nonlinear Cells During Directional Solidification
Kirk Brattkus, California Institute of Technology, and Chaouqi Misbah, University Paris VII

Connections Between Bifurcation Structure and Wavelength Selection in Cellular Patterns Grown by Directional Solidification
Kostas Tsiveriotis and R.A. Brown, Massachusetts Institute of Technology

Kinetic Effects in Directional Solidification
Greg Merchant, Northwestern University

Laser Melting of Thin Films
Geoffrey B. McFadden, and S.R. Coriell, National Institute of Standards and Technology, and L.N. Brush, University of Washington

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Tuesday, July 17/10:30 AM
Minisymposium 21

Spatio-Temporal Patterns in Neural Systems

This minisymposium will focus on topics connected with dynamic behavior and pattern formation in neurophysiology, cellular interactions, and neural networks. The speakers will describe theoretical approaches to neural networks with refractory states, the complex behavior of model neural systems in which recurrent inhibitory loops and mixed feedback are present, models of cellular and neural interactions in which competition for dominance leads to pattern selection, and models for oscillations in populations of pancreatic cells, close relatives of nerve cells. This minisymposium will complement an invited lecture by N. Kopell (Networks in Neurophysiology). After the formal presentations, a forum for

discussion of current mathematical techniques, models, and their application to the study of both theoretical and experimental neural systems will be provided.

Organizers: Leah Edelstein-Keshet, University of British Columbia, Canada, and G.B. Ermentrout, University of Pittsburgh

Dynamical Pattern Formation in Neural Networks
Jack Cowan, University of Chicago

Delayed Mixed Feedback and the Complexity of Neural Dynamics
John Milton and Michael C. Mackey, McGill University, Canada

Competition for Dominance in Cellular and Neural Networks
G. Bard Ermentrout, University of Pittsburgh, and L. Edelstein Keshet, University of British Columbia, Canada

Theoretical Models for Synchronization of Electrical Oscillations in the Pancreatic Islet
Cynthia L. Stokes, Arthur Sherman, and John Rinzel, National Institutes of Health

Tuesday, July 17/10:30 AM
Minisymposium 22

AWM-SIAM Panel on Applied Mathematics in Industry (A Panel Discussion)

The panel will consist of five women applied mathematicians who work in industry. Each panelist will speak about the area in which she works, what lead her into that application area, what kind of mathematics she uses, and describe some of the important open problems. There will be time for questions from the audience and discussion among the panelists.

Moderator: Jill P. Mesirov
Thinking Machines Corporation, Cambridge, MA

Panelists:

Rosemary Chang, Silicon Graphics, Mountain View, CA
Linda Kaufman, AT&T Bell Laboratories, Murray Hill
Ann K. Stehney, Center for Communications Research, Princeton
Marjorie L. Stein, U. S. Postal Service, Washington
Catherine Willis, Kidder, Peabody & Co., New York

Tuesday, July 17/3:15 PM
Minisymposium 23

Dynamics of Pattern Formation

The minisymposium will focus on evolving free boundaries occurring in phase change problems and in other applications. It will include basic theories of these interfaces, computational methods and rigorous results when they appear in the form of layers for associated systems of nonlinear parabolic partial differential equations.

Organizer: Paul C. Fife
University of Utah

Theories of Evolving Phase Boundaries
Morton Gurtin, Carnegie-Mellon University

Numerical Results in Unstable Solidification
John Strain, Courant Institute of Mathematical Sciences, New York University

Slow Motion Manifolds for the Cahn-Hilliard Equation
Peter Bates, Brigham Young University

Interfacial Phenomena in Reaction-Diffusion Equations
Xu-Yan Chen, Hiroshima University, Japan

Tuesday, July 17/3:15 PM
Minisymposium 24

Dynamics of Nonlinear Waves

The behavior of nonlinear wave propagation can become quite complicated when dynamical effects are considered, such as for pulsed, traveling, or standing waves. The speakers will present several different methods for studying the dynamics of nonlinear waves in these situations. Exact, perturbation, variational, and computational methods are described, and are used to show the wide range of behaviors that are possible in such problems (including chaotic dynamics). The examples to be discussed arise in applications ranging from nonlinear optics to fluid mechanics.

Organizer: William L. Kath
Northwestern University

Counterpropagating Light Beams in Nonlinear Dielectrics
Alejandro B. Aceves, University of New Mexico

Hamiltonian Chaos in Nonlinear Oscillators
Darryl D. Holm, Los Alamos National Laboratory

Hamiltonian Dynamics for Optical Fiber Solitons
David J. Muraki and William L. Kath, Northwestern University

On the Stability of Parametrically Excited Standing Waves
Hermann Riecke, Northwestern University

Tuesday, July 17/3:15 PM
Minisymposium 25

Fluid-Dynamic Stability I

The speakers in this minisymposium will present recent results on the stability properties of fluid flows described by the incompressible Navier-Stokes equations. Bifurcation of a steady Couette-Poiseuille flow will be discussed, and the principle of exchange of stability will be described in the context of transient solutions connecting fixed points of the Navier-Stokes equations and vortical disturbances in laminar flows over a curved surface. Self-induced stretching of slender vortex tubes will be shown to be governed by a cubically nonlinear Schrodinger equation.

Organizer: John Lavery
Office of Naval Research

Stability of Rotating Couette-Poiseuille Flow
George H. Knightly, University of Massachussets, Amherst, and Duane Sather, University of Colorado, Boulder

Transient Solutions in Viscous Fluids
Duane Sather, University of Colorado, Boulder

Stability Theory for Longitudinal Vortex-Type Disturbances to Laminar Flows
Isom H. Herron, Howard University

Effects of Nonlocal Selfstretching on the Evolution of a Perturbed Vortex Filament
Rupert Klein and Andrew J. Majda, Princeton University

Tuesday, July 17/3:15 PM
Minisymposium 26

Numerical Vortex Methods

Numerical vortex methods are based on a Lagrangian description of fluid dynamics in which the computational elements carry vorticity. This formulation is appealing on physical as well as mathematical grounds. The speakers in this minisymposium will present a sample of current research efforts into developing vortex methods and extending their range of application.

Organizer: Robert Krasny
University of Michigan, Ann Arbor

Numerical Simulation of Scalar Mixing in Shear Flow Using Three-Dimensioinal Vortex Methods
Ahmed F. Ghoniem and Omar M. Knio, Massachussetts Institute of Technology

The Random Vortex Method and Flow Past a Cylinder
Claude Greengard, IBM T.J. Watson Research Center, Yorktown Heights

The Application of Vortex Methods to Mathematical Computation
Michael Shelley, University of Chicago

On Vortex Sheet Roll-up at High Reynolds Numbers
Gretar Tryggyason, University of Michigan

Computation of Vortex Sheet Roll-Up
To be presented by organizer

Tuesday, July 17/3:15 PM
Minisymposium 27

Interface Instabilities During Solidification (Part 2 of 2)

(See description for Part 1, Minisymposium 20, July 17 at 10:30 AM)

Situations involving a change in the phase of material, such as the growth of a crystal from its molten state, lead to a wide variety of interesting free boundary problems. For many important applications, it is necessary to generalize the classical Stefan problem by including such effects as solute diffusion, fluid flow in the liquid phase, elastic effects in the solid phase, or body forces from applied electric or magnetic fields.

This record of two sessions will focus on the interaction of fluid flows or elastic fields with the solid-liquid interface.

Organizer: Geoffrey B. McFadden
National Institute of Standards and Technology

Morphological Stability of Elastically Stressed Solid-Liquid Interfaces
Peter W. Voorhees, B. Spencer, S.H. Davis, Northwestern University; Geoffrey B. McFadden, National Institute of Standards and Technology

The Influence of Benard Convection of Solid-Liquid Interfaces in Single and Two-Component Liquids
U. Muller, Kernforschungszentrum, West Germany

Effects of Temporal Modulation on Solidification
Bruce Murray, Geoffrey B. McFadden and S.R. Coriell, National Institute of Standards and Technology

Simulation of Free Boundaries, Fluid Flow, and Heat Transfer During Czochralski Growth
Phil Sackinger, Sandia National Laboratories

Tuesday, July 17/3:15 PM
Minisymposium 28

Chaos in Control Systems

(Sponsored by the SIAM Activity Group on Control and Systems Theory)

The study of chaos involves, nonlinear differential and difference equations, topological or differentiable dynamics, strange attractors and their invariant measures, the reconstruction of state trajectories from observations, and bifurcation phenomena, all of which are of interest to control theorists. Control theorists have their own questions and concerns: What are good criteria for occurrence of chaotic behavior in nonlinear systems? Can bounds be prescribed? Are chaotic systems good models for naturally occurring wide-band noise?

The speakers in this minisymposium will address such issues and specifically consider: How can complex time-series be extrapolated? When and why does chaos arise in adaptive controllers, computer-controlled systems (and others with stair-step quantizers) and the quadratic dynamics of the Riccati equations of Kalman filtering.

Organizer: David L. Elliott
Washington University

Optimal State Space Reconstructions for Nonlinear Prediction of Noisy Chaotic Time Series
Martin Casdagli, Los Alamos National Laboratory

Bifurcations and Complicated Dynamics in Continuous-Time Adaptive Control Systems
Faith M.A. Salam, Michigan State University

Adopting a Prescriptive Attitude Toward Complicated Dynamical Phenomena in Feedback Control Systems
David F. Delchamps, Cornell University

Predictability and Unpredictabl in Kalman Filtering
C.T. Byrnes, T. McGregor, Washington University; and A. Lindquist, Royal Institute of Technology, Sweden

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Tuesday, July 17/3:15 PM
Minisymposium 29

Cryptography

The speakers in this minisymposium will highlight the variety of recent work in cryptography: new techniques both for performing cryptographic tasks and for attacking certain cryptosystems, and theoretical investigation of the inherent cost of solving computational problems.

Organizer: Stuart Haber
Bellcore, Morristown, NJ

Experimental Quantum Cryptography
Gilles Brassard, Charles H. Bennett, and John Smolin, Universite de Montreal, Canada

Locally Random Reductions: Theory and Applications
Joan Feigenbaum, AT&T Bell Laboratories, Murray Hill, NJ

(Title to be announed)
Amos Fiat, Tel Aviv University, Israel

Progress in Factoring
Arten Lenstra, Bellcore

Tuesday, July 17/3:15 PM
Minisymposium 30

The Geometry and Topology of DNA

(Sponsored by the Society for Mathematical Biology)

The DNA of a living organism is a complex thread-like object which experiences interesting and nontrivial geometric and topological changes during vital cellular life processes. During the last decade, molecular biologists have developed techniques which use differential geometry and knot theory in the analysis of experiments on circular DNA. The aim of these experiements is to understand and quantize spatial molecular conformation and DNA enzyme mechanism. This new and perhaps unexpected interplay between experimental molecular biology and "pure" mathematics will be the subject of this minisymposium.

Organizer: De Witt L. Sumners
Florida State University

The Biological Implications of DNA Topology
Nicholas R. Cozzarelli, University of California, Berkeley

The Topology of DNA Recombination
To be presented by organizer

The Geometry of Supercoiled DNA
James H. White, University of California, Los Angeles

Topological Quantum Field Theory and DNA Topology
Louis H. Kauffman, University of Illinois, Chicago

Wednesday, July 18/3:15 PM
Minisymposium 31

Geometric Singular Perturbation Methods with Applications to Travelling Waves Applications (Part 1 of 2)

(A panel discussion sponsored by the SIAM Activity Group on Dynamical Systems)

In recent years, many different methods have been developed to study the ordinary differential equations resulting from the existence and stability questions for travelling waves. In complicated systems, the methods achieve their strongest results in the cases of singularly perturbed problems. On the other hand, singular structures are a common feature of many physical phenomena such as phase transitions in materials science, fast chemical reactions, and nerve activation. The aim of this minisymposium is to discuss the needs of the applications and then to compare and contrast the different methods in the context of those applications.

This minisymposium is organized as a two part panel discussion. The first part will address applications.

Organizer and Moderator: Christopher K.R.T. Jones
University of Maryland, College Park

Panelists:

Martin Feinberg, University of Rochester
Paul Fife, University of Utah
James Keener, University of Utah
Nancy Kopell, Boston University
M. Mimura, Hiroshima University, Japan

Wednesday, July 18/3:15 PM
Minisymposium 32

Optimal Design of Structures and Materials (Part 1 of 2)

One obtains an optimal design when the best use is made of available resources. Across a broad class of applications this "best use is accomplished by a fine-scale mixing of the available materials. Experience with this phenomena has led to the isolation of several best mixing strategies, called optimal microstructures.

In this minisymposium, the speakers will present recent progress in the systematic use of these microstructures as building blocks in optimal design procedures. In addition, the effect of such microstructure on the reflection and propagation of waves will be addressed. Our understanding of optimal microstructures is limited by our knowledge of material properties. The speakers will present recent progress in shape-memory and ferromagnetic materials.

Organizer: Steven Cox
Rice University

Shape Optimization for Minimum Compliance in Plane Stress Using Optimal Microstructures
Gregoire Allaire and *Robert V. Kohn*, Courant Institute of Mathematical Sciences, New York University

Topology and Shape Optimization of Three-Dimensional Shell Structures
Noboru Kikuchi and Katsuyuki Suzuki, University of Michigan, Ann Arbor

Scale Effects in the Optimal Design of a Microstructured Medium Against Buckling
Nicholas Triantafyllidis, University of Michigan, and Martin Bendsoe, The Technical University of Denmark, Lyngby, Denmark

Stress Minimum Forms for Elastic Solids
Lewis Wheeler, University of Houston

Theory of Games Approach to Structural Design
Konstantin Lurie, Worcester Polytechnic Institute

Wednesday, July 18/3:15 PM
Minisymposium 33

Nonlinear Optimization I

(Sponsored by the SIAM Activity Group on Optimization)

The development of algorithms and software for the solution of optimization problems with nonlinear constraints is of vital importance. Of special interest are algorithms for the solution of large scale problems. Applications include chemical engineering, process optimization, aircraft design, and financial planning. The speakers in this minisymposium will explore three of the leading appoaches for the solution of nonlinear programming problems: interior point methods, sequential quadratic programming, and decomposition methods.

Organizer: Jorge Moré
Argonne National Laboratory

Issues in Using Reduced Hessians for Successive Quadratic Programming
Richard H. Byrd and Yuanfu Xie, University of Colorado, Boulder

Accelerating the Convergence of Interior Point Methods
Richard A. Tapia and Yin Zhang, Rice University

Interior Methods for Nonlinearly Constrained Optimization
Margaret Wright, AT&T Bell Laboratories, Murray Hill, NJ

Coercion Methods for Decomposition of Multicommodity Generalized Network Problems
Stavros Zenios and Pamela K. Armstrong, University of Pennsylvania

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Wednesday, July 20/3:15 PM
Minisymposium 34

Recent Developments on Newton's Method

According to a theorem of Dennis and More , the full-step Newton iteration is the generic superlinearly convergent method in the vicinity of regular roots. Its perceived drawbacks are the cost of forming and factoring the Jacobian and the need to enforce or accelerate convergence, especially in the vicinity of singularities. In this minisymposium, the speakers will present simple line-search strategies to improve the local and global convergence properties, and it will be shown that, for some problem classes, Newton-steps can be computed at a cost of the same order of magnitude as the cost of evaluating the vector-functions.

Organizer: Andreas Griewańk
Argonne National Laboratory

Treating Dependencies in Interval Newton Methods with the Augmented System
R. Baker Kearfott, University of Southwestern Louisiana

Efficient Implementation of Newton's Method for Optimal Control
Joseph Dunn, North Carolina State University

A New-Line Search for Gauss-Newton on Potentially Singular Problems
Richard Drake, Washington State University

The Computational Complexity of Newton-Steps on Composite Functions
To be presented by organizer

Wednesday, July 18/3:15 PM
Minisymposium 35

Fluid-Dynamic Stability (Part 2 of 2)

(See description for Part I, Minisymposium 25 on July 17 at 3:15 PM)

The speakers in this minisymposium will present recent results on the stability properties of fluid flows

described by the incompressible Navier-Stokes equations. A new "multipolar" model for viscous fluid flow that takes into account the possibility of nonlinear relations between the stress tensors and the spatial derivatives of the velocity will be presented. Existence and stability results for a plane Poiseuille flow of a "bipolar" fluid will be described. Analytical and computational results, using traditional fluid-flow models, for the structure of an unstable detonation will be presented.

Organizer: John Lavery
Office of Naval Research

Nonlinear Multipolar Fluids: A New Model for Viscous Fluid Flows
Frederick Bloom, Northern Illinois University

Existence and Stability of Plane Poiseuille Flow of a Nonlinear Incompressible Bipolar Fluid
Hamed Bellout, Northern Illinois University

Theoretical and Numerical Structure for Unstable Detonations
Anne Bourlioux, Princeton University

The Convergence of the Vortex Method for Vortex Sheets
John S. Lowengrub, Stanford University

Wednesday, July 18/3:15 PM
Minisymposium 36

New Methods in Control of Distributed Parameter Systems

The speakers in this minisymposium will survey some of the important new methods in the study of control of distributed parameter systems. They will discuss the Hilbert uniqueness method, the use of multiplier methods and nonharmonic Fourier series, the boundary element method, and control and stabilization of systems with hidden variables such as viscoelastic systems.

Organizers: David L. Russell and Robert L. Wheeler, Virginia Polytechnic Institute and State University

The Boundary Element Methods for Boundary Control of Distributed Parameter Systems
Goong Chen and Jianxin Zhou, Texas A&M University

Exact Boundary Controllability in Short Time and Rapid Boundary Stabilization
Vilmos Komornik, Universite' de Bordeaux I, France

The Hilbert Uniqueness Method: Origins and Applications
John E. Lagnese, Georgetown University

On Control and Stabilization of Systems with Internal Variables
G. Leugering, Georgetown University

Wednesday, July 18/3:15 PM
Minisymposium 37

Views on Robustness of Control Systems

Robustness of control systems is roughly defined as the ability to provide good performance (in particular, stability) under perturbations within some specified bounds. The last decade witnessed a rapid growth of interest in the robustness area. The four talks in this session represent four different approaches to robustness. The paper by R. Datko shows that most feedback algorithms for boundary controlled systems fail to stabilize if an arbitrarily small time delay is present in the feedback loop. M. Smith will give a characterization of nondestabilizing perturbations by a gap metric in the space of input-output operators. The paper by L. Zaremba contributes to building bridges between differential games and robust control theory. Finally, the paper by A. Olbrot elaborates on stability margins, how to define them in general and how to calculate them.

Andrzej W. Olbrot
Wayne State University

The Robustness of Boundary Stabilized Elastic Systems with Respect to Time Delays
Richard Datko, Georgetown University

Operator Theory Methods for Robust Control
Tryphon T. Georgiou, University of Minnesota, Minneapolis, and *Malcolm C. Smith*, The Ohio State University

Affine Control Problems with Perturbations
Leszek S. Zaremba, University of Michigan

Generalized Stability Margins: New Concepts, Algebraic Criteria and Numerical Computations
To be presented by organizer

Wednesday, July 18/3:15 PM
Minisymposium 38

Algorithms for DNA Sequence Matching and Analysis

(Sponsored by the Society for Mathematical Biology)

This session focuses on new algorithms for use in DNA sequence and analysis. The problems solved by these algorithms have recently taken on new importance with the start of the Human Genome Project and the enormous amount of partial and complete DNA sequence and map information that is expected to be generated in the near future. Most algorithms in this problem domain have been based on fairly straightforward dynamic programming. With increasing amounts of data, and increasing sequence and pattern lengths, much more attention to time and space efficiency will be needed. The talks in this session all address this issue for different specific problems in DNA analysis. Talks show how to speedup dynamic programming for particular problems, or how to avoid dynamic programming entirely for problems where dynamic programming has previously been the method of choice in DNA algorithms.

Organizer: Daniel Gusfield
University of California, Davis

An Overview of Old and New Approaches to DNA Sequence Analysis
To be presented by organizer

Analysis of Restriction Maps
Webb Miller, Pennsylvania State University, University Park

Sparse Dynamic Programming
Raffaele Giancarlo, Columbia University

Sublinear Algorithm for Similarity Searching
Gene Myers, University of Arizona

Thursday, July 19/10:30 AM
Minisymposium 39

Solving Large Integer Programming Problems

Many practical problems fall into the class of combinatorial optimization problems, including the optimal design of VLSI circuits, the laying out of circuits to minimize the area dedicated to wires, the dispatching and routing of vehicles, the scheduling of crews to flights, as well as problems in physics and chemistry such as the determination of ground states of spin glasses, and determining the minimum energy states for alloy construction. Only recently has it been possible to solve problems having more than a few hundred variables. The speakers in this minisymposium will present recent research in the area of polyhedral theory, constraint generation, problem reformulation, linear programming technology and heuristics which allow the solution of such problems.

Organizer: Karla Hoffman
George Mason University

Linear Programming Tools for Integer Programming
Robert E. Bixby, Rice University

Extended Coefficient Reduction Methods for 0-1 Programming
Brenda Dietrich and *Laaureano Escudero*, IBM T.J. Watson Research Center, Yorktown Heights, NY

Approximation Algorithms for Constrained Machine Scheduling Problems
Leslie Hall, Princeton University, and David Shmoys, Cornell University

(S.K)-Cover Facet Inequalities for the Generalized Assignment Problem
Elsie Gottlieb, CUNY-Baruch College

Thursday, July 19/10:30 AM
Minisymposium 40

Parallel Optimization Methods

(Sponsored by the SIAM Activity Group on Optimization)

Optimization problems arise in a wide variety of scientific and engineering applications. Although significant progress has been made in optimization methodology, the time required to solve difficult large problems can be prohibitive. The potential power of parallel computers offers some hope of obtaining more rapid solutions, hence expanding the class of problems that can be considered "soluble."

The solution of optimization problems in parallel poses new challenges. Factors that determine the efficiency of a sequential method often differ and sometimes are in contrast to those determining the efficiency of a parallel approach.

The speakers in this minisymposium will address some of the problems faced and ideas developed for solving optimization problems in parallel.

Organizer: Ariela Sofer
George Mason University

Parallel Proximal Point Decomposition of Linear Programming Constraints
Renato De Leone, and Olvi Mangasarian, University of Wisconsin, Madison

Parallel Computation of Convex Hull in R ^ d by Linear Programming
J.B. Rosen and G.L. Xue, University of Minnesota, Minneapolis

Massively Parallel Algorithms for Multicommodity Networks
Yair Censor, University of Haifa, Israel, and *Stavros Zenios*, University of Pennsylvania

A General Purpose Parallel Algorithm for Unconstrained Minimization
Stephen Nash and *Ariela Sofer*, George Mason University

Thursday, July 19/10:30 AM
Minisymposium 41

Optimal Design of Structures and Materials (Part 2 of 2)

(See previous description for Part 1, Minisymposium 32, July 18 at 3:15 PM)

Organizer: Steven Cox
Rice University

Plane Waves in Layered Elastic Media
Rouben Rostamian, University of Maryland, Baltimore County

A Dispersive Effective Medium for Wave Propagation in Periodic Composites
Fadil Santosa, University of Delaware, and William W. Symes, Rice University

Young's Measure Minimizers in Ferromagnetism
Robert Rogers, Virginia Polytechnic Institute and State University

Domain Structure in Ferromagnetic Materials and the Coercivity Paradox
Rick D. James, University of Minnesota, Minneapolis

Thursday, July 19/10:30 AM
Minisymposium 42

Linear Programming — Theory and Practice

The speakers of this minisymposium will present some recent results relating to theoretical issues in linear programming, including duality, irreducible linear programs, randomized algorithms in parallel, and continuous trajectories of interior point algorithms. One of the speakers will also present results relating to the practical implementation of an interior point algorithm for network flow models.

Organizer: Ilan Adler
University of California, Berkeley

Parallel Linear Programming in Fixed Dimension Almost Surely in Constant Time
Noga Alon, Tel-Aviv University, Israel and *Nimrod Megiddo*, IBM Almaden Research Center, San Jose, CA

On the Continuous Trajectories for a Potential Reduction Interior Point Algorithm
Renato D.C. Monteiro, AT&T Bell Laboratories, Holmdel, NJ

Irreducible Dual Classes of Linear Programs
Ilan Adler and Alan Sanstad, University of California, Berkeley

An Implementation of the Dual Affine Scaling Algorithm for Network Flow Problems
Mauricio G.C. Resende, AT&T Bell Laboratories, Murray Hill, NJ and Geraldo Veiga, University of California, Berkeley

Thursday, July 19/10:30 AM
Minisymposium 43

Geometric Singular Perturbation Methods with Applications to Travelling Waves (Part 2 of 2)

(See description for Part 1, Minisymposium 31, July 18 at 3:15 PM)
(Sponsored by the SIAM Activity Group on Dynamical Systems)

In recent, years many different methods have been developed to study the ordinary differential equations resulting from the existence and stability questions for travelling waves. In complicated systems, the methods achieve their strongest results in the cases of singularly perturbed problems. On the other hand, singular structures are a common feature of many physical phenomena, such as phase transitions in materials science, fast chemical reactions, and nerve activation. The aim of this minisymposium is to firstly discuss the needs of the spplications and then to compare and contrast the different methods in the context of those applications.

This minisymposium is organized as a two part panel discussion. The second part will address methods.

Organizer and Moderator: Christopher K.R.T. Jones
University of Maryland, College Park

Panelists:

Jack Dockery, Montana State University
Robert Gardner, University of Massachusetts
Y. Nishiura, Hiroshima University, Japan
K. Sakamoto, Emory University
David Terman, Ohio State University

Thursday, July 19/10:30 AM
Minisymposium 44

Reliability of Finite Element Computations

Part I: A Posteriori Error Estimation and Adaptive Computational Methods of Transient Problems

The complexity of modern scientific and engineering computations has led to a need for greater software reliability. Research activity in developing adaptive numerical procedures for partial differential equations arose in part to address this need. Current state-of-the-art adaptive techniques automatically enhance solution bases by mesh refinement, mesh redistribution and/or variable order of accuracy. Efficient, accurate and robust a posteriori error estimates add the necesary measure of confidence in the computed results. While work in this area is far from complete, it is desirable from the point of view of reliability to also assess and control, where possible, the errors associated with idealization in a systematic manner, i.e. treat mathematically uncertainties inherited from the selection of computational method for the particular choice of boundary value problem intended to model the physical, chemical or biological phenomena being investigated. Issues of errors present in numerical computation and their relation to mathematical modeling are addressed in a two-part sypmposium having the titles:

Part I: **A Posteriori Error Estimation and Adaptive Computational Methods of Transient Problems**
Part II: **Control of Idealization and Discretization Errors in Computational Solid Mechanics**

The speakers in this session will present recent results on a posteriori error estimation and adaptive computational methods focussing on the important problem of balancing spatial and temporal errors in transient problems.

Organizers: Joseph E. Flaherty, Rensselaer Polytechnic Institute, and Soren Jensen, University of Maryland, Baltimore County

A Posteriori Error Estimates and Adaptive Refinement for Elliptic Equations
Randolph E. Bank, and Bruno D. Welfert, University of California, San Diego

Error Balancing and Control in Method of Lines Solvers for Time-Dependent Partial Differential Equations
Martin Berzins, University of Leeds, United Kingdom

A Posteriori Error Estimation and Adaptive Mesh Refinement for Transient Flow Problems
Richard E. Ewing, University of Wyoming

Error Estimation and Adaptive Solution of Parabolic Equations Using Finite Element-Galerkin Discretizations in Space and SIRK's in Time
Peter K. Moore, Tulane University

Thursday, July 19/10:30 AM
Minisymposium 45

Free Boundary Problems in Fluid Mechanics (Part 1 of 2)

The flow of a viscous fluid with a free surface occurs in a host of applications. Examples of these are coating flows, flows in a Hele-Shaw cell and the flows of films in the pulmonary system. Some questions associated with the modeling and evolution of these flows are the behavior of the contact line, the stability of the interface and the effects of surfactants on the stability and motion. The speakers will address these questions.

Organizer: Michael J. Miksis
Northwestern University

Viscous Fingering with a Moving Contact Line
Steven J. Weinstein, Eastman Kodak Company, Rochester, NY; Elizabeth B. Dussan V; Schlumberger-Doll Research, Ridgefield, CT; and Lyle H. Ungar, University of Pennsylvania

Fingering Instabilities and Spreading Liquid Layers
Eric Herbolzheimer, Sandra M. Troian, and Samuel A. Safran, Exxon Research and Engineering Company, Annandale, NJ

Viscous Sheets and Drops on an Inclined Plane
Leslie Hocking, University College London, United Kingdom

Interfacial Dynamics in the Pulmonary System
D. Halpern and *James B. Grotberg*, Northwestern University

Thursday, July 19/10:30 AM
Minisymposium 46

Control and Identification of Distributed Parameter Systems (Part 1 of 2)

(Sponsored by the SIAM Activity Group on Control and Systems Theory)

The subject of this minisymposium is control and identification of systems represented by partial differential equations. The speakers will address several issues including open-loop stability, stabilizability, optimal control, approximation theory for control system design, and combined control/structure design and system identification. While some of the theoretical methods apply to several classes of distributed systems, the specific examples involve distributed models of flexible mechanical systems, particularly beams and rods. Both theoretical and numerical results will be discussed in the minisymposium.

Organizer: J.S. Gibson
University of California at Los Angeles

Boundary Stabilization of Nonlinear Beams
John E. Lagnese, Georgetown University

Preservation of Stabilizability and Detectability of the Control System in Approximation
Chunming Wang, University of Southern California

A Method for Combined Control-Structure Optimization
Mark H. Milman, Jet Propulsion Laboratory

Thursday, July 19/10:30 AM
Minisymposium 47

Moving Ions Through Channels in Biological Membranes

(Sponsored by the Society for Mathematical Biology)

Membranes surround and define biological cells by restricting movement of the cell's components. But some ions must cross membranes if cells are to receive and transmit chemical energy, or communicate with neighbors. Many of these ions cross membranes in aqueous channels made from proteins. These ionic channels control biological functions such as signalling in the nervous system, energy transduction in sensory cells, coordination of muscle contraction, pumping of the heart, secretion of salt and fluids in kidneys, transport in epithelial cells. Thus, the mechanisms by which channels control the movement of ions are significant. One mechanism is electrodiffusion, described by the Nernst-Planck and Poisson partial differential equations and boundary conditions used to study transport in semiconductors, ceramics, solid, and liquid electrolyte solutions. The speakers will present analysis and applications of such equations in the context of channel permeation.

Organizer: Robert S. Eisenberg
Rush Presbyterian-St. Lukes Medical Center

Ionic Channels in Biological Cells
To be presented by organizer

Flow of Ions Through Narrow Membrane Channels
Victor Barcilon, University of Chicago

Boundary Conditions for the Diffusion of Ions Through Cell Membrane Channels
Peter Gates, K. E. Cooper, and J. L. Rae, Mayo Medical School

MINISYMPOSIA

Langevin Studies of Ion Motion in Framework Electrolytes
Mark Ratner, Rush Medical College and Northwestern University; and Abraham Nitzan, Tel Aviv University, Israel

Thursday, July 19/4:15 PM
Minisymposium 48

Interior-Point Methods for Linear Programming

(Sponsored by the SIAM Activity Group on Optimization)

Spearheaded by Karmarkar's linear programming algorithm and many of his novel ideas, research related to interior-point algorithms has revolutionized the field of linear programming, both from a theoretical and a computational viewpoint. The speakers in this minisymposium will present some of the most recent developments in this field.

Organizer: Robert M. Freund
Massachussetts Institute of Technology

Large Steps Potential Reduction Algorithms for Linear Programming
Clovis Gonzaga, Universide Federal do Rio de Janeiro, Brazil

Recent Results and Perspectives on Solving Linear Programming from Infeasible "Warm Start"
To be presented by organizer

"Anticipated" Behavior of Interior Point Algorithms for Linear Programming
A. Mizuno, Toyko Institute of Technology, Japan; Michael J. Todd, Cornell University; and Yinyu Ye, University of Iowa

"Anticipated" Behavior of Path-Following Algorithms for Linear Programming
S. Mizuno, Toyko Institute of Technology, Japan; Michael J. Todd, Cornell University; and Yinyu Ye, University of Iowa

Thursday, July 19/4:15 PM
Minisymposium 49

Integer Programming

The speakers in this minisymposium will address four topics related to the theory and application of integer programming. Tabu search as an alternative to integer programming for multi-machine scheduling problems will be discussed as will as the use of integer programming in propositional calculus. Solution techniques for binary programming problems and for integer programs, viewed as linear programs with exponentially many constraints, will also be discussed.

Organizer: Neal D. Glassman
Air Force Office of Scientific Reseach

Expedients for Solving Some Specially-Structured O-1 Programming Problems
Warren Adams, Clemson University

Scheduling on Parallel Processors with Linear Delay Penalties Using Tabu Search
J. Wesley Barnes, and Manuel Laguna, University of Texas, Austin

Solving LP Problems with Exponentially Many Constraints
Pravin Vaidya, University of Illinois, Urbana-Champaign

Branch-and-Cut Solution of Inference Problems in Propositional Logic
John Hooker, Carnegie-Mellon University, and C. Fedjki, Ecole El Ghazali, Constantine, Algeria

Thursday, July 19/4:15 PM
Minisymposium 50

Free Boundary Problems in Fluid Mechanics (Part 2 of 2)

(See description for Part I, Minisymposium 45, July 19 at 10:30 AM)

Free boundary problems occur in many areas of fluid mechanics. Some examples are the dynamics of bubbles, films and fluid layers. One of the physical parameters associated with the solution of the interface is surface tension. It influences the stability and evolution of the interface. The speakers in this session will discuss several problems in this area.

Organizer: Michael J. Miksis
Northwestern University

On the Stability of Rising Gas Bubbles
Daniel Meiron, California Institute of Technology

Numerical Computation of Solitary Waves of Finite Amplitude
Jean-Marc Vanden-Broeck, University of Wisconsin, Madison

Nonlinear Rupture of Free Films
Thomas Erneux and S.H. Davis, Northwestern University

Interaction of a Shock Wave with an Interface Separating Two Fluids
Michael J. Miksis, Northwestern University, and *Lu Ting*, Courant Institute of Mathematical Sciences, New York University

Thursday, July 19/4:15 PM
Minisymposium 51

Granular Flow

The subject of dynamical flow of granular materials (such as sand) has enjoyed a surge interest. The speakers in this minisymposium will present the two, quite distinct, reasons for this. Recent detailed experiments have helped determine the essential ingredients that describe real granular flow and thus characterize the governing dynamical equations. From a much broader perspective, sandpiles provide a prototypical dynamical system for discussing a new and far-reaching (if still speculative) theory known as self-organized criticality. In both instances, models using cellular automaton dynamics are playing a helpful theoretical role.

Organizer: Kurt Wiesenfield
Georgia Institute of Technology

Self-Organized Criticality in Sandpiles and Earthquakes
Per Bak, Brookhaven National Laboratory

Time-Dependence and Pattern Formation in Flowing Sand
Robert P. Behringer, Duke University

Critical Dynamics of an Evolving Sandpile
G. A. Held, IBM T. J. Watson Research Center; Per Bak, C. Tang, Brookhaven National Laboratory; and K. Wiesenfield, Georgia Institute of Technology

Flow in Granular Materials
Sidney Nagel, University of Chicago

Thursday, July 19/4:15 PM
Minisymposium 52

Control and Identification of Distributed Parameter Systems (Part 2 of 2)

(Sponsored by the SIAM Activity Group on Control and Systems Theory)

(See description for Part I, Minisymposium 46, July 19 at 10:30 AM)

Organizer: J. S. Gibson
University of California, Los Angeles

Control and Approximation of Thermoviscoelastic Systems
Zhuangyi Liu, University of Minnesota, Duluth

LQG Optimal Control of a Thermoelastic Beam
J.S. Gibson, University of California, Los Angeles, and I.G. Rosen, University of Southern California

Shape Identification Problems Arising in Thermotopography
Fumio Kojima, ICASE-NASA Langley Research Center; H. T. Banks, University of Southern California; and W. P. Winfree, NASA Langley Research Center

Thursday, July 19/4:15 PM
Minisymposium 53

Extreme-Point Results in Robust Control

A central problem in robust control is to determine whether every member in a family of polynomials (or rational functions) possesses a common desired property. Extreme-point results deal with the possibility of establishing such properties from evaluations of the family's extreme points. The proposed session will present some of the most recent results in this area of research.

Organizers: C. V. Hollot (Chair), University of Massachusetts, Amherst; and B. Ross Barmish, University of Wisconsin, Madison

Robust Stabilization of Interval Plants with First Order Compensators
C. V. Hollot, University of Massachusetts, Amherst; F. J. Kraus, Swiss Federal Institute of Technology, ETH-Zentrum, Switzerland; R. Tempo, Politechnico di Torino, Italy; and B. Ross Barmish, University of Wisconsin, Madison

Extremal Properties of Kharitonov Segments and Their Role in Robust Stability of Interval Control Systems
Herve Chapellat, M. Daleh, and *S. P. Bhattacharyya*, Texas A&M University

Vertex Implications for Frequency Response of Interval IIR Filters
N. K. Bose, Pennsylvania State University

Robust Schur Stability of Interval Polynomials
M. Mansour, Swiss Federal Institute of Technology, ETH-Zentrum, Switzerland

Thursday, July 19/4:15 PM
Minisymposium 54

Nonlinear Patterns and Dynamical Behavior of Biological Reaction-Diffusion Systems

With the increasing use of mathematical analysis in the life sciences, the application of reaction-diffusion equations to biological processes has become of interest to phenomenological modelers. Developmental biology and population ecology have proven themselves to be especially fruitful ground for such an endeavor. The minisymposium speakers will concentrate on specific model systems in these two areas and present analysis of their dynamical behavior by a variety of analytical and numerical techniques. Emphasis will be given to pattern formation when diffusion is present or the possibility of deterministic chaos in its absence.

Organizer: David J. Wollkind
Washington State University

A Cascading Development Model for Amphibian Embryos
Kemble R. Yates, Southern Oregon State College

Complex Spatial Patterns from Tissue Interactions
Valipuram S. Manoranjan, University of Surrey, United Kingdom

Qualitative Analysis of a Parametrically-Forced Temperature-Dependent Model of a Mite Predator-Prey Interaction
John B. Collings, Washington State University

Diffusive versus Morphological Instability: Analogous Ecological and Solidification Nonlinear Pattern Regulation
To be presented by organizer

Friday, July 20/10:30 AM
Minisymposium 55

Computational Integer Programming

Tremendous strides have been made in the last several years in the computational aspects of integer programming and combinatorial optimization. A variety of changes and ideas have contributed. Computer architectures have certainly played a role, and should lead to effective parallelization of the basic branch-and-bound search. Recent mathematical developments have been even more important, including ideas from polyhedral combinatorics and the theory of integral lattices.

Organizer: Robert E. Bixby
Rice University

Strategies for Parallel Integer Programming Algorithms
Russell A. Rushmeier, Georgia Institute of Technology, and Rice University

A Computational Approach to the Max-Cut Problem
Sanjay Saigal, Rice University

A Branch and Cut Optimizer for Set-Partitioning Problems
Karla L. Hoffman, George Mason University, and Manfred Padberg, New York University

Computational Experience with the Lovasz-Scarf Basis Reduction Algorithm for Mixed Integer Linear Programs
W. Cook, Bellcore and *T. Rutherford*, University of Western Ontario, Canada; and H. Scarf, Yale University

Friday, July 20/10:30 AM
Minisymposium 56

Interior-point Algorithms for Nonlinear Programming

The aim of this minisymposium is to describe recent developments and provide a perspective on new directions in interior-point algorithms for nonlinear programming, such as quadratic and convex programming. The speakers will present both theoretical and computational results for various nonlinear optimization problems.

Organizer: Yinyu Ye
University of Iowa

New Algorithm for Minimizing Convex Function Over Convex Sets
Pravin M. Vaidya, University of Illinois, Urbana-Champaign

Path-Following Methods for Convex Programming
Jie Sun and Sanjay Mehrotra, Northwestern University

Newton's Method for Parametric Center Problems
Robert Freund and Kok Choon Tan, Massachusetts Institute of Technology

Computational Aspects of an Interior-point Algorithm for Quadratic Problems with Box Constraints
Panos Pardalos and Chi-Geun Han, Pennsylvania State University, and Yinyu Ye, University of Iowa

(Title to be announced)
Yuri E. Nesterov and Arkady S. Nemirovsky, USSR Academy of Sciences, USSR

Friday, July 20/10:30 AM
Minisymposium 57

Nonlinear Optimization 2

(See description for Part I, Minisymposium 33, July 18 at 3:15 PM)

Nonlinear optimization models are a powerful class of models with numerous applications. Their flexibility carries a price since they can be much more difficult to solve than linear models. The speakers in this minisymposium will address the following topics — first, the uses of nonlinear optimization, describing multilevel optimization models and an application of nonlinear optimization to neural networks, and second, methods for their solution, with discussions of the theory and pratical behavior of particular optimization algorithms.

Organizer: Stephen G. Nash
George Mason University

Multilevel Optimization
Zhiyong Bi, Paul Calamai and *Andrew Conn*, University of Waterloo, Canada

Neural Nets, Digit Recognition, and Nonlinear Programming
Garth P. McCormick, George Washington University

Theory and Practice with the Symmetric Rank One Update for Unconstrained Optimization
Richard H. Byrd, Humaid Khalfan and *Robert B. Schnabel*, University of Colorado, Boulder

Globally Convergent Inexact Newton Methods
Stanley C. Eisenstat, Yale University; and *Homer F. Walker*, Utah State University

Friday, July 20/10:30 AM
Minisymposium 58

Reliability of Finite Element Computations
Part II: Control of Idealization and Discretization Errors in Computational Solid Mechanics

(See Part I — A Posteriori Error Estimation and Adaptive Computational Methods of Transient Problems, for description, Minisymposium 44, July 19 at 10:30 AM)

The speakers in Part II will present an assessment of the influence of various choices of constitutive equations, geometry, boundary and junction conditions of the "exact" and discrete solutions of problems.

Organizers: Joseph E. Flaherty, Rensselaer Polytechnic Institute, and Soren Jensen, University of Maryland, Baltimore County

Reliability Problems of Idealizations in Solid Mechanics
Ivo Babuska, University of Maryland, College Park

Uncertainties Associated with Constitutive Law Parameter Identification
Kenneth L. Jerina, Washington University

Mathematical Treatment of Problems Appearing in the Study of Some Models for Plasticity
Eric Bonnetier, Centre de Mathematiques Appliquees, Ecole Polytechnique, France

Mathematical Models for Structural Connections
Barna A. Szabo and Jacob Bortman, Washington University

Friday, July 20/10:30 AM
Minisymposium 59

Fortran 90: The Language, Numerical Applications, and Implementation Issues *(Sponsored by ACM-SIGNUM)*

Fortran 90 is the draft standard for Fortran, currently in the final stages of approval. The proposed langugage is an upward compatible extension of Fortran 77 with additional features in seven major areas: arrays, numerical computation, parameterized intrinsic data types, user-defined data types, pointers, and data abstraction. The speakers in this minisymposium survey Fortran 90 as an extension of Fortran 77, discuss the use of Fortran 90 to develop portable numerical software in root-finding, and dense and sparse linear algebra, and describe one implementation of Fortran 90 in progress. The minisymposium will end with a question/answer session about Fortran 90.

Organizer: Brian T. Smith
University of New Mexico

A Survey of the Fortran 90 Programming Langugae
Jerrold L. Wegener, Amoco Production Research

Using Fortran 90 for Zero-Finding Algorithms
To be presented by organizer

Using Fortran 90 for Data Abstraction — Multiprecision Packages and Varying Character Packages
J. L. Schonfelder, University of Liverpool, United Kingdom

Using Fortran 90 for Linear Algebra Packages
John K. Reid, AERE Harwell, United Kingdom

A Fortran 90 to Fortran 77 Translator Using TOOLPACK 8x
Malcolm S. Cohen, Numerical Algorithms Group, Ltd., United Kingdom

Friday, July 20/10:30 AM
Minisymposium 60

Mathematics in Neurocomputing

Neurocomputing and machine learning are burgeoning areas of research that lead to interesting problems in applied mathematics and computing. The speakers in this minisymposium will address topics at the interface between statistics, numerical analysis, machine learning and neural networks. All presentations will begin with a tutorial overview and then lead to a discussion of mathematical results in the field.

Organizer: George Cybenko
University of Illinois, Urbana-Champaign

Statistical Properties of Artificial Neural Networks
Andrew Barron, University of Illinois, Urbana-Champaign

Learnability and Vapnik-Chervonenkis Dimension
Anselm Blumer, Tufts University

Efficient Neural Network Learning Algorithms
George Cybenko and Sirpa Saarinen, University of Illinois, Urbana-Champaign

Stochastic Neural Dynamics
Jack Cowan, University of Chicago

Friday, July 20/10:30 AM
Minisymposium 61

Parallel Computation Networks

Efficient message transmission is critical to the success of massively parallel computer architectures. The speakers in this minisymposium will present recent developments in the design of message routing algorithms that are provably efficient and robust under node failures.

Organizer: Sandeep Bhatt
California Institute of Technology

Asymptotically Optimal Schedules for Packet Routing
Bruce M. Maggs, Massachusetts Institute of Technology

Minisymposia continued on page 19

PROGRAM-AT-A-GLANCE

SHORT COURSE ON CHAOTIC DYNAMICS, AN EMERGING SCIENCE

ORGANIZERS:
CELSO GREBOGI and JAMES A. YORKE

Saturday, July 14/PM

5:00 PM - 8:00 PM
Registration for Short Course

Sunday, July 15

8:00 AM
Registration for Short Course

9:00 AM
Introduction and Basic Concepts

10:30 AM
Coffee and Discussion

11:00 AM
Strange Attractors

12:30 PM
Lunch and Discussion

2:00 PM
Bifurcations to Chaos

3:30 PM
Coffee and Discussion

4:00 PM
Fractal Basin Boundaries

4:00 PM
Registration Desk Closes

5:30 PM
Discussion

6:00 PM
Adjournment

THE ANNUAL MEETING

Sunday, July 15/PM

6:00 PM
Registration for meeting

7:00 PM - 9:00 PM
SIAM Welcoming Reception
Cash Bar

9:00 PM
Registration Desk Closes

Monday, July 16/AM

7:30 AM
Registration Opens

8:15 AM
Welcoming Remarks

8:30 AM - 10:00 AM
Invited Presentations 1 and 2

8:30 AM
Algebraic Computation Comes of Age
Anthony C. Hearn
The RAND Corporation
Santa Monica, CA

9:15 AM
Wavelets Making Waves in Mathematics and Engineering
Ingrid Daubechies
AT&T Bell Laboratories and University of Michigan, Ann Arbor

10:00 AM - 10:30 AM
Coffee

10:30 AM - 12:30 PM
CONCURRENT SESSIONS

Minisymposium 1
Recent Mathematical Developments in Chaotic Dynamics
Chair: Timothy Sauer
George Mason University

Minisymposium 2
Applications of Wavelets Part 1: Numerical Analysis
Chair: Gregory Beylkin
Schlumberger Doll Research, Ridgefield, CT

Minisymposium 3
Numerical Solution of Wave Problems in Unbounded Domains
Chair: Dan Givoli
Technion-Israel Institute of Technology, Israel

Minisymposium 4
Parallel Coordinates: A Tool for Visualizing Multidimensional Problems
Chair: Alfred Inselberg
IBM Scientific Center, Los Angeles and University of Southern California

Minisymposium 5
Theory and Algorithms for Symbolic Computing
Chair: B.F. Caviness
University of Delaware

Minisymposium 6
Communication Complexity and Lower Bounds
Chair: Janos Simon
University of Chicago

Minisymposium 7
Sampling Theory and Practice
Chair: Farokh Marvasti
Illinois Institute of Technology

Contributed Presentations 1
Matrix Eigenvalue Problems

Contributed Presentations 2
Discrete Mathematics and Computer Science

Contributed Presentations 3
Communication Systems, Estimation and Learning

Monday, July 16/PM

12:30 PM - 2:00 PM
Lunch

2:00 PM - 2:45 PM
Invited Presentation 3
Fingers, Dendrites, and Cracks: Modelling Unstable Growth Processes
George M. Homsy
Stanford University

2:45 PM - 3:15 PM
Coffee

3:15 PM - 5:45 PM
CONCURRENT SESSIONS

Minisymposium 8
Disorderly Growth
Chair: Paul Meakin
E.I. du Pont de Nemours and Co., Wilmington

Minisymposium 9
Multidimensional Inverse Problems
Chair: John Lavery
Office of Naval Research

Minisymposium 10
DIMACS—The Center for Discrete Mathematics and Theoretical Computer Science
Co-Chairs: Daniel Gorenstein, Rutgers University
Robert E. Tarjan, Princeton University

Minisymposium 11
Symbolic Computing in Science and Engineering
Chair: Anthony C. Hearn
The RAND Corporation
Santa Monica

Minisymposium 12
Coding Theory
Chair: Vera Pless
University of Illinois, Chicago

Minisymposium 13
Mathematical Contest in Modeling—Modeling at the Undergraduate Level
Chair: Ben Fusaro
Salisbury State University

Minisymposium 14
Orthogonal Polynomials and Special Functions
(Sponsored by the SIAM Activity Group on Orthogonal Polynomials and Special Functions)
Chair: Charles F. Dunkl
University of Virginia

Contributed Presentations 4
Computational Methods for Ordinary Differential Equations and Integral Equations

Contributed Presentations 5
Algebraic Equation Solvers and Preconditioners

Contributed Presentations 6
Stochastic Problems

6:15 PM - 7:45 PM
SIAM Idea Exchange

PROGRAM-AT-A-GLANCE

Tuesday, July 17/AM

8:30 AM - 10:00 AM
Invited Presentations 4 and 5

8:30 AM
Networks in Neurophysiology
Nancy Kopell
Boston University

9:15 AM
Wanted: Applied Mathematicians to Try the Fruit Fly Challenge
Garrett M. Odell
University of Washington

10:00 AM - 10:30 AM
Coffee

10:30 AM - 12:30 PM
CONCURRENT SESSIONS

Minisymposium 15
Analysis of Chaotic Experimental Data
Chair: Stephen M. Hammel
Naval Surface Warfare Center

Minisymposium 16
Application of Wavelets Part 2: Signal Processing
Chair: Gregory Beylkin
Schlumberger-Doll Research, Ridgefield, CT

Minisymposium 17
Analysis of Queueing Models
Chair: Charles Tier
University of Illinois, Chicago

Minisymposium 18
Graph Algorithms
(Sponsored by the SIAM Activity Group on Discrete Mathematics)
Chair: Greg M. Frederickson
Purdue University

Minisymposium 19
Numerical Methods in Control
Chairs: H. Tran and M. Ito
North Carolina State University

Minisymposium 20
Interface Instabilities During Solidification (Part 1 of 2)
Chair: Geoffrey B. McFadden
National Institute of Standards and Technology

Minisymposium 21
Spatio-Temporal Patterns in Neural Systems
Co-Chairs: Leah Edelstein-Keshet
University of British Columbia, Canada and
G. Bard Ermentrout
University of Pittsburgh

Minisymposium 22
AWM-SIAM Women in Applied Mathematics
Chair: Jill Mesirov
Thinking Machines Corporation

Contributed Presentations 7
Wave Propagation and Scattering

Contributed Presentations 8
Transform and Complex Function Methods

Tuesday, July 17/PM

12:30 PM - 2:00 PM
Lunch

2:00 PM - 2:45 PM
Invited Presentation 6
Geometric Bounds for Eigenvalues
Perci Diaconis
Harvard University

2:45 PM - 3:15 PM
Coffee

3:15 PM - 5:45 PM
CONCURRENT SESSIONS

Minisymposium 23
Dynamics of Pattern Formation
Chair: Paul C. Fife
University of Utah

Minisymposium 24
Dynamics of Nonlinear Waves
Chair: William L. Kath
Northwestern University

Minisymposium 25
Fluid Dynamic Stability (Part 1 of 2)
Chair: John Lavery
Office of Naval Research

Minisymposium 26
Numerical Vortex Methods
Chair: Robert Krasny
University of Michigan, Ann Arbor

Minisymposium 27
Interface Instabilities During Solidification (Part 2 of 2)
Chair: Geoffrey B. McFadden
National Institute of Standards and Technology

Minisymposium 28
Chaos in Control Systems
(Sponsored by the SIAM Activity Group on Control and Systems Theory)
Chair: David L. Elliott
Washington University

Minisymposium 29
Cryptography
Chair: Stuart Haber
Bellcore, Morristown, NJ

Minisymposium 30
The Geometry and Topology of DNA
(Sponsored by the Society for Mathematical Biology)
Chair: De Witt L. Sumners
Florida State University

Contributed Presentations 9
Wavelets

Contributed Presentations 10
Control of Distributed Parameter Systems

Student Paper Competition
Award and Presentation — The Three Best Papers in Applied and Computational Mathematics

Professional Seminar 1
Success in Industry — What Does It Take?
Chair: Peter Castro, Eastman Kodak Company

6:00 PM - 10:30 PM
Western Dinner Theater/Play

Wednesday, July 18/AM

8:30 AM - 10:00 AM
Invited Presentations 7 and 8

8:30 AM
The Matrix Sign Function and Large-Scale Riccati Equations
Alan J. Laub
University of California, Santa Barbara

9:15 AM
Control of Systems Arising in Flexible Structures
Irena Lasiecka
University of Virginia, Charlottesville

10:00 AM - 10:30 AM
Coffee

10:30 AM - 11:15 AM
Special Presentation
New Directions in Mathematical Sciences Education
William E. Kirwan
President, University of Maryland, College Park, and
Chairman, MS-2000 Committee

11:30 AM
CONCURRENT SESSIONS

Special Presentation
Application of Dynamic Programming to Problems of Optimal Habitat Choice and Optimal Timing of Metamorphosis
Donald A. Ludwig
University of British Columbia, Canada

Contributed Presentations 11
Inverse Problems and Parameter Estimation

Contributed Presentations 12
Mathematical Modeling

Contributed Presentations 13
Matrix Computations

Contributed Presentations 14
Computer Arithmetic

Contributed Presentations 15
Robotics and Control Applications

Contributed Presentations 16
Robust Control

Contributed Presentations 17
Mathematics Education

Contributed Presentations 18
Interior Point Methods

Contributed Presentations 19
Nonlinear Programming

Poster Session

Wednesday, July 18/PM

12:30 PM - 2:00 PM
Lunch

2:00 PM - 2:45 PM
Invited Presentation 9
Crystal Microstructure Via Elasticity Theory
John M. Ball
Heriot-Watt University, Scotland

2:45 PM - 3:15 PM
Coffee

3:15 PM - 5:45 PM
CONCURRENT SESSIONS

Minisymposium 31
Geometric Singular Perturbation Methods with Applications to Travelling Waves (Part 1 of 2)
Sponsored by the SIAM Activity Group on Dynamical Systems
Chair: Christopher K.R.T. Jones
University of Maryland, College Park

Minisymposium 32
Optimal Design of Structures and Materials (Part 1 of 2)
Chair: Steven Cox
Rice University

Minisymposium 33
Nonlinear Optimization 1
(Sponsored by the SIAM Activity Group on Optimization)
Chair: Jorge Moré
Argonne National Laboratory

Minisymposium 34
Recent Developments on Newton's Method
Chair: Andreas Griewank
Argonne National Laboratory

Minisymposium 35
Fluid Dynamic Stability (Part 2 of 2)
Chair: John Lavery
Office of Naval Research

Minisymposium 36
New Methods in Control of Distributed Parameter Systems
Chairs: David L. Russell and Robert L. Wheeler
Virginia Polytechnic Institute and State University

Minisymposium 37
Views on Robustness of Control Systems
Chair: Andrzej W. Olbrot
Wayne State University

Minisymposium 38
Algorithms for DNA Sequence Matching and Analysis
(Sponsored by the Society for Mathematical Biology)
Chair: Daniel Gusfield
University of California, Davis

Contributed Presentations 20
Linear Programming

Contributed Presentations 21
Optimization Methods

Contributed Presentations 22
Mathematical Models in Population Dynamics and Physiology

Professional Seminar 2
From Manuscript to Bound Book — Becoming a Published Author
Chair: Vickie Kearn
SIAM, Philadelphia

PROGRAM-AT-A-GLANCE

Thursday, July 19/AM

8:30 AM - 10:00 AM
Invited Presentations 10 and 11

8:30 AM
Nonlinear Morphologies in Directional Solidification
Stephen H. Davis
Northwestern University

9:15 AM
Ill-Posed Problems in Granular Flow
David G. Schaeffer
Duke University

10:00 AM - 10:30 AM
Coffee

10:30 AM - 12:30 PM
CONCURRENT SESSIONS

Minisymposium 39
Solving Large Integer Programming Problems
Chair: Karla Hoffman
George Mason University

Minisymposium 40
Parallel Optimization Methods
(Sponsored by the SIAM Activity Group on Optimization)
Chair: Ariela Sofer
George Mason University

Minisymposium 41
Optimal Design of Structures and Materials (Part 2 of 2)
Chair: Steven Cox
Rice University

Minisymposium 42
Linear Programming—Theory and Practice
Chair: Ilan Adler
University of California, Berkeley

Minisymposium 43
Geometric Singular Perturbation Methods with Applications to Traveling Waves (Part 2 of 2)
Chair: Christopher K.R.T. Jones
University of Maryland, College Park

Minisymposium 44
Reliability of Finite Element Computations
Part 1: A Posteriori Error Estimation and Adaptive Computational Methods of Transient Problems
Co-Chairs: Joseph E. Flaherty
Rensselaer Polytechnic Institute and Soren Jensen
University of Maryland, Baltimore County

Minisymposium 45
Free Boundary Problems in Fluid Mechanics (Part 1 of 2)
Chair: Michael J. Miksis
Northwestern University

Minisymposium 46
Control and Identification of Distributed Parameter Systems (Part 1 of 2)
(Sponsored by the SIAM Activity Group on Control and Systems Theory)
Chair: J.S. Gibson
University of California, Los Angeles

Minisymposium 47
Moving Ions Through Channels in Biological Membranes
Chair: Robert S. Eisenberg
Rush Presbyterian-St. Lukes Medical Center

Contributed Presentations 23
Asymptotic Analysis and Solid Mechanics

Thursday, July 19/PM

12:30 PM - 2:00 PM
Lunch

2:00 PM - 3:00 PM
The John von Neumann Lecture
Vorticity, Turbulence, and Acoustics in Fluid Flow
Andrew J. Majda
Princeton University

3:15 PM - 3:45 PM
1990 SIAM Annual Business Meeting

3:45 PM - 4:15 PM
Coffee

4:15 PM - 6:30 PM
CONCURRENT SESSIONS

Minisymposium 48
Interior Point Methods for Linear Programming
(Sponsored by the SIAM Activity Group on Optimization)
Chair: Robert M. Freund
Massachusetts Institute of Technology

Minisymposium 49
Integer Programming
Chair: Neal D. Glassman
Air Force Office of Scientific Research

Minisymposium 50
Free Boundary Problems in Fluid Mechanics (Part 2 of 2)
Chair: Michael J. Miksis
Northwestern University

Minisymposium 51
Granular Flow
Chair: Kurt Wiesenfeld
Georgia Institute of Technology

Minisymposium 52
Control and Identification of Distributed Parameter Systems (Part 2 of 2)
(Sponsored by the SIAM Activity Group on Control and Systems Theory)
Chair: J.S. Gibson
University of California, Los Angeles

Minisymposium 53
Extreme-Point Results in Robust Control
Chair: C.V. Hollot
University of Massachusetts, Amherst

Minisymposium 54
Nonlinear Patterns and Dynamical Behavior of Biological Reaction Diffusion Systems
Chair: David J. Wollkind
Washington State University

Contributed Presentations 24
Reaction, Convection, and Diffusion Equations

Contributed Presentations 25
Finite Element Methods

Contributed Presentations 26
Computational Fluid Mechanics

Professional Seminar 3
Writing, Speaking, Communicating to Get Acceptance—Are We Doing A Good Job?
Chair: Donald E. Miller
Saint Mary's College, Notre Dame

Friday, July 20/AM

8:30 AM - 10:00 AM
Invited Presentations 12 and 13

8:30 AM
Interior Point Methods for Linear Programming--State-of-the-Art
David F. Shanno
Rutgers University

9:15 AM
Solving Large-Scale Combinatorial Optimization Problems in Practice
Martin Grötschel
Universitat Augsburg, West Germany

10:00 AM - 10:30 AM
Coffee

10:30 AM - 12:30 PM
CONCURRENT SESSIONS

Minisymposium 55
Computational Integer Programming
Chair: Robert E. Bixby
Rice University

Minisymposium 56
Interior-Point Algorithms for Nonlinear Programming
Chair: Yinyu Ye
University of Iowa

Minisymposium 57
Nonlinear Optimization 2
Chair: Stephen G. Nash
George Mason University

Minisymposium 58
Reliability of Finite Element Computations
Part 2: Control of Idealization and Discretization Errors in Computational Solid Mechanics
Co-Chairs: Joseph E. Flaherty
Rensselaer Polytechnic Institute and Soren Jensen
University of Maryland, Baltimore County

Minisymposium 59
Fortran 90: The Language, Numerical Applications, and Implementation Issues
(Sponsored by ACM-SIGNUM)
Chair: Brian T. Smith
Univeristy of New Mexico

Minisymposium 60
Mathematics in Neurocomputing
Chair: George Cybenko
University of Illinois, Urbana-Champaign

Minisymposium 61
Parallel Computation Networks
Chair: Sandeep Bhatt
California Institute of Technology

Contributed Presentation 27
Free Boundary and Interface Problems

Contributed Presentation 28
Numerical Computational Methods for PDEs

Friday, July 20/PM

12:30 PM - 2:00 PM
Lunch

2:00 PM - 4:00 PM
CONCURRENT SESSIONS

Minisymposium 62
Combinatorial Optimization
Chair: Giovanni Rinaldi
Istituto di Analisi dei Sistemi ed Informatica del CNR, Italy and New York University

Minisymposium 63
Network Optimization
Chair: Robert R. Meyer
University of Wisconsin, Madison

Minisymposium 64
Interior Point Methods in Optimization
Chair: Pravin M. Vaidya
University of Illinois, Urbana-Champaign

Minisymposium 65
The Hydrodynamic Model for Semiconductor Device Simulation
Chair: Carl L. Gardner
Duke University

Minisymposium 66
Scientific Computing on Shared Memory Multiprocessors
Chairs: Ahmed Sameh and George Cybenko
University of Illinois, Urbana-Champaign

Contributed Presentations 29
Partial Differential Equations

Contributed Presentations 30
Computational Methods for Partial Differential Equations

Contributed Presentations 31
Fluid Mechanics: Perturbations, Asymptotics and Stability

Contributed Presentations 32
Neural Computing and Neural Networks

4:30 PM
Meeting Adjourns

MINISYMPOSIA

continued from page 15

Equivalence of Message Scheduling Algorithms for Parallel Communication
Abhiram G. Ranade, University of California, Berkeley

Fault Tolerant Permutation Routing in Meshes
Prabhakar Raghavan, IBM T. J. Watson Research Center

Deterministic Sorting in Nearly Logarithmic Time on the Hypercube and Related Computers
Greg Plaxton, Massachusetts Institute of Technology, and Robert Cypher, IBM Almaden Research Center, San Jose, CA

Friday, July 20/2:00 PM
Minisymposium 62

Combinatorial Optimization

The theme of this session is the solution of large-scale combinatorial optimization problems. The speakers will present techniques that either use the partial linear description of the polyhedra associated with the problems or exploit the special structure of some instances of the problems that can be described by sets of points in a two-dimensional space. Both theoretical and computational results will be presented.

Organizer: Giovanni Rinaldi
Istituto di Analisi dei Sistemi ed Informatica del CNR, Italy, and New York University

On the Node-Weighted Steiner Tree Problem
Sunil Chopra, Northwestern University

Some Techniques for Large-Scale Geometric Combinatorial Optimization Problems
Michael Juenger and Gerhard Reinelt, Institut fuer Mathematik der UniversitaetAugsburg, W. Germany

The Symmetric Traveling Salesman Polytope: A Survey of the Results of the Last Five Years
Denis Naddef, Universite Joseph Fourier and Universite des Sciences Sociales de Grenoble, France

A Polyhedral Cutting-Plane Algorithm for the Capacitated Vehicle Routing Problem
Farid Harche, New York University, and Giovanni Rinaldi, Istituto di Analisi dei Sistemi ed Informatica del CNR, Italy

Friday, July 20/2:00 PM
Minisymposium 63

Network Optimization

Network optimization has historically been one of the principal areas of both reseach and application within mathematical programming. As computer speed and memory have increased dramatically in this decade, so has interest in the development of efficient optimization techniques for large-scale networks involving hundreds of thousands (and, in some cases, millions) of nodes and arcs. The speakers in this minisymposium will describe implemented algorithms capable of solving enormous network optimization problems within a reasonable time-frame.

Organizer: Robert R. Meyer
University of Wisconsin, Madison

A Large-Scale Network Flow Problem in the Dairy Industry
David L. Jensen, IBM T.J. Watson Research Center, and James Pratt, Cornell University

Solving Multicommodity Network Flow Problems on the Connection Machine
Stavros Zenios, University of Pennsylvania

The Solution of Large-Scale Networks by Successive Over-Relaxation
Renato De Leone, University of Wisconsin, Madison

A Tri-Partite Method for Multicommodity Flows
Gary L. Schultz, and Robert R. Meyer, University of Wisconsin, Madison

Friday, July 20/2:00 PM
Minisymposium 64

Interior-Point Methods in Optimization

During the past few years, there have been rapid developments in interior-point methods in optimization. The speakers in this minisymposium will review some of these developments and describe their use in constructing algorithms for problems such as integer programming and robust control.

Organizer: Pravin M. Vaidya
University of Illinois, Urbana-Champaign

Interior-Point Approach to NP-complete Problems
Narendra K. Karmarkar, AT&T Bell Laboratories, Murray, NJ

A Generalized Quadratic Form Potential for an Interior- Point Algorithm for Integer Programming
M.G.C. Resende, AT&T Bell Laboratories, Murray Hill, NJ

Robust Control System Models and Their Solution by the Karmarkar Algorithm
Narendra K. Karmarkar and *R.G. Ramakrishnan*, AT&T Bell Laboratories, Murray Hill, NJ

Friday, July 20/2:00 PM
Minisymposium 65

The Hydrodynamic Model for Semiconductor Device Simulation

The hydrodynamic model plays an important role in simulating the behavior of charge carriers in submicron semiconductor devices, since it exhibits hot carrier effects missing in the standard drift-diffusion model. The hydrodynamic equations are just the Euler equations of gas dynamics for a gas of charge particles in an electric field, with the addition of a heat conduction term. Thus the hydrodynamic model PDEs have hyperbolic, parabolic, and elliptic modes.

The speakers in this minisymposium will present recent theoretical and computational work on submicron devices, including applications of state-of-the-art hyperbolic methods, physical models for simulations, boundary conditions for 2D simulations, and simulations of a steady-state electron shock wave.

Organizer: Carl L. Gardner, Duke University

Physical Models for Hydrodynamic Device Simulations
William Coughran, AT&T Bell Laboratories, and Wolfgang Fichtner, ETH Zurich, Switzerland

Higher-Order Upwinding Methods for the Hydrodynamic Device Model
Emad Fatemi, University of California, Los Angeles, Joseph Jerome, Northwestern University, and Stanley Osher, University of California, Los Angeles

Boundary Conditions for 2D Hydrodynamic Device Simulations
Farouk Odeh, IBM T.J. Watson Research Center, Yorktown Heights, NY and Enrique Thomann, Oregon State University

Numerical Simulation of a Steady-State Electron Shock Wave in a Submicron Semiconductor Device
To be presented by organizer

Friday, July 20/2:00 PM
Minisymposium 66

Scientific Computing on Shared Memory Multiprocessors

With the advent of vector and parallel computers, designing numerical algorithms that take maximum advantage of the architectural features of such machines becomes of vital importance in realizing high performance in many applications. The speakers in this minisymposium will address this issue with concentration on shared-memory multiprocessors in which some possess a hierarchical organization of the memory system.

Organizers: Ahmed Sameh and George Cybenko
University of Illinois, Urbana-Champaign

Towards the Teraflop: Trends in Parallel Supercomputer Architecture 1990-1993
Robert Schreiber, RIACS and *Horst D. Simon*, NASA Ames Research Center

Sparse Matrix Computations on the Cray Multiprocessors
Roger Grimes and *John Lewis*, Boeing Computer Services

Vectorization and Parallelization of Transport Monte-Carlo Codes
Ken Miura, Fujitsu America, Inc., San Jose, CA

Relaxation-based Circuit Simulation on the Cedar System
Kyle Gallivan, G. Hung, Resve Saleh and Y. Wen, University of Illinois, Urbana

CONTRIBUTED PRESENTATIONS

Monday, July 16/10:30 AM
Contributed Presentations 1
Matrix Eigenvalue Problem

Matrix Equations and Eigenvalue Assignment Problem
Biswa Nath Datta, Northern Illinois University

Numerical Solution of the Eigenvalue Problem for Hermitian Toeplitz-Plus-Hankel Matrices
William F. Trench, Trinity University

Random Eigenvalue Problems and Structural Dynamics
H. Benaroya, Rutgers University

Iterative Convergence Rates for Perturbed Domains of Eigenvalues
Xiezhang Li, Kent State University

Parallel Connection in Infinite Network and Norm Convergence
Mohammad R. Khadivi, Jackson State University

Leverrier's Algorithm for Orthogonal Polynomial Bases
Stephen Barnett, University of Bradford, United Kingdom

A Tree of Generalizations of the Ordinary Singular Value Decomposition
Bart L. R. De Moor, Katholieke Universiteit Leuven, Belgium

Direct Use of Kuhn-Tucker Theory in the Computation of Eigenvalues
Kevin Y. K. Ng and *Man Lam Wong*, City Polytechnic of Hong Kong, Hong Kong

Asymptotic Behavior of Jacobi Methods
Vjeran Hari, University of Zagreb, Yugoslavia

Monday, July 16/10:30 AM
Contributed Presentations 2
Discrete Mathematics and Computer Science

A Diophantine Description of Graphs and Networks
Bruce Jeffrey Layman, Westinghouse Hanford Company, Richland, WA

Improving the Reliability of Communication Networks
Weigeng Shi and Brigitte Servatius, Worcester Polytechnic Institute

Uncovering Generalized-Network Structure in Matrices
Collette R. Coullard, Purdue University, West Lafayette; *John G. del Greco*, Loyola University of Chicago; and Donald K. Wagner, Purdue University, West Lafayette

A Graph Representation of Software Procedure Interfaces
Narayan C. Debnath, Winona State University

Scientific Visualization in Discrete Domains
Gregory E. Shannon, Indiana University, Bloomington

On Generalized Partitions of an N-set
Zhu-Xin Hu, University of Illinois, Urbana

Deciding Identities: Nonassociative Algebraic Computation107
David Pokrass Jacobs, Clemson University

Some Identities Relating to Partitions and Repetitions of Parts108
Muhammed Serdar Kirdar, University of Technology, Iraq

Monday, July 16/10:30 AM
Contributed Presentations 3
Communication Systems, Estimation and Learning

Minimum Bound of Auto and Cross Correlations of Sequences
Shuo-Yen Robert Li, Bellcore, Morristown, NJ and *Ning Zhang*, Pacific Bell, San Ramon, CA

Musical Aperiodic Binary Sequences
David Canright, Naval Postgraduate School

Over Sampling as an Alternative to Error Correction Codes in Digital Communication Systems
F. Marvasti and *Chuande Liu*, Illinois Institute of Technology

An Algorithm for Polynomial Based Non-Recursive Digital Filters
Richard W. Reichhardt, Northeastern Illinois University

Error Analysis of a Pairwise Summation Algorithm to Compute the Sample Variance
Jesse L. Barlow, Pennsylvania State University

LIRMRA: A Software for Linear Regression Models and Regression Analysis
Guofa Wu, Purdue University, West Lafayette and Zhe Xu, Central Iron and Steel Research Institute, People's Republic of China

A Stochastic Intelligence Learning Model for Adaptive Expert Systems
Pi-Sheng Deng, Sangamon State University

A Memory-Based Inductive Inference Approach to Knowledge Acquisition
Pi-Sheng Deng, Sangamon State University

Monday, July 16/3:15 PM
Contributed Presentations 4
Computational Methods for Ordinary Differential Equations and Integral Equations

Software Improvements for Multibody System Analysis
Joseph F. McGrath, Rajiv Rampalli and Michael Steigerwald, KMS Fusion, Ann Arbor, MI

Parallel and Interval Automatic Differentiation for Initial Value Problems
J. Daniel Layne, Martin Marietta Astronautics Group, Denver, CO

Concurrent DASSL: Solving Systems of Differential-Algebraic Equations on Multicomputers
Anthony Skjellum, California Institute of Technology

Krylov Methods in the Solution of Nonlinear Initial Value Problems
Steven L. Lee, University of Illinois, Urbana

Mathematical Software for Sturm-Liouville Problems
Steven Pruess, Colorado School of Mines

Recent Parallelization and Vectorization of Homotopy Algorithm for Symmetric Eigenvalue Problems
Hong Zhang, Clemson University

Unconventional Methods for Singular Integral Equations
Ezio Venturino, University of Iowa

Nonunique Solutions of a Second Order Boundary Value Problem
H. M. Atassi and M. Sen, University of Notre Dame

A Solution Corrector of Computation History in Differential Equation Problems
Yi-ling F. Chiang, The William Paterson College of New Jersey and Jih-fu Lai, New Jersey Institute of Technology

Monday, July 16/3:15 PM
Contributed Presentations 5
Algebraic Equation Solvers and Preconditioners

Branch Switching for Continuation for Algebraic Systems
Michael E. Henderson, IBM T. J. Watson Research Center

Preconditioned Iterative Methods for Homotopy Curve Tracking
Colin deSa, Kashmira M. Irani, *Calvin J. Ribbens* and Layne T. Watson, Virginia Polytechnic Institute and State University and Homer F. Walker, Utah State University

Design and Analysis of Toeplitz Preconditioners
C.-C. Jay Kuo, and Takang Ku, University of Southern California

Fast Preconditioners for Toeplitz Systems
Mathew Koshy, University of California, San Francisco

Stability of Banded Toeplitz Solvers
Elliot Linzer, Columbia University

Rapid Transpose Methods on Massively Parallel SIMD Computers
Chris Kuszmaul, MasPar Computer Corporation, Sunnyvale, CA

Attractive Basins for Bairstow's Method
David J. Uherka, University of North Dakota

New Preconditioners Based on Low-Rank Elimination
Asanobu Yamasaki, Murata Machinery Ltd., Japan

Monday, July 16/3:15 PM
Contributed Presentations 6
Stochastic Problems

The Pricing of Call Options When the Investor is Totally Risk Averse
Emmanuel Barron and Robert Jensen, Loyola University of Chicago

New Developments in Almost Sure Sample Stability of Nonlinear Stochastic Dynamic Systems
Zhi Yu Zhang, Polytechnic University, Brooklyn and Frank Kozin, Polytechnic University, Farmingdale

Nonlinear Thermodynamics and Modeling of Ergodic Hamiltonian Systems by Marcovian Processes
Victor Berdichevsky, Georgia Institute of Technology

A Modification of Dorfman's Group Testing Procedure for Use on a Markov Chain
Kenneth E. Schwartz, University of Toledo

Asymptotic Bounds on the Reliability of an m-Consecutive-k-out-of-n Reliability System
Anant P. Godbole, Michigan Technological University

Parallel Optimization of Monte Carlo Methods
Gary W. Howell, Pavlos Kairis, and Kamal Rekab, Florida Institute of Technology

Tuesday, July 17/10:30 AM
Contributed Presentations 7
Wave Propagation and Scattering

Energy Leakage and Reflection in Underwater Upslope Acoustic Wave Propagation
William L. Kath, Northwestern University; Antonmaria A. Minzoni, Northwestern University and University of Mexico, Mexico; Gregory A. Kriegsmann and Edward L. Reiss, Northwestern University

Dynamics of Coupled Solitons in Nonlinear Optical Fibers
Tetsuji Ueda and William L. Kath, Northwestern University

Absorbing Boundary Conditions for the Wave Equation; Low Frequency Corrections
T. M. Hagstrom, State University of New York, Stony Brook; S. I. Hariharan, University of Akron; and R. C. MacCamy, Carnegie-Mellon University

An Exact Solution of the (Helmholtz) Weyl Composition Equation
Louis Fishman, Colorado School of Mines

Asymptotic Solution of Weakly Nonlinear Wave Equations
Chirakkal V. Easwaran and Sunday C. Chikwendu, State University of New York, New Paltz

Solitary Wave Solutions of Nonlinear PDEs Using MACSYMA
Willy Hereman, Colorado School of Mines and Masanori Takaoka, Kyoto University, Japan

Multiple Scattering of Elastic Waves by a Distribution of Identical Spheres
D. D. Phanord, University of Alabama, Huntsville

Tuesday, July 17/10:30 AM
Contributed Presentations 8

Transform and Complex Function Methods

Numerical Inversion of Two-Dimensional Laplace Transform Using Double Orthogonal Series of (Generalized) Laguerre Polynomials
M. Vinayagamoorthy, Marquette University

Fourier Transforms of the Class of Functions $\{e^{i\omega x^n}\}$
Henry C. Foehl, Philadelphia College of Pharmacy and Science

Absolute Invariants of Images Under Translation
Robert D. Brandt and Feng Lin, Wayne State University

The Hankel Transform of Second Kind
Mihr J. Shah, Kent State University

T-Polynomials on Regular Polygons in the Complex Plane
Henry C. Thacher and David J. Hickman, Santa Cruz, CA

Numerical Conformal Mapping Methods for Exterior Regions
Thomas K. DeLillo and Alan R. Elcrat, Wichita State University

The Sum of Like Powers of the Zeros of the Riemann Zeta Function—High Precision Values
T. Y. Li, State University College of New York, Plattsburgh

Tuesday, July 17/3:15 PM
Contributed Presentations 9

Wavelets

Stability in Gabor Frame Reconstructions
David F. Walnut, Yale University

Bounds for the Ballian-Low Theorem
Christopher E. Heil, The MITRE Corporation, McLean, VA

Non-Interacting Wavelets for Adaptive Numerical Algorithms
Bradley K. Alpert, Yale University

The Discrete Frazier-Jawerth Transform
Daniel R. Fuhrmann and Arun Kumar, Washington University

Identification of Event Scales from Global Wavelet Statistics
L. Mahrt, Oregon State University

Tuesday, July 17/3:15 PM
Contributed Presentations 10

Control of Distributed Parameter Systems

Semicontinuous Viscosity Solutions for Hamilton-Jacobi Equations
Emmanuel Barron and Robert Jensen, Loyola University of Chicago

Viscosity Solutions of Optimal Control Problems on Attainable Sets
Leszek Saturnin Zaremba, University of Michigan, Ann Arbor

Optimal Control of Burger's Equation Using Quasi-Newton Methods
Edward J. Dean, Roland Glowinski and Pierre Gubernatis, University of Houston, University Park

Approximation of Optimal Boundary Controls for the Navier-Stokes Equations
T. P. Svobodny, Wright State University, M. D. Gunzburger, Virginia Polytechnic Institute and State University and L. S. Hou, Universite Laval, Canada

Thermal Boundary Control of a One-dimensional Linear Thermoelastic Rod
Scott W. Hansen, Virginia Polytechnic Institute and State University

Boundary Control of the Korteweg-de Vries-Burges Equation
Bingyu Zhang, University of Wisconsin, Madison

An Optimization Problem in Electromagnetic Wave Propagation
Robert Ochs, University of Toledo and Curtis Vogel, Montana State University

Control and Observation for Hereditary Systems of Neutral Type
Boris S. Mordukhovich, Wayne State University

Stabilizability of Large-scale Nonlinear Infinite Delay Systems
A. S. C. Sinha, Purdue University, Indianapolis

An Abstract Theory for Initial Boundary-Value Problems
Cesar Palencia, Universidad de Valladolid, Spain

Wednesday, July 18/11:30 AM
Contributed Presentations 11

Inverse Problems and Parameter Estimation

Identification of Parameters in a Weakly-Singular Kernel Arising in Viscoelasticity
Robert K. Powers and Dennis W. Brewer, University of Arkansas, Fayetteville

Solvability Conditions for Overposed Inverse Problems in Compressible Flows
Prabir Daripa, Texas A&M University, College Station

Bayesian Analysis and Regularization in Parameter Identification
Ben G. Fitzpatrick, University of Tennessee, Knoxville

A Multigrid Algorithm for Direct Algebraic Reconstruction of Medical Tomographic Images
William P. Tribbey, Computer Tech & Imaging, Knoxville, TN

Wednesday, July 18/11:30 AM
Contributed Presentations 12

Mathematical Modeling

Application of the Least Squares Approximation to the Design of Superconducting Toroidal Magnet Systems
Joseph W. Johnson, Astronautics Technology Center, Madison, WI

On the Mathematical Modelling of a Solid State Laser System
Thomas G. Wangler and John J. Swetits, Old Dominion University

Theory and Experiments for a Stress Controlled Rheometer
Leela Rakesh and James Angelos, Central Michigan University

A Theoretical Model for Voids Distribution in Polymer Composites
Aladin M. Boriek, Rice University; Mahmoud M. El-Alem, Alexandria University, Egypt; John E. Akin and Constantine D. Armeniades, Rice University

Wednesday, July 18/11:30 AM
Contributed Presentations 13

Matrix Computation

Interactive Sparse Matrix Computations in CLAM
David E. Foulser, Scientific Computing Associates, Inc., New Haven, CT and Yale University and William D. Gropp, Argonne National Laboratory

s-step Bi-orthogonal Lanczos Method
Sunkyung Kim and Anthony T. Chronopoulos, University of Minnesota, Minneapolis

A Tricyclic Tridiagonal Equation Solver
Stewart A. Levin, Mobil Research and Development. Dallas, TX and David S. Dodson, Convex Computer Corporation, Dallas, TX

Foundation Vertices in the Parallel Solution of Sparse Nonlinear Least-Squares Problems
Paul E. Plassmann, Argonne National Laboratory

Sparse Matrix Methods in MSC/NASTRAN
Shawn Shamsian and Louis Komzsik, The MacNeal Schwendler Corporation, Los Angeles, CA

Wednesday, July 18/11:30 AM
Contributed Presentations 14

Computer Arithmetic

Supercomputers Need Super Arithmetic
D. W. Lozier, National Institute of Standards and Technology and *Peter R. Turner*, US Naval Academy

Precise Computation Using Range Arithmetic, via C++
Oliver Aberth and Mark Schaefer, Texas A&M University, College Station

Implementation Experience for Log, Exp, and Power on SIMD Machines
Dennis Weeks, MasPar Computer Corp., Sunnyvale, CA

Wednesday, July 18/11:30 AM
Contributed Presentations 15

Robotics and Control Applications

A Parallel VLSI Architecture for Robot Motion Computations
Joseph R. Cavallaro, Rice University; Anne C. Elster, Cornell University and *Ian D. Walker*, Rice University

Optimization Methods for Robot Trajectory Planning
Elke Haaren, Universitat Trier, Federal Republic of Germany and University of Iowa; Rainer Hettich, Universitat Trier, Federal Republic of Germany; and *Kenneth O. Kortanek*, University of Iowa

A Kalman Filter Approach to Computer Antenna Pointing
Brian Bourgeois, University of Houston, Downtown and Jerry Suddath, NASA Johnson Space Center

Applying Control Theory in the Hydrocarbon Industry: What Is Being Done?
Gary L. Funk and Edward Gildone, Instrument Technology International, Houston, TX

Wednesday, July 18/11:30 AM
Contributed Presentations 16

Robust Control

Robust Control of Constrained Discrete Time Linear Systems
Mario Sznaier, California Institute of Technology

Reliable Controller Design Against Arbitrary Loop Failures
Belinda Y. Harris and L. H. Keel, Tennessee State University

Some Adaptive Optimal Filters for Linear, Discrete-Time, State-Space Models
Richard H. Burkhart, Boeing Computer Services, Seattle, WA

A New Approach to Equality State Constraints in Optimal Control
Gianna Stefani, Universita de Napoli, Italy and *PierLuigi Zezza*, Universita de Firenze, Italy

CONTRIBUTED PRESENTATIONS

Wednesday, July 18/11:30 AM
Contributed Presentations 17
Mathematics Education

Teaching Applied Mathematics Early
Gilbert Strang, Massachusetts Institute of Technology

Computer Algebra Systems and Their Impact on Mathematics Education
David C. Arney and Michael C. Talbott, United States Military Academy

Teaching a First Course in Fourier Analysis
David W. Kammler, Southern Illinois University

Using the Supercomputer to Enhance Undergraduate Education
Kris Stewart, San Diego State University

Mathematics for Biology Majors
Torcom Chorbajian, University of Northern Colorado

Numerical Systems Design
Beatriz Regina Tavares Franciosi and *Dalcidio Moraes Claudio*, Instituto de Informatica, Brazil

Wednesday, July 18/11:30 AM
Contributed Presentations 18
Interior Point Methods

On Combined Phase1-Phase2 Projective Methods for Linear Programming
Michael J. Todd and *Yufei Wang*, Cornell University

Implementation of a Primal-Dual Interior Point Method
Sanjay Mehrotra, Northwestern University

On Finding a Vertex Solution Using Interior Point Methods
Sanjay Mehrotra, Northwestern University

Interior Point Methods, Nonlinear and Parallel Optimization
Roman Polyak, IBM T. J. Watson Research Center

Wednesday, July 18/11:30 AM
Contributed Presentations 19
Nonlinear Programming

Minimizing a Non-convex Quadratic Subject to Two Quadratic Constraints in Two Dimensions
J. E. Dennis, Jr. and *Karen A. Williamson*, Rice University

A Superlinearly Convergent Reduced Hessian Updating Method
Chaya Gurwitz, Brooklyn College of CUNY

Nonsmooth Optimization in Structural Design
Aharon Ben-Tal, Technion-Israel Institute of Technology, Israel

Solving Box-Constrained Quadratic Programming on Shared Memory Multiprocessor
F. Perla, Universita di Napoli, Italy and G. Toraldo, Universita della Basilicata, Italy

Wednesday, July 18/3:15 PM
Contributed Presentations 20
Linear Programming

A Non-Interior Point Approach to Linear Programming
Ma Chen and *Cerry M. Klein*, University of Missouri, Columbia

A Hybrid Polynomial Algorithm for Linear Programming
Siming Huang, University of Iowa

Strong Linear Programming Relaxations for the Orienteering Problem
Adrienne Leifer, Stanford University and *Moshe B. Rosenwein*, AT&T Bell Laboratories, Holmdel, NJ

Isometric Plane Algorithm (IPA) for Linear Programming (LP)
Xu Shurong, Zhongshan University, and Nie Yiyong, ShengYang Institute of Computing Technology, Academia Sinica, People's Republic of China

Wednesday, July 18/3:15 PM
Contributed Presentations 21
Optimization Methods

On Finding the Global Minima of a Function of One Variable
L. C. W. Dixon, Numerical Optimisation Centre, Hatfield Polytechnic, United Kingdom

Parallel Simulated Annealing for Finding Minima of Functions on a Hypercube Multiprocessor
Kyung-Geun Lee and Soo-Young Lee, Cornell University

Large Scale Nonlinear Programming Using Interior Point and Successive Linear Programming Methods
Kumaraswamy Ponnambalam, University of Waterloo, Canada

A Primal-Relaxed Dual Global Optimization Approach
Christodoulos A. Floudas and Vishy Visweswaran, Princeton University

A Projected Gradient Method
P. L. De Angelis, Universita di Napoli, Italy and G. Toraldo, Universita della Basilicata, Italy

Convergence of Iterative Methods for Convex Linear Complementarity Problems
Alvaro Rodolfo De Pierro, State University of Campinas, Brazil

A Parallel Nonlinear Programming Method for Solving Optimal Control Problems
Joao Lauro Dorneles Faco, Universite de Paris-Sud, France

Wednesday, July 18/3:15 PM
Contributed Presentations 22
Mathematical Models in Population Dynamics and Physiology

Juvenile Dispersal, Limited Breeding Sites, and Metapopulation Dynamics in a Class of BIDE Models
Gregory J. Davis and Robert W. Howe, University of Wisconsin, Green Bay

Simulation of Epidemics for Diseases Which May Cause Immunity in Age Stuctured Populations
Fabio A. Milner, IIa Universita de Roma, Italy

A Nonlinear Poroelastic Model of Flow and Deformation in the Pulmonary Interstitium
Jeffrey R. Sachs, James B. Grotberg and Matthew R. Glucksberg, Northwestern University

A Three Dimensional, Hexagonal Lattice Theory of Muscular Mechanics
Theodore S. Feit, Burbank Imaging, Burbank, CA

Geometric Analysis of the Carpal Complex
Deborah P. Levinson, University of South Florida

Threshold Behavior and Propagation for a Differential-Difference System
Wei-zheng Gao, State University of New York, Buffalo

Canonical Pharmacokinetic Compartment Modeling
Patrick D. McCray, Searle Research and Development, Skokie, IL

Thursday, July 19/10:30 AM
Contributed Presentations 23
Asymptotic Analysis and Solid Mechanics

Homogenization by Limit Process Expansions
Julian D. Cole, Rensselaer Polytechnic Institute

The Global Structure of Buckled States for Compressible Columns
Stuart S. Antman, University of Maryland, College Park and *John F. Pierce*, U. S. Naval Academy

The Buckling of Elastic Spherical Shells
Frank E. Baginski, George Washington University

On a Nonlinear Volterra Integral Equation Arising in a Dynamic Elastic Crack Model
Jay R. Walton, Texas A&M University, College Station

Predictive Formalism for Scatter in Brittle Fracture
Alexander Chudnovsky and *Boris Kunin*, University of Illinois, Chicago

The Computer-aided Analytic Solution of Stress Fields of Screw Dislocations in Multilaminated Elastic Materials — In "Reduce 3" Environment —
Yao-huan Xu, Grove City College

Thursday, July 19/4:15 PM
Contributed Presentations 24
Reaction, Convection, and Diffusion Equations

Nonlinear Hydrodynamic Stability and Spinning Deflagration of Liquid Propellants
John K. Bechtold and Stephen B. Margolis, Sandia National Laboratories

Shock-Layer Bounds for a Singularly Perturbed Equation
Jeffrey S. Scroggs, ICASE, NASA Langley Research Center

Ignition in the Boundary Layer Behind a Shock Propagating into a Reactive Gas
D. Glenn Lasseigne and Thomas L. Jackson, Old Dominion University

Structural Stability in Strongly Monotone Dynamical Processes
Peter Takac, Vanderbilt University

Kernel Based Methods for Nonlinear Parabolic Equations
James F. Epperson, University of Alabama, Huntsville

Software for a Diffusion-Reaction Problem
Granville Sewell, University of Texas, El Paso and H. G. McMath, Exxon Chemical Corporation, Baytown, TX

Nonlinear Diffusion of Impurities in Semiconductors
Donald Schwendeman, Rensselaer Polytechnic Institute

A Symmetrization Procedure for Convection-Diffusion Problems Solved by Incomplete Orthogonalization
C.-C. Jay Kuo, and Hwang-Cheng Wang, University of Southern California

Travelling Wave Solutions of Some Reaction-Diffusion Equations in Cylindrical Domains
Jose M. Vega, Universidad Politecnica de Madrid, Spain

Nonlinear Stability of Pulsating Flames
Carlos Alvarez-Pereira and Jose M. Vega, Universidad Politecnica de Madrid, Spain

The Steady States of Some Reaction-Diffusion Equations in Slender Cylindrical Domains
Ignacio E. Parra and Jose M. Vega, Universidad Politecnica de Madrid, Spain

Thursday, July 19/4:15 PM
Contributed Presentations 25
Finite Element Methods

Boundary Element Methods in Three Dimensions: An Empirical Study
Kendall E. Atkinson, University of Iowa

A 3-D h-Adaptive Finite Element Scheme
Joseph H. Schmidt and Graham F. Carey, University of Texas, Austin

Sum-Accelerated Pseudospectral Methods: The Euler-Accelerated Sinc Algorithm
John P. Boyd, University of Michigan, Ann Arbor

Polar-spline Approximation
Cun-Quan Zhang, West Virginia University

Analysis of a Finite Element Method for the Drift-Diffusion Model of the Semiconductor Device Equations
Bernardo Cockburn and *Ioana Triandaf*, University of Minnesota, Minneapolis

An H_0^m Interpolation Result
Soren Jensen, University of Maryland, Baltimore

Hybridization of Finite-element and Finite-difference Methods for Evolutionary PDEs
Gholam-Ali Zakeri, University of Wisconsin, La Crosse

A Least-squares Method for Stokes Problem Acceleration-Pressure Formulation
Ching Lung Chang, Cleveland State University

Numerical Schemes for the Acoustic Wave Equation in Heterogeneous Media
Alain Sei and F. Collino, Institut Francais du Petrole, France

A-Posteriori Error Estimate for the Acoustic Wave Equation in Heterogeneous Media
Alain Sei, L. Jannaud and A. Bamberger, Institut Francais du Petrole, France

Thursday, July 19/4:15 PM
Contributed Presentations 26
Computational Fluid Mechanics

Parallel Domain Decomposition Algorithms in CFD
David Keyes, Yale University

A Second-Order Accurate Scheme for the Incompressible Navier-Stokes Equations
John C. Strikwerda, University of Wisconsin, Madison

Multidomain Adaptive Pseudospectral Methods for Compressible Viscous
Problems Patrick Hanley, University of Connecticut, Storrs

Spectral Element Solution of Fluid Flow Problems
Mark Schumack, *William W. Schultz* and John P. Boyd, University of Michigan, Ann Arbor

Particle-Mesh Methods for the Evaluation of Fields Induced by Vortex Sheets
Anita Mayo, IBM T. J. Watson Research Center

Existence, Uniqueness, and Computation of Solutions of the Double-Piston Problem for Viscous, Isentropic Flow
Roger E. Zarnowski, University of Oklahoma, Norman

Numerical and Asymptotic Solutions for the Peristaltic Transport of a Heat-Conducting Fluid
Dalin Tang, Worcester Polytechnic Institute

Thermal Simulation of Pipeline Flow
Philip Thomas Keenan, University of Chicago

Friday, July 20/10:30 AM
Contributed Presentations 27
Free Boundary and Interface Problems

Interface Tracking
Stephen F. Davis, Naval Surface Warfare Center

A Front-tracking Method for Incompressible Flows
G. Tryggvason and S. O. Unverdi, University of Michigan, Ann Arbor

Numerical Solution of a Moving Boundary Problem in Viscoplastic Flow
Fritz Keinert, Iowa State University

The Simulation of Shock Accelerated Fluid Interfaces
John W. Grove, State University of New York, Stony Brook

Interfacial Wave Theory of Solidification – Pattern Formation and Selection Condition of Solution
Jian-Jun Xu, McGill University, Canada

Solidification of Half-cells in Narrow Channels
William T. Grayhack, Iowa State University

Friday, July 20/10:30 AM
Contributed Presentations 28
Numerical and Computational Methods for PDEs

A Multidomain Pseudospectral Method for Elastic Wave Calculations in Layered Media
Jeffrey M. Augenbaum, University of Connecticut, Storrs

Numerical Analysis of a 1-Dimensional Immersed-Boundary Method
Richard P. Beyer, Jr. and Randall J. LeVeque, University of Washington

A Numerical Method for Detecting Singular Minimizers of Multidimensional Problems in Nonlinear Elasticity
Pablo V. Negron-Marrero, University of Puerto Rico

Incomplete Block Factorization on Multiprocessor/Vector Computers
Douglas E. Salane, City University of New York, John Jay College

Preconditioned Krylov Methods in the Method of Lines Setting
George D. Byrne, Exxon Research and Engineering Company, Annandale, NY

Parallel ELLPACK for Shared-Memory Machines Calvin J. Ribbens, Virginia
Polytechnic Institute and State University

Total Flux for Mixed Boundary Value Problems for Diffusion Systems. Time-dependent Boundary Conditions.
Davis K. Cope, North Dakota State University

Simplicial Methods for Manifolds and Applications Geovan Tavares, Catholic University, and Instituto de Matematica
Pura e Aplicada, Brazil

Friday, July 20/2:00 PM
Contributed Presentations 29
Partial Differential Equations

Half-range Expansions and the Solution to the Milne Problem for Sturm-Liouville Operators
Patrick S. Hagan, Los Alamos National Laboratory

On Degenerate Hyperbolic Conservation Laws
E. Bruce Pitman, State University of New York, Buffalo

A Solution to a Neumann Problem
Daniel Dicker, State University of New York, Stony Brook

An Integral Transform Method for Solving the Equations of Charge Transport in an Electrolytic Solution
Daniel R. Baker, General Motors Research Laboratories, Warren, MI

Perturbation Theories Using Normal Forms
Raghu R. Gompa, Indiana University, Kokomo

Discontinuous Inverse Sturm-Liouville Problems with Symmetric Potentials
Mei Kobayashi, IBM Research and Tokyo Research Laboratory, Japan

Friday, July 20/2:00 PM
Contributed Presentations 30
Computational Methods for PDEs

Fractal Concepts Applied to Numerical Grid Generation
Stephen Bova and Graham F. Carey, University of Texas, Austin

A New Method for One Dimensional Adaptive Grid Generations
Prabir Daripa, Texas A&M University, College Station

Automatic Domain Partitioning in Three Dimensions
Stephen A. Vavasis, Cornell University

An Adaptive Numerical Integration Algorithm for Hyper-Spherical Regions
Alan Genz, Washington State University

Computing Eigenvalues/Eigenfunctions by Using Implicit Decomposition Method
Jenn-Ching Luo, Columbia University

MESA:A3-D Eulerian Hydrocode for Penetration Mechanics Studies
Kathleen Holian, David A. Mandell, Stewart J. Mosso, and *Randolph Henninger*, Los Alamos National Laboratory

Parallel A_0-Stable Method for Second Order Hyperbolic Equations
David A. Voss and A. Q. M. Khaliq, Western Illinois University

Galerkin Methods for a Singularly Perturbed Hyberbolic Problem with Nonlocal Nonlinearity
Benjamin F. Esham, State University of New York, College at Geneseo and Elizabeth G. Yanik, Emporia State University

Fully Discrete Approximation of Parabolic Boundary Value Problems with Nonsmooth Boundary Data
Gilbert K. Choudury, University of Cincinnati

The Numerical Solution of a Nonlinear Diffusion Problem
N. S. Asaithambi and *Rajat S. Chaudhuri*, Mississippi State University

Friday, July 20/2:00 PM
Contributed Presentations 31
Fluid Mechanics: Perturbation, Asymptotics and Stability

Moderate Speed Low Aspect-ratio Flat Ship Theory
Susan L. Cole, Rensselaer Polytechnic Institute

Thermocapillary Convection in Thin Liquid Films
A. Oron, Los Alamos National Laboratory and P. Rosenau, Technion-Israel Institute of Technology, Israel and Los Alamos National Laboratory

Analytic Solutions to Semi-Infinite End Condition Problems in Fluid Dynamics and Elasticity Demonstrating the Existence of Waves with Positive and Negative Phase Velocities
Robert T. Folk, Lehigh University and *Irwin S. Goldberg*, St. Mary's University

Application of Quasilinearization to Viscoelastic Fluid Flow Through a Porous Annulus
R. K. Bhatnagar, University of Pittsburgh, Greensburg; Daniel Okunbor, University of Illinois, Urbana and H. W. Vayo, University of Toledo

Surface Waves on Thin Liquid Films at High Flow Rates
L. Michael Santi, Christian Brothers College

CONTRIBUTED PRESENTATIONS

Symmetry and Semi-Symmetry Reduction of Reynolds Equation
Martha L. Abell, Georgia Southern College and William F. Ames, Georgia Institute of Technology

Stability of Flows of Viscoelastic Fluids With a Differential Constitutive Equation
Colette Guillope, Universite Paris-Sud and C.N.R.S., France

A Stability Problem in Anisotropic MHD
Michele Maiellaro, University of Bari, Italy

Friday, July 20/2:00 PM
Contributed Presentations 32

Neural Computing and Neural Networks

A Nonlinear Pattern Classification Device
V. W. Noonburg and Chris Armen, University of Hartford

An Analysis of the Capacity of Associative Memory Neural Nets
Laurene V. Fausett, Florida Institute of Technology

Neural Network Training Via Interior Point Methods
Robert H. Leary, San Diego Supercomputer Center

Strictly Local Backpropagation
Donald W. Fausett, Florida Institute of Technology

Recurrent Associative Memories and Linear Programming
James Moore, University of Southern California

On Maximum Picking Neural Networks
Bruce W. Suter, Air Force Institute of Technology

Tolerance Vision Model of Neural Network Computer
Ming Zhang, Ruli Wang, and Yiming Gong, Shanghai Institute of Technical Physics, The Chinese Academy of Sciences, People's Republic of China

POSTER SESSION

Wednesday, July 18/11:30 AM

Direct Approximation Techniques for Solving Feed Forward Networks: Linear and Nonlinear Techniques
James K. Peterson, Kentwood, MI

Molecular Dynamics Simulations of Microscopic Structures in Fluids
Jeffrey H. Dunn, S. G. Lambrakos and P. G. Moore, Naval Research Laboratory

Modelling Complex Intramolecular Processes on an Intermolecular Time-scale using Constrained Molecular Dynamics
S. G. Lambrakos and Jeffrey H. Dunn, Naval Research Laboratory

Molecular Dynamics Simulations at Constant Pressure
P. G. Moore, S. G. Lambrakos and Jeffrey H. Dunn, Naval Research Laboratory

Roots of a Polynomial Via a Parallel Newton's Method
D. A. Linwood, California State University, Fresno

Flow Inside a Triangle with Moving Boundaries
Calvin J. Ribbens and Layne T. Watson, Virginia Polytechnic Institute and State University, and C.-Y. Wang, Michigan State University

Bound Smoothing Under Chirality Constraints
T. F. Havel, University of Michigan, Ann Arbor and W. M. Dress, University Bielefeld, West Germany

Finite Amplitude Shear Waves in a Channel with Compliant Boundaries
James M. Rotenberry, Southern Methodist University

Fractal Basin Boundaries in a Chaotic Adaptive Controller
Faramarz Mossayebi and Tom T. Hartley, University of Akron

Superconvergent Grids for Two-Point Boundary Value Problems
William C. Connett, Wojciech L. Golik, and Alan L. Schwartz, University of Missouri, St. Louis

Detection and Analysis of Concentrated Shear Zones in Turbulent Flows Using Wavelet Transform Methods
N. K. K. Gamage, Oregon State University

EXHIBITORS

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Plenum Publishing Corporation

Plenum Publishers announces a new journal: *Computational Mathematics and Modeling.* Articles for the journal will be carefully selected from the *Transactions of the Faculty of Computational Mathematics and Cybernetics of Moscow State University.*

New books include the first title in the Nonlinear Physics Series: *Current Algebras and Groups* by J. Mickelsson; the Second Volume of *Structual Optimization* edited by Prager & Save; and the Second Edition of *Mathematical Methods in kinetic theory* by Cercignani.

Springer-Verlag New York, Inc.

Visit Springer-Verlag's display for excellent, high-quality research monographs, textbooks and journals on probability in science and engineering as well in related areas. Find recently released titles such as Protter's *Stochastic Integration and Differential Equations* along with the classics. Remember to ask Springer's representative about the special exhibit discounton these and other important titles.

SOFTWARE EXHIBITS

IMSL, Inc.

The IMSL Libraries are a comprehensive resource of FORTRAN subroutines. MATH/LIBRARY contains over 400 mathematical subroutines for applications requiring accurate, reliable computation. STAT/LIBRARY offers a wide selection of statistical capabilities for analyzing and presenting data in scientific and business applications. SFUN/LIBRARY evaluates special functions in applied mathematics and scientific applications.

The MathWorks, Inc.

MATLAB, an interactive software program for scientific and engineering applications, creates a high-productivity environment for numeric computation and graphic display. It combines numerical analysis, matrix computation, signal processing, and 2D and 3D graphics in an easy-to-use environment. MATLAB provides interactive access to state-of-the-art linear algebra and matrix algorithms from LINPACK AND EISPACK, as well as other numeric techniques. In addition to its comprehensive set of scientific functions and matrix operations, MATLAB is fully extensible, allowing users to edit existing functions and to create new ones.

Soft Warehouse, Inc.

Derive is a menu-driven computer algebra system for IBM PC and compatible computers. It eliminates the drudgery of solving problems that scientists, educators, students and engineers might otherwise have done by hand. Derive does symbolic and numerical algebraic, differential and recurrence equation solving. It also does exact & approximate arithmetic to thousands of digits, calculus, trig, matrices, vectors, and 2D & 3D plots. The suggested list price is $200.

Symbolics

MACSYMA is the most powerful symbolic-numerical mathematics software Package on mainframes. A complete MACSYMA for 386 DOS PC's is exhibited, with over 1,300 commands.
Highlights:

- Arithmetic: Exact arithmetic arbitrary size integers, floats, arbitrary precision floats, complex numbers.
- Algebra: simplification, factoring, trigonometry, matrices, solving equations, summing series, special functions.
- Calculus: differentiation, limits integration, Laplace and Fourier transforms, differential equations, integral equations, perturbation methods, vector calculus, tensor calculus.
- Numerical analysis.
- Plotting: two and three dimensions, adaptive density plotting.
- Programming tools: language, pattern matchers, data base, compiler, debugger.
- Interfaces to Fortran, C, TeX.

SYSTAT, Inc.

SYSTAT, Inc. offers statistical analysis and graphics software for education, research, business, and scientific applications. Products range from instructional MYSTAT versions, to FASTAT, an intermediate business and educational tool, to SYSTAT/SYGRAPH, a comprehensive scientific research tool. Software available for PC 's, Macintosh, and a variety of minicomputers. Supplementary modules for SYSTAT and SYGRAPH provide highly specialized analyses, dynamic graph rotation, and data transfer.

Wolfram Research, Inc.

Mathematica is both an interactive calculation tool and a programming language. Its numerical capabilities include arbitrary precision arithmetic and matrix manipulation and it can manipulate formulae directly in algebraic form. Mathematica can also generate two-dimensional plots, contour plots and shaded-color three-dimensional pictures. Mathematica runs on Apollo, Ardent, Cray, DEC, Data General, Hewlett-Packard, IBM-RT, MIPS, 386-based MS-DOS, Macintosh, NeXT, Silicon Graphics, Sony, Stellar, and Sun computers.

HARDWARE EXHIBITS

IBM

IBM will be featuring math based applications on the recently announced IBM RISC System/6000 workstation.

The RISC System/6000 family (nine models) is designed to connect to everything from IBM mainframes to PS/2's, as well as the full range of non-IBM systems.

The operating system for the RISC System/6000 is AIX, IBM's version of UNIX. It supports C, Fortran, COBOL, AIXwindows as a graphical user interface.

MATLAB™

High-Performance Numeric Computation and Data Analysis

MATLAB has rapidly become an industry standard for engineering and scientific research. Its unique interactive interface, algorithmic foundation, easy extensibility, and speed make MATLAB the software system of choice for ***high productivity and high creativity*** research.

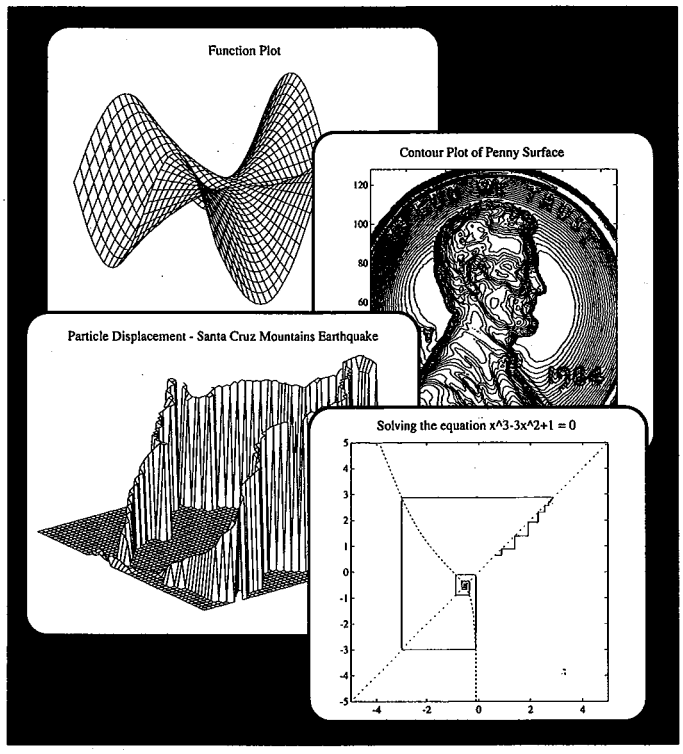
Problems and solutions are expressed just as they are written mathematically – ***without the need for traditional programming***. As a result, you can solve numerical problems in a fraction of the time required to write a program in Fortran, Basic, or C. Then plot the results as 2-D and 3-D graphics, with publication-quality output to plotters, dot-matrix printers, and laser printers.

"I can create algorithms so easily that it almost seems like cheating."

Amnon Aliphas,
Personal Engineering & Instrumentation News

Add to MATLAB your choice of tools for digital signal processing, system identification, control system design, and more. MATLAB's open-system design lets you see the algorithms and the implementations, even change them to suit your specific requirements.

MATLAB is developed by The MathWorks, a leader in software for data analysis and mathematics. Our users – in thousands of companies and universities – know that MATLAB enables them to work more creatively and productively. Take a look at how MATLAB can do the same for you.



"MATLAB is the undisputed choice for computation-intensive engineering work."

Charles Seiter,
Macworld

"MATLAB's power and ease of use go a long way toward taking the drudgery out of repetitive analysis projects."

Richard Santalesa,
IEEE Spectrum

Computers supported

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To find out more about MATLAB, call us at **(508) 653-1415**. Or simply return the completed coupon to the address below.

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The MATH WORKS Inc.

21 Eliot Street
South Natick, MA 01760
Phone: (508) 653-1415
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SIAMC 4/90

TRANSPORTATION

BY AIR

American Airlines has been chosen as the official carrier for this conference. You can fly to Chicago and save on travel from July 12-22, 1990 inclusive.

In a special arrangement with SIAM, American Airlines is offering you the services of their toll free convention reservation desk, along with a complement of discounts.

- 5% off any fare for which you qualify, including First Class and Ultra Saver fares. THE DISCOUNTS CAN RANGE FROM 40%-70% OFF NORMAL COACH FARES!

***OR** . . . for those of you who do not qualify for the above discounts.*

- American Airlines will offer a minimum of 45% off regular coach fares. Those passengers originating in Canada will be offered a 35% discount off full coach fares. Both of these rates require a 7 day advance purchase.

To make reservations for one of the above discounted fares:

- Call American Airlines Convention Desk, at 1-800-431-1790, seven days a week 8:00 A.M. to 11:00 PM Eastern Time . Be sure to mention the SIAM account number: S0320CN. American Airlines will arrange to mail your tickets to your home or office.
- For those of you having to use a corporate or university travel agent, you may still purchase your ticket through the local agent, just be sure to mention to the agent the above discounts. Your local agent can call the American Airlines Convention Desk to make your reservation. Make sure that the agent uses the SIAM account number: S0320CN.

Courtesy Airport Transportation: There is no courtesy van service available to the hotel from the airport.

CAR RENTAL

Dollar Rent A Car has been selected as the official car rental agency for the 1990 SIAM Annual Meeting. The following rates will apply:

Type of Car	Daily Rate	Weekly Rate
Compact	$39	$149.99
Intermediate	$42	$169.99
Standard	$42	$169.99
Premium	$49	$249.99

- These rates are valid July 12-22, 1990 and are available at the airport location.
- Unlimited Mileage.

Rental Requirements

- Cars must be picked up and dropped off at the same location.
- You must be 21 years of age and have a valid U.S. or International Driver's License.
- You must have one of the following credit cards to rent a car: AMEX, MasterCard, VISA or Diners Club.
- The prices quoted do not include refueling services, tax, optional collision damage waiver and personal accident insurance.

Reservations

We encourage you to make an advance reservation, as on-site availability cannot be guaranteed. Make reservations by calling: 1-800-421-6878. Make sure to give them the SIAM account code: CCSIA7. Be certain to mention that you are attending the 1990 SIAM Annual Meeting, July 15-20, in Chicago, Illinois.

DIRECTIONS FOR DRIVING FROM THE AIRPORT

Take Kennedy Expressway east to the Ohio exit. Take Ohio exit until you cometo Michigan Avenue. At Michigan and Ohio take a right. Follow this to South Waters Street. At South Waters and Michigan Avenue, make a U-turn and go back one block to Michigan and Wacker. At Michigan and Wacker make a left then proceed for half a block and the Hyatt Regency is on you right. The Hyatt is approximately 15 miles from the airport.

PUBLIC TRANSPORTATION FROM THE AIRPORT

There is no complimentary bus or van service from the airport to the Hyatt Regency Hotel.

Outside the baggage claim terminal at each airline, you can catch the Continental Bus Line (blue and white buses). The cost is $10.75 to the Hyatt Regency. They continually pass in front of all the terminals. Once aboard the bus, ask to be dropped off at the Hyatt Regency.

Taxicab service is also available outside the baggage claim areas. The average cost of the cab service is $25.00 to $30.00.

ABOUT THE HOTEL

Hyatt Regency Hotel
In Illinois Center
151 East Wacker Drive
Chicago, Illinois 60601
(312) 565-1234

SIAM is holding a block of rooms at the Hyatt Regency Hotel on a first come first served basis at the specially discounted rates of $86/Single and $116.00 /Double. There is a 10.1% occupancy tax that is added to your room rate. These rooms will be held for our exclusive use only until June 25, 1990, after which date reservations will depend on availability and the above rates may not be in effect. We urge you to make your reservations as soon as possible. You may do so by telephoning (312) 565-1234, or via the Hotel Reservation Form on the inside back page of this brochure (domestic mail only). When making reservations by telephone, be certain to obtain the discounted rate by identifying yourself as an attendee at the 1990 Annual SIAM Meeting.

Arrivals and Departures: Your room will be reserved for you until 6:00 PM. If later arrival is anticipated, please guarantee your reservation by credit card or advance deposit. Check-out time is 12:00 PM.

Facilities: At the Hyatt Regency you have ten restaurants and lounges from which to choose. Stetson's Chop House emphasizes steaks, lobsters and roast duckling. At Scampi you'll enjoy a relaxed island setting featuring 24 hour service. Sample the deli sandwiches at Mrs. O'Leary's . . . or enjoy a kosher restaurant, La Misada. The Hyatt Regency is located just minutes away from Chicago's Art Institute and walking distance from many shops and restaurants.

The Hyatt Regency is affiliated with the Downtown Health Club located 441 North Wabash (directly across the bridge on Michigan Avenue and the North side of the Wrigley Building). Cost for Hyatt guests is $12.00 by showing the club attendant your Hyatt Passport (received upon check-in). If you would like to swim, you must go to the health club as the hotel does not have a pool on site.

Parking: At the Hyatt Regency parking rates are $7 for 1 hour, $11 for 2 to 11 hours and $15 for 12 to 24 hours. Alternative parking is avaiable at the following locations:

- Standard Oil Building—200 East Randolph Street located two block south of the Hyatt, within walking distance to the hotel.
  RATE: $6.00 flat fee for up to 12 hours
- Three Illinois Center—Lower Columbus Drive and South Waters Street connected to Hyatt by enclosed concourse. Enter at Lower Columbus Drive.
  RATES: $7.50 for 4-12 hourse; $8.50 for 12-24 hours.

REGISTRATION INFORMATION

Please complete the Advance Registration Form found on the back page of this brochure and return it in the envelope provided in the middle section of this program. We urge attendees to register in advance as the registration fee is lower for advance registrants. Advance registration must be received by July 9, 1990.

The registration desk will be open as listed below.

Saturday, July 14	5:00 PM-8:00 PM
Sunday, July 15	8:00 AM-4:00 PM
	6:00 PM-9:00 PM
Monday, July 16	7:30 AM-4:30 PM
Tuesday, July 17	8:00 AM-4:30 PM
Wednesday, July 18	8:00 AM-4:30 PM
Thursday, July 19	8:00 AM-4:30 PM
Friday, July 20	8:00 AM-2:00 PM

GET-TOGETHERS

SIAM Welcoming Reception
Sunday, July 15th 7:00 PM-9:00 PM
Cash Bar

SIAM Idea Exchange $18
Monday, July 16th, 6:00 PM-7:30 PM

This a great time to get together with your colleagues to exchange ideas and get your questions answered. This get-together will consist of three stations where the chefs are creating the dishes right before your eyes. Menus will consist of chicken and steak fajitas, freshly made rottini, tortellini and fettucini and marinara and alfredo sauce, and oriental stir fry consisting of shrimp scallops, chicken and chinese vegetables. Domestic beer and assorted sodas will also be available.

Western Dinner Theater/Play $36.00
Tuesday, July 17, 1990, 6:00 PM-10:30 PM

High steppin' dance hall girls, toe tappin' fiddler, guitar and banjo pickin' slick card tricks and lots of cold beer, wine and apple cider is only part of this two and a half hour western adventure. After boarding the buses at the Hyatt Regency, you'll arrive at Dry Gulch, a western dinner theater where you'll be greeted with a 1/2 hour cocktail reception followed by a feast consisting of a six course dinner of assorted cheeses and breads, a fresh vegetable tray and dip, soup of the day, tangy beef ribs, cornish hens, corn on the cob, and dessert. All this while experiencing a musical comedy revue featuring Sheriff Bob and his Band, Miss Kitty and her Dance Hall Girls and Slippery Sam the Magic Man. This promises to be a fun-filled casual evening.

REGISTRATION FEE:

		SIAM Member	Non-Member	Student
Short Course	Advance	$115	$140	$75
	On-Site	$135	$150	$95
Conference	Advance	$100	$135	$15
	On-Site	$130	$165	$15

Non-SIAM Members
Non-member registrants are encouraged to join SIAM in order to obtain the member rate for conference registration and enjoy all the other benefits of SIAM membership. You can join SIAM by filling out a membership form at the SIAM Registration Desk. If you join for this meeting, SIAM will retroactively give you the member rate for registration.

Notice
There will be no prorated fees. No refunds will be issued once the conference has started.

If SIAM does not receive your Advance Registration Form by July 9th, you will be asked to give us a check or a credit card number at the conference. We will not process either until we have ascertained that your registration form has gone astray. In the event that we receive your form after July 9, 1990, we will destroy your check or credit card slip.

Telephone Messages
The telephone number at the Hyatt Regency Hotel is 1-(312)-565-1234. The Hyatt will either connect you with the SIAM registration desk or forward a message.

Credit Cards
SIAM accepts VISA, MasterCard and American Express for the payment of registration fees and special functions. When you complete the Advance Registration Form, please be certain to indicate the type of credit card, the number, and the expiration date.

SIAM Corporate Members
Non-member attendees who are employed by the following institutions are entitled to the SIAM member rate.

Aerospace Corporation
Amoco Production Company
AT&T Bell Laboratories
Bell Communications Research
The Boeing Company
BP America
E.I. duPont de Nemours and Company
Eastman Kodak Company
Exxon Research and Engineering Company
General Motors Corporation
GTE Laboratories, Inc.
Hollandse Signaalapparaten B.V.
IBM Corporation
ICASE-NASA Langley Research Center
IMSL, Inc.
MacNeal-Schwendler Corporation
Martin Marietta Energy Systems
Mathematical Sciences Research Institute
Schlumberger Industries
Supercomputing Research Center, a division of Institute for Defense Analyses
Texaco, Inc.
United Technologies Corporation

UPCOMING CONFERENCES

November 5-8, 1990
Second SIAM Conference on Linear Algebra in Signals, Systems and Control
Cathedral Hill Hotel, San Francisco, CA
Sponsored by the SIAM Activity Group on Linear Algebra

January 7-9, 1991
SIAM Workshop on Automatic Differentiation
Hilton Hotel
Breckenridge, CO

January 28-30, 1991
ACM/SIAM Symposium on Discrete Algorithms
Cathedral Hill Hotel
San Francisco, CA

March 25-27, 1991
Fifth SIAM Conference on Parallel Processing for Scientific Computing
The Westin Hotel
Houston, TX

May 6-8, 1991
SIAM Conference on Domain Decomposition Methods for Partial Differential Equations
Omni Hotel
Norfolk, VA

July 8-12, 1991
Second International Conference on Industrial and Applied Mathematics (ICIAM 91)
Sheraton Washington Hotel
Washington, D.C.

September 16-19, 1991
Fourth SIAM Conference on Applied Linear Algebra
Radisson University Hotel
Minneapolis, MN

HOTEL RESERVATION FORM

1990 SIAM Annual Meeting

July 15–20, 1990
Hyatt Regency Hotel
Chicago, Illinois

PLEASE SEND ME A CONFIRMATION NOTICE
Specially discounted rooms are being held for our exclusive use until June 25, 1990. After that date, reservations will depend on availability. Your reservation is not confirmed until acknowledged in writing by the hotel or verified by phone. When making reservations by phone, be certain to identify yourself as an attendee at the 1990 SIAM Annual Meeting. Telephone 1-(312)-565-1234

Name _____ Phone _____
First Last

Address _____

City _____ State _____ Zip _____

Please reserve [ ] Single($86) [ ] Double($116) Arrival Date _____

Arrival Time _____ Check-Out Date _____

Guarantee my room for late arrival (after 6:00 PM) [ ] Yes [ ] No

I choose to pay by [ ] AMEX [ ] VISA [ ] MC [ ] Check

Credit Card Number* _____

Expiration Date _____ Deposit $_____ (Late Arrivals Only)

Signature _____

If you list your credit card number, please enclose this card in an envelope and mail to: Reservations, Hyatt Regency Chicago, In Illinois Center, 151 East Wacker Drive, Chicago, IL 60601.
*You only need to list your credit card number if you want to guarantee your room for late arrival.

ADVANCE REGISTRATION FORM

1990 SIAM Annual Meeting
July 15–20, 1990
Hyatt Regency Hotel Chicago, Illinois

Advance registration form must be received at the SIAM office by July 9, 1990. If paying by check, please make check payable to SIAM.

REGISTRATION FEE:

		SIAM Member	Non-Member	Student
Short Course	Advance	$115	$140	$75
	On-Site	$135	$150	$95
Meeting	Advance	$100	$135	$15
	On-Site	$130	$165	$15

Registration Fee:

Short Course	$_____	$_____	$_____
Meeting	$_____	$_____	$_____
Idea Exchange $18	$_____	$_____	$_____
Western Dinner/Play $36	$_____	$_____	$_____
Total	$_____	$_____	$_____

Please Print

Name _____
(First) (Last)

Affiliation _____

Department _____

Address _____

City _____ State _____ Zip _____

Telephone Number _____

Local Address in Chicago _____

I wish to pay by [ ] AMEX [ ] VISA [ ] MC [ ] Check

Credit Card Number _____

Expiration Date _____

Signature _____

Detach card and enclose with payment in the envelope provided (domestic mail only) and mail to: SIAM, 3600 University City Science Center, Philadelphia, PA 19104-2688.