ANNIVERSARY MEETING

July 20 - 24, 1992

Century Plaza Hotel and Towers
Los Angeles, California

Tutorials on

July 19, 1992

Workshop on

July 19, 1992

MEETING THEMES

(partial listing)

- Adaptive Grid Methods
- Applications of Mathematics to Material Science
- Computational Fluid Dynamics
- Dynamical Systems
- Geometric Design
- Global Climate Change
- Grid Generation
- Modeling Geophysical Phenomena
- Multigrid Methods
- Nonlinear Forecasting
- Numerical Methods for Differential Algebraic Equations
- Numerical Methods for Ordinary and Partial Differential Equations
- Optimization
- Parallel Computing
- Special Functions
- Turbulence Modeling
- Waves and Wavelets

PRELIMINARY PROGRAM

DEADLINE DATES

Hotel Registration
June 28, 1992

Advance
Conference Registration
July 8, 1992

Tour Registration
July 8, 1992

CONTENTS

ORGANIZING COMMITTEE

James M. Hyman (Chair)
Theoretical Division
Los Alamos National Laboratory

Robert E. Barnhill
Office of the Vice President
for Research
Arizona State University

Marsha J. Berger
Courant Institute
of Mathematical Sciences
New York University

Avner Friedman
Institute for Mathematics
and Its Applications
University of Minnesota, Minneapolis

Thomas A. Manteuffel
Department of Mathematics
University of Colorado, Denver

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

Joseph E. Oliger
Department of Computer Science
Stanford University

Stanley J. Osher
Department of Mathematics
University of California, Los Angeles
and Cognitech, Inc.,
Santa Monica, CA

Tutorial on Numerical Optimization and Software

Tutorial Description and Objectives
The use of optimization in industrial applications and in other areas of applied mathematics could be greatly widened and enhanced if potential users were made aware of the capabilities of existing algorithms and the availability of software which implements these algorithms. In this course, the lecturers aim to provide information about algorithms and software that can be used for basic research in numerical optimization techniques.

The course will cover four main problem areas. These are nonlinear equations and nonlinear least squares, unconstrained optimization, constrained optimization, and global optimization.

Who Should Attend?
Academics, industrialists, and government researchers in science, engineering and economics, who have found that optimization problems arise in their work. Employees of companies who create and distribute numerical software, and wish to learn more about the state of the software market.

Recommended Background
A basic knowledge of computational linear algebra (Gaussian elimination, Cholesky decomposition, QR decomposition, eigenvalues and eigenvectors of symmetric matrices), and calculus for functions of several variables (derivatives, Taylor's theorem, and Lagrange's theorem for minimization problems with constraints).

Lecturers
Jorge J. Moré and Stephen J. Wright, MCS Division, Argonne National Laboratory.

Jorge J. Moré played a lead role in the development of MINPACK, a collection of high-quality optimization subroutines distributed worldwide. He is currently working on an expanded version of this collection, with a focus on large-scale optimization.

Stephen J. Wright is known for his contributions to optimization and parallel numerical methods. His recent work has been on algorithms for constrained and nonsmooth optimization, and on stable parallel methods for ordinary differential equations and optimal control.

Information will be provided about the availability of software for different classes of optimization problems. This will be of immediate benefit to the applications community.

PROGRAM

9:00 AM	**Nonlinear Equations and Nonlinear Least Squares** Jorge J. Moré and Stephen J. Wright
10:30 AM	Coffee
11:00 AM	**Unconstrained Optimization** Jorge J. Moré and Stephen J. Wright
12:30 PM	Lunch
2:00 PM	**Linear Programming** Stephen J. Wright
3:00 PM	Coffee
3:30 PM	**Nonlinear Programming** Jorge J. Moré and Stephen J. Wright
4:30 PM	**Global Optimization** Jorge J. Moré
5:00 PM	Discussion
5:30 PM	Adjourn

Tutorial Registration Fees: (applies to either tutorial)

Registration Fees*	SIAM Member	Non-Member	Student
Advance	$120	$140	$55
On-Site	$140	$160	$75

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

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

Tutorial on Multigrid Methods and Applications

Tutorial Description and Objectives
The course begins with a basic tutorial on the fundamentals of relaxation, coarse-grid correction, and analytical tools. A working lunch will involve discussions tailored to the audience; informal lectures will be based on participants' interests and interaction will be encouraged. A list of possible topics will be provided at registration to help initiate this interaction. The afternoon session will be devoted to introducing a new unified framework for developing multigrid schemes, with concrete examples to illustrate the basic concepts.

The lectures are based on three books ("A Multigrid Tutorial" by William Briggs and "Multilevel Adaptive Methods for Partial Differential Equations" and "Multilevel Projection Methods for Partial Differential Equations" by Stephen F. McCormick) and a guidebook (Multilevel Techniques: 1984 Guide with Application to Fluid Dynamics" by Achi Brandt). These materials will be available to the tutorial participants at substantial discounts.

Who Should Attend?
This tutorial is designed for mathematicians, engineers, physicists, and other theoreticians and practitioners involved in large-scale computation who want to obtain a better understanding of multigrid techniques.

Recommended Background
A familiarity with conventional discretization and solution methods for partial differential equations.

Lecturers
Achi Brandt is the Elaine and Bram Goldsmith Professor of Applied Mathematics at the Weizmann Institute of Science, Rehovot, Israel and winner of the 1990 Rothschild Prize in Mathematics. He received his Ph.D. from the Weizmann Institute of Science.

William Briggs is a professor in and chair of the Department of Mathematics, University of Colorado at Denver. He received his Ph.D. in applied mathematics from Harvard University in 1978.

Stephen F. McCormick is a professor in the Department of Mathematics, University of Colorado at Denver. He received his Ph.D. from the University of Southern California in 1971.

PROGRAM

8:15 AM	**Overview** Stephen F. McCormick
8:30 AM	**A Multigrid Tutorial** William Briggs **Overview of Multigrid and Multilevel Methods** **Model Problems** **Basic Iterative Methods** **Basic Multigrid Methods**
10:30 AM	Coffee
11:00 AM	**Implementations and Practical Considerations** **Some Theory** William Briggs
12:00 PM	Box Lunch **Open Discussion** Achi Brandt **Partial Differential and Integral Problems** **Global Optimization** **Statistical Physics** **Integral Transforms** **Many Body Computations**
2:30 PM	**Multilevel Projection Methods** Stephen F. McCormick **Basic Methods** **Elliptic Equations and Eigenproblems**
3:30 PM	Coffee
4:00 PM	**Multilevel Projection Methods** Stephen F. McCormick **Nonlinearity and Local Refinement** **Applications**
6:00 PM	Adjourn

Mathematical and Computational Sciences Awareness Workshop

Chair: Richard A. Tapia, Rice University

Mathematics and science teachers play a seminal role in counseling, directing, and motivating students with interest in mathematics, science, and engineering. It is crucial to the creative exercise of their duties that they be aware of developments and opportunities in the mathematical and computational sciences.

The goal of this workshop is to enable the participants to develop this awareness. The speakers will present expository talks on directions and opportunities in the mathematical and computational sciences. The topics that will be addressed include: the role of computation and its impact on mathematics, trends in parallel computing, and job opportunities in mathematics, science, and engineering.

The workshop is directed toward teachers in high school and two-year colleges, but anyone interested in the future of the mathematical sciences will find the workshop of value.

SCHEDULED SPEAKERS

Maria Celis
Silicon Graphics

Ana Guzman
National Science Foundation

Herbert B. Keller
California Institute of Technology

Juan Meza
Sandia National Laboratories

Gilbert Strang
Massachusetts Institute of Technology

Richard A. Tapia
CRPC, Rice University

Virginia Torczon
CRPC, Rice University

This is a full-day workshop, and lunch is included with cost of registration.

Registration Fees*:

Advance	$25
On-site	$40

Registration card is on page 47.

* There is a special discount for high school teachers.

INVITED PRESENTATIONS

MONDAY, JULY 20/8:00 AM
INVITED PRESENTATION 1

New Directions in Multi-Scale Computations

Following an elementary example, the speaker will review recent conceptual developments and new tasks and types of multiscale algorithms. These may include new, fully efficient multigrid algorithms for general nonelliptic systems and high-Reynolds flows; inverse problems; highly indefinite wave equations; many-eigenfunction problems; equations with "topological charges" (Dirac solvers); fast determinant updates; massive parallel processing across space and time; general fast integral transforms; O(n) calculation of n-body interactions; global optimization and spatial mathematical programming; multigrid Monte-Carlo and fast thermodynamic limits; molecular dynamics/statistics; and derivation of macroscopic equations from microscopic physics.

Achi Brandt
The Elaine and Bram Goldsmith Professor of Applied Mathematics
Department of Applied Mathematics
Weizmann Institute of Science, Rehovot, Israel

MONDAY, JULY 20/8:45 AM
INVITED PRESENTATION 2

Adaptive Methods for Time-Dependent Partial Differential Equations

As problems increase in complexity, there is a corresponding need to automate a greater portion of the solution process. Adaptive methods utilize preliminary solutions computed with a coarse discetization and a low-order technique to automatically identify and improve solutions where needed. We review the basic enrichment schemes of (h-type) mesh refinement/coarsening, (p-type) local variation of order, and (r-type) mesh motion and their use singly or in combination. We describe methods of estimating discretization errors and strategies for using them to guide adaptive enrichment. Time-dependent systems involve additional complications such as balancing space and time errors. We conclude with some extensions to parallel computing environments.

Joseph E. Flaherty
Department of Computer Science and
Scientific Computation Research Center
Rensselaer Polytechnic Institute

MONDAY, JULY 20/2:00 PM
INVITED PRESENTATION 3

Global Climatic Change: An Environmental and Mathematical Challenge

The atmospheric concentrations of infrared absorbing gases due to anthropogenic emissions are increasing. They are perturbing the radiative forcing that determines the subtle chemical, dynamical, and thermodynamic interactions among the atmosphere, ocean, land surface, and biosphere, and, as a result, are drawing strong international political interest.

The ability to numerically simulate the past behavior of these complex, coupled systems is a neccessary but not sufficient condition for projecting future changes in climate. Many challenges for numerical simulation remain, such as extensive non-linear coupling, turbulence, natural variability, chaotic behavior, and small signal detection.

The speaker will discuss the challenges and progress that has been made in numerical simulation of the global climate.

Michael C. MacCracken
Atmospheric and Geophysical Sciences Division
Lawrence Livermore National Laboratory

TUESDAY, JULY 21/8:00 AM
INVITED PRESENTATION 4

Chaotic Transport in Dynamical Systems

Over the past thirty years there have been great advances in our understanding of geometric structures in the phase space of nonlinear dynamical systems. Objects such as KAM tori, Smale horsehoes, cantori, and invariant manifolds are quite familiar from the study of Hamiltonian systems and maps. Recently, however, other geometrical objects such as lower dimensional versions of KAM tori, "whiskered" tori and traveling horeshoe maps have been added to the list of geometrical structures as a result of advances in our understanding of phase space structure in multi-degree-of-freedom Hamiltonian systems and in vector fields with general time-dependence. The importance of these geometrical structures is that in many cases they form a "skeleton in phase space" which governs many issues related to "phase space transport".

In this presentation, the speaker will discuss some of these new mathematical results and motivate the point of view that many applications in science and engineering involving nonlinear dynamical systems can be very naturally formulated as "phase space transport" problems. He will illustrate this approach by considering some specific examples arising in fluid mechanics and theoretical chemistry where this modern, dynamical systems approach allows one to solve problems that were intractable by classical methods.

Stephen Wiggins
Division of Engineering and Applied Science
Thomas Laboratory
California Institute of Technology

INVITED PRESENTATIONS

TUESDAY, JULY 21/9:15 AM
INVITED PRESENTATION 5

Dispersive Initial Value Problems and Their Limiting Behavior

In this presentation, the speaker will provide an overview of a variety of equations describing physical systems in which dissipative or diffusive mechanisms are absent, but which undergo dispersive processes. He will discuss the limiting behavior of such a system when the parameter in the dispersive term tends to zero. The limit exists in the weak, i.e., average sense, and can be described with great precision. The speaker will present several completely integrable cases in which the limiting behavior has been analyzed and understood and exhibit explicit solutions and trace within their structure the passage to zero of the small parameter. In this way, not only the weak limit, but the microstructure of the oscillations can be understood.

Peter D. Lax
Courant Institute of Mathematical Sciences
New York University

TUESDAY, JULY 21/2:00 PM
INVITED PRESENTATION 6

Predicting the Future with Nonlinear Models

The speaker will discuss the problem of making predictions, based only on past data, for systems that cannot be understood from first principles. This can involve dynamical systems (time series) or cross sectional data (with no explicit time dependence). This is often called the "generalization" problem.

Fluid flows, mechanical oscillations, sunspots, ice ages, and financial markets are challenging applications. The standard methods for solving these problems include linear regression, nonparametric modeling, and nonlinear regression (e.g. neural networks). The speaker will compare and contrast these methods, discuss their positive and negative features, mention new approaches, and outline fundamental problems for future research.

J. Doyne Farmer
Prediction Company and
Santa Fe Institute, Santa Fe, NM

WEDNESDAY, JULY 22/8:00 AM
INVITED PRESENTATION 7

Mathematical Problems in Photography

In this presentation, the speaker will explain, from a mathematician's perspective, what photographic film is and how it works, and will discuss a variety of mathematical models from photographic science, including a statistical model of image structure, a stochastic process model of latent image formation, and reaction-diffusion models of development. He will explain the mathematics of these models, and how they are used to understand and improve the photographic process. In the course of this presentation, he will touch on outstanding mathematical problems in wave propagation in random media, homogenization theory, parameter identification, and partial differential equations.

David S. Ross
Research Center
Eastman Kodak Company

WEDNESDAY, JULY 22/9:00 AM
INVITED PRESENTATION 8

Some Mathematical Problems in Polymer Processing

The mechanical properties of polymeric materials depend on structure developed during liquid-state processing. The entangled macromolecules exhibit highly nonlinear relations between structure, stress state, and deformation history, and traditional fluid/solid boundary conditions may not apply at the high stress levels characteristic of processing. Numerical schemes to describe flow and structure develpment in complex shaping geometries may fail, and asymptotic solutions to provide guidance are often unavailable. The speaker will describe some of the unusual flow phenomena experienced in polymer processing and point out where he believes the problems in understanding are mathematical in nature.

Morton Denn
Chemical Engineering Department
University of California, Berkeley

WEDNESDAY, JULY 22/2:00 PM
INVITED PRESENTATION 9

The Numerical Solution of Differential-Algebraic Equations

In recent years, much activity has been devoted to the development of numerical methods and underlying theory for the solution of differential-algebraic equation (DAE) systems. These systems occur as initial value problems in the computer-aided design of mechanical systems, vehicle simulation, robotics, circuit analysis, chemical process simulation, trajectory simulation, flow of incompressible fluids, and in many other applications. Boundary-value problems in DAEs arise from parameter estimation and optimal control of the above systems, DAEs are different from standard-form ODE systems in that, while they include ODEs as a special case, they also include problems that are quite different. Numerical methods applied directly to DAEs can experience difficulties with stability and order of convergence which have necessitated the development of new methods and theory. There are a wide range of challenges for software. In this presentation, the speaker will provide an overview of recent progress in this area and discuss what needs to be done.

Linda R. Petzold
Department of Computer Science
University of Minnesota, Minneapolis

THURSDAY, JULY 23/8:00 AM
INVITED PRESENTATION 10

Wavelet Transforms versus Fourier Transforms

The speaker will present a basic introduction to wavelets. The introduction will start with an orthogonal basis of piecewise constant functions, constructed by dilation and translation. The "wavelet transform" maps each $f(x)$ to its coefficients with respect to this basis. The mathematics is simple and the transform is faster that the FFT. But approximation by piecewise constants is poor. To improve this first wavelet, we are led to dilation equations. Higher order wavelets are constructed and it is surprisingly quick to compute with them - always indirectly and recursively.

The speaker will comment informally on the contest between these transforms in signal processing, especially for video and image compression (including fingerprints). So far the Fourier Transform - or its real version, the Discrete Cosine Transform - is winning.

Gilbert Strang
Department of Mathematics
Massachusetts Institute of Technology

Get-Togethers

SIAM Welcoming Reception
7:00 PM - 9:00 PM, Sunday, July 19, 1992
California Showroom
Cash Bar and assorted mini hors d'oeuvres

Spouse/Guest Tours
Monday, July 20 - Thursday, July 23, 1992
See Page 41.

EVENING Get-Together

TOUR #5 — LA City Light Tour and Dinner
6:00 PM - 11:00 PM, Wednesday, July 22, 1992, Cost $35.00

Wine and sodas will be served while you see the sites of Downtown Los Angeles, Beverly Hills and Two Rodeo Avenue. You'll stop at Two Rodeo Avenue, a town square lined with broad limestone steps and sculptured marble fountains. This is an area that has become a shopping, dining and entertainment spot. There will be time here to browse and window shop. Then its off to the famous Olvera Street, the founding site of Los Angeles. You'll have time to walk down Olvera Street to enjoy the bazaars and early Spanish dwellings where Los Angeles first buildings still stand. Dinner, which is included, will be arranged at La Golondrina, a lovely authentic Mexican restaurant on Olvera Street. After dinner, you'll visit little Tokyo and Chinatown before heading back through Hollywood. You'll be stopping off at the Mann's Chinese Theatre, home of hand and footprints of the industry's most glittering stars.

INVITED PRESENTATIONS

THURSDAY, JULY 23/8:45 AM
INVITED PRESENTATION 11

Tensor Methods for Nonlinear Equations and Optimization

Systems of nonlinear equations and unconstrained optimization problems are common numerical problems, and are often expensive to solve. Standard methods for solving these problems base each iteration upon a linear model of the nonlinear equations or a quadratic model of the optimization objective function. These methods are quite successful, but have drawbacks. They interpolate only a limited amount of information about the problem, and they converge slowly when the Jacobian or Hessian matrix at the solution is singular. Tensor methods try to improve upon these methods by utilizing higher order models in an unusual and efficient manner. The speaker will describe the computational and theoretical properties of tensor methods, including their recent adaptation to large sparse problems and constrained optimization problems.

Robert B. Schnabel
Department of Computer Science
University of Colorado, Boulder

THURSDAY, JULY 23/1:30 PM
THE JOHN VON NEUMANN LECTURE

Lagrange Multipliers and Optimality

The use of Lagrange multipliers in handling constraints in a problem of optimization has a long tradition, but with the modern emphasis on computation it has taken on new significance. Von Neumann's game-theoretic ideas have revealed that the multipliers often solve a 'dual' problem, and this has been a key to their interpretation. Sensitivity of solutions with respect to data perturbations has further revealed an important role. The lecture will trace these themes and explain recent developments in which a more versatile composite model can be substituted for the usual one with hard constraints, and multipliers can be derived right from a generalized chain rule in nonsmooth analysis.

R. Tyrrell Rockafellar
Department of Mathematics
University of Washington, Seattle

FRIDAY, JULY 24/8:00 AM
INVITED PRESENTATION 12

Procedurally-Defined Curves and Surfaces in Computer-Aided Geometric Design

Since its inception in the 1960s, computer-aided geometric design has primarily been concerned with the ab initio computer specification of curves and surfaces to suit various functional or aesthetic requirements. A diverse array of methods that facilitates the design of smooth free-form geometries through various interpolation, approximation, and shape-modification strategies has accumulated. As these methods have matured, attention has shifted increasingly to those loci, described in terms of given curves and surfaces by conceptually simple geometric procedures, that arise in applications. Surface intersections (the loci of points constrained to lie simultaneously on two given surfaces), offsets (the loci of points that maintain a fixed distance from given curves or surfaces),and bisectors (the loci of points that remain equidistant with respect to two given curves or surfaces) are some examples.

The speaker will provide a survey of the mathematical difficulties incurred in computing such procedurally-defined curves and surfaces. These difficulties stem from their algebraic and topological complexity, their incompatibility with the simple parametric forms used in design problems, and the exceptionally high premium on accuracy and robustness.

Rida T. Farouki
IBM Thomas J. Watson Research Center

PRIZES AND AWARDS

MONDAY, JULY 20/9:30 AM

40th Anniversary Award

SIAM is celebrating its 40th anniversary at this 1992 annual meeting. Over the past 40 years, we have enjoyed the support of many individuals and organizations, and we gratefully acknowledge this support. Among these supporters are our corporate members who have contributed not only funds but also the participation of many individual members. Among our corporate members, the IBM Corporation is unique in its support of SIAM for 40 years.

TUESDAY, JULY 21/8:45 AM

Mathematical Contest in Modeling (MCM)

Student Paper Competition Award

The Three Best Papers in Applied and Computational Mathematics

The Alice T. Schafer Mathematics Annual Prize Award

Alice T. Schafer Mathematics Annual Prize Award is given by AWM to an undergraduate woman for excellence in mathematics.

TUESDAY, JULY 21/10:30 AM

Student Paper Competition Presentation

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

WEDNESDAY, JULY 22/8:45 AM

THE RICHARD C. DIPRIMA PRIZE

The Richard C. DiPrima Prize, established in 1986, is awarded to a young scientist who has done outstanding research in applied mathematics (defined as those topics covered by SIAM journals) and who has completed his/her doctoral dissertation and completed all other requirements for his/her doctorate during the period running from three years prior to the award date to one year prior to the award date.

THURSDAY, JULY 23/1:30 PM

The John von Neumann Lecture

This prize, established in 1959, is in the form of an honorarium for an invited lecture called The John von Neumann Lecture. The lecturer will survey and evaluate a significant and useful contribution to mathematics and its applications. It may be awarded to a mathematician or to a scientist in another field, but in either case, the recipient should be one who has made distinguished contributions to pure and/or applied mathematics.

FRIDAY, JULY 24/8:45 AM

The George Polya Prize

The Polya Prize, established in 1969, is awarded for a notable application of combinatorial theory made during the five to ten years preceding the award.

SPECIAL SESSIONS

MONDAY, JULY 20/4:00 PM

ICEMAP Special Session

(see page 17)

TUESDAY, JULY 21/3:30 PM

AWM (Association for Women in Mathematics) Panel on Research in Government

(MS25, see page 20)

TUESDAY, JULY 21/8:00 PM

A Panel Discussion on Mathematics, Modeling, and Simulation of Industrial Problems

(see page 22)

THURSDAY, JULY 23/2:30 PM

1992 SIAM Business Meeting

The annual business meeting of SIAM will be held on Thursday, July 23, 1992 at 2:30 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.

Robert E. O'Malley, Jr., President

Following are subject classifications for the sessions. The codes in parentheses designate session type and number. The session types are Invited (IP), Minisymposium (MS), and Contributed (CP).

Applications in Engineering and Sciences
Biological Mathematics (CP32, page 34)
Chemical Kinetics (CP30, page 34)
Economics (CP31, page 34)
Fast Solvers for Electromagnetics (MS47, page 29)
Image Processing (CP14, page 24)
Modeling Earthquake Dynamics (MS6, page 14)
Neural Network Training (MS34, page 24)
Nonlinear Inverse Problems in Medical Imaging, Geophysics, and Astrophysics (MS7, page 14)
Nonlinear Analysis Applied to Image Processing (MS12, page 15)
Regular and Chaotic Dynamics Arising in Nonlinear Optics (MS32, page 23)
Signal Processing (Wavelets) (CP21, page 29)
Wavelet Transforms versus Fourier Transforms (IP10, page 28)

Climate and Ocean Modeling
Attractors, Length Scales and Fluctuations in Ocean Dynamics (MS23, page 20)
Global Climatic Change: An Environmental and Mathematical Challenge (IP3, page 15)
Mathematical and Computational Issues in Climate Modeling (MS10, page 15)

Computational Fluid Dynamics
Adaptive Methods in Computational Fluid Dynamics (MS44, page 28)
Boundary Conditions for the Simulation of Unsteady Flows (MS39, page 26)
Computational Fluid Dynamics (CP24, page 31)
Vortex Methods and Vortex Dynamics for Incompressible Flow, Parts 1 and 2 (MS56, page 33; MS63, page 35)

Computer Science and Discrete Mathematics
Computer Science (CP29, page 34; CP34, page 36)
Research Directions in Highly Parallel Architectures (MS59, page 33)

Continuum Mechanics and Material Science
Application of Dynamical Systems Theory to Continuum Mechanics (MS15, page 18)
Elasticity (CP20, page 27)
Modeling the Chemomechanics of Gels (MS30, page 23)
New Developments in Plate and Shell Theory, Parts 1 and 2 (MS49, page 29; MS54, page 30)
Some Mathematical Problems in Polymer Processing (IP 8, page 23)

Dynamical Systems
Application of Dynamical Systems Theory to Continuum Mechanics (MS15, page 18)
Applying Constructive Mathematical Techniques to Dynamical Systems Experiments (MS69, page 36)
Chaotic Transport in Dynamical Systems (IP4, page 18)
Dynamical Systems and Chaos (CP17, page 26)
Effective Equations for Fluid Flow, Parts 1 and 2 (MS31, page 23; MS38, page 25)
Recent Advances in the Theory and Application of Dynamical Systems (MS58, page 33)
Regular and Chaotic Dynamics Arising in Nonlinear Optics (MS32, page 23)
The Reemergence of Kinetic Theory in Applications (MS4, page 13)

Geometric Design and Computation
A Multidimensional System of Parallel Coordinates: Foundations and Applications (MS41, page 26)
Geometric Design and Approximation Theory (CP28, page 32)
Procedurally-Defined Curves and Surfaces in Computer-Aided Geometric Design (IP12, page 33)

Grids and Grid Generation
Grid Generation: Theory and Applications, Parts 1 and 2 (MS45, page 28; MS50, page 30)
Moving and Graded Grids (CP7, page 19)

Ill-Posed and Inverse Problems
Ill-Posed Evolution Equations: Their Physical Meaning and Possible Regularizations (MS5, page 13)
Inverse Coefficient Problems for Systems, Parts 1 and 2 (MS19, page 19; MS26, page 20)
Nonlinear Inverse Problems in Medical Imaging, Geophysics and Astrophysics (MS7, page 14)
Numerical Treatment of Large-Scale Ill-Posed Problems (MS40, page 26)

Industrial Problems
Advances in Applied Reservoir Simulations in the Oil Industry (MS55, page 31)
Fast Solvers for Electromagnetics (MS47, page 29)
Industrial Computing (MS3, page 13)
Mathematical Problems in Photography (IP7, page 23)
Mathematics, Modeling, and Simulation of Industrial Problem (Panel Discussion, page 22)
Optical Fiber Manufacture and Application (MS11, page 15)
Semiconductor Process Simulation (MS28, page 21)
Semiconductors and Transport Equations (CP16, page 25)

Inertial Manifolds and Applications
Attractors and Inertial Manifolds for Certain Infinite Dimensional Dynamical Systems (MS65, page 35)
Differential-Algebraic Equations and Approximate Inertial Manifolds: Connections, Theory and Algorithms, Parts 1 and 2 (MS46, page 28; MS51, page 30)

Iterative Methods for Linear and Nonlinear Equations
Iterative Methods for Solving Algebraic Equations (CP19, page 27)
Iterative Methods for Large-Scale Nonlinear Systems (MS53,page 30)
Iterative Methods for Solving Integral Equations (MS35, page 24)
Preconditioning of Conjugate Gradient Type Methods for Non-Hermitian Matrices (MS27, page 21)
Recent Advances in Krylov Subspace Methods for Nonsymmetric Matrix Computations (MS21, page 19)

Linear Algebra
Implicit Matrix Computations (MS36, page 24)
Numerical Methods for Eigenvalue Problems (CP6, page 16)
Numerical Linear Algebra (CP22, page 29)
Rank Revealing Factorizations and Condition Estimation, Parts 1 and 2 (MS60, page 34; MS67, page 36)
Recent Developments in Linear Algebra (MS9, page 14)
Recursive and Total Least Squares (MS48, page 29)

Mathematical Analysis, Differential Equations and Applications
Analysis of Differential Equations (CP9, page 19)
Applications and Applied Analysis (CP5, page 16)
Blow-up Behavior of Solutions of Semi-Linear Parabolic Equations (MS66, page 35)
Dispersive Initial Value Problems and Their Limiting Behavior (IP5, page 18)
Mathematical Analysis (CP26, page 31)
Nonlinear Analysis Applied to Image Processing (MS12, page 15)
Young Measures and Viscosity Solutions in Nonlinear PDE Theory (MS16, page 18)

Mathematics Education
Mathematical and Computational Sciences Awareness Workshop (Workshop, page 4)
The Teaching of Applied Mathematics (MS14, page 16)

Multigrid and Multiscale Methods
Multigrid Methods and Applications (Tutorial, page 3)
Multigrid Methods for Problems with Discontinuous Coefficients (MS1, page 13)
New Directions in Multiscale Computations (IP1, page 13)

PROGRAM-AT-A-GLANCE

Saturday, July 18

6:00 PM - 8:00 PM

Registration for Tutorials and Workshop opens
California Showroom

Sunday, July 19

7:30 AM - 5:00 PM

Registration opens
California Showroom

8:00 AM - 6:00 PM

Tutorial on Numerical Optimization and Software
Plaza Room

Tutorial on Multigrid Methods and Applications
Westside Room

Workshop on Mathematical and Computational Sciences Awareness
Beverly Hills Room

10:30 AM-11:00 AM

Coffee/Optimization and Multigrid Tutorials and Workshop
California Showroom

12:00 PM

Lunch/Mathematical and Computational Sciences Awareness Workshop
Santa Monica Room

12:30 PM - 2:00 PM

Lunch/Optimization (Sit-Down Menu)
California Showroom

3:00 PM - 4:00 PM

Coffee/Optimization and Multigrid Turorials and Workshop
California Showroom

7:00 PM - 9:00 PM

Welcoming Reception
California Showroom

7:00 PM - 9:00 PM

Registration opens

Monday, July 20

6:45 AM

Registration opens
California Showroom

7:45 AM

Opening Remarks
James M. Hyman
LA Ballroom

8:00 AM

IP1
New Directions in Multi-Scale Computations
Achi Brandt
LA Ballroom

8:45 AM

IP2
Adaptive Methods for Time-Dependent Partial Differential Equations
Joseph E. Flaherty
LA Ballroom

9:30AM

40th Anniversary Award
John A. Armstrong
LA Ballroom

10:15 AM

Coffee
California Showroom

10:45AM-12:45PM
CONCURRENT SESSIONS

MS1
Multigrid Methods for Problems with Discontinuous Coefficients
Organizer: Joel E. Dendy, Jr.
LA Ballroom

MS2
Underresolved Computations and Subscale Capturing
Organizer: Chi-Wang Shu
Santa Monica Room

MS3
Industrial Computing
Organizer: Victor Pereyra
Westside Room

MS4
The Reemergence of Kinetic Theory in Applications
Organizer: David Levermore
Plaza Room

MS5
Ill-Posed Evolution Equations: Their Physical Meaning and Possible Regularizations
Organizer: M. Gregory Forest
Westwood Room

MS6
Modeling Earthquake Dynamics
Organizer: William I. Newman
Pacific Room

MS7
Nonlinear Inverse Problems in Medical Imaging, Geophysics, and Astrophysics
Organizer: Jorge P. Zubelli
Brentwood Room

MS8
Applications for Highly Parallel Computing
Organizers: Michael R. Leuze and Donald M. Austin
Palisades Room

MS9
Recent Developments in Linear Algebra
Organizer: David Carlson
Encino Room

CP1
Finite Element Methods
Beverly Hills Room

12:45 PM

Lunch

2:00PM

IP3
Global Climatic Change: An Environmental and Mathematical Challenge
Michael C. MacCracken
LA Ballroom

2:45PM

Coffee
California Showroom

3:30 PM-5:30PM
CONCURRENT SESSIONS

MS10
Mathematical and Computational Issues in Climate Modeling
Organizer: Robert C. Malone
LA Ballroom

MS11
Optical Fiber Manufacture and Application
Organizer: John S. Abbott
Beverly Hills Room

MS12
Nonlinear Analysis Applied to Image Processing
Organizer: Stanley J. Osher
Plaza Room

MS13
Software for Highly Parallel Computing
Organizer: Robert S. Schreiber
Pacific Room

MS14
The Teaching of Applied Mathematics
Organizer: Gilbert Strang
Brentwood Room

CP2
Numerical Methods for Conservation Laws
Santa Monica Room

CP3
Numerical Methods for Boundary Value Problems
Westside Room

CP4
Particle and Vortex Methods
Westwood Room

CP5
Applications and Applied Analysis
Encino Room

CP6
Numerical Methods for Eigenvalue Problems
Sherman Oaks Room

4:00 PM

Special Session
ICEMAP (the Interagency Committee for Extramural Mathematics Programs)
Chair: Judith S. Sunley
Palisades Room

IP = Invited Presentation
CP = Contributed Presentation
MS = Minisymposium

PROGRAM-AT-A-GLANCE

Tuesday, July 21

7:00AM
Registration opens
California Showroom

8:00 AM
IP4
Chaotic Transport in Dynamical Systems
Stephen Wiggins
LA Ballroom

8:45AM
Prize Awards
Mathematical Contest in Modeling (MCM), Student Paper Competition Award—The Three Best Papers in Applied and Computational Mathematics, and The Alice T. Schafer Mathematics Annual Prize Award
LA Ballroom

9:15AM
IP5
Dispersive Initial Value Problems and Their Limiting Behavior
Peter D. Lax
LA Ballroom

9:30 AM-4:00 PM
Exhibits
California Showroom

10:00AM
Coffee
California Showroom

10:30 AM -12:30 PM
CONCURRENT SESSIONS

MS15
Application of Dynamical Systems Theory to Continuum Mechanics
Organizer:
Roberto Camassa
LA Ballroom

MS16
Young Measures and Viscosity Solutions in Nonlinear PDE Theory
Organizer:
Sivaguru S. Sritharan
Santa Monica Room

MS17
Guided Wave Propagation
Organizers:
Michael D. Collins and Michael B. Porter
Westside Room

10:30 AM - 12:30 PM
CONCURRENT SESSIONS CONTINUED

MS18
ADIFOR —Automatic Differentiation in Fortran
Organizer:
George F. Corliss
Plaza Room

MS19
Inverse Coefficient Problems for Systems (Part 1 of 2)
Organizers: Ziqui Sun and Victor Isakov
Westwood Room

MS20
Parallel Algorithms and Software for Large Scale Eigenvalue Problems
Organizer:
Jean-Philippe Brunet
Brentwood Room

MS21
Recent Advances in Krylov Subspace Methods for Nonsymmetric Matrix Computations
Organizer:
Roland W. Freund
Palisades Room

CP7
Moving and Graded Grids
Beverly Hills Room

CP8
Statistical Testing
Pacific Room

CP9
Analysis of Differential Equations
Encino Room

Student Paper Competition Presentation
Sherman Oaks Room

12:30 PM
Lunch

AWM Executive Committee Luncheon
Redwood Room

Poster Session Set Up
California Showroom

2:00 PM
IP6
Predicting the Future with Nonlinear Models
J. Doyne Farmer
LA Ballroom

2:45 PM
Coffee
California Showroom

6:30 PM
Alice T. Schafer Prize Dinner
Redwood Room

8:00 PM - 9:30 PM
Mathematics, Modeling, and Simulation of Industrial Problems (A Panel Discussion)
Organizer: James G. Glimm
Pacific/Palisades Room

3:30 PM - 5:30PM
CONCURRENT SESSIONS

MS22
Applications of Sampling Theory
Organizer:
Farokh A. Marvasti
LA Ballroom

MS23
Attractors, Length Scales and Fluctuations in Ocean Dynamics
Organizer:
Darryl D. Holm
Westside Room

MS24
Numerical Methods for Differential-Algebraic Equations and Applications
Organizer: Uri M. Ascher
Plaza Room

MS25
AWM *(Association for Women in Mathematics)* **Panel on Research in Government**
Organizer:
Joyce R. McLaughlin
Westwood Room

MS26
Inverse Coefficient Problems for Systems (Part 2 of 2)
Organizers: Ziqui Sun and Victor Isakov
Pacific Room

MS27
Preconditioning of Conjugate Gradient Type Methods for Non-Hermitian Matrices
Organizers: Roland Freund, Peter Forsyth and Wei-Pai Tang
Palisades Room

MS28
Semiconductor Process Simulation
Organizer: Leonard J. Borucki
Sherman Oaks Room

MS29
The Mathematical Contest in Modeling
Organizer: B.A. Fusaro
Encino Room

CP10
Wave Motion
Santa Monica Room

CP11
Numerical Approximation of Boundaries in PDE's
Beverly Hills Room

CP12
Parallel Numerical Methods
Brentwood Room

Poster Session
California Showroom

Wednesday, July 22

7:30 AM
Registration opens
California Showroom

8:00 AM
IP7
Mathematical Problems in Photography
David S. Ross
LA Ballroom

8:45 AM
The Richard C. DiPrima Prize Presentation
LA Ballroom

9:00 AM
IP8
Some Mathematical Problems in Polymer Processing
Morton Denn
LA Ballroom

9:30 AM - 4:00 PM
Exhibits
California Showroom

9:45 AM
Coffee
California Showroom

10:30 AM - 12:30 PM
CONCURRENT SESSIONS

MS30
Modeling the Chemomechanics of Gels
Organizers: Jeffrey R. Sachs and David S. Ross
Encino Room

MS31
Effective Equations for Fluid Flow (Part 1 of 2)
Organizer: Kurt S. Riedel
LA Ballroom

MS32
Regular and Chaotic Dynamics Arising in Nonlinear Optics
Organizer: Gregor Kovacic
Beverly Hills Room

MS33
Taylor Series for ODEs and DAEs
Organizer:
George F. Corliss
Westside Room

MS34
Neural Network Training
Organizer:
Scott A. Markel
Westwood Room

MS35
Iterative Methods for Solving Integral Equations
Organizer:
Anne Greenbaum
Pacific Room

MS36
Implicit Matrix Computations
Organizer:
Adam W. Bojanczyk
Sherman Oaks Room

CP13
Parallel Numerical Methods for PDEs
Santa Monica Room

CP14
Image Processing
Plaza Room

CP15
Numerical Analysis 1
Brentwood Room

CP16
Semiconductors and Transport Equations
Palisades Room

12:30 PM
Lunch

2:00 PM
IP9
The Numerical Solution of Differential-Algebraic Equations
Linda R. Petzold
LA Ballroom

2:45 PM
Coffee
California Showroom

3:30 PM - 5:30 PM
CONCURRENT SESSIONS

MS37
Parameter Estimation for ODEs and DAEs
Organizer:
Stephen Wright
LA Ballroom

MS38
Effective Equations for Fluid Flow (Part 2 of 2)
Organizer: Kurt S. Riedel
Santa Monica Room

MS39
Boundary Conditions for the Simulation of Unsteady Flows
Organizer:
Thomas Hagstrom
Beverly Hills Room

MS40
Numerical Treatment of Large-Scale Ill-Posed Problems
Organizers: Curt Vogel and Per Christian Hansen
Plaza Room

MS41
A Multidimensional System of Parallel Coordinates: Foundations and Applications
Organizer: Alfred Inselberg
Westwood Room

MS42
Asymptotic and Perturbation Methods in Nonlinear Wave Propagation
Organizer:
William L. Kath
Palisades Room

CP17
Dynamical Systems and Chaos
Westside Room

CP18
Software
Pacific Room

CP19
Iterative Methods for Solving Algebraic Equations
Brentwood Room

CP20
Elasticity
Sherman Oaks Room

Thursday, July 23

7:30 AM

Registration opens
California Showroom

8:00 AM

IP10
Wavelet Transforms Versus Fourier Transforms
Gilbert Strang
LA Ballroom

8:45 AM

IP11
Tensor Methods for Nonlinear Equations and Optimization
Robert B. Schnabel
LA Ballroom

9:00 AM - 4:00 PM

Exhibits
California Showroom
Last Day of Exhibits

9:30 AM

Coffee
California Showroom

10:00 AM - 12:00PM
CONCURRENT SESSIONS

MS43
Large-Scale Optimization
Organizer:
Thomas F. Coleman
LA Ballroom

MS44
Adaptive Methods in Computational Fluid Dynamics
Organizer: Phillip Colella
Santa Monica Room

MS45
Grid Generation: Theory and Applications (Part 1 of 2)
Organizers:
Jose E. Castillo
and Patrick M. Knupp
Beverly Hills Room

MS46
Differential-Algebraic Equations and Approximate Inertial Manifolds: Connections, Theory and Algorithms (Part 1 of 2)
Organizers:
Yannis Kevrekidis
and Edriss S. Titi
Westside Room

MS47
Fast Solvers for Electromagnetics
Organizer:
Vijaya Shankar
Pacific Room

MS48
Recursive and Total Least Squares
Organizer: James R. Bunch
Brentwood Room

MS49
New Developments in Plate and Shell Theory (Part 1 of 2)
Organizers: Robert P. Gilbert and Klaus Hackl
Encino Room

CP21
Signal Processing (Wavelets)
Plaza Room

CP22
Numerical Linear Algebra
Westwood Room

CP23
Numerical Analysis 2
Palisades Room

12:00 PM

Lunch

1:30 PM

The John von Neumann Lecture
Lagrange Multipliers and Optimality
R. Tyrrell Rockafellar
LA Ballroom

2:30 PM

SIAM Business Meeting
LA Ballroom

3:00 PM

Coffee
California Showroom

3:30 PM - 5:30 PM
CONCURRENT SESSIONS

MS50
Grid Generation: Theory and Applications (Part 2 of 2)
Organizers:
Jose E. Castillo
and Patrick M. Knupp
Beverly Hills Room

MS51
Differential-Algebraic Equations and Approximate Inertial Manifolds: Connections, Theory and Algorithms (Part 2 of 2)
Organizers:
Yannis Kevrekidis
and Edriss S. Titi
Santa Monica Room

MS52
Sensitivity and Condition Estimation
Organizers: Charles S. Kenney and Alan J. Laub
Westside Room

MS53
Iterative Methods for Large-Scale Nonlinear Systems
Organizer:
Homer F. Walker
Westwood Room

MS54
New Developments in Plate and Shell Theory (Part 2 of 2)
Organizers: Robert P. Gilbert and Klaus Hackl
Brentwood Room

MS55
Advances in Applied Reservoir Simulations in the Oil Industry
Organizer: Ernest Y. Chung
Palisades Room

CP24
Computational Fluid Dynamics
LA Ballroom

CP25
Control Theory and Optimization
Plaza Room

CP26
Mathematical Analysis
Pacific Room

CP27
Theoretical Issues in Numerical Analysis
Encino Room

CP28
Geometric Design and Approximation Theory
Sherman Oaks Room

Friday, July 24

7:30 AM

Registration opens
California Showroom

8:00 AM

IP12
Procedurally-Defined Curves and Surfaces in Computer-Aided Geometric Design
Rida T. Farouki
LA Ballroom

8:45 AM

The George Polya Prize Presentation
Convex Polyhedra, Rigidity of Frameworks, Linear Programming and Computers
Gil Kalai
LA Ballroom

9:30 AM

Coffee
California Showroom

10:00 AM - 12:00 PM
CONCURRENT SESSIONS

MS56
Vortex Methods and Vortex Dynamics for Incompressible Flow (Part 1 of 2)
Organizer:Thomas Y. Hou
LA Ballroom

MS57
Finite Difference Discretizations and Their Applications to Complex Modeling Problems (Part 1 of 2)
Organizers:
Stanly Steinberg
and Deborah Sulsky
Beverly Hills Room

MS58
Recent Advances in the Theory and Application of Dynamical Systems
Organizer: Peter W. Bates
Santa Monica Room

MS59
Research Directions in Highly Parallel Architectures
Organizers:
Anoop Gupta
and Robert Schreiber
Westside Room

MS60
Rank Revealing Factorizations and Condition Estimation (Part 1 of 2)
Organizers: Tony F. Chan and Per Christian Hansen
Plaza Room

MS61
Optimization of Trajectories by Collocation Methods
Organizer:
Kathryn Brenan
Westwood Room

MS62
Special Functions and Their Applications (Part 1 of 2)
Organizers:
Mourad E.H. Ismail
and Charles F. Dunkl
Pacific Room

CP29
Computer Science 1
Brentwood

CP30
Chemical Kinetics
Palisades Room

CP31
Economics
Encino Room

CP32
Biological Mathematics
Sherman Oaks Room

12:00 PM

Lunch

1:30 PM

Registration closes
California Showroom

1:30 PM -3:30PM
CONCURRENT SESSIONS

MS63
Vortex Methods and Vortex Dynamics for Incompressible Flow (Part 2 of 2)
Organizer: Thomas Y. Hou
LA Ballroom

MS64
Finite Difference Discretizations and Their Applications to Complex Modeling Problems (Part 2 of 2)
Organizers:
Stanley Steinberg
and Deborah Sulsky
Beverly Hills Room

MS65
Attractors and Inertial Manifolds for Certain Infinite Dimensional Dynamical Systems
Organizer: Anthony T.Chronopoulos
Santa Monica Room

MS66
Blow-up Behavior of Solutions of Semi-Linear Parabolic Equations
Organizers:
Hamid Bellout
and Man K. Kwong
Plaza Room

MS67
Rank Revealing Factorizations and Condition Estimation (Part 2 of 2)
Organizers: Tony F. Chan and Per Christian Hansen
Westwood Room

MS68
Special Functions and Their Applications (Part 2 of 2)
Organizers: Mourad E.H. Ismail and Charles F. Dunkl
Palisades Room

MS69
Applying Constructive Mathematical Techniques to Dynamical Systems Experiments
Organizer: Ira B. Schwartz
Encino Room

CP33
Numerical Methods for ODE's and DAE's
Westside Room

CP34
Computer Science 2
Pacific Room

CP35
Randomness, Stochastic Processes and Applications
Brentwood Room

3:30 PM

Conference Adjourns

Visit Birkhäuser's Booth at the SIAM Meeting in July

20% Discount Available

A. Fässler, Ingenieurschule Biel, Switzerland and the late **Eduard Stiefel**

Group Theoretical Methods and their Applications

Written at a level appropriate to scientists wishing to apply the concepts to symmetry problems or to familiarize themselves with group theory in an applied setting. Illustrated with over 50 figures, this book presents theory, examples, and applications, interacting with each other in a didactically refreshing and unconventional way, while maintaining mathematical integrity and accuracy. The applications are written with the non-expert in mind.
1992/Approx. 305 pp., 57 illus./Hardcover/ISBN 0-8176-3527-0/$49.50

R.J. LeVeque, University of Washington, Seattle

Numerical Methods for Conservation Laws

Developed for a graduate-level course on the theory and numerical solution of nonlinear hyperbolic systems of conservation laws. Intended for a wide audience, this book will be of use to both numerical analysts and to computational researchers in a variety of applications.
1992/232 pp./Softcover/ISBN 0-8176-2464-3/$24.50
Lectures in Mathematics

N. G. Lloyd, University College of Wales; **W. M. Ni,** University of Minnesota; **L. A. Peletier,** Leiden University; **J. Serrin,** University of Minnesota *(Eds.)*

Nonlinear Diffusion Equations and their Equilibrium States, 3

This volume had its origins in the highly acclaimed Gregynog, Wales, August 1989 session of an ongoing series that began at the Mathematical Sciences Research Institute. In this area of endeavor, this series of conferences serves as an important vehicle to disseminate information and highlight new developments. Research workers in applied mathematics, engineering, physics, chemistry, and biology will find much of interest both for themselves and for their graduate students beginning their studies of special topics.
1992/Approx. 600 pp., 4 illus./Hardcover
ISBN 0-8176-3531-9/$120.00(tent.)
Progress in Nonlinear Differential Equations and their Applications, Vol. 7

S.Y. Pilyugin, State University Petrodvorets, St. Petersburg, Russia

Introduction to Structurally Stable Systems of Differential Equations

This book provides an introduction to the theory of structural stability - one of the most important branches of modern theory of dynamical systems. It contains a description of main ideas of the theory and proofs of such fundamental results as the Stable Manifold Theorem and the Kupka-Smale Theorem. Geometry of Morse-Smale systems, transversal homoclinic points and the analytic strong transversality condition are treated in detail.
1991/Approx. 200 pp./Hardcover/ISBN 0-8176-2574-7/$54.00 (tent.)

Three Easy Ways to Order!

- **Call:** Toll-Free 1-800-777-4643. In NJ please call (201) 348-4033. Your reference number is Y564.
- **Write:** Send payment plus $2.50 for postage and handling to: **Birkhäuser,** Order Fulfillment -Dept. Y564, P.O. Box 2485, Secaucus, New Jersey 07096-2491.
- **Visit:** Your Local Technical Bookstore.

Visa, MasterCard, American Express and Discover charge cards as well as personal checks and money orders are acceptable forms of payment. All orders will be processed upon receipt. If an order cannot be fulfilled within 90 days, payment will be refunded. Prices quoted are payable in U.S. currency or its equivalent.

I. Gohberg, Tel Aviv University, Israel; **N. Krupnik,** Bar Ilan University, Ramat Gan, Israel *(Eds.)*

One-Dimensional Linear Singular Integral Equations

This book is the first part of an introduction into the theory of linear one-dimensional singular integral operators. The main topics of this volume are: boundedness of singular integral operators in various function spaces, invertibility of these operators, and inversion methods, Noether-Fredholm theory, and local principles. The book contains both a general abstract approach and concrete solution methods for singular integral equations, various applications, numerous examples and exercises. Here only singular integral operators with continuous coefficients on closed curves are considered. The case of discontinuous coefficients and more general curves will be considered in a second volume.
1992/272 pp./Hardcover/ISBN 0-8176-2584-4/$95.00
Operator Theory, Volume 53

A.N. Leznov and **M.V. Savel'ev,** Institute for High Energy Physics, Protvino, USSR

A Group-Theoretical Method for Integration of Nonlinear Dynamical Systems

Reviews a large number of specific one and two-dimensional equations that describe non-linear phenomena in various areas of modern theoretical and mathematical physics. It is meant, above all, for physicists who specialize in field theory and physics of elementary particles and plasma, for mathematicians dealing with non-linear differential equations, differential geometry and algebra, and the theory of Lie algebras and groups and their representations, and for students and post-graduates in these fields.
1992/Approx. 526 pp./Hardcover/ISBN 0-8176-2615-8/$160.00 (tent.)

R.M. Blumenthal, University of Washington

Excursions of Markov Processes

Discusses the analysis and construction of Markov processes in terms of the excursions of the path between visits to a subset of the state space. The purpose of this book is to attract graduate students and research mathematicians to the subject and to acquaint them with the theory, techniques and applications of the excursion viewpoint. Emphasis is on a notable aspect of excursion theory, its use in making specific computations and in providing concrete illustrations of many concepts, even some deeply theoretical ones, from probabilistic potential theory. There is much current research in probability that uses the ideas and techniques of excursion theory, and many open problems are suggested by this research.
1991/275 pp./Hardcover/ISBN 0-8176-3575-0/$64.50
Probability and Its Applications

C.H. Scholz, Columbia University; and **B.B. Mandelbrot,** IBM *(Eds.)*

Fractals in Geophysics

A collection of papers in which fractal geometry is applied to geophysical phenomena. Topics include fractal analysis of topography and landforms, faulting and fracture networks, fluid flow, geophysical data sets, and seismology of fractal media.
1989/260 pp./Hardcover/ISBN 0-8176-2206-3/$62.50

Birkhäuser
Boston Basel Berlin

6:45/CALIFORNIA SHOWROOM

Registration Opens

7:45/LA BALLROOM

Opening Remarks

James M. Hyman, Los Alamos National Laboratory

8:00/LA BALLROOM

IP1/Chair: Thomas A. Manteuffel, University of Colorado, Denver

New Directions in Multi-Scale Computations

Achi Brandt
The Elaine and Bram Goldsmith Professor of Applied Mathematics
Department of Applied Mathematics
Weizmann Institute of Science, Rehovot, Israel

8:45/LA BALLROOM

IP2/Chair: Thomas A. Manteuffel, University of Colorado, Denver

Adaptive Methods for Time-Dependent Partial Differential Equations

Joseph E. Flaherty
Department of Computer Science and Scientific Computation Research Center
Rensselaer Polytechnic Institute

9:30/LA BALLROOM

Chairs: I. Edward Block, Managing Director, and Robert E. O'Malley, Jr., President, SIAM

40th Anniversary Award

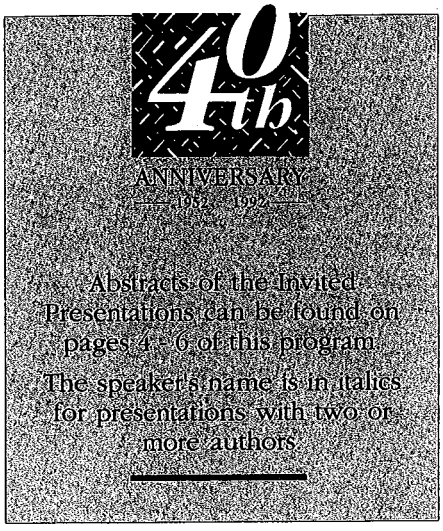
This award is presented to IBM corporation in recognition of its support of SIAM for forty years.

The Contribution of Applied and Computational Mathematics at IBM, Now and in the Future

John A. Armstrong
Vice President-Science and Technology
IBM Corporation

10:15/CALIFORNIA SHOWROOM

Coffee



10:45AM - 12:45PM

CONCURRENT SESSIONS

MS1/LA BALLROOM

Multigrid Methods for Problems with Discontinuous Coefficients

Many important physical problems are modeled by differential equations with anisotropic coefficients that jump by orders of magnitude across internal interfaces. Examples include petroleum reservoir engineering, modeling of contaminant transport, and design of nuclear reactors. This minisymposium explores several new advances in solving these problems using multigrid methods. Two of the talks deal with diffusion equations; the other two deal with the neutron transport equation, either by using diffusion synthetic acceleration or by using a direct multigrid attack.

Organizer: Joel E. Dendy, Jr.
Los Alamos National Laboratory

10:45 **Semi-Coarsening Multigrid Methods for Elliptic Partial Differential Equations with Highly Discontinuous Coefficients**
Stephen Schaffer, New Mexico Insitute of Mining and Technology

11:15 **Robust Multigrid Algorithms for Massively Parallel Architectures, Using Multiple Semicoarsened Grids**
John R. Van Rosendale, NASA Langley Research Center, Joel E. Dendy, Jr., Organizer, and Naomi H. Naik, Lamont Doherty Geological Observatory of Columbia University

11:45 **Multigrid Solution of the Diffusion Equation with Bilinear Discontinuous Mixed Finite Element Discretization**
J.E. Morel, Los Alamos National Laboratory, and J.E. Dendy, Jr., Organizer

12:15 **Fast Multilevel Algorithms for the Solution of Transport Equations**
Thomas A. Manteuffel, University of Colorado, Denver and J.E. Morel, Los Alamos National Laboratory

MS2/SANTA MONICA ROOM

Underresolved Computations and Subscale Capturing

The speakers in this minisymposium will discuss numerical techniques when the computational degrees of freedom or number of operations are too small to resolve all existing scales in a problem, but some essential features of the problem can be faithfully resolved to adequate accuracy. Shock capturing, front capturing and multi-resolution techniques are examples in this category.

Organizer: Chi-Wang Shu
Brown University

10:45 **Numerical Approximation of Stiff Partial Differential Equations**
Bjorn Engquist, University of California, Los Angeles

11:15 **Title to be announced**
Chris Anderson, University of California, Los Angeles

11:45 **Computing the Weak Limit of KdV**
John Strain, The Institute for Advanced Study, Princeton, NJ and David W. McLaughlin, Princeton University

12:15 **Shock Capturing and Global Resolution**
Chi-Wang Shu, Organizer

MS3/WESTSIDE ROOM

Industrial Computing

The speakers in this minisymposium will present examples of problems from or of interest to industry which involve large scale scientific computing and applied mathematics. The intention is to encourage interdisciplinary discussion, so the speakers have been drawn from several fields. They will explain what are the problems, what are their current solutions and what needs to be done in the future.

Organizer: Victor Pereyra
Weidlinger Associates, Los Altos, CA

10:45 **The Impact of Algorithms on Semiconductor Device Simulation**
William M. Coughran, Jr., AT&T Bell Laboratories

11:15 **Large Scale Geophysical Inversion Using Global Search Methods**
John A. Scales, Martin L. Smith, and Terri L. Fisher, Amoco Research Center, Tulsa, OK

11:45 **Shock Capturing Methods in Oil Reservoir Simulation**
Bjorn Engquist, University of California, Los Angeles

12:15 **A Parallel Network Computer Approach for 3D Geophysical Modeling**
Juan C. Meza, Sandia National Laboratories, Livermore, CA, M. Koshy, Weidlinger Associates, Los Altos, CA and Victor Pereyra, Organizer

12:45 **Hierarchical Parametric Spline Surfaces in Computer-Aided Design**
Richard H. Bartels, University of Waterloo, Canada

MS4/PLAZA ROOM

The Reemergence of Kinetic Theory in Applications

Summary, speakers and titles will be listed in the final program.

Organizer: David Levermore
University of Arizona

MS5/WESTWOOD ROOM

Ill-Posed Evolution Equations: Their Physical Meaning and Possible Regularizations

This minisymposium will focus on four physically motivated examples in which ill-posed evolution equations arise. In each case, the ill-posedness signals an interesting nonlinear phenomenon, but some modification is required to model the onset or emergence. The speakers will present two distinct mathematical scenarios. In each scenario, the physical equations are presumed fundamental so that the underlying equilibrium or mode Ansatz must be enlarged. In the second case, the background structure Ansatz itself is of fundamental interest, together with its destabilization, and then new physics is proposed to neutralize or bound the previously unbounded growth rates.

Organizer: M. Gregory Forest
Ohio State University

10:45 **An Unstable Modulation Theory and Optical Oscillations**
David Muraki and David W. McLaughlin, Princeton University, Otis C. Wright, Ohio State University; and M. Gregory Forest, Organizer

11:15 **The von Neumann Paradox in Weak Shock Reflection and Weakly Nonlinear Geometrical Optics**
Ruben R. Rosales, Massachusetts Institute of Technology

10:45 AM - 12:45 PM
CONCURRENT SESSIONS

11:45 Stable Methods for Vortex Sheet Motion in the Presence of Surface Tension
Greg Baker and *Andre Nachbin*, Ohio State University

12:15 Surface Tension Driven Change of Type in Free Surface Fibers and Jets
M. Gregory Forest, Organizer, and Qi Wang, Indiana University-Purdue University

MS6/PACIFIC ROOM

Modeling Earthquake Dynamics

Earthquakes can be regarded as dynamical systems with spatial and temporal scaling properties as well as other nonlinear manifestations (e.g.~coherent structures, fractal geometry, self-organized criticality, low dimensional chaos). They are the result of slip or rupture between blocks of material ("tectonic plates") at or near the earth's surface, driven by convection in the earth's interior. Our understanding of these events has been limited by our ability to model and efficiently compute the evolution of the continuum systems.

The speakers in this session will focus on some of the fundamental questions germane to the modeling of these phenomena, describe the nature of the application, and present some models, numerical methods and results obtained in recent investigations of earthquake-related phenomena.

Organizer: William I. Newman
University of California, Los Angeles

10:45 Scaling and Statistics in a Dynamic Model of a Fault
Jean M. Carlson, James S. Langer, Bruce E. Shaw, University of California, Santa Barbara and C. Tang, NEC Research Institute, Princeton, NJ

11:15 Scaling and Critical Phenomena in a Class of Burridge-Knopoff Models for Earthquakes
John Rundle, Lawrence Livermore National Laboratory, Livermore, CA and William Klein, Boston University

11:45 Application of the Equivariant Branching Lemma to Steady-State Bifurcations in Spherical Shell Convection
Cheryl A. Stewart, Cornell University

12:15 A Renormalization Approach to Multidimensional Nonlinear Continuum Mechanics: Applications to Earthquake Modeling
William I. Newman, Organizer, James M. Hyman, Los Alamos National Laboratory, Leon Knopoff, University of California, Los Angeles, Donald L. Turcotte, Cornell University and David K. Campbell, Los Alamos National Laboratory

MS7/BRENTWOOD ROOM

Nonlinear Inverse Problems in Medical Imaging, Geophysics, and Astrophysics

This minisymposium is concerned with nonlinear problems in the reconstruction of the interior of bodies from external measurements. Such problems arise in medical imaging, geophysics, and helioseismology. The session will focus on models that yield a nonlinear inverse problem or that require information from higher order terms. Most of the current methods for nonintrusive reconstruction are based on linearized approximations. In many situations, however, the nonlinear terms are indispensable.

The speakers will discuss models and their solution including developments in the field of "diffuse tomography", where the linearization process yields an undetermined system and so requires the study of the fully nonlinear problem.

Organizer: Jorge P. Zubelli
University of California, Santa Cruz

10:45 Diffuse Tomography
Alberto Grunbaum, University of California, Berkeley

11:15 The Isotropic Case of Diffuse Tomography. Computational and Theoretical Aspects
Jorge P. Zubelli, Organizer

11:45 A New Step in The Asymptotic Inversion of Free Oscillation Data
Mikhail Brodsky, University of California, Berkeley

12:15 Conservative Numerical Uncertainty Estimates in Inverse Problems
Philip Stark, University of California, Berkeley

MS8/PALISADES ROOM

Applications for Highly Parallel Computing

Sponsored by
SIAM Activity Group on Supercomputing

Highly parallel computers are playing an increasingly important role in scientific computing. The most powerful computers available today are highly parallel. Although many problems remain to be solved before these machines will be used widely and efficiently, their impact is already being felt by researchers in numerous applications areas. Computation is beginning to take its place beside theory and experimentation as a third way of doing science.

The speakers in this minisymposium will discuss the application of state of the art parallel computers in a variety of grand challenges. Particular emphasis will be placed on the improvements in mathematical models that are required to obtain more accurate solutions to these complex problems and that are made possible by the power of these computers.

Organizers: Michael R. Leuze
Oak Ridge National Laboratory,
and Donald M. Austin,
University of Minnesota, Minneapolis

10:45 Solving Material Science Problems at ORNL's Center for Computational Studies
G.A. Geist, Oak Ridge National Laboratory

11:15 Iterative Finite Element Computation of Unsteady Incompressible Flows with the Stabilized Space-Time Formulations
Tayfun E. Tezduyar, Marek A. Behr, Sanjay Mittal, and Andrew A. Johnson, Army High Performance Computing Research Center, and University of Minnesota, Minneapolis

11:45 Computation of Compressible Flows with the Piecewise Parabolic Method
Paul Woodward, Army High Performance Computing Research Center and University of Minnesota, Minneapolis

12:15 Simulation of Homogeneous Turbulence on the Intel iPSC/80 Gamma and Delta
Alan Wray, Nasa Ames Research Center

MS9/ENCINO ROOM

Recent Developments in Linear Algebra

Sponsored by
SIAM Activity Group on Linear Algebra

Linear algebra is an important tool both for modeling and for numerical work in many areas, including computer science, economics, engineering, operations research and statistics. It is also an active subject for research within mathematics. Talks are scheduled to cover recent developments in four areas: core linear algebra, numerical linear algebra, applications of linear algebra, and the teaching of linear algebra. They will present the major areas of current activity and the "hot topics" — where we are and where we are going.

Organizer: David Carlson
San Diego State University

10:45 Matrix Theory: Where is the Core?
Charles R. Johnson, The College of William and Mary

11:15 Recent Developments in Large-Scale and Parallel Matrix Computations and their Applications in Linear Control
Biswa N. Datta, Northern Illinois University

11:45 Recent Developments in Linear Algebra for Numerical Optimization
Margaret H. Wright, AT&T Bell Laboratories

12:15 Current Quandaries in Matrix Computations
Beresford N. Parlett, University of California, Berkeley

12:45 Recent Developments in the Teaching of Linear Algebra
David Carlson, Organizer

CP1/BEVERLY HILLS ROOM

Finite Element Methods

Chair: Weimin Han, University of Iowa

10:45 The Convergence of Finite Element Methods for the Shallow Arch Problem
Barbara Swart, University of Pretoria, South Africa and B.D. Reddy, University of Cape Town, South Africa

11:00 Enriched Least-Squares Finite Element for a Model Boundary Value Problem
Ching Lung Chang, Cleveland State University

11:15 Wilson's Element for the Reissner-Mindlin Plate
Zhimin Zhang, Texas Tech University, and Shangyou Zhang, University of Delaware

11:30 Reduced Continuity Finite Element Approximations for Convection Dominated Convection-Diffusion Equations
Da-mu Cai, University of Wisconsin, Madison

11:45 The *P*-version Penalty Finite Element Method
Weimin Han, University of Iowa

12:00 Multi-*p* Methods Based on Textured Decomposition Iterations
Ning Hu and I. Norman Katz, Washington University, St Louis, MO

12:15 Piecewise Polynomial Collocation for Boundary Integral Equation
David Chien and Kendall E. Atkinson, University of Iowa, Iowa City

12:30 Finite Element Analysis of a Holonomic Elastic-Plastic Problem
Weimin Han, University of Iowa

MEETING PROGRAM

12:45-2:00
Lunch

2:00/LA BALLROOM
IP3/Chair: Robert C. Malone, Los Alamos National Laboratory

Global Climatic Change: An Environmental and Mathematical Challenge

Michael C. MacCracken
Atmospheric and Geophysical Sciences Division
Lawrence Livermore National Laboratory

2:45/CALIFORNIA SHOWROOM
Coffee

3:30PM - 5:30PM
CONCURRENT SESSIONS

MS10/LA BALLROOM

Mathematical and Computational Issues in Climate Modeling

Comprehensive computer models for understanding and predicting changes in the earth's climate will require far more powerful computers than are presently available. These models will couple atmospheric and oceanic global circulation models and will add complex calculations associated with atmospheric chemistry, land surface processes, and the biosphere. Development of accurate and efficient methods for solving the many types of equations that arise in climate models will play a critical role in achieving the required level of performance.

The minisymposium will acquaint the audience with a few of the problems confronting developers of global climate models and some methods that are being employed. The speakers will discuss a variety of computational methods applicable to numerical simulations of the atmosphere and oceans.

Organizer: Robert C. Malone, Los Alamos National Laboratory

3:30 **Some Selected Computational Aspects of Modeling the Atmosphere**
Akio Arakawa, University of California, Los Angeles

4:00 **The Free-Surface Formulation for a Global Ocean Model**
John Dukowicz, Los Alamos National Laboratory

4:30 **The Vector Harmonic Transform Method for Solving Partial Differential Equations on the Sphere**
Paul N. Swarztrauber, National Center for Atmospheric Research, Boulder, CO

5:00 **Modern Numerical Methods for Treating Sharp Fronts in Fluid Flow**
Steven T. Zalesak, NASA Goddard Space Flight Center, Greenbelt, MD

MS11/BEVERLY HILLS ROOM

Optical Fiber Manufacture and Application

The speakers will present interesting problems arising in the modeling of phenomena in the manufacturing process for optical fibers and in the light propagation in the fiber itself. The manufacturing problems include problems in two-phase-flow, heat transfer, chemical reactions, radiation heat transfer, and the consolidation of porous bodies. The light propagation problems include predicting different attenuation and dispersion phenomena or the inverse problem of measurement interpretation. The work in this area has contributed to an increasing variety of specialized fiber designs and manufacturing improvements and thereby to the central role of optical fiber in our information-intensive world.

Organizer: John S. Abbott, Corning Incorporated, Corning, NY

3:30 **Applied Mathematics in Optical Fiber Manufacture**
John S. Abbott, Organizer

4:00 **Numerical Modeling of Transport Phenomena in the Manufacture of Optical Fibers**
Kenneth L. Walker, AT&T Bell Laboratories

4:30 **Design of Lightguide Preform Fabrication by MCVD: Modeling of Agglomerate Particle Formation by Coagulation and Sintering**
Sotiris E. Pratsinis, University of Cincinnati

5:00 **A Model for Unsteady Analysis of Preform Drawing**
Matthew R. Myers, U.S. Food and Drug Administration

MS12/PLAZA ROOM

Nonlinear Analysis Applied to Image Processing

Problems in image processing such as enhancement, noise removal, compression, edge detection, segmentation, and the recovery of shapes from shading are complicated by the fact that images are characterized by edges and other singularities. These problems are central to the manipulation and analysis of pictures by computer. Standard signal processing techniques have difficulty in the presence of these singularities. Recently nonlinear analysis techniques (mostly partial differential equation based) have been developed by several different groups to handle these difficulties. And multiresolution analysis has proven useful in this connection.

The speakers will discuss new nonlinear approaches to some of these basic issues of image processing.

Organizer: Stanley J. Osher, Cognitech, Inc., Santa Monica, CA and University of California, Los Angeles

3:30 **Mathematical Morphology and Nonlinear Partial Differential Equations**
Pierre-Louis Lions, Universite Paris IX-Dauphine, France

4:00 **Image Segmentation**
Jean-Michel Morel, Centre de la Recherche de Mathematique de la Decision, France, and *Georges Koepfler*, Centre de la Recherche de Mathematique de la Decision, France, and Cognitech, Inc., Santa Monica, CA

4:30 **Nonlinear Diffusion in Image Processing**
Jayant Shah, Northeastern University

5:00 **Image Processing with Subcell Accuracy**
Leonid I. Rudin, Cognitech, Inc., Santa Monica, CA, and Stanley J. Osher, Organizer

MS13/PACIFIC ROOM

Software for Highly Parallel Computing

Sponsored by
SIAM Activity Group on Supercomputing

The topic of the minisymposium is systems software - compilers, runtime systems and operating systems - for highly parallel computers. The speakers will present new research in several related directions: advanced timing and debugging tools for distributed-memory systems, advanced compiler optimization and parallelization of sequential codes, fast implementation of parallel prefix operations, and software support for shared address spaces in distributed memory machines.

Organizer: Robert S. Schreiber, RIACS-NASA Ames Research Center

3:30 **Munin: Efficient and Flexible Distributed Shared Memory**
Willy Zwaenepoel, Rice University

4:00 **Recognizing and Parallelizing Bounded Recurrences**
David Callahan, Tera Computer Company, Seattle, WA

4:30 **Why and How Instruction Level Parallelism**
Alexandru Nicolau, University of California, Irvine

5:00 **Performance Analysis Environments for Scalable Parallel Systems**
Daniel Reed, University of Illinois, Urbana

3:30PM-5:30PM
CONCURRENT SESSIONS

MS14/BRENTWOOD ROOM
The Teaching of Applied Mathematics

SIAM is very much involved with education, and one central part is classroom teaching. This minisymposium concentrates on several key courses in applied mathematics. The participants will speak about their own experience and emphasis and expectations. The presentations will be informal, with participation hoped for from the audience (as in good teaching).

Organizer: Gilbert Strang
Massachusetts Institute of Technology

3:30 **Teaching Linear Algebra**
Gilbert Strang, organizer

4:00 **Teaching Modeling**
Richard Haberman, Southern Methodist University

4:30 **The Teaching of Numerical Analysis**
Chris R. Anderson, University of California, Los Angeles

5:00 **Teaching Combinatorics**
Adriano Garsia, University of California, San Diego

5:30 **Computer Versus Computational Literacy: Investigations in Undergraduate Curricula**
Kris Stewart, San Diego State University

CP2/SANTA MONICA ROOM
Numerical Methods for Conservation Laws

Chair: James P. Collins,
Naval Surface Warfare Center, Silver Spring, MD

3:30 **Tracking of Shear Layers and Contacts**
Stephen F. Davis, Naval Surface Warfare Center, White Oak, MD

3:45 **Shock Tracking Based on High Resolution Wave Propagation Methods**
Keh Ming Shyue and Randall L. LeVeque, University of Washington, Seattle

4:00 **The Extremum Tracking Approach for Numerical Analysis of Conservation Laws**
Huanan Yang, Kansas State University

4:15 **Disconinuity-Adaptive Godunov Scheme**
W.H. Hui, Hong Kong University of Science and Technology, Hong Kong and C.Y. Lepage, University of Waterloo, Canada

4:30 **A Novel Lax-Wendroff Type Scheme for Non-Conservative 1-Dimensional Hyperbolic Systems**
Vianey Villamizar, Guillermo Miranda and Otilio Rojas, Universidad Central de Venezuela, Venezuela

4:45 **An Adaptive Random Choice Method**
Yu Song, Indiana University, South Bend

5:00 **An Implicit-Explicit Godunov Method for Compressible Gas Dynamics**
James P. Collins, Naval Surface Warfare Center, Silver Spring, MD

5:15 **Parallel Solution of Systems of Conservation Laws Using High Order Methods of Godunov Type**
Marcin Paprzycki and Ken Bridges, University of Texas-Permian Basin, Odessa and Xuefeng Li, Loyola University

CP3/WESTSIDE ROOM
Numerical Methods for Boundary Value Problems

Chair: Charles Goldstein,
Brookhaven National Laboratory

3:30 **Comparing Direct and Iterative Parallel Methods for Boundary Problems**
Ian Gladwell and Gertrud Kraut, Southern Methodist University

3:45 **Matrix Decomposition Algorithms in Modified Nodal Spline Collocation Methods for Separable Elliptic Problems**
Bernard Bialecki and *Graeme Fairweather*, University of Kentucky

4:00 **A Parallel Chopping Algorithm for ODE Boundary Value Problems**
Marcin Paprzycki, University of Texas-Permian Basin, Odessa and Ian Gladwell, Southern Methodist University

4:15 **Superconvergent Grids for Generalized Trapezoidal Method in Numerical Solution of Two-Point BVPs for Systems of First-Order Differential Equations**
William C. Connett, Wojciech L. Golik, and Alan L. Schwartz, University of Missouri, St. Louis

4:30 **Boundary Value Methods for Initial Value Differential Algebraic Equation**
P. Amodio, *M. Mazzia* and D. Trigiante, Universita di Bari, Italy

4:45 **Spectral Distribution and Convergence of Conjugate Gradient-Like Methods for Non-Selfadjoint Boundary Value Problems**
Charles Goldstein, Brookhaven National Laboratory, Upton, NY

5:00 **Convection-Diffusion Computations: Spectrum Enveloping and Upwinding**
Valipuram S. Manoranjan, Wahington State University, Pullman

CP4/WESTWOOD ROOM
Particle and Vortex Methods

Chair John Steinhoff,
The University of Tennessee Space Institute

3:30 **Slightly Viscous Three-Dimensionsl Flow in Non-Cartezian Coordinates**
Dalia Fishelov, The Hebrew University, Jerusalem, Israel

3:45 **Computation of Instability and Collapse of an Axisymmetric Vortex Sheet with Swirl**
Xiaofan Li and Russel E. Caflisch, University of California, Los Angeles and Michael Shelley, University of Chicago

4:00 **Initial-Boundary Conditions for Vorticity**
J.Z. Wu, H. Wu and J.M. Wu, The University of Tennessee Space Institute, Tullahoma and H.Y. Ma, Academia Sinica, People's Republic of China

4:15 **Computational Vorticity Capturing**
John Steinhoff, W. Yunghu and T. Mersch, The University of Tennessee Space Institute, Tullahoma

4:30 **A Particle Method Formulation for Modons**
Marie Dillon Dahleh, University of California, Los Angeles and Sue Ellen Haupt, University of Colorado, Boulder

4:45 **Order of a Particle Method for Geophysical Fluid Dynamics**
Marie Dillon Dahleh, University of California, Los Angeles

CP5/ENCINO ROOM
Applications and Applied Analysis

Chair: Jonathan Luke,
New Jersey Institute of Technology

3:30 **Theoretical Study of Wall-Slip During Rheological Measurements Based on Experimental Data**
Renching Zhang, *Leela Rakesh*, James Angelos, Edward Kaufman, George Grossman and Stan Hirschi, Central Michigan University, Mt. Pleasant

3:45 **Decay and Periodic Solutions for Semi-Linear Parabolic Equations at Resonance**
Yuncheng You, University of South Florida

4:00 **A Nonlinear Version of the Cauchy-Riemann Equation Has Nice Features**
Anne C. Morlet, University of Utah

4:15 **On the Steady Flow of a Viscous Fluid Along a Tube with Porous Walls**
Chunqing Lu, Southern Illinois University, Edwardsville

4:30 **Theory and Computations of the Rising Plane Bubble Problem**
Prabir Daripa, Texas A&M University, College Station

4:45 **A Study of Optimal Critical Airfoils**
J.D. Cole, *M.C.A. Kropinski* and D.W. Schwendeman, Rensselaer Polytechnic Institute

5:00 **Low Speed Two-Dimensional Flow Past a Body**
Susan L. Cole and T. Darton Strayer, Rensselaer Polytechnic Institute

5:15 **The Thermocapillary Motion of Collections of Bubbles**
Jonathan Luke, New Jersey Institute of Technology

5:30 **Energy Growth for Viscous Shear Flows**
Satish Reddy, Courant Institute of Mathematical Sciences, New York University and Dan Hennington, Massachusetts Institute of Technology

CP6/SHERMAN OAKS ROOM
Numerical Methods for Eigenvalue Problems

Chair: Anne Trefethen,
Thinking Machines Corporation

3:30 **Multivariate Eigenvalue Problem: Algebraic Theory and Numerical Methods**
Moody T. Chu and J. Loren Watterson, North Carolina State University

3:45 **Simple Scheme for Vectorizing the Bisection Method for Finding Eigenvalues**
Alan M. McKenney, Courant Institute of Mathematical Sciences, New York University

4:00 **Generalized Divide and Conquer Method for Symmetric Eigenvalue Problems**
Yue Zhang, University of Kentucky

4:15 **A Parallel Algorithm for Real Symmetric Generalized Tridiagonal Eigenproblem**
Kuiyuan Li, University of West Florida; Tien-Yien Li and Zhonggang Zeng, Michigan State University

4:30 **The Lanczos and Pade-Rayleigh-Ritz Methods on Massively Parallel Architectures**
Nahid Emad, Universite Pierre et Marie Curie, France, and Yale University

3:30PM-5:30PM
CONCURRENT SESSIONS

4:45 **A Massively Parallel Algorithm for Computing the Eigenvalues of an Unsymmetric Matrix**
Chih-Chang Lin, University of California, Santa Barbara and Earl Zmijewski, James Madison University

5:00 **Parallel Computation of Pseudospectra**
Anne E. Trefethen, Thinking Machines Corporation and Lloyd N. Trefethen, Cornell University

5:15 **Computing the Hankel Singular Values of Large, Sparse Linear Systems**
Thorkell Gudmundsson and Alan J. Laub, University of California, Santa Barbara

5:30 **A Divide-and-Conquer Method for Computing Complementary Invariant Subspaces of Symmetric Matrices**
Christian Bischof and *Xiaobai Sun*, Argonne National Laboratory

4:00PM-5:30PM

SPECIAL SESSION/PALISADES ROOM
Chair: Judith S. Sunley
Division Director
Division of Mathematical Sciences
National Science foundation

ICEMAP (the Interagency Committee for Extramural Mathematics Programs)

Federal funding for the mathematical sciences is expected to increase slowly in the years ahead. Support for some areas will increase and new areas are likely to be supported.

Agency representatives will review the results of recent major competitions and identify future opportunities for new support.

Free things to do in LA

Beaches

L.A.'s magnificent coastline stretches 72 miles long from Malibu to Long Beach. A 22-mile bike path, the longest beach bicycle path in the world, is part of L.A.'s beach scene. Must sees include funky Venice Beach (the Ocean Front Walk is a must!) trendy Santa Monica, Playa del Rey, and star studded Malibu, otherwise known as Hollywood By The Sea.

MEETING PROGRAM

7:00/CALIFORNIA SHOWROOM
Registration opens

8:00/LA BALLROOM
IP4/Chair: Stanley J. Osher, University of California, Los Angeles

Chaotic Transport in Dynamical Systems

Stephen Wiggins
Division of Engineering and Applied Science
Thomas Laboratory
California Institute of Technology

8:45/LA BALLROOM
Prize Awards

Mathematical Contest in Modeling (MCM)

Student Paper Competition Award

The Three Best Papers in Applied and Computational Mathematics

The Alice T. Schafer Mathematics Annual Prize Award

Alice T. Schafer Mathematics Annual Prize Award is given by AWM to an undergraduate woman for excellence in mathematics.

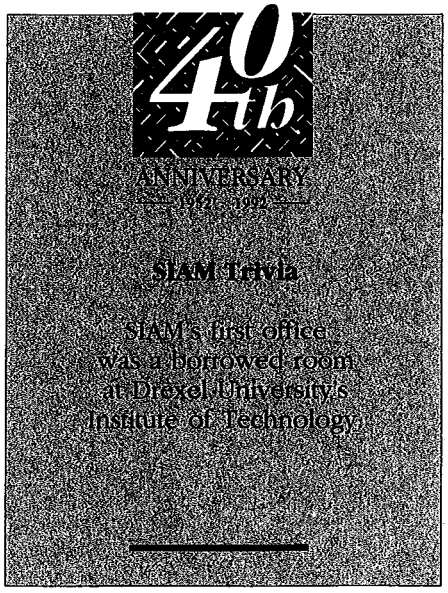
9:15/LA BALLROOM
IP5/Chair: Stanley J. Osher, University of California, Los Angeles, and Cognitech, Inc., Santa Monica, CA

Dispersive Initial Value Problems and Their Limiting Behavior

Peter D. Lax
Courant Institute of Mathematical Sciences, New York University

9:30 AM-4:00 PM/CALIFORNIA SHOWROOM
Exhibits

10:00/CALIFORNIA SHOWROOM
Coffee



10:30 AM-12:30 PM
CONCURRENT SESSIONS

MS15/LA BALLROOM

Application of Dynamical Systems Theory to Continuum Mechanics

Dynamical systems theory has become a rapidly developing subject, in which mathematical techniques and concepts are being used as paradigms to interpret phenomena from applications and conversely the needs arising from applications stimulate the development of new mathematical approaches. This is particularly evident in the area of continuum mechanics, where both the case in which a finite dimensional model effectively describes the dynamics and the case in which the dynamics is essentially infinite dimensional can occur.

The speakers will discuss specific examples from fluid and solid mechanics that illustrate both cases. They will emphasize the geometric point of view using the tools of local and global analysis for invariant manifolds and geometric singular perturbation theory.

Organizer: Roberto Camassa, Los Alamos National Laboratory

10:30 **Chaos in a Sperical Drop**
Dana D. Hobson, Massachusetts Institute of Technology

11:00 **The Dynamical Creation of Microstructure in Material Phase Transformations**
Pieter J. Swart, Carnegie Mellon University

11:30 **Singularly-Perturbed Dynamical Systems Theory Applied to Flows Exhibiting Large-Scale Chaos**
Tasso J. Kaper, Brown University, and Stephen Wiggins, California Institute of Technology

12:00 **The Kirchoff and C. Neumann Tops**
Roberto Camassa, Organizer, and Darryl D. Holm, Los Alamos National Laboratory

MS16/SANTA MONICA ROOM

Young Measures and Viscosity Solutions in Nonlinear PDE Theory

This minisymposium will focus on the theory and numerical analysis of nonlinear partial differential equations that arise in the dynamics and control of fluid flows and other related fields. The theory of Young measures has been shown to play a key role in the calculus of variations, optimal control theory, nonlinear elasticity, phase transitions, nonlinear hyperbolic systems and recently in the optimal control of viscous flows. The theory of viscosity solutions provides a means to characterize solutions to nonlinear partial differential equations which arise for example in deterministic and stochastic control theory. The speakers will discuss the latest developments and open problems in these frontier disciplines of applied mathematics.

Organizer: Sivaguru S. Sritharan, University of Colorado, Boulder

10:30 **Young Measures in Optimal Control of Viscous Flow**
Sivaguru S. Sritharan, organizer

11:00 **Finitely Additive Probability Measures and Control of Viscous Flow**
Hector Fattorini, University of California, Los Angeles

11:30 **Viscosity Solutions of Hamilton-Jacobi Equations in Finite Dimensions**
Michael G. Crandall, University of California, Santa Barbara

12:00 **Higher-order Essentially Nonoscillatory Schemes for Hamilton-Jacobi Equations**
Stanley J. Osher, University of California, Los Angeles and Chi-Wang Shu, Brown University

MS17/WESTSIDE ROOM

Guided Wave Propagation

The speakers in this minisymposium will describe theoretical and numerical methods and results for different types of guided wave propagation. Problems in this area offer interesting challenges due to nonlinearity, reverberation, chaotic behavior, interference, and the size and complexity of the medium. The speakers will discuss applications in fiber optics, ocean acoustics, and seismology. The methodology they will present is also applicable to other types of guided wave propagation.

Organizers: Michael D. Collins, Naval Research Laboratory, Washington, DC and Michael B. Porter, New Jersey Institute of Technology

10:30 **Chaos in Ocean Acoustic Waveguides**
Frederick D. Tappert, Kevin B. Smith and Michael G. Brown, University of Miami

11:00 **Pulse Dynamics in Nonlinear Optical Fibers and Waveguides**
William L. Kath, Northwestern University

11:30 **Nested Waveguides**
Michael B. Porter, Organizer and Finn B. Jensen, SACLANT Undersea Research Centre, Italy

12:00 **Parabolic Equation Methods for Sound Propagation and Scattering in a Waveguide**
Michael D. Collins, Organizer

MS18/PLAZA ROOM

ADIFOR — Automatic Differentiation in Fortran

Scientific computation libraries for solving stiff ordinary differential equations, optimization, or nonlinear equations often require the user to provide routines to compute Jacobians or even Hessians. The underliying algorithms can usually substitute finite difference approximations for the necessary derivatives, but only at the expense of performance. ADIFOR (Automatic Differentiation In FORtran) is a Fortran-to-Fortran source transformation tool that allows users of such library packages to enjoy both the performance of analytic derivatives and the freedom from supplying hand-coded derivatives. The speakers will present a survey of the mathematical fundamentals of automatic differentiation, the functionality and performance of ADIFOR, and describe the application of ADIFOR to industrial problems.

Organizer: George F. Corliss, Argonne National Laboratory

10:30 **Automatic Differentiation — Derivatives are Easy and Cheap**
George F. Corliss, Organizer

11:00 **The Performance of ADIFOR-Generated Codes**
Alan Carle, Rice University

11:30 **Using Automatic Differentiation in Parameter Identification**
Alan Carle, J.E. Dennis, Jr., *Guangye Li* and Karen A. Williamson, Rice University

12:00 **Automatic Differentiation and Numerical Software Design**
Christian H. Bischof, Argonne National Laboratory

10:30AM - 12:30PM
CONCURRENT SESSIONS

MS19/WESTWOOD ROOM

Inverse Coefficient Problems for Systems (Part 1 of 2)

The purpose of this minisymposium is to give an overview of the most recent developments in the area of inverse coefficient problems for differential systems originating from mathematical physics and material sciences. The speakers will present recent theoretical and numerical results on a number of inverse coefficient problems for systems such as Maxwell's systems and elasticity systems. These problems are important in a variety of applications including medical imaging and nondestructive testing of materials.

Organizers: Ziqui Sun and Victor Isakov
Wichita State University

10:30 **Inverse Boundary Value Problem for Systems**
Gunther Uhlmann, University of Washington

11:00 **Inverse Problems for Maxwell's Equations**
David Isaacson and Margaret Cheney, Rensselaer Polytechnic Institute

11:30 **Inverse Problems for Maxwell's Equations in an Inhomogeneous Medium**
Lassi Paivarinta, University of Helinski, Finland

12:00 **Electromagnetic Inverse Problems**
Ziqui Sun, Organizer

MS20/BRENTWOOD ROOM

Parallel Algorithms and Software for Large Scale Eigenvalue Problems

This minisymposium focuses on the problem of extracting selected eigenvalues and eigenvectors of very large matrices on distributed memory machines with a large number of processors.

The speakers will discuss the sparse data structures for massively parallel processors, balancing computation in subspace projection algorithms, implicit restarted algorithms for Krylov subspace methods and alternatives to the QR algorithm for dense non-symmetric problems. They will address the difficult issues of scalability and load balance for very large eigenvalue problems and the implications for development of mathematical software.

Organizer: Jean-Philippe Brunet
Thinking Machines Corporation, Cambridge, MA

10:30 **Sparse Matrix Eigenvalue Calculations on Parallel Computers: Obstacles and Trends**
Youcef Saad, University of Minnesota, Minneapolis

11:00 **Implicitly Restarted Arnoldi Methods for Large Scale Eigenvalue Problems**
Danny C. Sorensen, Rice University

11:30 **A Data Parallel Implementation of Implicitly Restarted Methods**
Jean-Philippe Brunet, Organizer, S. Lennart Johnsson, Thinking Machines Corporation, Cambridge, MA, Danny C. Sorensen and Phuong Vu, Rice University

12:00 **Some Alternatives to the QR Method for Parallel Solution of the Dense Nonsymmetric Eigenproblem**
Elizabeth R. Jessup, University of Colorado, Boulder

MS21/PALISADES ROOM

Recent Advances in Krylov Subspace Methods for Nonsymmetric Matrix Computations

Krylov subspace methods, such as the Lanczos algorithm or the Arnoldi process, are very powerful tools for iterative matrix computations. In recent years, research in this area has focused mainly on Krylov subspace methods for non-Hermitian matrix iterations. In particular, there has been a true revival of the nonsymmetric Lanczos process. The speakers in this minisymposium will survey some of the recent advances in Krylov subspace algorithms for solving general non-Hermitian linear systems. They will emphasize convergence results for Arnoldi-based methods and on various new Lanczos-based Krylov subspace schemes.

Organizer: Roland W. Freund
RIACS-NASA Ames Research Center

10:30 **Matrices that Generate the Same Krylov Varieties**
Anne Greenbaum, Courant Institute of Mathematical Sciences, New York University

11:00 **Ideal Arnoldi and Ideal GMRES**
Lloyd N. Trefethen, Cornell University

11:30 **Transpose-Free Lanczos-Based Krylov Subspace Methods**
Roland W. Freund, Organizer

12:00 **An Implementation of the QMR Method Based on Coupled Two-Term Recurrences**
Noel M. Nachtigal, RIACS-NASA Ames Research Center, Roland W. Freund, Organizer, and Tedd Szeto, University of California, Los Angeles

CP7/BEVERLY HILLS ROOM

Moving and Graded Grids

Chair: Prabir Daripa, Texas A&M University

10:30 **Moving Space-Time Finite Elements Methods for Convection- Diffusion Equations**
Randolph E. Bank and *Rafael F. Santos*, University of California, San Diego

10:45 **Creation and Annihilation of Nodes for the Moving Finite Element Method**
Andrew Kuprat, Los Alamos National Laboratory

11:00 **A Finite Element Method on Consistent Recursive Grids**
G. Kozlovsky, The City College of The City University of New York

11:15 **Automatic Graded Delaunay Tetrahedral Grid Generation**
Robert E. LaBarre, United Technologies Research Center, East Hartford, CT

11:30 **Numerical Experiments on Quasiconformal Mappings**
Prabir Daripa, Texas A&M University, College Station

CP8/PACIFIC ROOM

Statistical Testing

Chair: Otto Ruehr
Michigan Technological University

10:30 **Computing the Minimum Hellinger Distance Between an Estimate and Family of Probability Density Functions**
Michael W. Trossett, Tuscon, AZ

10:45 **Exact AOQLs in Acceptance Sampling**
Jack Tomsky, Lockheed Missiles and Space Co., Palo Alto, CA

11:00 **Improved Test for Normality of Distribution**
Chen-Cheng W. Yu, IBM Corporation, Kingston, NY

11:15 **Inequalities for the Tails of Some Elementary Series**
O. Ruehr, Michigan Technological University, H. Alzer, Wladbrol, Germany and J.L. Brenner, Palo Alto, CA

11:30 **A Property of Random Vectors and a New Definition of Multivariate *t* Distribution**
Guofa Wu, University of Toledo

11:45 **Methods for Detecting Outliers in Univariate Samples**
Guofa Wu and Roger J. McNichols, University of Toledo

12:00 **Development of Confidence Interval Estimates for Predictions from a Rainfall-Runoff Model**
Theodore V. Hromadka, California State University, Fullerton and Williamson & Schmid, Tustin, CA; R.J. Whitley, University of California, Irvine; R.H. McCuen, University of Maryland, College Park; and C.C. Yen, Williamson & Schmid, Tustin, CA

CP9/ENCINO ROOM

Analysis of Differential Equations

Chair: Paul K. Newton,
University of Illinois, Urbana

10:30 **Solutions to a General Forced Nonlinear Oscillations Problem**
Julian J. Wu, U.S. Army Research Office and L.C. Chien, Academia Sinica, Taipei, Taiwan, Republic of China

10:45 **Rapidly Forced Initial Value Problems**
Paul K. Newton, University of Illinois, Urbana

11:00 **Nonstrictly Hyperbolic System of Conservation Laws with Applications to MHD Shock Waves**
Moysey Brio, University of Arizona and Philip Rosenau, Los Alamos National Laboratory and Technion-Israel Institute of Technology, Haifa, Israel

11:15 **Approximation of Ginzburg-Landau Models for Superconductivity**
Qiang Du, Michigan State University, Max Gunzburger and Janet Peterson, Virginia Polytechnic Institute and State University

11:30 **Saturation Effects in Transistor Oscillators**
Ned J. Corron, Dynetics, Inc., Huntsville, AL and Gregory A. Kriegsmann, New Jersey Institute of Technology

12:00 **A Mathematical Model for the Functional Relationship of Shape, Pressure Distribution, and Materials Properties of Diaphragm**
A.M. Boriek and J.R. Rodarte, Baylor College of Medicine: A.S. El-Bakry, S. Cox and R. Tapia, Rice University

12:15 **Steady State Computations of Granular Flow in an Axisymmetric Hopper**
Feng Wang, State University of New York, Stony Brook; Carl L. Gardner and David G. Schaeffer, Duke University

12:30 **Stabilizing Unstable Procedures**
Gautam M. Shroff, Indian Institute of Technology, New Delhi, India and Herbert B. Keller, California Insitute of Technology

10:30/SHERMAN OAKS ROOM

Student Paper Competition Presentation

12:30-2:00
Lunch

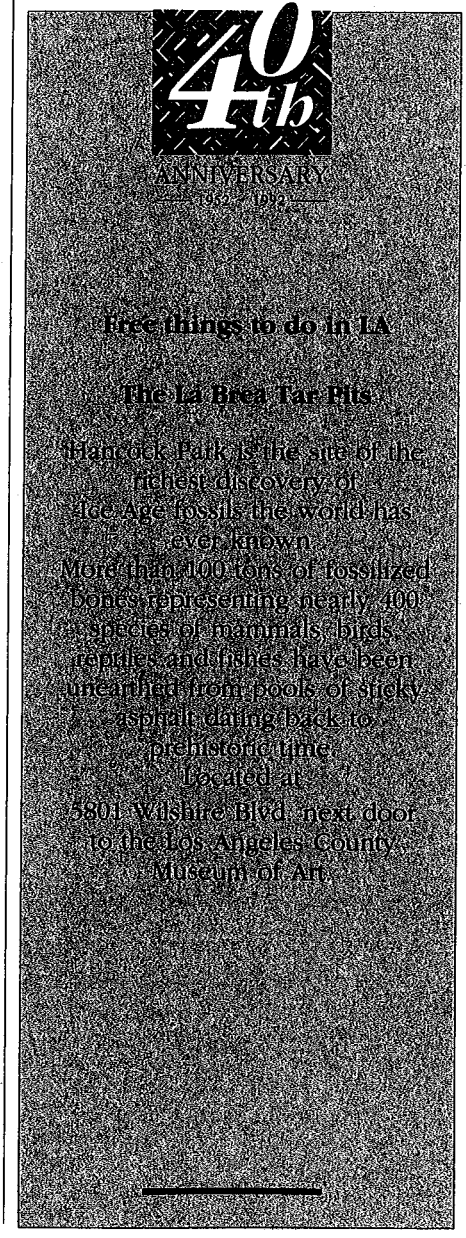
12:30/REDWOOD ROOM
AWM Executive Committee Luncheon

12:30/CALIFORNIA SHOWROOM
Poster Session Set Up

2:00/LA BALLROOM
IP6/Chair: James M. Hyman,
Los Alamos National Laboratory
Predicting the Future with Nonlinear Models

J. Doyne Farmer
Prediction Company and
Santa Fe Insitute, Santa Fe, NM

2:45/CALIFORNIA SHOWROOM
Coffee



3:30-5:30 PM
CONCURRENT SESSIONS

MS22/LA BALLROOM
Applications of Sampling Theory

The speakers in this minisymposium will discuss the latest developments in sampling theory with emphasis on nonuniform sampling. They will consider applications in speech, image and video processing and coding and discuss signal recovery from nonuniform samples is another topic that will be emphasized.

Organizer: Farokh A. Marvasti
Oak Park, IL

3:30 **Image Recovery from Nonuniform Samples**
Farokh A. Marvasti, organizer

4:00 **Reconstruction of Signals from Irregular Sampling using Iterative Techniques**
Hans Feichtinger and Thomas Strohmer, University of Wien, Austria

4:30 **Application of Nonuniform Sampling to Speech**
Nicholas Zervos, AT&T Bell Laboratories

5:00 **Latest Developments in Sampling Theory**
Ahmed I. Zayed, California Polytechnic State University, San Luis Obispo

MS23/WESTSIDE ROOM
Attractors, Length Scales and Fluctuations in Ocean Dynamics

Comprehensive numerical simulations have recently been progressing toward better understanding of ocean dynamics and its role in the climate system. Ocean dynamics involves interactions of length scales ranging at least from meters to thousands of kilometers, driven by local and global weather systems and strongly influenced by rotation and continental boundaries. The speakers in this minisymposium will discuss some of the mathematical and computational approaches for treating such a wide range of length and associated time scales in nonlinear pde models of ocean dynamics.

Organizer: Darryl D. Holm
Los Alamos National Laboratory

3:30 **Climate Change and Fluctuation Dissipation**
C. E. Leith, Lawrence Livermore National Laboratory

4:00 **An Accurate Hyperbolic System for Approximately Hydrostatic and Incompressible Oceanographic Flows**
G.L. Browning, National Center for Atmospheric Research, Boulder, CO

4:30 **Manifolds of Slow Solutions for Highly Oscillatory Problems**
Jens Lorenz, The University of New Mexico, Albuquerque

5:00 **Attractor Dimension for the Barotropic Component of the Brian-Cox-Semtner Ocean Dynamics Model**
Darryl D. Holm, Organizer

MS24/PLAZA ROOM
Numerical Methods for Differential-Algebraic Equations and Applications

Many problems arising in applications can be formulated as systems of differential-algebraic equations (DAEs) with initial or boundary conditions. The aim of this minisymposium is to explore practical techniques for the numerical solution of such problems. The speakers will describe some numerical methods, some available software and some applications which yield particularly challenging DAEs.

Organizer: Uri M. Ascher
University of British Columbia, Canada

3:30 **Regularization Methods for DAEs**
Robert E. O'Malley, Jr. and L. Kalachev, University of Washington

4:00 **DAEs Solution and Optimization Applications in Process Engineering**
Lorenz T. Biegler, Carnegie Mellon University

4:30 **Half-Explicit Integration Methods for Constrained Mechanical Systems**
C. Lubich, Eidgenossische Technische Hochschule - Zurich, Switzerland

5:00 **Software for Boundary Value DAEs**
Uri M. Ascher, Organizer and Ray J. Spiteri, University of British Columbia, Canada

MS25/WESTWOOD ROOM
AWM Panel on Research in Government

Six applied mathematicians will give presentations on their research at government laboratories. The speakers will discuss problems in deep space communication, including the use of error correcting codes and data compression; the application of dynamic positron emission tomography (PET) methodology to cardiac stress testing, accurate quantitative description of the propagation of sound in a highly complicated ocean environment; global climate models, optimal control of bioremediation through supply of nutrients to the bacteria, groundwater simulations for transport of hazardous waste; fractals and fractal measures and their relation to ongoing work at NIST; and work on nonlinear dynamics and computational fluid dynamics at NASA.

Organizer Joyce R. McLaughlin
Rensselaer Polytechnic Institute

3:30 **Deep Space Communication**
Laif Swanson, Jet Propulsion Laboratory

4:00 **Dynamic Positron Emission Tomography and Cardiac Artery Disease**
Pamela Coxson, Lawrence Berkeley Laboratory

4:30 **Applied Mathematics in Underwater Acoustics**
Alex Tolstoy, Naval Research Laboratory

5:00 **Environmental Modeling at Oak Ridge**
Suzanne Lenhart, Oak Ridge National Laboratory and University of Tennessee, Knoxville

5:30 **My Research Experiences at NIST**
Fern Hunt, National Institute of Standards and Technology and Howard University

6:00 **Nonlinear Dynamics and Computational Fluid Dynamics**
Helen Yee, NASA Ames Research Center

MS26/PACIFIC ROOM
Inverse Coefficient Problems for Systems (Part 2 of 2)

(For Description, see MS 19, page 19)

Organizers: Ziqui Sun and Victor Isakov
Wichita State University

3:30 **Inverse Seismic Problems**
Richard E. Ewing, University of Wyoming

4:00 **Inverse Problems for Elasticity Systems**
Victor Isakov, Organizer

4:30 **The Inverse Bacsattering for Real-Valued Potentials**
Gregory Eskin, University of California, Los Angeles

5:00 **Sensitivity Study of Reaction Diffusion Equations for Film Development**
C.K. Chu, Columbia University

3:30 PM - 5:30 PM
CONCURRENT SESSIONS

MS27/PALISADES ROOM

Preconditioning of Conjugate Gradient Type Methods for Non-Hermitian Matrices

The preconditioned conjugate gradient algorithm (CG) is a powerful and efficient technique for solving Hermitian positive definite linear systems. The success of CG has triggered extensive research in the area of CG-like methods for solving general non-Hermitian linear systems, and a number of such algorithms have been proposed, including GMRES, CGS, QMR, and Bi-CGSTAB. As for CG, it is crucial to combine these algorithms with an effective preconditioner.

In this minisymposium, the speakers will address issues related to the development of efficient preconditioners for non-Hermitian CG-like methods. In particular, they will discuss the problem of the ordering of the unknowns for incomplete factorization preconditioner, the design of preconditioners for parallel architectures, and the performance of these methods in various application areas.

Organizers: Roland Freund
RIACS-NASA Ames Research Center,
Peter Forsyth, and Wei-Pai Tang
University of Waterloo, Canada

3:30 **Exploiting Anisotropy in Preconditioning Convection-Diffusion-Reaction Systems**
David Keyes, Yale University

4:00 **High Accuracy Preconditioners and Applications**
Youcef Saad, University of Minnesota, Minneapolis

4:30 **Implementation Issues for Preconditioned CG-like Methods**
Wei Pai Tang, Organizer

5:00 **Implementation of a Parallel Preconditioned Orthomin Algorithm in a Package for General Sparse Matrices**
Zahari Zlatev, National Environmental Research Institute, Denmark

MS28/SHERMAN OAKS ROOM

Semiconductor Process Simulation

Semiconductor modeling encompasses the study of the physical phenomena underlying the manufacture of integrated circuit components. The modeling of the introduction and diffusion of impurities and point defects in various materials and the modeling of delineation, growth and mechanical behavior of thin films are typical examples.

Researchers seeking to explain important observations often pose complex models with serious uncertainties in basic physics, parameter values, and mathematical properties. Although numerical methods are the mainstay, some important insights can be obtained only by applying modern mathematical concepts and methods. In this minisymposium, experts in the field will discuss some of the important modeling issues and the methods in currently being used.

Organizer: Leonard J. Borucki
Motorola Advanced Technology Center, Meza, AZ

3:30 **Diffusion on Networks**
Marius Orlowski, Motorola Inc., Austin, TX

4:00 **Modeling of Clustering and Precipitation Processes**
Scott T. Dunham, Boston University

4:30 **Asymptotic Analysis of Nonlinear Diffusion in Semiconductors**
John R. King, University of Nottingham, United Kingdom

5:00 **Transient Enhanced Diffusion and the Growth and Annealing of Dislocation Loops**
Leonard J. Borucki, Organizer

MS29/ENCINO ROOM

The Mathematical Contest in Modeling

The two winning teams of undergraduates will present their solutions to the 1992 Mathematical Contest in Modeling. The two teams are chosen by SIAM judges.

Organizer: B.A. Fusaro
Salisbury State University

3:30 **Mathematical Contest in Modeling**
B.A. Fusaro, Organizer
Titles and Speakers to be announced

CP10/SANTA MONICA ROOM

Wave Motion

Chair: John Kroll, Old Dominion University

3:30 **Long Periodic Internal Waves**
Jean-Marc Vanden-Broeck and Robert E. L. Turner, University of Wisconsin, Madison

3:45 **Gravity-Capillary Solitary Waves in Water of Infinite Depth**
Jean-Marc Vanden-Broeck, University of Wisconsin, Madison and Frederic Dias, Universite de Nice, France

4:00 **Construction of Numerical Solutions of Permanent HeavyWaves of Two Liquids**
Nabil Moussa, The American University, Cairo, Egypt

4:15 **Navier-Stokes Flow Down an Inclined Plane: Downward Periodic Motion**
Yoshiaki Teramoto, Kyoto University, Japan

4:30 **Numerical Results for Peristaltic Motion of Viscous Flows with Elastic Free Boundaries**
Dalin Tang and Samuel Rankin, Worcester Polytechnic Institute

4:45 **WKBJ Depth Migration**
Sheng-tai Li and *Cheng-shu Wang*, Academia Sinica, People's Republic of China

5:00 **Wave Field Splitting, Invariant Imbedding, and Phase Space Analysis Applied to Scalar Wave Propagation Modeling**
Louis Fishman, Colorado School of Mines

5:15 **A Oneway Wave Operator as a Preconditioner**
Gerald W. Hedstrom, Lawrence Livermore National Laboratory, Livermore, CA

5:30 **The Linear Stability of a Canonical Oceanic Front**
John Kroll, Old Dominion University

CP11/BEVERLY HILLS ROOM

Numerical Approximation of Boundaries in PDE's

Chair: Robert L. Higdon, Oregon State University

3:30 **A Finite Element Method for Domains with Corners**
Dan Givoli and Leonid Rivkin, Technion-Israel Institute of Technology, Haifa, Israel; and Joseph B. Keller, Stanford University

3:45 **Hypersingular Integral Equations at a Corner**
L.J. Gray, Oak Ridge National Laboratory, Oak Ridge, TN and Lisa L. Manne, University of Tennessee, Knoxville

4:00 **On Using the Modified Nystrom Method to Solve the 2-D Laplace Equation with Mixed Boundary Conditions**
Raymond S.-C. Cheng, David Taylor Research Center, Bethesda, MD

4:15 **Rapid Solution of the Laplace Equation on Regions with Fractal Boundaries**
Jin Hon Ma, Yale University and Vladimir Rokhlin, Institute of Advanced Study, Princeton, NJ

4:30 **Optimal Order Multigrid Methods for Solving Exterior Boundary Value Problems**
George C. Hsiao and *Shangyou Zhang*, University of Delaware

4:45 **A Non-Reflecting Boundary Condition for Computational Aeroacoustic Problems**
Jay Casper, Vigyan, Inc., Hampton, VA and H.L. Atkins, NASA Langley Research Center

5:00 **Radiation Boundary Conditions for Dispersive Waves**
Robert L. Higdon, Oregon State University

5:15 **A Spatially Exact Non-Reflecting Boundary Condition**
Dan Givoli, Technion-Israel Institute of Technology, Haifa, Israel

5:30 **Reynolds Averaged Equations at a Renormalization Group Fixed Point for Compressible Two Phase Flow**
Y. Chen, Y. Deng, *James G. Glimm* and Gang Li, State University of New York, Stony Brook

CP12/BRENTWOOD ROOM

Parallel Numerical Methods

Chair: Francis X. Canning, Rockwell Science Center, Thousand Oaks, CA

3:30 **Data Parallel Finite Element Techniques for ComputationalFluid Dynamics of Connection Machine Systems**
Zdenek Johan and Thomas J.R. Hughes, Stanford University and Kapil K. Mathur and S. Lennart Johnsson, Thinking Machines Corporation

3:45 **The "Merge and Conquer" Strategy for Solving Time Dependent Partial Differential Equations on Parallel Computers**
Jianping Zhu, Mississippi State University

4:00 **A Parallel Splitting Algorithm for Second Order Multidimensional Hyperbolic PDEs**
D.A. Voss and A.Q.M. *Khaliq*, Western Illinois University

4:15 **A Parallel-Vector Algorithm for Solving Higher KDV Equations**
Thiab R. Taha and JerJiann Liaw, University of Georgia

4:30 **Solution of the Landau-de-Gennes Equations of Liquid Crystal Physics on a SIMD Computer**
Paul A. Farrell, Arden Ruttan and Reinhardt R. Zeller, Kent State University

4:45 **Fast Iterative Solution of the Helmholtz Equation over 1,000 λ Domains**
Francis X. Canning, Rockwell Science Center, Thousand Oaks, CA

3:30PM-5:30PM
CONCURRENT SESSIONS

POSTER SESSION/CALIFORNIA SHOWROOM

An Efficient Parallel Projection Method for Flow Simulations
Ping Lee, Schlumberger Laboratory for Computer Science, Austin, TX

Spacelike Surfaces in Lorentzian Manifold
Abderrahim El Ghanmi, Franklin University

Exact Difference Schemes for Nonlinear Partial DifferentialEquations
S. Roy Choudhury, University of Central Florida

The Numerics of Turbulent Processes in High Porosity NonuniformPorous Media
Vladimir S. Travkin and Ivan Catton, University of California, Los Angeles

Some Experience Using Modifications of Conjugate Gradient on a Nonsymmetric Complex Linear System From a 3-D Helmholtz Equation
Louis W. Ehrlich and David M. Silver, The Johns Hopkins University

Visualizing Orthodrop's Solving of Huge, Sparse Linear Systems
Douglas Moreman, Southern University, Baton Rouge

Analysis and Numerical Simulation of a Catalytic Reaction
Wen Zhang and Ian Gladwell, Southern Methodist University

Steady State and Travelling Wave Solutions in a Nonlinear Reactive-Convective System
J. David Logan and Thomas S. Shores, University of Nebraska, Lincoln

Fast Direct Solvers for Three-Dimensional Orthogonal Spline Collocation Equations
Karin R. Bennett, University of Minnesota, Minneapolis

Sum-Acceleration and Tikhonov Regularization Algorithms in Chebyshev and Fourier Spectral Methods
John P. Boyd, University of Michigan, Ann Arbor

Stable Time-Periodic Solutions of Reaction-Diffusion Systems and Their Galerkin Approximations
Arnold Dikansky, St. John's University

Using ANSYS to Solve General Boundary Value Problems
Shirley B. Pomeranz, University of Tulsa

Computations of Nonnested Multigrid Methods for 2D and 3D Boundary Value Problems with Singularities
Shangyou Zhang, University of Delaware

Asymptotic Analysis of an Unsteady Singularly Perturbed System
Sally Shao, Cleveland State University

Lattice Gas Models for Supersonic Hydrodynamics
John Scalo and Paul Kornreich, University of Texas, Austin

A Noise-Resistant Parameter Estimation Method Using InnerProducts
Deborah Sturm, City University of New York-College of Staten Island

A Hybrid Fast Poisson Solver for Irregular Domains in Two Dimensions
Alan M. McKenney and Leslie Greengard, Courant Institute of Mathematical Sciences, New York University and Anita Mayo, IBM Thomas J. Watson Research Center, Yorktown Heights, NY

New Algorithms for the "Minimal Form" Problem
Joseph S. Oliveira and *Grant O. Cook, Jr.*, Lawrence Livermore National Laboratory, Livermore, CA and Mark R. Purtill, Insitute for Defense Analysis, Princeton, NJ

3-Color Domain Decomposition Techniques for Elliptic Boundary Value Problems with Discontinuous Diffusion Coefficients
Chen-Yao George Lai and W. Proskurowski, University of Southern California

Domain Decomposition Methods for Solving the Steady-State Incompressible Navier-Sokes Equations
Carl Scarbnick, San Diego Supercomputer Center, San Diego, CA

Code Generation in ALPAL Using Symbolic Techniques
Grant O. Cook, Jr., Lawrence Livermore National Laboratory, Livermore, CA

The Matrix Editor for Symbolic Jacobians in ALPAL
Jeffrey F. Painter, Lawrence Livermore National Laboratory, Livermore, CA

Existence and Iteration Theorems for Fixed Points of Pseudo-contractive Mappings in Hilbert Spaces
J.J. Moloney and *Xinlong Weng*, Marshall University

Curvature Computations for Contact Curves in General Surface Fillets
Isaac Lef, Schlumberger Technologies, Billerica, MA

Historical Relationships Between Newton's Method and Its Immediate Precursors and Successors
Tjalling J. Ypma, Western Washington University, Bellingham

Some New Observations on the Classical Logistic Equation with Heredity
Jay I. Frankel, Florida Institute of Technology and *S. Roy Choudhury*, University of Central Florida

6:30/REDWOOD ROOM

Alice T. Schafer Prize Dinner

8:00-9:30/PACIFIC/PALISADES ROOM

Mathematics, Modeling, and Simulation of Industrial Problems (A Panel Discussion)

The panel will in broad terms characterize the role of industrial competitiveness. In particular, the panel will address questions such as these:

- What is the role of simulation and quantitative modeling in insuring a comptetitive position for U.S. industry in the 21st century?
- What types of technical training and personal skills are most important for an industrial mathematician?
- How does an industrial mathematician find or choose good problems to work on? How does he or she work with others to find solutions and to get the answers used effectively?
- What can the professional societies do to further support industrial mathematics?
- What is the role of government and the universities?

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

Principal Speaker: John Alic
Office of Technology Assessment
U.S. Congress

Technology and Economic Competitiveness
The United States has lost the overall lead in technology it held in the earlier postwar period, and in the future can probably hope at best to be first among equals. This will require a reshaping of Federal technology policies. In brief, the United States must improve its mechanisms both for generating new knowledge and for diffusing existing knowledge.

Panelist: John Abbott, Corning Inc., Corning, NY
Leonard Borucki, Motorola Advanced Technology Center, Meza, AZ

MEETING PROGRAM

7:30/CALIFORNIA SHOWROOM
Registration opens

8:00/LA BALLROOM
IP7/Chair: Avner Friedman, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

Mathematical Problems in Photography

David S. Ross
Research Center
Eastman Kodak Company

8:45/LA BALLROM
Prize Presentation
The Richard C. DiPrima Prize

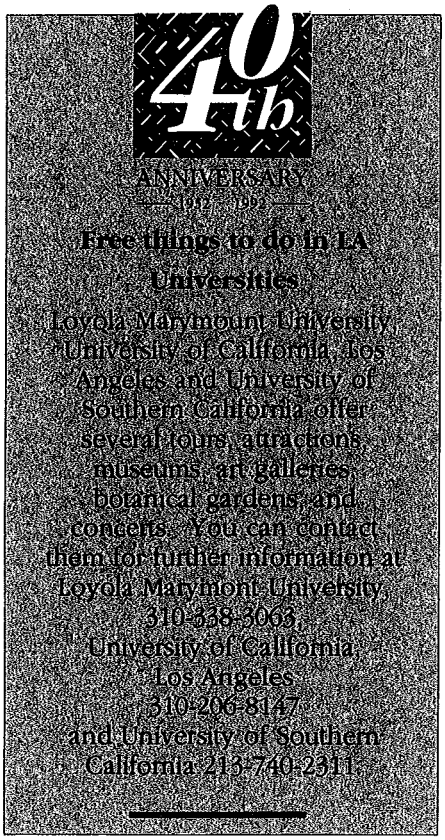
9:00/LA BALLROOM
IP8/Chair: Avner Friedman, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

Some Mathematical Problems in Polymer Processing

Morton Denn
Chemical Engineering Department
University of California, Berkeley

9:30 AM-4:00 PM/CALIFORNIA SHOWROOM
Exhibits

9:45/CALIFORNIA SHOWROOM
Coffee



10:30AM-12:30PM
CONCURRENT SESSIONS

MS30/ENCINO ROOM

Modeling the Chemomechanics of Gels

Speakers in this minisymposium will present mathematical models of the fascinating interaction between chemistry and mechanics in gels. A gel is a fluid-filled polymer network, and may be thought of as two coexisting, deformable media. Naturally occuring gels include the cornea of the eye and articular cartilage, while industrial applications range from chemical separation, DNA fingerprinting, drug delivery, and photography to manufacturing automotive fuel lines.

The mechanical properties of gels depend on polymer-polymer (e.g. electrostatic and cross-linking), fluid-fluid (viscosity and diffusion), and fluid-polymer (viscous and electrochemical) interactions. Modeling gel behavior involves the mathematics of nonlinear reaction-diffusion equations, large deformation continuum mechanics, moving boundary problems, statistical mechanics, homogenization theory, and electrochemistry. The speakers will discuss mathematical properties, scientific implications, and limitations of current theories.

Organizers: Jeffrey R. Sachs, National Institute of Standards and Technology, Gaithersburg, MD, and David S. Ross, Kodak Research Laboratories, Rochester, NY

10:30 Reaction-Diffusion Swelling Photographic Emulsions
Kam-Chuen Ng, Kodak Research Laboratories, Rochester, NY

11:00 Kinetic Swelling of Crosslinked Polymers
Giuseppe Rossi, Ford Motor Company, Dearborn, MI

11:30 Dynamic and Stationary Pattern Formation in the Cell Cortex
Mark Lewis, University of Washington, Seattle

12:00 Swelling and Transport in Polymer Hydrogels
Jeffrey R. Sachs, Organizer

12:30 Model for Gel Swelling Incorporating Solvation Forces
Ronald A. Siegel, University of California, San Francisco

MS31/LA BALLROOM

Effective Equations for Fluid Flow (Part 1 of 2)

Many fluid flow problems possess complicated microscopic dynamics that are of little interest on macroscopic scalelengths. The goal of turbulence theory is to derive effective flow equations on the macroscopic scalelengths. Recently, a number of new mathematical tools, such as homogenization and renormalization, have been applied to complex flows. These methods are more sophisticated versions of multiple scale analysis and statistical physics principles. A number of different flow geometries have been solved explicitly. The solutions show that long term memory effects and nondiffusive behavior often occur, and elucidate the role of the inertial cascade in determining the effective equation.

The speakers will survey the new mathematical methods and the resulting applications of homogenization theory and renormalization.

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

10:30 Real-space Renormalization of Vortical Flow
Alexandre Chorin, University of California, Berkeley

11:00 Quasi Wave Modes in Dispersed Random Media
Ping Sheng, Exxon Research and Engineering Co., Annandale, NJ, Xiaodun Jing, University of Minnesota, and Minyao Zhou, Exxon Research and Engineering Co., Annandale, NJ

11:30 Effective Equations and Inverse Cascade for the Kolmogorov Flows
Weinan E, The Institute for Advanced Study, Princeton, NJ

12:00 A Rigorous View on the Statistical Mechanics of Fluid Vortices
Michael Kiessling, Dartmouth College

MS32/BEVERLY HILLS ROOM

Regular and Chaotic Dynamics Arising in Nonlinear Optics

Dynamical systems methods are of growing importance in analyzing models in nonlinear optics. The models describe various experimental setups which may lead to potential applications in all optical logic devices, optical communication, image processing and other areas.

The speakers will discuss models based on near-integrable ordinary differential equations. They will present methods for analyzing them, including Hamiltonian reduction and reconstruction, the multi-dimensional Melnikov method and numerical simulations and diagnostics. They will particularly concentrate on problems of chaotic light-matter interaction in various ring-cavity lasers.

Organizer: Gregor Kovacic, Rensselaer Polytechnic Institute

10:30 Homoclinic Chaos due to Competition among Degenerate Modes in a Ring-Cavity Laser
Alejandro Aceves, University of New Mexico, Albuquerque, Darryl D. Holm, Los Alamos National Laboratory, and Gregor Kovacic, Organizer

11:00 Chaotic Laser-Matter Interaction
Alejandro Aceves, University of New Mexico, *Darryl D. Holm*, Los Alamos National Laboratory, and Gregor Kovacic, Organizer

11:30 Turbulent Patterns in Wide Gain Section Lasers
Per Jakobsen and Jerry Moloney, University of Arizona, Tucson

12:00 Homoclinic Chaos in a Laser-Matter System
Gregor Kovacic, Organizer, and Darryl D. Holm, Los Alamos National Laboratory

MS33/WESTSIDE ROOM

Taylor Series for ODEs and DAEs

Taylor series methods for the numerical solution of ordinary differential equations have been known for a long time. They are competitive with standard methods, and they can give analytic information about the solution which is not available from any other numerical method. However, their acceptance has been hampered by the alledged difficulty of computing the necessary higher derivatives. The techniques of automatic differentiation allow the easy, inexpensive, accurate computation of high derivatives. Hence, a variety of methods using Taylor or Pade' expansions for ordinary differential equations and differential algebraic equations are now being actively explored. The speakers will discuss some of these methods.

Organizer: George F. Corliss, Argonne National Laboratory

10:30AM-12:30PM
CONCURRENT SESSIONS

10:30 Defect Controlled Taylor Series Methods in a Computer Algebra System
Robert Corless, University of Western Ontario, Canada

11:00 High-order Stiff ODE Solvers via Automatic Differentiation
Gabriela Schranz-Kirlinger, Technical University of Vienna, Austria

11:30 Automatic Evaluations of Taylor-Coefficient Vectors and Their Jacobians for the Numerical Solution of ODEs and DAEs
Andreas Griewank, Argonne National Laboratory

12:00 Automatic Differentiation and General Methods for Nonlinear DAEs
Stephen L. Campbell, North Carolina State University

MS34/WESTWOOD ROOM

Neural Network Training

Neural network research spans many disciplines, including computer science, psychology, neurobiology, engineering, and mathematics. Artificial neural networks have been successfully used in a variety of applications such as character recognition, speech, signal, and image processing.

Practical applications of artificial neural networks often require the determination of hundreds or even thousands of network parameters. The task of determining these parameters, called neural network training, can be formulated as a mathematical optimization problem. This minisymposium will focus on neural network training with special emphasis on state-of-the-art training algorithms.

Many of the best practical training results to date have been reported by researchers in disciplines other than mathematics. The purpose of this session is to foster interaction between applied mathematicians and the broader neural network research community.

Organizer: Scott A. Markel
David Sarnoff Research Center, Princeton, NJ

10:30 Ill-Conditioning in Neural Network Training Problems
George Cybenko and *Sirpa Saarinen*, University of Illinois, Urbana

11:00 Cascade-Correlation: A Greedy Learning Algorithm for Artificial Neural Networks
Scott E. Fahlman, Carnegie Mellon University

11:30 Neural Network Training with Constraints
Roger L. Crane and *Scott A. Markel*, Organizer

12:00 Beyond Regression: Learning Continuous Probability Distributions with the Contrastive Hebbian Algorithm
Javier Movellan and James L. McClelland, Carnegie Mellon University

MS35/PACIFIC ROOM

Iterative Methods for Solving Integral Equations

Recent advances in iterative methods and in fast techniques for applying integral operators have made integral equation formulations an attractive approach to solving many problems of mathematical physics. The speakers in this minisymposium will explore the latest developments in problem formulation and techniques for the numerical solution of integral equations.

Organizer: Anne Greenbaum
Courant Institute of Mathematical Sciences, New York University

10:30 On the Numerical Solution of the Biharmonic Equations in the Plane
Leslie Greengard, Courant Institue of Mathematical Sciences, New York University, and *Anne Greenbaum*, Organizer, and Anita Mayo, IBM Thomas J. Watson Research Center

11:00 Application of Integral Equation Methods to Problems in Elasticity and Fluid Dynamics
Anita Mayo, IBM Thomas J. Watson Research Center, and Leslie Greengard, Courant Institute of Mathematical Sciences, New York University

11:30 Multipole-Accelerated Iterative Methods for Time-Dependent and Complex Integral Equations, with Applications to Engineering Electromagnetics
S. Kim, K. Nabors and *Jacob White*, Massachusetts Institute of Technology

12:00 Two-grid Iteration Methods for Solving Boundary Integral Equations
Kendall E. Atkinson, University of Iowa

MS36/SHERMAN OAKS ROOM

Implicit Matrix Computations

In many applications, one needs to compute a decomposition of a product of several matrices. Examples include an eigenvalue decomposition of a product of two symmetric matrices, a singular value decomposition of a product of two matrices, (cf. the generalized singular value decomposition, GSVD). a singular value decomposition (SVD) of a product of three matrices (canonical correlations), and the recently proposed complete orthogonal decomposition (URV decomposition) are important examples. For obvious numerical reasons, one wishes to avoid forming the explicit matrix product. The goal is to devise an implicit algorithm that works on the data matrices separately, and to preserve whatever properties that the original matrices possess.

The speakers in this minisymposium will present and discuss new algorithms for computing accurate decompositions of matrix products.

Organizer: Adam W. Bojanczyk
Cornell University

10:30 Implicit Method for Computing the SVD of a Product of 2x2 Triangular Matrices
Adam W. Bojanczyk, Organizer

11:00 On a Modified URV Factorization and its Update
J. Chun, GE Research and Development, Schenectady, NY

11:30 Generalizing the URV Decomposition for Adaptive Parameter Estimation
Franklin T.Luk, Rensselaer Polytechnic Institute

12:00 Generalizations of the Singular Value and QR Decomposition
Bart De Moor and *Paul Van Dooren*, University of Illinois, Urbana-Champaign

CP13/SANTA MONICA ROOM

Parallel Numerical Methods for PDEs

Chair: I. Norman Katz, Washington University

10:30 A Preconditioned Textured Decomposition for Parallel Implementation of the *p*-Version of the Finite Element Method
Yimin Zhu and I. Norman Katz, Washington University, St Louis, MO

10:45 A Hybrid Additive Multiplicative Schwarz Method for Nonsymmetric Problems
Xiao-Chuan Cai, University of Kentucky, Lexington

11:00 Domain Decomposition for Singular Neumann Boundary Problem
Jian-Ping Shao, University of California, Los Angeles

11:15 Efficient Solution of Almost Block Diagonal Systems Arising from Spectral Decomposition on Rectangular Domains
Marcin Paprzycki and Cliff Cyphers, University of Texas-Permian Basin, Odessa

CP14/PLAZA ROOM

Image Processing

Chair: John A. Crow, Rockwell International Corp., Anaheim, CA

10:30 Shape from Shading: Nonlinear Model Analysis and Robust Algorithms
Kyoung Mu Lee and C.-C. Jay Kuo, University of Southern California

10:45 Advanced Discrete Techniques for Image Transformation
Z.C. Li, Concordia University, Canada

11:00 Abstract Approximation for Degenerate Nonlinear Distributed Parameter Systems and Generalized Galerkin Schemes
Chaolin Mao and *I.G. Rosen*, University of Southern California and Simeon Reich, University of Southern California and Technion - Israel Institute of Technology, Haifa, Israel

11:15 Determination of Physical Parameters in Nonlinear Differential Equations of Motion
Julius S. Bendat, J.S. Bendat Company, Los Angeles, CA

11:30 Recovery of a Lossy Acoustic Medium from its Point-Source Response
Bruce Chaderjian, California State University, Long Beach

11:45 Continuity of the Forward Map for a Linearized Inverse Problem in Several Dimensional Wave Propagation
Gang Bao and William W. Symes, Rice University

12:00 Numerical Solution of Integral Equations Involving the Logarithmic Potential
John A. Crow, Rockwell International Corporation, Anaheim, CA

10:30AM-12:30PM
CONCURRENT SESSIONS

CP15/BRENTWOOD ROOM
Numerical Analysis 1
Chair: Thomas Y. Hou, Courant Institute of Mathematical Sciences, New York University

10:30 **Error Propagation into $C^{\times}$ Regions**
Freda Porter-Locklear, Pembroke State University

10:45 **Accuracy and Speed in Computing the Chebyshev Collocation Derivative**
Wai-Sun Don and Alex Solomonoff, Brown University

11:00 **Nonlinear Galerkin Methods Using Chebyshev or Legendre Polynomials**
Jie Shen, Pennsylvania State University, University Park

11:15 **Numerical Study of Pseudospectral Methods in Shock Wave Simulation**
Wai-Sun Don, Brown University

11:30 **Comparison of Finite Difference and Pseudo-Spectral Approximations for Hyperbolic Equations**
Yu-Chung C. Hou, Courant Institute of Mathematical Sciences, New York University

11:45 **Weak Instability of the Pseudo-Spectral Method without Smoothing**
Jonathan Goodman and *Thomas Y. Hou*, Courant Institute of Mathematical Sciences, and Eitan Tadmor, Tel-Aviv University, Israel

CP16/PALISADES ROOM
Semiconductors and Transport Equations
Chair: Peter G. Petropolous, Brooks Air Force Base, San Antonio, TX

10:30 **Numerical Analysis of Semiconductor Devices**
Zhangxin Chen, AHPCRC/University of Minnesota, Minneapolis and Bernardo Cockburn, University of Minnesota, Minneapolis

10:45 **Asymptotically Accurate Models of Semiconductors**
Patrick S. Hagan, Los Alamos National Laboratory, Los Alamos, NM, Robert W. Cox, Indiana University-Purdue University, Barbara A. Wagner, University of Arizona, and Luis Reyna, IBM Thomas J. Watson Research Center

11:00 **Preconditioned Krylov Subspace Methods for 3-D Semiconductor Process Modeling**
Walter B. Richardson, Jr., University of Texas, San Antonio

11:15 **Semiclassical Equations for Electrons in High Electric Fields**
Tetsuji Ueda and Patrick S. Hagan, Los Alamos National Laboratory

11:30 **Relaxation Wave Solutions of Reaction-Diffusion Systems**
Leonid V. Kalachev, University of Washington, Seattle

11:45 **Numerical Transport in Diffusive Regimes**
Shi Jin, Institute for Advanced Study, Princeton, NJ

12:00 **On Modeling the Self-Organizing Structures of Electromagnetic Polarization Phenomena**
Leon A. Steinert, Physical Synergetics Institute, Long Beach, CA

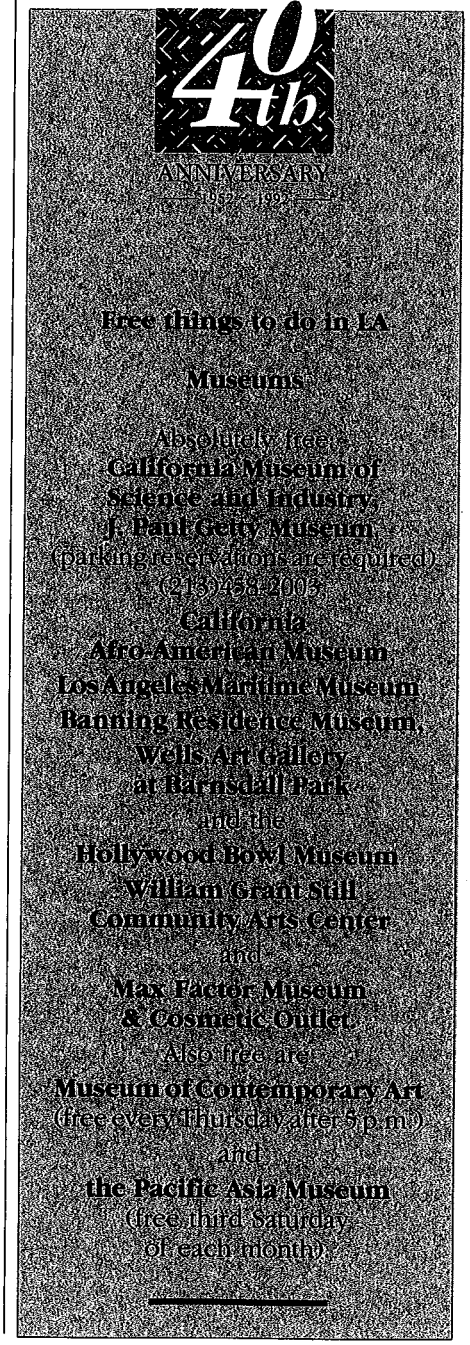
12:15 **Analysis of Electrically Large Finite Diffraction Gratings on Dielectric Interfaces**
Peter G. Petropoulos, Brooks Air Force Base, San Antonio, TX and Gregory Kriegsmann, New Jersey Institute of Technology

12:30-2:00
Lunch

2:00/LA BALLROOM
IP9/Chair: Marsha J. Berger, Courant Institute of Mathematical Sciences, New York University

The Numerical Solution of Differential-Algebraic Equations
Linda R. Petzold
Department of Computer Science
University of Minnesota, Minneapolis

2:45/CALIFORNIA SHOWROOM
Coffee



3:30PM-5:30PM
CONCURRENT SESSIONS

MS37/LA BALLROOM
Parameter Estimation for ODEs and DAEs
Sponsored by
SIAM Activity Group on Optimization

Many physical systems with dynamics that are described by systems of ordinary differential or differential-algebraic equations depend on a finite number of parameters whose values may be estimated by making observations of the system at various times during its evolution. Chemical reaction processes and robot movement are good examples. Some parameter estimation problems are difficult to solve; they challenge the robustness and efficiency of algorithms for optimization and boundary value problems. In this session, the speakers examine some of the applications, and describe approaches for solving these problems which are robust, efficient and parallelizable.

Organizer: Stephen Wright
Argonne National Laboratory

3:30 **Parameter Estimation and Identification Strategies in Process Engineering**
Lorenz T. Biegler, Carnegie-Mellon University

4:00 **Algorithms for Parameter Identification**
J.E. Dennis Jr., Guangye Li and *Karen A. Williamson*, Rice University

4:30 **Parallel Algorithms for Parameter Estimation in ODEs**
Stephen Wright, Organizer

5:00 **Title to be announced**
Hans-Georg Bock, University of Heidelberg, Germany

5:30 **Diffpar, a Toolbox for Parameter Estimation in ODEs Modelling e.g. Chemical Kinetics**
Lennart Edsberg, Royal Institute of Technology, Stockholm, Sweden and Per-Ake Wedin, Institute of Information Processing, University of Umea, Sweden

MS38/SANTA MONICA ROOM
Effective Equations for Fluid Flow (Part 2 of 2)
(For Description, see MS 31, page 23)

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

3:30 **Dynamics of Drift Waves in Sheared Flow**
Patrick Diamond, University of California, San Diego

4:00 **Approximate and Exact Renormalization Theories for a Model for Turbulent Transport**
Marco Avellaneda, Courant Institute of Mathematical Sciences, New York University and Andrew Majda, Princeton University

4:30 **The Scaling Behavior of Fluid Mixing Induced by a Random Velocity Field**
Qiang Zhang, State University of New York, Stony Brook

5:00 **Multiple Scale Analysis of Quasilinear Passive Transport in a Sheared Periodic Pipe.**
Kurt S. Riedel, Organizer

3:30 PM - 5:30 PM
CONCURRENT SESSIONS

MS39/BEVERLY HILLS ROOM

Boundary Conditions for the Simulation of Unsteady Flows

Improvements in computing technology have opened up the possibility for accurate simulation of unsteady flows. However, fundamental issues concerning boundary conditions are not yet satisfactorilly understood. For problems posed on unbounded domains, radiation conditions must be given at artificial boundaries. These are not directly determined by the physics, but are based on mathematical and computational considerations. For certain reformulations of the governing equations (e.g. vorticity, pressure Poisson, ...), even the imposition of a no-slip condition at solid walls is nontrivial.

Boundary conditions for time-dependent partial differential equations have been derived by a number of seemingly disparate techniques; asymptotic analyses of linearized problems (using both far-field and high frequency expansions), energy methods and ad-hoc physical reasoning. The main questions that need to be addressed are the usual ones for any approximation: accuracy, stability and efficient implementation.

The purpose of this minisymposium is to bring together researchers who are working on these problems. We hope to uncover commonalities among the results obtained by different research groups and to identify outstanding issues which remain unresolved.

Organizer: Thomas Hagstrom
University of New Mexico, Albuquerque

3:30 **Stable and Asymptotically Stable Boundary Conditions for High Order Compact Schemes**
David Gottlieb, Brown University

4:00 **Some OBC Problem Areas for Viscous Incompressible Flow**
Philip Gresho, Lawrence Livermore National Laboratory, Livermore, CA

4:30 **Stable Boundary Conditions for Higher Order Finite Difference Methods on Domains with Non-Smooth Boundaries**
Pelle Olsson, University of Uppsala, Sweden

5:00 **Boundary Conditions and Time Accurate Simulations of Compressible Flows**
S.I. Hariharan, University of Akron, and Thomas Hagstrom, Organizer

5:30 **Boundary Layers at Artificial Boundaries for Models of Slightly Compressible Flow**
Jens Lorenz, University of New Mexico, Albuquerque, and Thomas Hagstrom, Organizer

MS40/PLAZA ROOM

Numerical Treatment of Large-Scale Ill-Posed Problems.

Solutions to ill-posed problems are very sensitive to perturbations of the data. Regularization (i.e., stabilization) is required to obtain useful approximations to these solutions. Typically, regularization techniques filter out components of the solution that are adversely affected by noise in the data, while retaining components that are little affected by noise.

In this minisymposium, the speakers will present some recent results regarding regularization methods for large-scale ill-posed problems, which occur in important areas such as image processing, seismology, and medicine. They will focus on iterative methods for regularization, a new method for choosing regularization parameters, and applications of these methods.

Organizers: Curt Vogel,
Montana State University and
Per Christian Hansen,
Technical University of Denmark

3:30 **The Use of the L-Curve in the Regularization of Discrete Ill-Posed Problems**
Per Christian Hansen, Organizer

4:00 **Reconstruction of Tissue Metabolism from Dynamic Emission Tomography Data**
Finbarr O'Sullivan, University of Washington Medical Center

4:30 **Total Variation Based Restoration of Noisy, Blurred Images**
Stanley J. Osher, University of California, Los Angeles

5:00 **The Block Power Method for Ill-Posed Problems**
Curt Vogel, Organizer

MS41/WESTWOOD ROOM

A Multidimensional System of Parallel Coordinates: Foundations and Applications

Based on a multidimensional system of Parallel Coordinates a methodology for visualizing (analytic and synthetic geometry in) Euclidean *N*-Dimensional space is formulated. For any positive integer *N*, a *1-1* mapping between *N*-dimensional and 2-dimensional subsets is constructed recursively in the dimensionality. Relations in N variables are represented by planar diagrams with properties analogous to the corresponding *N*-Dimensional hypersurface. In the plane a point-to-line duality leads to some optimal convexity algorithms. A *N*-Dimensional line duality leads to some optimal convexity algorithms. A *N*-Dimensional line is represented by *N-1* indexed planar points and in general p-dimensional flats in N-space are represented by *(N-p)p* indexed points. From these representations ("pencil and paper") geometrical construction algorithms for translations, rotations, hyperplane intersections, and point membership queries and others as well as the representation of *N*-Dimensional polytopes are obtained. Together with the representation of a class of hypersurfaces an algorithm for constructing and displaying any point interior, exterior will be shown. Applications to Statistics Conflict Resolution (Collision Avoidance) Air Traffic Control, Computational Geometry, Computer Vision, Process Control and Optimization will be presented.

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

3:30 **Mathematical Foundations of Parallel Coordinates**
Alfred Inselberg, Organizer, and Bernard Dimsdale, IBM Scientific Center, Los Angeles, CA and University of Southern California and University of California, Los Angeles

4:00 **Representing Polytopes and Surfaces in Parallel Coordinates**
Avijit Chatterjee and C.K. Hung, University of Southern California

4:30 **Statistical Applications of Parallel Coordinates**
C. Gennings, W.H. Carter, Jr. and K.S. Dawson, Virginia Commonwealth University

5:00 **Applications of Parallel Coordinates to Management**
Anand Desai, Ohio State University and Lawrence C. Walters, Brigham Young University

MS42/PALISADES ROOM

Asymptotic and Perturbation Methods in Nonlinear Wave Propagation

Nonlinear wave equations arise in diverse settings, including fluid mechanics, electromagnetics and reaction-diffusion problems. Application and extension of classical perturbation methods (including multiple-scale and boundary-layer theory) have led to new insights into the dynamics of these systems. This minisymposium will be comprised of discussions of how asymptotic and perturbation methods are currently being used in these applications.

Organizer: William L. Kath
Northwestern University

3:30 **Microwave Heated Materials**
Gregory A. Kriegsmann, New Jersey Institute of Technology

4:00 **Weakly Nonlinear Waves: Multiple Scale Solutions and Some Unsolved Problems**
Jerry Kevorkian, University of Washington

4:30 **The Slow Accomodation of a Traveling Wave to its Tail for Reaction-Diffusion Equations**
Michael Booty and *Richard Haberman*, Southern Methodist University and Tim Minzoni, IIMAS, Universidad Nacional Autonoma de Mexico, Mexico

5:00 **Advection of a Passive Scalar by a Dipolar Vortex Couple**
Andrew J. Bernoff and Joseph F. Lingevitch, Northwestern University

CP17/WESTSIDE ROOM

Dynamical Systems and Chaos

Chair: S.M. Shahruz, Berkeley Engineering Research Institute

3:30 **A Symbolic Algorithm for Predicting Types of Hopf Bifurcations in Autonomous Dynamical Systems**
Raouf A. Raouf, United States Naval Academy

3:45 **Turbulence Models Constructed from Unaveraged Equation with Chaotic Map Closures**
J.M. McDonough, X. Zhong and L. Xiang, University of Kentucky, Lexington

4:00 **Fractal Structures in the Higher Order Symplectic Integration Algorithms**
Toshiaki Itoh, Kobe University, Japan

3:30PM - 5:30PM
CONCURRENT SESSIONS

4:15 **The Iterative Evolution of Complex Systems**
T. Erber, Illinois Institute of Technology and *D.R. Gavelek*, XonTech, Inc., Van Nuys, CA

4:30 **Ill-Posed Problems and Chaos**
Din-Yu Hsieh, Hong Kong University of Science and Technology, Hong Kong

4:45 **Are Cross-Waves Chaotic?**
Cynthia M. Bowline, Robert T. Hudspeth, and Ronald B. Guenther, Oregon State University

5:00 **Weakly Nonlinear Surface Waves on a Ferrofluid**
Mark Engel, Luther College, University of Regina, Canada and R.R. Rosales, Massachusetts Institute of Technology

5:15 **Approximate Decoupling of Weakly Nonclassically Damped Linear Second-Order Systems Under Harmonic Excitations**
S.M. Shahruz, Berkeley Engineering Research Institute and A.K. Packard, University of California, Berkeley

CP18/PACIFIC ROOM
Software
Chair: Michael Berry, University of Tennessee, Knoxville

3:30 **ALPAL, a High-Level Tool for Building Simulation Codes**
Grant O. Cook, Jr., Lawrence Livermore National Laboratory, Livermore, CA

3:45 **Block Cyclic Dense Linear Algebra for the Connection Machine System CM-200**
Woody Lichtenstein and S. Lennart Johnsson, Thinking Machines Corporation, Cambridge, MA

4:00 **An Object Oriented C++ Interface to Linpack**
Allan H. Vermeulen, University of Waterloo, Canada

4:15 **Distributed Basic Linear Algebra Subprograms**
Jack Dongarra, University of Tennessee, Knoxville and Oak Ridge National Laboratory, Oak Ridge, TN and *Robert van de Geijn*, University of Texas, Austin

4:30 **SVDPACK - A Fortran-77 Subroutine Library for Computing the Sparse Singular Value Decomposition**
Michael W. Berry, University of Tennessee, Knoxville

CP19/BRENTWOOD ROOM
Iterative Methods for Solving Algebraic Equations
Chair: J. Strigberger, Concordia University, Canada

3:30 **Comparison of Iterative Methods for Nonsymmetric Coupled Elliptic Equations**
June M. Donato, Oak Ridge National Laboratory

3:45 **The Conjugate Gradient Method for Nonsymmetric Fredholm Integral Equations of the Second Kind**
Jose D. Flores, University of South Dakota

4:00 **On Preconditioned CG-like Methods for Nonsymmetric Linear Systems**
Ulrike Meier Yang, University of Illinois, Urbana

4:15 **A Special Preconditioner for Solving Discretized Convection-Diffusion Equations**
Min Chen, Pennsylvania State University, State College and Roger Temam, Universite Paris-Sud, Orsay, France

4:30 **The Convergence Rate for Chebyshev SIM with Estimated Complex Segment Spectrum**
Xiezhang Li, Georgia Southern University

4:45 **The Inexact Newton Method Using Cimmino's or Kaczmarz's Method**
Liu Changwen and Randall Bramley, University of Illinois, Urbana

5:00 **Hybrid Parallel Architectures to Solve Sparse Linear Algebra Problems**
Serge G. Petiton, Site Experimental en Hyperparallelisme Establissement Technique Central de l'Armement, Arcueil-Paris, France and Yale University

5:15 **A Finite Element / GMRES Algorithm for Transonic and Supersonic Euler Equation Computations**
J. Strigberger, G. Baruzzi, and W.G. Habashi, Concordia University, Canada and M. Fortin, Universite Laval, Canada

CP20/SHERMAN OAKS ROOM
Elasticity
Chair: Patricia Lewis, Iowa State University

3:30 **Diffraction by a Buried Semi-Infinite Crack in an Elastic Half-space**
Patricia Lewis, Ames Laboratory, Iowa State University and Gerry Wickham, Ames Laboratory, Iowa State University and Manchester University, England

3:45 **Creep Behaviour of Isotropic and Anisotropic Materials**
Josef Betten, Technical University of Aachen, Germany

4:00 **Statistical Origin of the Difference between Griffith Energies of Crack Initiation and Arrest**
Boris Kunin, Michael Gorelik and *Alexander Chudnovsky*, University of Illinois, Chicago

4:15 **Propagating Phase Boundaries in Solids**
Philippe LeFloch, Courant Institute of Mathematical Sciences, New York University

4:30 **The Flutter Instability in Elastic-Plastic Material**
Lianjun An, McMaster University, Canada

4:45 **Approximate Analytical Solutions for Some Nonlinear Vibrating Structures**
Victor Z. Gristchak, Dnepropetrovsk State University, Ukraine

5:00 **A Numerical Algorithm in the Theory of Mindlin Plates**
Christian Constanda, University of Strathclyde, Glasgow, Scotland

5:15 **Asymptotic Properties in Viscoelasticity and Thermo-Visco-Elasticity (TVE)**
Jaime E. Munoz Rivera, National Laboratory for Scientific Computation, Rio de Janeiro, Brazil

5:30 **Computer Aided Rheology: Determination of Temperature Shift Factors, and Data Fitting from Steady Flow Measurements of Linear Viscoelastic Material**
Renching Zhang, *Leela Rakesh*, James Angelos, Edward Kaufman, George Grossman and Stan Hirschi, Central Michigan University, Mt. Pleasant

7:30/CALIFORNIA SHOWROOM
Registration opens

8:00/LA BALLROOM
IP10/Chair:Joseph E. Oliger, Stanford University
Wavelet Transforms versus Fourier Transforms
Gilbert Strang
Department of Mathematics
Massachusetts Institute of Technology

8:45/LA BALLROOM
IP11/Chair:Joseph E. Oliger, Stanford University
Tensor Methods for Nonlinear Equations and Optimization
Robert B. Schnabel
Department of Computer Science
University of Colorado, Boulder

9:00 AM-4:00 PM/CALIFORNIA SHOWROOM
Exhibits

9:30/CALIFORNIA SHOWROOM
Coffee

40th ANNIVERSARY

Free things to do in LA

Exposition Park

Here you'll find a collection of first-rate museums: California Afro-American Museum, the California Museum of Science and Industry and the Natural History Museum, the world's largest rose garden with 150 variety of roses, the Los Angeles Memorial Coliseum, site of the 1932 and 1984 Summer Olympic Games; the Sports Arena and plenty more. Across the street is the University of Southern California (USC) where an hour-long walking tour of the century-old campus is free.

10:00 AM - 12:00 PM
CONCURRENT SESSIONS

MS43/LA BALLROOM
Large-Scale Optimization
Sponsored by
SIAM Activity Group on Optimization
Researchers in optimization are increasingly turning their attention to large-scale problems, i.e, problems requiring the exploitation of special structure. With this focus comes greater awareness of the applications giving rise to the optimization problems - the talks in this section illustrate this point. Large-scale emphasis also leads to a greater concern with iterative linear solvers, exploitation of sparsity, parallelism, and new ways to deal with constraints. All these features are amply illustrated in the talks in this minisymposium.

Organizer: Thomas F. Coleman
Cornell University

10:00 Inexact Newton Methods and the Ginzburg-Landau Model for Type II Superconductors
Paul Plassmann and Stephen Wright, Argonne National Laboratory

10:30 Large-Scale Box-Constrained Least Squares Calculations for Turbulent Combustion
Thomas F. Coleman, Organizer and *Chunguan Sun*, Cornell University

11:00 Trust Region Methods for Large Optimization Problems with Nonlinear Constraints
Jorge Nocedal, Northwestern University

11:30 On the Solution of Large-Scale Piecewise Linear Norm Minimization Problems
Thomas Coleman, Organizer and *Yuying Li*, Cornell University

MS44/SANTA MONICA ROOM
Adaptive Methods in Computational Fluid Dynamics
Computational methods are becoming an essential tool in fluid dynamics, both for understanding the fundamental mathematics and physics, as well as in practical engineering design. In this minisymposium, the speakers will discuss adaptive methods for finite difference calculations, which they view as a collection of techniques for accurately and efficiently resolving various aspects of the complex spatial structures arising in fluid dynamics problems. The techniques they will discuss include: adaptive gridding techniques, such as local refinement, which enable one to automatically and dynamically add and delete grid points, in order to maintain uniform accuracy; front tracking, in which one treats certain thin fronts as infinitely thin moving free boundaries in a finite difference calculation; and various techniques for treating complex boundary geometries.

Organizer: Phillip Colella
University of California, Berkeley

10:00 An Adaptive Grid Method for 3-D Transonic Aerodynamics Problems
Robin Melvin, Michael B. Bieterman, John E. Bussoletti, Craig L. Hilmes, Forrester T. Johnson and David P. Young, Boeing Computer Services, Seattle, WA

10:30 Adaptive Numerical Methods for Time-dependent Incompressible Flow Problems
John B. Bell, Lawrence Livermore National Laboratory, Livermore, CA

11:00 The Chimera Method for Flows about Complex Configurations
Joseph Steger, University of California, Davis

11:30 Adaptive Mesh Refinement and Front Tracking for Hyperbolic PDE's
Phillip Colella, Organizer

MS45/BEVERLY HILLS ROOM
Grid Generation: Theory and Applications (Part 1 of 2)
Numerical grid generation plays a critical role in any scientific computing problem in which the geometry of the underlying region is complex or when the solution has a complex structure. The speakers in this session will present algorithms and applications for two and three dimensional problems. They will also discuss solution adaption techniques. A major portion of the session will be devoted to surface grid generation.

Organizers: José E. Castillo
San Diego State University and
Patrick M. Knupp
Ecodynamics Research Associates Incorporated, Albuquerque, NM

10:00 Computational Aspects of the Deformation Approach to Adaptive Grid Generation
Patrick M. Knupp, Organizer

10:30 Grid Generation and the Vehicle/Propeller Flow Field
Thomas S. Mautner, Naval Command Control and Ocean Surveillance Center, San Diego, CA

11:00 Some Recent Results on Deformation Methods
Gordon Liao, University of Texas, Arlington

11:30 Solution Adaptive Grid Generation - Discrete Variational Approach
Erik M. Pedersen, Rohr Incorporated, Chula Vista, CA, and San Diego State University

MS46/WESTSIDE ROOM
Differential-Algebraic Equations and Approximate Inertial Manifolds: Connections, Theory and Algorithms (Part 1 of 2)
Many dissipative Partial Differential Equations (PDEs) exhibit low-dimensional long time behavior. To better understand and characterize this behavior and include issues such as hyperbolicity, stability, bifurcation and chaotic dynamics, one must find an appropriate way of representing the behavior by exploiting its low-dimensionality. The theory of Inertial Manifolds is an attempt in this direction. An Inertial Manifold constitutes an exact interaction law between "high" and "low" modes in dissipative PDEs. Since this law is in general not available in closed form, one seeks to approximate it by an Approximate Inertial Manifold (AIM). Most extant AIMs take the form of implicit algebraic relations, leading to a reduced system of Differential Algebraic Equations (DAEs) for the dynamics on the manifold.

This minisymposium is organized to promote the interaction between researchers working on the solution of DAEs and those using them in the AIM context. The speakers will present work on theory and algorithm development (Part 1) and computational results (Part 2).

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

10:00 Approximation of Inertial Manifolds and Algebraic Differential Equations
Roger Temam, Indiana University, Bloomington, and Universite Paris-Sud, France

10:30 Invariants and DAEs
C. William Gear, NEC Research Institute Inc., Princeton, NJ

11:00 The Center-Unstable Manifold Reduction as an Approximate Inertial Manifold
Dieter Armbruster, Arizona State University

10:00AM-12:00PM
CONCURRENT SESSIONS

11:30 Constraint Preserving DAE Integrators
Stephen L. Campbell, North Carolina State University

MS47/PACIFIC ROOM

Fast Solvers for Electromagnetics

The ability to predict radar return from complex structures with layered material media over a wide frequency range (100MHz to 20 GHz) is a critical technology need for the development of stealth aerospace configurations. With the increasing power of supercomputers and advances in numerical algorithms, computational modeling of the various forms of Maxwell's equations (integral and differential, frequency and time domain) is becoming very attractive.

The speakers in this minisymposium will present recent developments in fast solvers for problems in electromagnetics and discuss future trends in supercomputing using massively parallel processing architectures leading to possible teraflop execution speeds.

Organizer: Vijaya Shankar
Rockwell International Science Center, Thousand Oaks, CA

10:00 Development of a Gigaflop Performance Algorithm for Maxwell's Equations of Electromagnetics
Vijaya Shankar, Organizer

10:30 Computational Modeling of Femtosecond Optical Solitons
Rose Joseph, and Allen Taflove, Northwestern University

11:00 Solving Large Unstructured Grid Time Domain Electromagnetic Problems in MIMD Computers
Neil Madsen, Lawrence Livermore National Laboratory, Livermore, CA

11:30 Sparse Integral Equations Based Solution of Maxwell's Equations
Francis Canning, Rockwell International Science Center, Thousand Oaks, CA

MS48/BRENTWOOD ROOM

Recursive and Total Least Squares

The standard least squares problem (minimize the 2-norm of the residual $r(x) = Ax-b$ over all x) has been solved stably and efficiently. However, there are still open questions in related areas: updating least squares solutions, recursive least squares lattices, and collinearity in total least squares. The speakers will address some of the problems in these related areas.

Organizer: James R. Bunch
University of California, San Diego

10:00 Accurate Updating and Downdating of Least Squares Solutions
Ake Bjorck and L. Elden, University of Linkoping, Sweden and *Haesun Park*, University of Minnesota, Minneapolis

10:30 Implementation Issues of the Recursive Least Squares Lattice Algorithm for Real-Time Applications
Richard C. North, Naval Ocean Systems Center, San Diego, CA

11:00 Performance Effects of the Exponential Weighting Parameter on a RSL Lattice Filter Algorithm
Richard C. Le Borne, University of California, San Diego

11:30 Total Least Squares and the Ill-conditioned Least Squares Problem
Ricardo D. Fierro, University of California, San Diego

MS49/ENCINO ROOM

New Developments in Plate and Shell Theory (Part 1 of 2)

Within the last decade, considerable progress has been made on constructive theories for plate and shells, such theories start with the full set of equations for the three dimensional body and derive two dimensional models by means of asymptotics and expansion techniques without any a priori assumptions about the variations of the quantities involved across the thickness of the body. This approach provides a rational foundation for the formulation of plate and shell theories. The speakers in this minisymposium will demonstrate the power of this approach on a variety of problems involving different linear and nonlinear geometrics and materials.

Organizers: Robert P. Gilbert and Klaus Hackl
University of Delaware

10:00 An Asymptotic Theory for the Thermoelastic Plate
Klaus Hackl, Organizer

10:30 Asymptotic Methods Applied to Strongly Anisotropic and Inhomogeneous Plates
Robert G. Root, Lafayette College

11:00 Calculation of Microstresses in a Thick Heterogenous Plate by Homogenization
Roland J. Tapiero, Universite Claude Bernard, France

11:30 Constitutive Equations for a Hypermembrane Shell
James L. Buchanan, U.S. Naval Academy

CP21/PLAZA ROOM

Signal Processing (Wavelets)

Chair: Sergio E. Zarantonello, Fijitsu America, Inc., San Jose, CA

10:00 Shannon's Sampling Theorem as a Problem of Approximation in Function Spaces; Extensions to Multiresolution Structures and Wavelets and Asymptotic Equivalence with the Classical Sampling Procedure
Akram Aldroubi and Michael Unser, National Institutes of Health

10:15 New Convolution Kernels for the Berenstein Deconvolution Theory and Their Applications to Filtering
Stephen D. Casey, The American University

10:30 A Robust Algorithm for Spectral Exploration of Constrained Signals
Cheng-shu Wang and Jian-feng Tai, Academia Sinica, Beijing, People's Republic of China

10:45 Spectral Analysis of Nonstationary Processes
Nuno Crato, University of Delaware

11:00 Tree-Structured Wavelet Transform for Texture Analysis
Tianhorng Chang and C.-C. Jay Kuo, University of Southern California

11:15 An Adaptive Grid Approach for Image Compression
K.-J. Wong, Y.-C. Lin and C.-C. Jay Kuo, University of Southern California

11:30 A Parallel Implementation of the Backpropagation Model for Facial Recognition
Su-Shing Chen, National Science Foundation and University of North Carolina, Charlotte; R. Truman Sands, and *Sergio E. Zarantonello*, Fujitsu America, Inc., San Jose, CA

CP22/WESTWOOD ROOM

Numerical Linear Algebra

Chair: Andrew T. Ogielski, Bell Communications Research

10:00 A Study on Increasing Accuracy of a New Decomposition Technique
Jenn-Ching Luo, Columbia University

10:15 Row Ordering for a Sparse QR Decomposition
Thomas H. Robey, Sandia National Laboratories, Albuquerque, NM and Deborah Sulsky, University of New Mexico

10:30 Using Strassen's Matrix Multiplication in Parallel Soultion of Dense Linear Systems
Marcin Paprzycki, University of Texas-Permian Basin, Odessa

10:45 A Note on Implementing Some Symmetric Matrix Decompositions
Nai-kuan Tsao, Wayne State University

11:00 Searching for Elfinvalues
B. Bertram and O. Ruehr, Michigan Technological University

11:15 A Quasi-Gauss-Newton Method for Solving Nonlinear Algebraic Equations
Hu Wang and R.P. Tewarson, State University of New York, Stony Brook

11:30 Sparse Matrix Computations on Parallel Processor Arrays
Andrew T. Ogielski and William Aiello, Bell Communications Research, Morristown, NJ

11:45 New Efficient Least Squares Parallel Methods for Solving the Equation $Ax=b$
Ubaldo Garcia-Palomares, University Simon Bolivar, Caracas, Venezuela

CP23/PALISADES ROOM

Numerical Analysis 2

Chair: Freda Porter-Locklear, Pembroke State University

10:00 Integral Inequalities, Discretisation Methods and Convergence
Sean McKee, University of Strathclyde, Glasgow, Scotland

10:15 A New Petrov-Galerkin Scheme of Parallel-Structure for Constrained Variational Problems
Gabriel N. Gatica and Rodolfo A. Araya, Universidad de Concepcion, Chile

10:30 Numerical Studies of Propagation of Singularities in Semi-Linear Hyperbolic Systems
Freda Porter-Locklear, Pembroke State University

11:00 A-Posteriori Error Analysis for Linearization of Nonlinear Elliptic Problems and Their Discretizations
Weimin Han, University of Iowa

11:15 Stability of the Difference Approximations for the Parabolic Initial Boundary Value Problems
Lixin Wu and Heinz-Otto Kreiss, University of California, Los Angeles

11:30 Finite Difference Method with Cubic Spline for Solving Nonlinear Schrodinger Equation
M.S. Ismail, King Abdulaziz University, Saudi Arabia

12:00-1:30
Lunch

1:30/LA BALLROOM
The John von Neumann Lecture
Chair: Margaret H. Wright,
AT&T Bell Laboratories
Lagrange Multipliers and Optimality
R. Tyrrell Rockafellar
Department of Mathematics
University of Washington, Seattle

2:30/LA BALLROOM
SIAM Business Meeting

3:00/CALIFORNIA SHOWROOM
Coffee

3:30PM-5:30PM
CONCURRENT SESSIONS

MS50/BEVERLY HILLS ROOM
Grid Generation: Theory and Applications (Part 2 of 2)
(For Description see MS 45, Page 28)
Organizers: José E. Castillo
San Diego State University and
Patrick M. Knupp
Ecodynamics Research Associates
Incorporated, Albuquerque, NM

3:30 **Grid Generation and Large-Scale Optimization**
José E. Castillo, Organizer

4:00 **Truncation Error in Grid Generation: A Case Study**
Richard Luczak, Numerical Algorithms Group, Inc., Downer's Grove, IL, and Patrick M. Knupp, Organizer

4:30 **Some Novel Techniques for Grid Generation and Quasi-Conformal Mappings**
Prabir Daripa, University of Texas, College Station

5:00 **Grid Refinement and Solution Iteration**
G.F. Carey, S. Bova, H. Kohli and V. Carey, University of Texas, Austin

MS51/SANTA MONICA ROOM
Differential-Algebraic Equations and Approximate Inertial Manifolds: Connections, Theory and Algorithms (Part 2 of 2)
(For Description see MS 46, page 28)
Organizers: Yannis Kevrekidis
Princeton University and
Edriss S. Titi
University of California, Irvine

3:30 **On the Algebraic Approximation of the Attractors of Some Dissipative Differential Equations**
Ciprian Foias, Indiana University, Bloomington

4:00 **On Singularities of Solutions of Differential-Algebraic Equations and Their Computation**
Werner C. Rheinboldt and Patrick J. Rabier, University of Pittsburgh

4:30 **On a Numerical Scheme Based on the Algebraic Approximation of the Attractor**
Michael S. Jolly, Indiana University, Bloomington

5:00 **Quasi-Stationary Approximate Inertial Manifolds for the Navier-Stokes Equations**
Don A. Jones, University of California, Irvine and *Edriss S. Titi*, Organizer

MS52/WESTSIDE ROOM
Sensitivity and Condition Estimation
The speakers in this minisymposium will focus on estimating the sensitivity of numerical computations in the presence of perturbations introduced by the use of inaccurate initial data, finite precision arithmetic, or other sources of error. The scope of their presentations is broad enough to include such areas as backward error analysis, structured and componentwise condition estimation, sensitivity of standard problems like matrix problems and updating condition estimates.
Organizers: Charles S. Kenney and Alan J. Laub
University of California, Santa Barbara

3:30 **Evaluating the Frechet Derivative of the Matrix Exponential**
Roy Mathias, University of Minnesota, Minneapolis, and College of William and Mary

4:00 **Dynamic Condition Estimators**
Christian Bischof, Argonne National Laboratory

4:30 **The Eigenproblem Condition Estimation in LAPACK**
Zhoajun Bai, University of Kentucky and James Demmel, University of California, Berkeley

5:00 **Small-Sample Monte Carlo Condition Estimation for Direction-of-Arrival Algorithms**
Thomas A. Bryan, University of California, Santa Barbara, and Charles S. Kenney and Alan J. Laub, Organizers

5:30 **Small-Sample Monte Carlo Condition Estimates**
Charles S. Kenney and Alan J. Laub, Organizers

MS53/WESTWOOD ROOM
Iterative Methods for Large-Scale Nonlinear Systems
Large-scale systems of nonlinear equations arise from a number of sources, perhaps the most important of which is the discretization of continuous problems posed as differential or integral equations. Discretized problems are often especially challenging not only because of their size but also because they reflect mathematical properties of the underlying continuous problems that must be addressed in solving them. Although the most difficult problems will always require considerable problem-specific treatment, general methods and techniques are becoming increasingly better developed. The speakers in this minisymposium will discuss Newton-like methods and their application to difficult large-scale problems, particularly discretized problems.
Organizer: Homer F. Walker
Utah State University

3:30 **Nonlinear GMRES at Boeing,**
Richard H. Burkhart, Boeing Computer Services, Seattle, WA

4:00 **Iterative Methods for Compact Fixed Point Problems**
Carl T. Kelley, North Carolina State University

4:30 **Newton's Method Applied to Nonlinear Elliptic Eigenvalue Problems**
Thomas Kerkhoven, University of Illinois, Urbana

5:00 **Trust Region Methods and Incomplete Cholesky Factorizations for Large-scale Minimization Problems**
Jorge J. Moré, Argonne National Laboratory, Brett M. Averick and Richard G. Carter, University of Minnesota, Minneapolis

MS54/BRENTWOOD ROOM
New Developments in Plate and Shell Theory (Part 2 of 2)
(For Description, see MS 49, page 29)
Organizers: Robert P. Gilbert and Klaus Hackl
University of Delaware

3:30 **An Asymptotic Theory for the Elastoplastic Plate**
Robert P. Gilbert, Organizer

4:00 **Models of Plates Derived from Linear 3D Elasticity**
Denis Caillerie, Sols Solides Structures, France

4:30 **Boundary Integral Formulations for Plate Problems**
George C. Hsiao, University of Delaware

3:30PM-5:30PM
CONCURRENT SESSIONS

MS55/PALISADES ROOM

Advances in Applied Reservoir Simulations in the Oil Industry

The simulation of flow in hydrocarbon reservoirs is used routinely in the oil industry for the management of oil and gas production operations. The highly variable and uncertain nature of the geologic detail and the strong dependence of the fluid displacement mechanisms on fluid distributions require the development of more accurate and efficient numerical methods.

The speakers will describe the development of higher order numerical methods, the estimation of parameter sensitivities, the use of massively parallel computers, and trends in computation in the oil industry.

Organizer: Ernest Y. Chung
Chevron Oil Field Research Company, La Habra, CA

3:30 **A Simple TVD Second Order Scheme for Commercial Reservoir Simulators**
Barry Rubin, BP Exploration Inc., Houston, TX and M.G. Edwards, BP Research, Middlesex, United Kingdom

4:00 **Use of Simulated Parameter Gradients in Reservoir Optimization Problems**
Ole Vignes, Norsk Hydro Research Center, Bergen, Norway

4:30 **The Simulation of Large, Heterogeneous Reservoir Models Using a Massively Parallel Computer**
W.H. Chen, D.R. Jones, Chevron Oil Field Research Company, La Habra, CA and *E.Y. Chung*, Organizer

5:00 **Technical Computing: Enabling Platform for Technological Breakthrough**
S. Bette, Mobil Research and Development Corporation, Dallas, TX

CP24/LA BALLROOM

Computational Fluid Dynamics

Chair: T.R. Hoffend, Jr., University of Minnesota, Minneapolis

3:30 **Nonlinear Longitudinal Waves in Cylindrical Shells**
Meyer Pesenson, University of California, Los Angeles

3:45 **Connecting Double Points in Taylor Vortex Flows**
John H. Bolstad, Lawrence Livermore National Laboratory, Livermore, CA

4:00 **Turbulent Shear Flow Over Topography: Stratification Effects**
Stephen R. Karpik, University of Toronto, Canada

4:15 **Characterization of Axisymmetric Flow in an Aquifer System**
Tony A. Rizk, Tennessee Valley Authority, Norris, TN

4:30 **Modified Rayleigh Benard Convection Problem in Cylindrical Geometry**
A. Shayganmanesh, Iran University of Science and Technology, Iran

4:45 **On Equal Order Interpolation for Incompressible Flow**
David Silvester, UMIST, United Kingdom and Stanford University

5:00 **Relativistic Theory of Superpotentials for a Nonhomogeneous, Spacially Isotropic Medium**
T.R. Hoffend, Jr., University of Minnesota, Minneapolis and R.K. Kaul, State University of New York, Buffalo

5:15 **Numerical Solution of the Transient Cross-Well Electromagnetic Problem in Geophysical Exploration**
Robert H.J. Gmelig Meyling, Royal Dutch/Shell, The Netherlands

5:30 **Technology Transfer in Applied Mathematics in Australia**
Noel G. Barton, CSIRO, New South Wales, Australia

CP25/PLAZA ROOM

Control Theory and Optimization

Chair: M. Dahleh, University of California, Santa Barbara

3:30 **An Inverse Problem of the Weighted Shortest Path Problem**
Shaoji Xu, Rutgers University and *Jianzhong Zhang*, City Polytechnic of Hong Kong

3:45 **On the Shortest Path Problem for Robot Car**
Gholamreza Dadgar Javid, and Han-Long Yang, University of Kaiserslautern, Germany

4:00 **On the Convergence of Pattern Search Methods**
Virginia Torczon, Rice University

4:15 **Minimization of Control Points for the Execution of Robotic Trajectory with Assigned Maximum Deviation - Theory and Experiment**
B. Donoso, *T.C. Yih* and I.N. Tansel, The State University of Florida, Miami

4:30 **A New Approach to Singularly Perturbed Optimal Control (SPOC) Problems in Discrete Time**
Vladimir Gaitsgory, Bar-Ilan University, Israel

4:45 **On a Nonlinear Hereditary Control Problem**
N.G. Medhin, Clark Atlanta University

5:00 **Robust Stability and Performance of Control Systems**
M. Dahleh, University of California, Santa Barbara, A. Tesi, Universita di Firenze, Italy, and A. Vicino, Universita di L'Aquila, Italy

5:15 **An Optimal Control Problem for Expedient Systems with Leading Stochastic Disturbance**
Leonid Khilyuk, Pheonix International Inc., Los Angeles, CA

CP26/PACIFIC ROOM

Mathematical Analysis

Chair: Jorge P. Zubelli, University of California, Santa Cruz

3:30 **Kinetic Formulation of Nonlinear Conservation Laws**
P.L. Lions, Universite Paris-Dauphine, France, B. Perthame, Universite d'Orleans, France and *Eitan Tadmor*, Tel Aviv University, Israel

3:45 **On Affine Plane Curve Evolution**
Guillermo Sapiro, Technion-Israel Institute of Technology, Haifa, Israel and Allen Tannenbaum, University of Minnesota, Minneapolis

4:00 **An Algorithm for Pseudo-Differential Operator Calculation**
Gang Bao and William W. Symes, Rice University

4:15 **Asymptotic Theory for Weakly Nonlinear Wave Equations**
Chirakkal V. Easwaran, State University of New York, New Paltz

4:30 **Wave Mode Coupling and Matrix Wiener-Hopf Factorization**
Gerry Wickham, Ames Laboratory, Iowa State University and Manchester University, England

4:45 **Classical and Nonclassical Similarity Reductions of Some Cahn-Hilliard Equations**
S. Roy Choudhury, University of Central Florida

5:00 **Differential Equations in the Spectral Parameter and Polynomial τ Functions**
Jorge P. Zubelli, University of California, Santa Cruz

5:15 **Blow-up Surfaces for Nonlinear Wave Equations**
Walter Littman and *Satyanad Kichenassamy*, University of Minnesota, Minneapolis

5:30 **Peano Dynamics and the Geometry of Space and Time**
M.S. El Naschie, University of Cambridge, United Kingdom

CP27/ENCINO ROOM

Theoretical Issues in Numerical Analysis

James Paul Holloway, University of Michigan, Ann Arbor

3:30 **Applications of the Hadamard Product to Matrix Perturbation Theory**
Roy Mathias, University of Minnesota, Minneapolis and College of William and Mary

3:45 **Random Products of Nonexpansive Mappings**
John M. Dye, California State University, Northridge and Simeon Reich, University of Southern California

4:00 **The Relationship Between ε-Pseudo-Eigenvalues and the Fourier Analysis Technique**
June M. Donato, Oak Ridge National Laboratory

4:15 **Hamiltonian Discretization of PDE's Using Finite Element and Spectral Methods**
James Paul Holloway, University of Michigan, Ann Arbor

4:30 **A Fornberg-like Conformal Mapping Method for Slender Regions**
Thomas K. DeLillo and Alan R. Elcrat, Wichita State University

4:45 **Singularly Perturbed Fredholm Integral Equations**
Michael D. Collins, Naval Research Laboratory, Washington, DC and Gregory A. Kriegsmann, New Jersey Institute of Technology

5:00 **Airy and Bessel Functions by Integration of ODEs**
Daniel W. Lozier, National Institute of Standards and Technology and Frank W.J. Olver, University of Maryland, College Park

3:30PM-5:30PM
CONCURRENT SESSIONS

CP28/SHERMAN OAKS ROOM
Geometric Design and Approximation Theory
Chair: Joseph W. Johnson, Astronautics Technology Center, Madison, WI

3:30 **SLI Arithmetic: An Environment for Data-Fitting**
Peter R. Turner, U.S. Naval Academy, Annapolis, MD

3:45 **Application of Bivariate Cubic Interpolating Spline in Surface Construction**
Zhen-Xiang Xiong, Alhambra, CA

4:00 **A Class of Oblique Projection Methods for Large Nonsymmetric Systems**
Kaibin Huang and Shijian Yan, Nanjing Normal University, Nanjing, The People's Republic of China

4:15 **Curve and Surface Approximation with Higher Order Hierarchical Splines**
Renshan Tang and C.-C. Jay Kuo, University of Southern California

4:30 **Projection Solutions of Forbenius-Perron Operator Equations**
Jiu Ding, University of Southern Mississippi and Tien Yien Li, Michigan State University

4:45 **On Invertible Piecewise Linear Mappings**
D. Ralph, Cornell University

5:00 **Magnetic Force Calculations for the Design of Magnetic Refigerator Drive Systems**
Joseph W. Johnson, Astronautics Technology Center, Madison, WI

5:15 **Polynomia Multivariata et Polytopia Multidimensa**
Bruce Jeffrey Layman, Westinghouse Hanford Company, Richland, WA

SIAM Trivia

Members of the organizing committee for the proposed society (that would become SIAM) were L.E. Block, Donald B. Houghton, Samuel S. McNeary, Cletus O. Oakley, George W. Patterson III, and George Sonneman.

MEETING PROGRAM

7:30/CALIFORNIA SHOWROOM
Registration opens

8:00/LA BALLROOM
IP12/Chair: Rosemary Chang, Silicon Graphics
Procedurally-Defined Curves and Surfaces in Computer-Aided Geometric Design
Rida T. Farouki
IBM Thomas J. Watson Research Center

8:45/LA BALLROOM
Prize Presentation
The George Polya Prize

Convex Polyhedra, Rigidity of Frameworks, Linear Programming and Computers
Convex polyhedra have been studied by pure and applied mathematicians since ancient times. The speaker will present some new relations between the combinatorial theory of convex polyhedra and other areas of mathematics and its applications. He will discuss relations between the rigidity theory of frameworks and face-numbers of polyhedra in high dimensions, applications from and to linear programming, and proving theorems about polyhedra by computers.
Gil Kalai
The Hebrew University of Jerusalem, Israel

9:30/CALIFORNIA SHOWROOM
Coffee

40th ANNIVERSARY
1952 - 1992

SIAM Trivia

SIAM's first election was held in the fall 1952. The results, announced on October 14, 1952, were as follows:

President
William E. Bradley
Vice President
Grace M. Hopper
Vice President
George W. Patterson III
Treasurer
Emil Arnelotti
Secretary
I.E. Block

10:00AM - 12:00PM
CONCURRENT SESSIONS

MS56/LA BALLROOM
Vortex Methods and Vortex Dynamics for Incompressible Flow (Part 1 of 2)
Many physically interesting flows are vorticity dominant, such as turbulent flow and two-phase flow. For these problems, vorticity is the important variable to monitor and the vortex method is a desirable numerical method. One difficulty of the vortex method is the treatment of small scales in 3-D vortex calculations. Other interesting questions include singularity formation for 3-D incompressible Euler equations, effect of singularity on the onset of turbulence, the stabilizing effect of surface tension and viscosity for interfacial flows. This minisymposium hopes to bring together experts in this field and present their latest results in solving these problems.
Organizer: Thomas Y. Hou
Courant Institute of Mathematical Sciences, New York University

10:00 **Treatment of Small Scales in 3-D Vortex Calculations.**
Thomas Buttke, Courant Institute of Mathematical Sciences, New York University and *Alexandre Chorin*, University of California, Berkeley

10:30 **Instabilities and Singularities for Axisymmetric Flow With Swirl**
Russel E. Caflisch, University of California, Los Angeles

11:00 **Well-Posedness of Fluid Interfaces With Zero Density On One Side**
J. Thomas Beale, Duke University, Thomas Y. Hou, Organizer and John Lowengrub, Stanford University

11:30 **Stabilizing Effect of Surface Tension For Interface Problems**
J. Thomas Beale, Duke University, *Thomas Y. Hou*, Organizer and John Lowengrub

MS57/BEVERLY HILLS ROOM
Finite Difference Discretizations and Their Applications to Complex Modeling Problems (Part 1 of 2)
Often realistic modeling problems involve the solution of large systems of partial differential equations posed in complex regions. Finite-difference methods can be extended to such problems; these extensions retain many of the advantages of standard finite-difference methods on rectilinear grids in simple geometries. The speakers in this minisymposium will address issues in applying finite-difference algorithms to such complex modeling problems.
Organizers: Stanly Steinberg and Deborah Sulsky
University of New Mexico, Albuquerque

10:00 **High Order Finite Volume Approximations of Partial Differential Equations on Nonuniform Grids**
James H. Hyman and Robert J. Knapp, Los Alamos National Laboratory

10:30 **A Particle-In-Cell Method for Fluid and Solid Mechanics**
Deborah Sulsky, Organizer

11:00 **The Method of Support Operators**
Mikhail Yu. Shashkov, Russian Academy of Sciences, Russia

11:30 **Domain Decomposition Methods for Incompressible Flow**
John C. Strikwerda, University of Wisconsin, Madison

MS58/SANTA MONICA ROOM
Recent Advances in the Theory and Application of Dynamical Systems
Sponsored by
SIAM Activity Group on Dynamical Systems
This minisymposium will feature three talks in which each speaker will discuss some key ideas of modern dynamical systems theory and illustrate their use. Chris Jones will speak on averaging and invariant manifold theory applied to planetary motion. Dave Terman will speak on geometric singular perturbation theory and chaotic dynamics in models for the electrical activity of pancreatic beta-cells. Gene Wayne will discuss infinite-dimensional KAM theory with connections to quantum mechanics of random media and scattering in nonlinear Schrodinger equations. While this session cannot represent all areas falling under the SIAG-DS umbrella, the speakers will set the stage for our biannual meeting scheduled for October.
Organizer: Peter W. Bates
Brigham Young University

10:00 **Capture in Resonance and the Spin/Orbit Ratio of Mercury**
Christopher K.R.T. Jones, Brown University

10:40 **Geometric Analysis of Bursting Oscillations in Excitable Systems**
David H. Terman, Ohio State University

11:20 **Infinite Dimensional Kolmogorov-Arnold-Moser Theorems**
C. Eugene Wayne, Pennsylvania State University

MS59/WESTSIDE ROOM
Research Directions in Highly Parallel Architectures
Sponsored by
SIAM Activity Group on Supercomputing
Large-scale parallel machines have long held the promise of substantially higher performance than uniprocessor systems. Fulfilling this promise has been difficult for many reasons, including lack of systems and applications software, lack of architectures that are friendly to software, and lack of large-scale machines.

In this minisymposium, the speakers focus on recent advances in computer architecture that are attempting to change this situation. The new architectures give the highest priority to ease of programming and scalability. Along with these advances, there is a convergence between architectures that traditionally were considered very different, including shared memory, message passing, dataflow, and systolic architectures.
Organizers: Anoop Gupta
Stanford University and
Robert Schreiber,
RIACS-NASA Ames Research Center

10:00 **Design of the Stanford DASH Multiprocessor**
Anoop Gupta, Organizer

10:30 ***T: Building Blocks for Multithreaded Multiprocessors**
Gregory M. Papadopoulos, Massachusetts Institute of Technology

11:00 **The Interplay between Communication and Programming for a Parallel System**
Thomas Gross, Carnegie Mellon University

11:30 **A Mechanism-Based Parallel Computer**
William J. Dally, Massachusetts Institute of Technology

10:00AM - 12:00PM

CONCURRENT SESSIONS

MS60/PLAZA ROOM

Rank Revealing Factorizations and Condition Estimation (Part 1 of 2)

A rank revealing factorization (RRF) of a matrix A is a pivoted factorization, e.g. an LU or a QR factorization, that is guaranteed to display the numerical rank of A. An RRF has a well-conditioned leading triangular block of size equal to the numerical rank of A and a trailing triangular block with small norm. It provides information that would otherwise have to be computed by means of a much more expensive singular value decomposition. Hence, RRFs are potentially important tools in applications such as signal processing where fast computations are necessary, and in connection with sparse matrices.

The speakers in this minisymposium deal with the existence of RRFs and, in particular, efficient implementations of RRF algorithms.

Organizers: Tony F. Chan
University of California, Los Angeles
and Per Christian Hansen,
Technical University of Denmark

10:00 A Class of $O(n)$ Algorithms for Estimation of T^{-1} for Triangular Matrices T
Leslie V. Foster, San Jose State University

10:30 Systolic Rank Revealing QR Algorithms
Tony F. Chan, *Per Christian Hansen*, Organizers; Flavio Lorenzelli and Kung Yao, University of California, Los Angeles

11:00 From QR to SVD via RRQR
Shivkumar Chandrasekaran and *Ilse Ipsen*, Yale University

11:30 The Existence of the RRQR Factorization and a Reliable Algorithm for Column Selection Problem
Y. P. Hong and *C.-T. Pan*, Northern Illinois University

MS61/WESTWOOD ROOM

Optimization of Trajectories by Collocation Methods

A trajectory optimization problem is composed of the equations of motions, some boundary conditions, a performance index, and possibly some path constraints. When path constraints are included, the system is a set of differential-algebraic equations (DAE's). In a collocation approach, a discretization is applied to this system over the entire trajectory simultaneously to obtain a sparse, large scale parameter optimization (LSPO) problem. The LSPO problem is then solved with a nonlinear programmming (NLP) algorithm. There are several efforts underway to develop trajectory optimization codes based on collocation methods.

The speakers in this session will discuss the different approaches taken, how the sparsity of the problems has been exploited in the NLP algorithm design, and the application of collocation methods to DAE's.

Organizer: Kathryn Brenan
The Aerospace Corporation,
Los Angeles, CA

10:00 Direct Transcription Methods for Trajectory Optimization
P. J. Enright, Jet Propulsion Laboratory, Pasadena, CA

10:30 Issues in the Direct Transcription of Optimal Control Problems to Sparse Nonlinear Programs
J. Betts and W. Huffman, Boeing Computer Services, Seattle, WA

11:00 A SQP Algorithm for Large Optimization Problems arising in Trajectory Calculations
Philip E. Gill, University of California, San Diego

11:30 A Sparse Generalized Reduced Gradient Algorithm for Optimal Control Problems
Kathryn Brenan, organizer, W. Hallman, H. Nguyen, and W. Yeung, The Aerospace Corporation, Los Angeles, CA

MS62/PACIFIC ROOM

Special Functions and Their Applications (Part 1 of 2)

These two sessions will cover some of the main research topics of this area. Recent developments in the general theory of orthogonal polynomials, such as asymptotics of zeros, relations between the three-term recurrence coefficients and the measure of orthogonality, and applications in approximation theory will be presented. Also there will be talks on several methods, some involving computer assistance, for establishing theorems and identities for both classical and q-type special functions. The important role played by special functions in harmonic analysis will be shown by examples from homogeneous spaces, hypergroups, and differential equations.

Organizer: Mourad E.H. Ismail
University of South Florida, and
Charles F. Dunkl,
University of Virginia, Charlottesville

10:00 Title to be announced
R. William Gosper, Symbolics Inc., Mountain View, California

10:30 A Cubic and a Quintic Summation Formula
Mizan Rahman, Carleton University, Ottawa, Canada

11:00 Orthogonal Polynomials on Rn, Product Formulas, and Hypergroups
Alan Schwartz and William C. Connett, University of Missouri, St. Louis

11:30 Special Functions on Finite Upper Half Planes
Audrey Terras, and J. Angel, N. Celniker, S. Poulos, C. Trimble and E. Velasquez, University of California, San Diego

CP29/BRENTWOOD ROOM

Computer Science 1

Chair: Yasha Karant, California State University, San Bernardino

10:00 Compiler Specifications for Parallel Processing
Ali Behforooz, Towson State University

10:15 Buffer Size and its Effect on Production System Availability
Suresh Chandra Baral, South Carolina State College, Orangeburg

10:30 On the Error Vectors Improving the Security in a Cryptosystem
Chul Kim, Kwangoon University, Seoul, Korea

10:45 Clocked Queueing Networks for Parallel Architecture
Ora E. Percus, Courant Institute of Mathematical Sciences, New York University

11:00 Criteria for an Object Set for Concurrent Processing
Robert Arter, Cassandra Jenkins and *Yasha Karant*, California State University, San Bernardino

11:15 Diffusion Approximation for Head of the Line Processor Sharing for Two Parallel Queues
John A. Morrison, AT&T Bell Laboratories, Murray Hill, NJ

CP30/PALISADES ROOM

Chemical Kinetics

Chair: Edward J. Bissett, Gener Motors Research Laboratories

10:00 Reducing Nonlinear Systems of Transport Equations to Laplace's Equation
Daniel R. Baker, General Motors Research Laboratories, Warren, MI

10:15 The Numerical Solution of Differential-Algebraic Boundary Value Problems Arising in Detonation Theory
Christian C. Beardah, University of Manchester, United Kingdom and Ruth M. Thomas, UMIST, United Kingdom

10:30 Mathematical Aspects of Adsorption in Countercurrent Exchangers
Dmitry A. Altshuller, Mathematical and Computing Research, Chesterfield, MO

10:45 Analyzing and Exploiting the Numerical Properties of Zone Fire Models
Glenn P. Forney, National Institute of Standards and Technology and William F. Moss, Clemson University

11:00 Mathematical Modeling of Heated Catalytic Converters
Edward J. Bissett and Se H. Oh, General Motors Research Laboratories, Warren, MI

11:15 Light-off Behavior of Catalytic Converters
Colin P. Please, University of Southampton, England and *Donald W. Schwendeman*, Rensselaer Polytechnic Institute

11:30 A Class of Infinitely-Coupled Amplitude Equations for Acoustic Oscillations in Resonance Tubes
Stephen B. Margolis, Sandia National Laboratories, Livermore, CA

CP31/ENCINO ROOM

Economics and Environmental Impacts

Chair: To be announced

10:00 Empirical Problems of Data Envelopment Analysis Convex Models on Multi-input, Multi-output Production Systems
Agapi Somwaru and Wen Huang, United States Department of Agriculture

10:15 Environmental Policies and Multi-Input, Multi-Output Nonparameteric Production System
Richard Nehring, *Agapi Somwaru* and John Schaub, United States Department of Agriculture

10:30 Environmental Impacts and the Revision of Multifactor Productivity Growth Indexes
Edlon Ball, Kevin Ingram, Richard Nehring and *Agapi Somwaru*, United States Department of Agriculture, and Knox Lovell, University of North Carolina, Chapel Hill

CP32/SHERMAN OAKS ROOM

Biological Mathematics

Chair: David M. Cohen, University of Southern California

10:00 Complex Behavior in a Nerve Conduction Model
Lisa J. Holden, Kalamazoo College and Thomas Erneux, Northwestern University

10:15 Mathematical Models and Computer Simulation for Synchronization of Bacterial Culture Growth
Chichia Chiu and Frank C. Hoppensteadt, Michigan State University

10:00AM-12:00PM
CONCURRENT SESSIONS

10:30 Syntactic Simulation of Atomic Flow in Biochemical Pathways
David M. Cohen and Richard N. Bergman, University of Southern California

10:45 Why the Ant Trails Look so Straight and Nice
Alfred M. Bruckstein, Technion-Israel Institute of Technology, Haifa, Israel

12:00-1:30
Lunch

1:30/CALIFORNIA SHOWROOM
Registration closes

1:30PM-3:30PM
CONCURRENT SESSIONS

MS63/LA BALLROOM
Vortex Methods and Vortex Dynamics for Incompressible Flow (Part 2 of 2)
(For Description, see MS 56, page 33)

Organizer: Thomas Y. Hou
Courant Institute of Mathematical Sciences, New York University

1:30 Computing Mean Quantities Using Vortex Methods
Jonathan Goodman, Courant Institue of Mathematical Science, New York University and Stanford University

2:00 Computation of Unsteady Bluff Body Flows with a Fast Viscous Vortex Method
Anthony Leonard, California Institute of Technology

2:30 Flow Structures in the Rayleigh-Benard Turbulence
Michael Shelley, University of Chicago and Institute for Advanced Study, Princeton, NJ

3:00 Numerical Approximations of Incompressible Flows Using Stable and High Order Numerical Boundary Conditions
Brian T.B. Wetton, University of British Columbia, Canada

MS64/BEVERLY HILLS ROOM
Finite Difference Discretizations and Their Applications to Complex Modeling Problems (Part 2 of 2)
(For Description, see MS 57, Page 33)

Organizers: Stanly Steinberg and Deborah Sulsky
University of New Mexico, Albuquerque

1:30 Cartesian Grid Methods for Flow in Irregular Regions
Marsha J. Berger, Courant Institute of Mathematical Sciences, New York University and *Randall LeVeque*, University of Washington, Seattle

2:00 Finite-Difference Methods in Logically Rectangular Grids
Stanly Steinberg, Organizer

2:30 Finite Differences and Elliptic Operators
Bernd Heinrich, Technische Universitat Chemnitz, Germany

MS65/SANTA MONICA ROOM
Attractors and Inertial Manifolds for Certain Infinite Dimensional Dynamical Systems
The long time behavior of certain nonlinear evolutionary partial differential equations (PDEs) is described by their global attractor set. Such PDEs generate an infinite dimensional dynamical system with trajectories in phase space that enter and eventually remain in an absorbing set. Inertial manifolds are finite dimensional smooth manifolds which attract exponentially the solution trajectories. They are known to exist for a number of dissipative PDEs modeling physical systems. Even when an inertial manifold is known to exist, an efficient approximation scheme is needed to compute it.

The speakers will present interesting results on exponential attractors and (approximate) inertial manifolds for certain classes of important nonlinear evolutionary PDEs.

Organizer: Anthony T. Chronopoulos
University of Minnesota, Minneapolis

1:30 A Construction of Exponential Attractors with Optimal Lyapunov Dimension
Alp Eden, Basil Nicolaenko, Arizona State University, and Ciprian Foias, Indiana University, Bloomington

2:00 Inertial Manifolds and Stabilization of Nonlinear Beams with Strucutral Damping
Yuncheng You, University of South Florida and Mario Taboada, University of Southern California

2:30 An Approximate Inertial Manifold for Computing Burgers' Equation
L.G. Margolin, Los Alamos National Laboratory and *Don A. Jones*, University of California, Irvine

3:00 DAE Methods and Approximate Inertial Manifolds
A.T. Chronopoulos, Organizer and M.S. Jolly, Indiana University, Bloomington

MS66/PLAZA ROOM
Blow-up Behavior of Solutions of Semi-Linear Parabolic Equations
Nonlinear heat problems with sources, as modeled by semi-linear parabolic equations, arise in many practical applications. The phenomenon of finite-time blow-up exhibited by such models has attracted the attention of many researchers. Early theoretical results consisted mainly of sufficient criteria and estimates of the blow-up time and blow-up rate; however, the precise behavior of the solutions near the blow-up points was not tackled until much later. This behavior is important for the numerical computation of the solution near the blow-up time, since computation is hampered by the singular nature of the solution, and for a better understanding of the thermal runaway process from a physical point of view. The speakers will discuss the behavior of model solutions near blow-up.

Organizers: Hamid Bellout
Northern Illinois University and
Man K. Kwong,
Argonne National Laboratory

1:30 Final Time Blow-up Asymptotics
Jerrold Bebernes, National Science Foundation, and University of Colorado, Boulder

2:00 A Center Manifold Approach to the of Blowing-up Solutions of Semi-Linear Heat Equations
Stathis Filippas, University of Paris VI, France, Robert V. Kohn, Courant Insitute of Mathematical Sciences, New York University and Wenxiong Liu, University of Minnesota, Minneapolis

2:30 The Generic Behavior for the Blow-up of the Semi-Linear Heat Equations
Wenxiong Liu, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

1:30PM - 3:30PM
CONCURRENT SESSIONS

3:00 **Asymptotic Behavior Near Blow-up Points for a Semi-Linear Parabolic Equation**
Juan S.L. Velazquez, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis

MS67/WESTWOOD ROOM

Rank Revealing Factorizations and Condition Estimation (Part 2 of 2)

(For Description, see MS 60, page 34)

Organizers: Tony F. Chan
University of California, Los Angeles
and Per Christian Hansen,
Technical University of Denmark

1:30 **A Robust Sparse RRQR Factorization**
Daniel J. Pierce and John G. Lewis, Boeing Computer Services, Seattle, WA

2:00 **An Efficient Total Least Squares Algorithm Based on a Rank- Revealing Two-sided Orthogonal Decomposition.**
Sabine Van Huffel, Katholieke Universiteit Leuven, Belgium and *Hongyuan Zha*, Stanford University

2:30 **Accurate Singular Values and the QD Algorithm**
K.V. Fernando, Numerical Algorithms Group, Oxford, United Kindgom and the University of California, Berkeley, and *Beresford N. Parlett*, University of California, Berkeley

3:00 **Orthogonal Cholesky Algorithm**
K.V. Fernando, Numerical Algorithms Group, Oxford, United Kindgom and the University of California, Berkeley, and Beresford N. Parlett, University of California, Berkeley

3:30 **Orthorgonal Projection and Total Least Squares**
Ricardo D. Fierro and James R. Bunch, University of California, San Diego

MS68/PALISADES ROOM

Special Functions and Their Applications (Part 2 of 2)

(For Description, see MS 62, page 34)

Organizer: Mourad E.H. Ismail
University of South Florida, and
Charles F. Dunkl,
University of Virginia, Charlottesville

1:30 **Biorthogonality and Continued Fractions**
David Masson, University of Toronto, Canada

2:00 **Inequalities and Monotonicity Properties for Zeros of Hermite Functions**
Arpad Elbert, Hungarian Academy of Sciences, Budapest, Hungary and *Martin Muldoon*, York University, North York, Canada

2:30 **Generalized Jacobi Weights, Christoffel Functions, and Jacobian Polynomials**
Thomas Erdelyi and *Paul Nevai*, Ohio State University, Columbus and Alphonse P. Magnus, Universite Catholique de Louvain, Belgium

3:00 **Weber's Integral Theorem and Singular Solutions for Mixed Boundary Value Problems of Elasticity**
Ram P. Srivastav, State University of New York, Stony Brook

3:30 **Title to be announced**
Alberto Grunbaum, University of California, Berkeley

MS69/ENCINO ROOM

Applying Constructive Mathematical Techniques to Dynamical Systems Experiments

Recent progress in the study of geometry of nonlinear dynamical systems has yielded novel techniques in which an experimentalist can apply mathematical and computer-based tools usually used by theoreticians. The speakers will present new applications of experimental data including novel techniques for identifying a model from data based on knot theory and topology and using a chaotic time series to have several subsystems operate in synchrony. The speakers will also discuss the use of constructive mathematical techniques to control unstable periodic orbits and apply continuation methods to experiments. These techniques are not model dependent, and are applicable to a wide range of the physical sciences.

Organizer: Ira B. Schwartz
U.S. Naval Research Laboratory, Washington, DC

1:30 **How to Construct Topological Models of Dynamical Systems from Data**
Robert Gilmore, Drexel University

2:00 **Using Time Series for Feedback Control of Chaotic Systems**
Celso Grebogi, University of Maryland, College Park

2:30 **Driving Systems with Chaotic Signals**
Louis M. Pecora and Thomas L. Carroll, Naval Research Laboratory, Washington, DC

3:00 **Tracking Unstable Periodic Orbits in Experiments: A New Continuation Method**
Ira B. Schwartz, Organizer and *Iona Triandaf*, Naval Research Laboratory, Washington, DC

CP33/WESTSIDE ROOM

Numerical Methods for ODE's and DAE's

Chair: Florian Potra, University of Iowa

1:30 **B-stability of Implicit Runge-Kutta with Retarded Argument**
Jacques Reverdy, Laboratoire d'Analyse Numerique, Toulouse, France

1:45 **Numerical Methods for Multibody System Analysis**
Joseph F. McGrath, Michael F. Steigerwald and Liang Tang, Mechanical Dynamics, Inc., Ann Arbor, MI

2:00 **Treatment of Discontinuities with Multistep Methods**
Fred T. Krogh, Jet Propulsion Laboratory, California Institute of Technology

2:15 **Numerical Integrators for Real-Time Simulation of Mechanical Systems**
Florian Potra, University of Iowa, Iowa City

2:30 **Some Aspects of Time-Stepping and Iteration**
G.F. Carey, E. Barragy, S. Bova, A. Lorber, W. Joubert and A. Pardhanani, The University of Texas, Austin

2:45 **Parallel Solution of Linear Systems of ODE**
Luigi Brugnano and D. Trigiante, Universita de Bari, Italy

CP34/PACIFIC ROOM

Computer Science 2

Chair: Daphne D. Liu, California State University, Los Angeles

1:30 **T-Colorings and the Channel Assignment Problem**
Daphne D. Liu, California State University, Los Angeles

1:45 **Stable Marriages and Polyhedral Combinatorics**
Uriel G. Rothblum, Technion-Israel Institute of Technology, Haifa, Israel

2:00 **Partitions of a Finite Three-Complete Partial Order Poset**
Shiojenn Tseng and Muh-Chyi Horng, Tamkang University, Taiwan, Republic of China

2:15 **On Understanding Kemeny's Quest: Is Programming or Mathematics to be the Language of Science in the 21st Century?**
G. Arthur Mihram, Princeton, NJ and *Danielle Mihram*, University of Southern California

CP35/BRENTWOOD ROOM

Randomness, Stochastic Processes and Applications

Chair: Michael Mascagni, Supercomputing Research Center, Bowie, MD

1:30 **Numerical Simulation of Confined Diffusion**
Diego Bricio Hernandez, CIMAT, Guanajato, Mexico and *Flavio Sartoretto*, Universita di Padova, Italy

1:45 **Hydrodynamic Limit and Large Deviations for Stochastic Cahn-Hilliard Equations**
Mou-Hsing Chang, University of Alabama, Huntsville

2:00 **Random Perturbations to the Nonlinear Betatronic Motion in Particle Accelerators**
Renato Spigler and Massimo Toniolo, University of Padova, Italy

2:15 **Navier-Stokes Equations**
G. Adomian, Athens, GA

2:30 **Reduction of the Zakai Equation to the Forward Komogorov Equation**
B.L. Rozovskii, University of Southern California

2:45 **A Gradient Random Walk Method for Two-Dimensional Reaction-Diffusion Equations**
Michael Mascagni, Supercomputing Research Center, Bowie, MD and Arthur Sherman, National Institutes of Health

3:30PM

Conference Adjourns

Springer for Applied Mathematics

Maple V: The Future of Mathematics!

B.W. Char, Drexel University; **K.O. Geddes,** University of Waterloo; **G.H. Gonnet,** ETH Zentrum; **B.L. Leong,** University of Waterloo; **M.B. Monagan,** ETH Zentrum; and **S.M. Watt,** IBM Watson Research Center

Maple V is an interactive system for symbolic computation providing hundreds of functions for use in the sciences, engineering, and diverse areas of mathematics. It provides powerful facilities for numeric and symbolic calculation and for color graphics.

First Leaves
A Tutorial Introduction to Maple V

Shows how to use **Maple V** both as a calculator and as a programming language for more demanding or specialized tasks. Topics covered include the basic data types and statements in the **Maple V** language.
1992/224 pp./Hardcover/$24.00/ISBN 0-387-97621-3

Maple V Library Reference Manual

All of the functions available in the Maple library are described in this manual. Each description includes a short explanation of the function, the parameters that it uses, and additional details about the function.
1991/698 pp./Hardcover/$39.50/ISBN 0-387-97592-6

Maple V Language Reference Manual

Describes the Maple language and covers the topics of expressions, basic data types, structured data types, programming statements, and procedures.
1991/267 pp./Hardcover/$24.95/ISBN 0-387-97622-1

A. Heck, University of Nijmegen, The Netherlands

Introduction to Maple
A Computer Algebra System

A readable manual explaining how to use **Maple V** as a symbolic calculator. Provides the necessary background for those who wish to extend the built-in knowledge of **Maple V** by implementing new algorithms.
1992/280 pp., 35 illus./Hardcover/$39.00(tent.)
ISBN 0-387-97662-0

For additional information on Maple V, please contact Waterloo Maple Software, 160 Columbia Street West, Waterloo, Ontario, Canada, N2L 3L3. Phone: (519) 747-2373, E-mail: wmsi@daisy.waterloo.edu

J.K. Hale, Georgia Institute of Technology, Atlanta, GA and **H. Koçak,** University of Miami, Coral Gables, FL

Dynamics and Bifurcations

This comprehensive textbook is designed to take undergraduate and beginning graduate students of mathematics, science, and engineering from the rudimentary beginnings to the exciting frontiers of dynamical systems and their applications. It is a masterful exposition of the foundations of ordinary differential and difference equations from the contemporary viewpoint of dynamical systems and bifurcations. In both conception and execution, the authors implement a fresh approach to mathematical narration. Fundamental ideas are explained in simple settings, the ramifications of theorems are explored for specific equations, and above all, the subject is related in the guise of a mathematical epic. With its insightful and engaging style, as well as its numerous computer-drawn illustrations of notable equations of theoretical and practical importance, this unique book will simply captivate the attention of students and instructors alike.
1992/568 pp., 314 illus./Hardcover/$49.00/ISBN 0-387-97141-6
***Texts in Applied Mathematics*, Volume 3**

S. Wiggins, California Institute of Technology, Pasadena, CA

Chaotic Transport in Dynamical Systems

Many issues related to the behavior of nonlinear dynamical systems can be naturally expressed as "phase space transport problems". **Chaotic Transport in Dynamical Systems** develops this point of view with examples from fluid mechanics, celestial mechanics, the dynamics of bubbles, and presents them in the context of two dimensional maps. This theory is then applied to convective mixing and transport in fluid flows. A comparison of the theory to that of a Markov model is considered and the theory is extended to Hamiltonian systems with multiple degrees of freedom. The most complete discussion available of the geometrical structure of the phase space of Hamiltonian systems is also included. The fact that phase space transport describes both the transient and asymptotic behavior, allowing one to give a practical as well as quantitative description, is the main theme throughout.
1992/301 pp., 116 illus./Hardcover/$39.95/ISBN 0-387-97522-5
***Interdisciplinary Applied Mathematics*, Volume 2**

J. Hubbard and **B. West,** Cornell University, Ithaca, NY

MacMath
A Dynamical Systems Software Package for the Macintosh™

An updated collection of twelve interactive graphics programs for the Macintosh computer addressing differential equations and iteration. The MacMath programs encourage experimentation and vastly increase the number of examples to which a student may be quickly exposed. They are also ideal for exploring applications of differential equations and iteration which, roughly speaking, form the interface between mathematics and the real world. MacMath permits easy investigation of various models, particularly in showing the effects of a change in parameters on ultimate behavior of the system.
1991/162 pp., 164 illus., plus 2 diskettes/Softcover/$49.95
ISBN 0-387-97416-4

Order Today!

- **Call:** Toll-Free 1-800-SPRINGE(R): 1-800-777-4643. In NJ call 201-348-4033 (8:30 AM — 4:30 PM EST). Your reference number is **S237.**
- **Write:** Send payment plus $2.50 postage and handling for first book and $1.00 for each additional book to: Springer Verlag New York Inc., Dept. #S237, PO Box 2485, Secaucus, NJ 07096-2491.
- **Visit:** Your local technical bookstore.

Instructors: Call or Write for information on textbook examination copies!

SPRINGER 150 1842-1992 FOR SCIENCE

Springer-Verlag

New York • Berlin • Heidelberg • Vienna • London • Paris • Tokyo • Hong Kong • Barcelona • Budapest

Be sure to visit SIAM's 40th Anniversary Meeting Exhibit Hall. The exhibits are always an integral part of our annual meetings, and this year is no exception. More than 32 companies are participating, including publishers, hardware and software companies, and other scholarly/technical societies. The exhibitors are anxious to meet you and show you their products and services, so don't miss out.

All exhibits will be located in the California Showroom.

Exhibit hours are as follows:

Tuesday, July 21	9:30 AM - 4:00 PM
Wednesday, July 22	9:30 AM - 4:00 PM
Thursday, July 23	9:00 AM - 4:00 PM

SIAM 40th Anniversary Meeting Exhibitors

(confirmed at press time)

Academic Press, Inc.
American Mathematical Society (AMS)
American Society of Mechanical Engineers (ASME)
Association for Women in Mathematics (AWM)
Birkhäuser
Cambridge University Press
Chapman & Hall
CRC Press, Inc.
Digital Equipment Corporation
Elsevier Science Publishing Co.
Gauthier-Villars North America, Inc.
Gordon & Breach Science Publishers, Inc.
Hemisphere Publishing Corporation
IBM
IMSL, Inc.
John Wiley & Sons, Inc.
Jones and Bartlett Publishers
Kluwer Academic Publishers
MathSoft, Inc.
Numerical Algorithms Group, Inc.
Oxford University Press
Pergamon Press, Inc.
Plenum Publishing Corporation
Rogue Wave Software, Inc.
Scientific Medical Publications of France, Inc. (SMPF)
Societâ Italiana di Matematica Applicata e Industriale (SIMAI)
Springer-Verlag NY, Inc.
Symbolics, Inc.
The Math Works, Inc.
Thinking Machines Corporation
Wadsworth-Brooks/Cole Publishing Co.
Wolfram Research, Inc.

Academic Press, Inc.
1250 Sixth Avenue
San Diego, CA 92101

The American Mathematical Society
P.O. Box 6248
Providence, RI 02940-6248
The AMS exhibit offers you a look at some of the world's important scholarly research in mathematics in several forms: electronic database, review volumes, books, journals, Russian translations, and videotaped lectures. Be sure to see a free demonstration of MathSci - a comprehensive database offering you access to over 1,000,000 records in mathematics, statistics, and computer science. You can access MathSci Disc online or with a set of 3 compact discs.

Birkhäuser
675 Massachusetts Avenue
Cambridge, MA 02139

Visit Birkhäuser's Booth # (38, 39) for an impressive selection of mathematics books featuring Manfredo do Carmo's brilliant text on *Riemannian Geometry*, Pierre Bernhard and Tamer Başar's timely monograph on *H^∞-Optimal Control and Related Minimax Design Problems*, Albert Faessler's (written with the late Eduard Stiefel) stimulating textbook on *Group Theoretical Methods and Their Applications*, and first announcement - *Adventures in Applied Mathematics* by Sid Resnick. *(What is the random world of Happy Harry??)* A 20% discount is available on all pre-paid orders at the conference.

Cambridge University Press
40 West 20th Street
New York, NY 10011

Cambridge University Press publishes many fine books and journals in the applied sciences. Please stop by our booth to review our list and to receive a 20% discount on all books and journals.

Chapman & Hall
29 West 25th Street
New York, NY 10001

CRC Press, Inc.
Times Mirror
2000 Corporate Blvd., NW
Boca Raton, FL 33431

CRC Press, Inc. presents its latest and bestselling titles in Mathematics including the 29th edition of *Standard Mathematical Tables...Standard Probability and Statistics Tables and Formulae...Fractal Geometrics...Fast Fourier Transforms*...and a new version of the *Handbook of Mathematical Curves and Surfaces* -now on diskette

Digital Equipment Corporation
4 Results Way
Marlboro, MA

Digital Equipment Corporation along with its mathematical solution providers will present the test track — a place where you can see some of the world's best applications and give them a test drive. You will be able to see demonstrations of the products and give them a test drive yourself on a variety of Digital platforms. Come speak with such leading application providers as Waterloo Maple Software, Mathsoft and Wolfram Research. We look forward to greeting you at SIAM '92.

Elsevier Science Publishing Co.
655 Avenue of the Americas
New York, NY 10010

ELSEVIER SCIENCE PUBLISHERS, publishes some 650 journals, more than 8,000 books, and scientific information in electronic databases and on CD-ROM. All areas of pure and applied mathematics and numerical computing are covered under the well-known imprints of North-Holland and Elsevier. You are invited to visit our display where a special discount will be available.

Gordon and Breach Science Publishers, Inc.
5310 Tacony Street, Box 330
Philadelphia, PA 19103

Gordon and Breach Science Publishers/Harwood Academic Publishers are publishers of scientific, technical and academic books. Our list covers all areas of pure and applied mathematics, including linear algebra, function theory, chaos and integrals, and series.

IBM
1503 LBJ Freeway
Dallas, TX 75234-6032

IMSL Inc.
Suite 3000
1414 Southwest Freeway
Sugarland, TX 77418-3498

IMSL is the world's leading developer and distributor of mathematical, statistical, and graphics visualization solutions for FORTRAN and C application programs.

John Wiley & Sons, Inc.
605 Third Avenue
New York, NY 10158

Over 100 books, including titles in the Wiley-Interscience Series in Discrete Mathematics and Optimization; fractals; modeling; dynamical systems and chaos; the Wiley Classics Library; the Pure and Applied Mathematics Series; and selections from the Pitman Research Notes in Mathematics. Display and free sample copies of professional journals.

Jones and Bartlett Publishers, Inc.
20 Park Plaza
Boston, MA 02116

Jones and Bartlett is a publisher of scientific books and journals ranging from undergraduate texts to research level monographs, expanding into scientific software and audio-visual media. In addition to our newest books we will show the award winning video Not Knot presenting a technically and mathematically innovative computer animation of hyperbolic space. We demonstrate image compression software including a Clip Art Package that allows one to clip full color images into documents and desktop presentations.

Kluwer Academic Publishers
101 Philip Drive
Norwell, MA 02061

Kluwer Academic Publishers is an international publisher of scholarly books and journals in the area of applied mathematics. Visit our booth to pick up a special conference discount sheet and to receive a free sample copy of one of our renowned journals. Or come by to discuss book proposals with the publisher.

MathSoft, Inc.
201 Broadway
Cambridge, MA 02139

MathSoft, Inc., the worldwide leader in mathematical software for educators and technical professionals, will exhibit our most current products at the SIAM show. Mathcad 3.0 includes symbolic and numeric computation capabilities, innovative windows, handbooks, and all Mathcad's regular features in an easy-to-use, yet powerful package. Stop by our booth and say hello!

Numerical Algorithms Group, Inc.
1400 Opus Place, Suite 200
Downers Grove, IL 60515

NAG will be exhibiting the latest release of AXIOM - the Scientific Computational System. Axiom is the commercial version of IBM's internal scratchpad software which offers powerful symbolic and visual mathematical capabilities. Also on display, the NAG Fortran 90 Compiler. The NAG compiler is the first commercially released compiler product to support the full ISO standard. NAG will also display information on latest releases of the NAG Fortran Library, NAG C Library, NAG Graphics Library and other speciality libraries.

Oxford University Press
200 Madison Avenue
New York, NY 10016

Oxford University Press will display a wide range of books and journals in the area of applied and computational mathematics.

Pergamon Press, Inc.
395 Saw Mill River Road
Elmsford, NY 10523

Pergamon Press is a leading international publisher of scientific and technical books and journals.

Plenum Publishing Corporation
233 Spring Street
New York, NY 10013

Plenum introduces a new series: *Surveys in Applied Mathematics*, Edited by J.B. Keller, D.W. McLaughlin, and G.C. Papanicolaou. New and noteworthy titles: *Chaos, Order, and Patterns*, Ed. R. Artuso, P. Cvitanovic, G. Casati; *The Global Geometry of Turbulence*, Ed. J. Jiménez. Forthcoming: *Nonlinear Parabolic and Elliptic Equations*, by C.V. Pao. Now publishing more pages! *Journal of Dynamics and Differential Equations*, Editor-in-Chief: George Sell.

Rogue Wave Software, Inc.
P.O. Box 2328
Corvallis, OR 97339

We will be displaying our C++ class libraries to do object-oriented numerical programming. These libraries include Math.h++, Matrix.h++ and Linpack.h++. Rogue Wave C++ class libraries combine power and ease of use to improve the performance and reliability of your numerics code. An innovative class structure makes the manipulation of vectors and matrices as easy as built in types like double, yet its inlined assembly BLAs makes your code faster than C or Fortan. Fully integrates with Rogue Wave's other non-numeric C++ class libraries to provide the complete C++ solution.

Scientific Medical Publications of France, Inc. (SMPF)
100 East 42nd Street, Suite 1002
New York, NY 10017

We are the Association of French Publishers in the field of Sciences. We will display Scientific Books & Journals in French & English.

Society for Industrial and Applied Mathematics (SIAM)
3600 University City Science Center
Philadelphia, PA 19104-2688

The Society for Industrial and Applied Mathematics was found in 1952 to further the application of mathematics to science and industry, to promote basic mathematical research leading to new methods an techniques useful to industry and science, and to provide media for the exchange of information and ideas between mathematicians and other technical and scientific personnel. SIAM provides a much-needed link between mathematical theory and applications through the sponsorship of conferences, meetings, workshops, publications, and other activities that foster the exchange of ideas and the incorporation of science into product and process technology.

Società Italiana di Matematica Applicata e Industriale (SIMAI)
C.P. 385
00100 ROMA
Centro (RM)
ITALY

SIMAI is the Italian Society for Applied and Industrial Mathematics, officially established in December 1990, counting today over 500 members. Our participation at the SIAM Meeting in Los Angeles will acknowledge SIAM's 40th anniversary, and at the same time bring the existence of SIMAI to the external world's attention.

Springer-Verlag NY, Inc.
175 Fifth Avenue
New York, NY 10010

For 150 years Springer-Verlag has published high quality books and journals covering a wide array of mathematical topics. Our book program includes both series and monographs addressing the history of mathematics, algebra, number theory, analysis, geometry, topology, combinatorics, numerics, mechanics, heat transfer, fluids, signal processing, control theory, probability and statistics. The levels vary from introductory undergraduate texts to high level research volumes. The authors teach or conduct research at the finest institutions, and are leaders in their fields. The journal program publishes up to date, peer reviewed articles which vary from the applied to the theoretical.

Symbolics, Inc.
MACSYMA Division
8 New England Executive Park
Burlington, MA 01803

Symbolics' powerful and popular MACSYMA symbolic math software now features multiple graphics interfaces, including support for the X window system, a state of the art integer factoring capability and improved support for handling trig special angles.

MACSYMA version 417.100 includes over 375 active examples of commands, over 180 active demos, over 90 on-line usage files that describe major "out of core" packages and over a dozen new families of special functions. In total, over 50 line-item features have been added or improved for version 417.100.

The MathWorks, Inc.
Cochituate Place
24 Prime Park Way
Natick, MA 01760

The MathWorks will be demonstrating its newest version of the MATLAB interactive software system for high-performance numeric computation, including application toolboxes for digital signal processing, optimization, and system simulation. Product enhancements include advanced graphics and scientific visualization capabilities, sparse matrix support, and expanded debugging features.

Wadsworth - Brooks/Cole Publishing Co.
511 Forest Lodge Road
Pacific Grove, CA 93950

Wadsworth - Brooks/Cole will exhibit books from their advanced book series in mathematics, statistics, and operations research. They will also demonstrate the Academic and Student versions of Maple for the PC and Macintosh, EXP: The Scientific Word Processor, and MathWriter: The Scientfic Word Processor for the Macintosh.

Wolfram Research, Inc.
100 Trade Center Drive
Champaign, IL 61820

Mathematica® 2.0 is a general system for doing numerical, symbolic, and graphical computation. It can be used both as an interactive calculation tool and as a programming language. Its numerical capabilities include arbitrary precision arithmetic and matrix manipulation. It can manipulate formulas directly in algebraic form, performing such operations as symbolic equation solving, integration, differentiation, and power series expansion. The *Mathematica* kernel has been streamlined to increase efficiency. On systems with a sophisticated graphical user interface, users can create interactive documents that combine input and output with text, graphics, and sounds. *Mathematica* generates two- and three-dimensional graphics in PostScript form.

acm

INTERNATIONAL SYMPOSIUM ON SYMBOLIC AND ALGEBRAIC COMPUTATION

JULY 27-29, 1992
BERKELEY, CALIFORNIA

Conference Chair
Erich Kaltofen

Conference Officers
Richard Fateman
Robert Grossman
Daniel Lazard
Moss Sweedler
Barry Trager
Paul Wang

Program Committee
Bruce Char
Henri Cohen
James Davenport
Jean Della Dora
John Gilbert
Lakshman Y. N.
Daniel Lazard
Gerhard Michler
Michael Monagan
Jean-Jacques Risler
Horst Simon
Stanly Steinberg
Barry Trager
Carlo Traverso
Richard Zippel

Local Arrangements Committee
John Canny
James Demmel
Richard Fateman
Kathy Yelick

The annual International Symposium on Symbolic and Algebraic Computation (ISSAC), sponsored by the ACM Special Interest Groups on Symbolic and Algebraic Manipulation and on Numerical Mathematics, will be held on the campus of the University of California at Berkeley, July 27-29, 1992.

Symposium keynote speakers are Professor **John R. Rice** of Purdue University, whose lecture title is "What is an Answer?" and Professor **William M. Kahan** of the University of California, Berkeley, whose lecture is titled "A Fear of Constants."

Papers presenting original research in all aspects of symbolic and algebraic computation will be given. Typical, but not exclusive topics include: combined symbolic/numeric methods; algorithms for problems in algebra, number theory, group theory, algebraic geometry, differential algebra, and differential equations; languages and systems for symbolic computation; parallel symbolic computation; automatic theorem proving and programming; applications of symbolic computation to mathematics, science, engineering, and education.

For further information regarding the 1992 ISSAC symposium, please send your name, address, and electronic mail address to:

Professor Katherine Yelick
ATTN: ISSAC '92
571 Evans Hall
Computer Science Division
University of California
Berkeley, California 94720

The above requested information may also be sent electronically to issac@cs.berkeley.edu. Please indicate in your message if you would prefer to receive information via electronic mail or postal mail.

T O U R S

SPOUSE / GUEST TOURS AND EVENING GET-TOGETHER

The following is a list and description of tours that will be available during the meeting. You can register for these tours by filling out the Tour Registration Card located on the back of this brochure, enclose payment and mail to: Rosco/Cottrell, Inc. 150 Paularino Avenue, Suite 155, Costa Mesa, CA 92626. Telephone 714-755-1500. FAX 714-755-1511. Your contact is Mindy Rosenblum.
Registration and payment for these tours must be received by July 8, 1992.

TOUR #1
INTERNATIONAL FLAVOR OF LOS ANGELES

Olvera Street, Little Tokyo, Chinatown. . . the names conjure up the ethnic delights of the architecture and storefronts that make up these mini communities in the heart of L.A. They're all just a few blocks apart. The city's beginnings are on the first stop, Olvera Street, where you'll find the Avila Adobe, once the town's poshest house, now the city's oldest dwelling. Also amidst the concrete canyons are the financial towers that make up downtown L.A. and the Music Center, site of Broadway productions and for years the Academy Awards ceremonies.

A drive through Hollywood will allow our guide to share fascinating stories of the film industry (past and present), and point out landmarks associated with memorable events in the world of entertainment. The famous intersection of Hollywood and Vine serves as one of the city's boundaries, as does the Sunset Strip (don't fail to notice the giant billboards - often a show in themselves). Next you'll stop at Mann's Chinese Theatre, home of handprints and footprints of the industry's most glittering stars.

Your lunch stop ("on your own") will be at the world famous Farmer's Market. Farmer's Market was begun as a place for Depression-era farmers to sell their crops, and has now evolved into over 130 food stalls, kitchens and stores, where you're sure to find a special meal or gourmet delicacy to satisfy your appetite and/or to take home. And next door to Farmer's Market is CBS Television Studios, where the network's West Coast sitcoms and daytime dramas are filmed.

Monday, July 20, 1992
10:00 AM - 3:00 PM
Cost: $19.00

TOUR #2
BY THE SEA, BY THE SEA, BY THE BEAUTIFUL SEA

Santa Monica is a center for a Southern California Beach lifestyle that's envied the world over. Just a block from the beach, Santa Monica's Main Street ranks right up there with some of the best browsing that can be found anywhere. Besides the assortment of unique art galleries, featuring artists of every era and discipline, there are fashion stores, antique shops and some of the best people-watching around. You'll have plenty of time to explore up and down the boulevard, looking for that special souvenir of your California visit.

Santa Monica Place is a three-level shopping destination with over 160 terrific stores, restaurants and specialty carts located in the heart of Santa Monica. It's all the best that Southern California has to offer. . . sandy beaches and ocean breezes, trendy restaurants and fashionable boutiques, interesting people and a relaxed friendly attitude.

Venice Beach is filled with sidewalk vendors and roller skaters. Entertainment is non-stop along this stretch which also has the famed "muscle beach" located on it, where you can watch bodybuilders working out in the fresh outdoors. Jugglers, mimes, magicians, and anything else you can imagine show off their skills to passersby. Some great bargains and unique gifts are available from the many sidewalk vendors.

Tuesday, July 21, 1992
10:00 AM - 2:30 PM
Cost: $19.00

TOUR #3
TAKE A PEEK AT PARAMOUNT

No visit to the movie-making capital of the world would be complete without a glimpse at the inner workings of a real Hollywood movie studio. A behind-the-scenes walking tour of Paramount Studios is a novel treat that "not just anyone" can experience while in Los Angeles.

Paramount Studios, tucked away behind giant pink gates in the heart of Hollywood, is one of the oldest and most prestigious working studios. Expertly trained guides walk you through the backlots of the studio and combine history with anecdotal acting stories. Everything from costume design to special effects, and make-up to set construction will be previewed on this talking tour.

If a show is being taped in the studio you may get a first hand preview, so keep your eyes open - you never know which stars might be working on their next "big hit."

Wednesday, July 22, 1992
1:00 PM - 4:30 PM
Cost: $28.00

TOUR #4
SEASIDE ART ADVENTURE J. Paul Getty Museum

Publicized as the world's "richest" museum, the Getty is a magnificent setting for the treasures it contains. The building itself is a replica of a 4th-century Roman villa complete down to the smallest detail. With its enormous endowment, the Getty collects art treasures from around the globe. Impressionist paintings, works of the Dutch and Italian Renaissance Masters, and the world's most valuable collection of Greek and Roman antiquities fill the galleries. Outside, the gardens and reflecting pool are a tranquil setting for relaxing and taking pictures.

Thursday, July 23, 1992
9:30 AM - 1:00 PM
Cost $17.00

TOUR #5
LA City Light Tour and Dinner

Wine and sodas will be served while you enjoy the sites of Downtown Los Angeles, Beverly Hills and Two Rodeo Avenue. You'll stop at Two Rodeo Avenue, a town square lined with broad limestone steps and sculptured marble fountains. This is an area that has become a new shopping, dining and entertainment area. You will be given time here to browse and window shop. Then its off to the famous Olvera Street, the founding site of Los Angeles. You'll have time to walk down Olvera Street to enjoy the bazaars and early Spanish dwellings where Los Angeles first buildings still stand. Dinner which is included will be arranged at La Golondrina, a lovely authentic Mexican restaurant on Olvera Street. After dinner, you'll visit little Tokyo and Chinatown before heading back through Hollywood. You'll be stopping off at the Mann's Chinese Theatre home of hand and footprints of the industry's most glittering stars.

Wednesday, July 22, 1992
6:00 PM - 11:00 PM
Cost $35.00

ALL TOURS ARE BASED ON A MINIMUM OF 30 ATTENDEES. REFUNDS WILL BE MAILED IF REGISTRATION DOES NOT REACH 30 AND THE TOUR IS CANCELLED.

ALL BUSES FOR TOURS WILL DEPART FROM THE CENTURY PLAZA HOTEL LOBBY. BOARDING TIME IS 15 MINUTES PRIOR TO SCHEDULED DEPARTURE.

TRANSPORTATION

By Air

Official Carrier for Continental USA and Canada

American Airlines AA is the official carrier for this meeting. In a special arrangement for this meeting, you can fly to Los Angeles, California, at a discounted rate from July 17 - July 27, 1992, inclusive.

- For those attendees traveling from points in the United States, American Airlines is offering a 45% discount off regular full coach airfares. For those in Canada, the discount is 35%. Each rate requires seven (7) days advance purchase.
- American Airlines is offering a 5% discount off any published airfare (including First Class and Ultra Saver fares) for which you qualify, i.e., you must satisfy all rules and restrictions the fares quoted. Discounts can range from 40% to 70% off regular coach fares.

To make reservations for either of the above discounted fares:

- Call American Airlines Convention Desk at the toll free number **800-433-1790** seven days as week from 8:00 AM to 11:00 PM (EST). Be sure to mention the SIAM Account Number **S02Z2CN**. American Airlines will mail tickets to your home or office.

TO USE CORPORATE OR UNIVERSITY TRAVEL AGENTS, your travel agent should call the American Airlines Convention Desk to make your reservation. Make sure your agent mentions the discounts and uses the SIAM Account Number **S02Z2CN**.

By Car

Avis Rent A Car

Avis Rent A Car has been selected as the official car rental agency for this meeting. Cars can be rented at the Los Angeles International Airport or at the Century Plaza Hotel.

The rates on the right will apply between July 13 - 27, 1992.

Reservations

We encourage you to make an advance reservation, as on-site availability cannot be guaranteed. Make reservations by calling **1-800-331-1600**. When making reservations be sure to mention the **AWD # A/B464357** rate code: **04**. You should also mention that you are attending the SIAM 40th Anniversary Meeting, July 20 - 24, in Los Angeles, California, in order to receive the indicated rates.

- Cars can be picked up at any Southern California Location. Specifically at the Los Angeles International Airport (Baggage Claim) or Century Plaza Hotel (Lobby Level).
- You can pick up and drop off cars at different locations for a minimal additional charge.
- You must be at least 25 years of age and have a valid U.S. or International Drivers License.
- You must have one of the following credit cards to rent a car: AMEX, MasterCard, or VISA.

On occasion, the car rental agency may offer special rates that are lower than rates quoted above. As an attendee you are still eligible for the lower of the two rates. In most instances, the conference discounted rates are lower than those quoted to the general public.

SIAM ANNUAL MEETING

July 20 - 24, 1992
Los Angeles, California

Avis Worldwide Discount (AWD) Number A/B 464357

CONVENTION/MEETING RATES		
CLASS	DAILY	WEEKLY
SUB-COMPACT	$28.00	$110.00
COMPACT	$29.00	$120.00
INTERMEDIATE	$31.00	$130.00
FULL SIZE 2DR	$33.00	$150.00
FULL SIZE 4DR	$35.00	$160.00
PREMIUM	$39.00	$180.00
LUXURY/MINIVANS*	$42.00	$230.00
CONVERTIBLES*	$55.00	$270.00

UNLIMITED MILEAGE ON ABOVE RATES or, 5% off any published rate.
*Subject to availability. Booked on request basis only.

Available One Week Prior to and One Week After your Convention/Meeting

One-way charges may apply. Refueling and taxes extra. Optional coverage available, LDW $9.00/day), PAI ($3.00/day), PEP ($1.50/day).

SIAM Conferences and Tutorials

1992

SEPTEMBER 17 - 19, 1992

SIAM Conference on CONTROL AND ITS APPLICATIONS
Minneapolis, MN
Sponsored by SIAM Activity Group on *Control and Systems Theory*
Organizer: Kevin A. Grasse, University of Oklahoma, Norman

OCTOBER 15 - 19, 1992

SIAM Conference on APPLICATIONS OF DYNAMICAL SYSTEMS
Salt Lake City, UT
Sponsored by SIAM Activity Group on *Dynamical Systems*
Co-organizers: Peter W. Bates, Brigham Young University, and Christopher K.R.T. Jones, Brown University

1993

JANUARY 25 - 27, 1993

Fourth ACM- SIAM Symposium on DISCRETE ALGORITHMS
Austin, TX
Sponsored by ACM-SIGACT and SIAM Activity Group on Discrete Mathematics
Abstract deadline: 7/13/92
Organizer: Vijaya Ramachandran, University of Texas, Austin

MARCH 21 - 24, 1993

Sixth SIAM Conference on PARALLEL PROCESSING FOR SCIENTIFIC COMPUTING
Norfolk, VA
Sponsored by SIAM Activity Group on Supercomputing
Abstract deadline: 9/14/92
Organizer: Richard F. Sincovec, Oak Ridge National Laboratory

JUNE 7 - 11, 1993

SIAM Conference on MATHEMATICAL AND NUMERICAL ASPECTS OF WAVE PROPAGATION PHENOMENA
University of Delaware, Newark, Delaware
Abstract Deadline: 11/13/92
Organizer: Ralph Kleinman, University of Delaware

JULY 12 - 16, 1993

SIAM ANNUAL MEETING
Philadelphia, PA
Abstract Deadline: 1/15/93

Driving Directions to Century Plaza Hotel

From Los Angeles International Airport and North

Take 405 North and exit at Santa Monica Blvd. (not to be confused with Santa Monica Freeway offramp which comes first.) Turn right on Santa Monica Blvd., go two miles east and turn right on Avenue of the Stars. Hotel is two blocks down on right. It is a large crescent-shaped building with fountains in front.

South

Take 405 South. Exit at Santa Monica Blvd. Make a left on Santa Monica Blvd. and go two miles east. Turn right on Avenue of the Stars, go two blocks and hotel is on the right.

West

Take 10 Freeway West. (When you go through downtown L.A, the 10 will change names from San Bernadino Fwy. to Santa Monica Fwy. Keep going west.) Exit the 10 at Robertson Blvd. Turn right on Robertson and go two miles north. Turn left on Pico and go two miles west. Then turn right on Avenue of the Stars. Go half a mile and hotel is on the left. (To make it easier, the second set of fountains you see is in front of the Century Plaza Hotel. The first are in front of the Marriott.)

East

Take 10 Fwy. East and exit at Overland. Follow exit ramp around to the right and turn right on Overland. Go north on Overland about 1-1/2 miles. Turn right on Pico and go two miles east. Turn left on Avenue of the Stars, go half a mile and the hotel is on the left. Watch for second set of fountains. The hotel is a big crescent shaped building.

Transportation From the Airport

Super Shuttle

The Century Plaza Hotel does not have a complimentary shuttle to and from the airport. There is Super Shuttle, a van service that you can take from the baggage claim area (Ground Transportation). Collect your baggage, then call Super Shuttle at 417-8988 or use the phone on the Ground Transportation Board located in baggage claim area. Pick-up is at the Van Stop Area on the airport lower level. Super Shuttle vans are blue and yellow. The shuttle service is approximately $11.00 each way. (See attached coupon for discount). The hotel is approximately 18 miles from the airport and about a 30-minute ride.

Taxi cabs are available at the airport. The approximate cost is $20.00.

40th ANNIVERSARY

SIAM Trivia

The first speaker at the first SIAM meeting (March 17, 1952) was W. E. G. Swann, Director of the Bartol Foundation of the Franklin Institute. The title of his presentation was "Mathematics the Backbone of Science". There was an audience of approximately 180.

Century Plaza Hotel and Tower

2025 Avenue of the Stars
Century City
Los Angeles, CA 90067
(213) 277-2000

The Century Plaza Hotel and Tower are set amid 14 acres of lush gardens on Los Angeles' fashionable Westside, two blocks from Beverly Hills, and in the heart of Century City. The Tower has been designed to reflect the residential character of an elegant European palazzo. The collection of signature art and antiques placed throughout the Tower is of museum quality.

Room Rates

$ 95.00 Single Room
$117.00 Double Room
There is a 12.5% occupancy tax charge per room.

Reservation Deadline

June 28, 1992

To make a reservation

- Use Reservation Card on back of this program or call hotel at (213) 277-2000
- Identify yourself as an attendee at the SIAM Annual Meeting
- Be sure to request a confirmation number

Deposit

A deposit in the amount of one night's room rate or the use of a major credit card number with the expiration date is required to confirm your reservation

Cancellation

To obtain a refund, reservations must be cancelled by 5:00 PM, 48 hours prior to your scheduled arrival.

Arrivals and Departures

You may check in anytime after 3:00 PM; you must check out by 1:00 PM.

Hotel Facilities

The hotel is equipped with 2 outdoor heated pools. Life cycles can be found at each pool for aerobic exercise.

Within Walking Distance

Avenue of the Stars, Constellation Boulevard and Galaxy Way—the location of the Century Plaza is filled with activities which include 18 first-run movie theatres, hits at the Schubert Theatre, the International Food Market with many fast food and ethnic food choices, and the Century City Shopping Center and Marketplace with 150 shops and boutiques.

Babysitting Service

Babysitting service is available through the hotel's Concierge Desk.

A list of babysitting services has been supplied to SIAM by the hotel, and is available through the SIAM conference department.

Tours and Sightseeing

There are a vast number of tours available in the Los Angeles area. A great source for the best deals is the hotel's Concierge Desk. Please note the special tours set up specifically for attendees, guests, and spouses. (See page 41)

Parking

Overnight	Valet Parking	$15.40
	Self Parking	$ 9.90
Day Rate	Valet Parking	$ 6.60
	Self Parking	$ 3.50

Car Rental

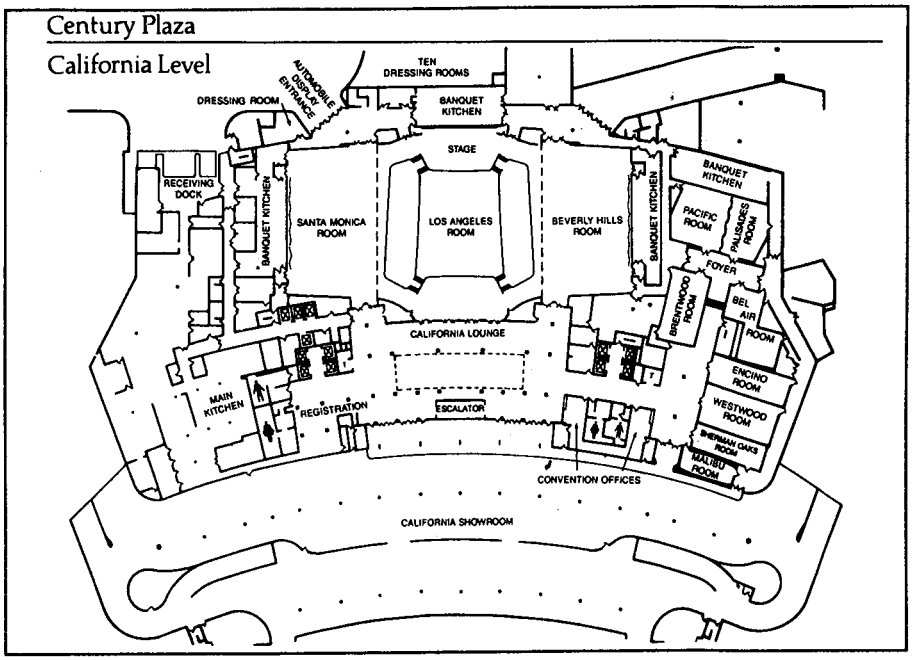
Avis Car Rental has been selected as the official car rental agency for this conference. They do have an office on-site at the Century Plaza Hotel, located in the lobby level across from the front desk.

40th ANNIVERSARY
1951 - 1991

Information on Local Attractions and Sightseeing

If you would like to get further information on places to go and things to do in the LA area prior to the conference, contact

the Los Angeles Convention and Visitors Bureau
515 South Figueroa Street
Eleventh Floor
Los Angeles, CA 90071
Telephone: 213-624-7300
Fax: 213-624-9746



Maple V. The Best Engineered And Most Thoroughly Tested Computer Math System Available.

Maple V's visualization of step responses of a feedback control system.

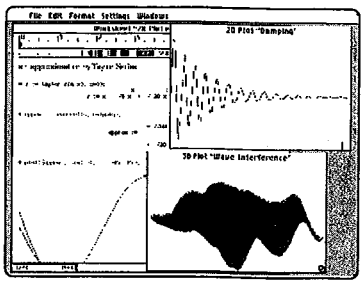
Maple V is widely recognized as ***the*** computer algebra software of choice by engineers, mathematicians, scientists and educators. And for good reason – Maple V provides a complete mathematical environment for performing symbolic and numeric computations, quickly and accurately.

Maple V is the computer algebra system that takes much of the drudgery out of mathematics by calculating answers at electronic speed – for even the most complex problems.

With Maple V, the hours (or even days) you spend solving equations, are a thing of the past.

Maple V puts the power of 2,000 functions in calculus, linear algebra, differential equations, statistics and more, literally at your fingertips.

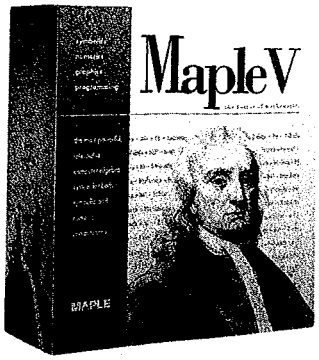
And, if necessary, you can easily customize Maple V to fit your specific needs by using its comprehensive programming and debugging tools.



Combine output, graphics and text in one document with Maple V Notebooks.

As you know, much of today's mathematical computation relies on visualization – that's why Maple V makes it possible to view complex scientific and engineering data in exciting new ways. By combining a superior algebraic engine with a user-friendly GUI (Graphical User Interface), Maple V provides extremely versatile 2-D and 3-D color graphing capabilities.

Maple V executes efficiently in a very small amount of memory – and it's versatile too. Maple V runs on virtually any computer, from a low cost Macintosh to a multi-million dollar super-computer.



Speed, efficiency, accuracy, versatility – Maple V delivers it all.

Contact us today for availability, pricing and licensing information.

And ask about our free demo video.

MAPLE

The Future of Mathematics

Waterloo Maple Software
160 Columbia Street West, Dept. 504
Waterloo, Ontario, Canada N2L 3L3
Phone (519) 747-2373 Fax (519) 747-5284
E-mail:wmsi@daisy.waterloo.edu