

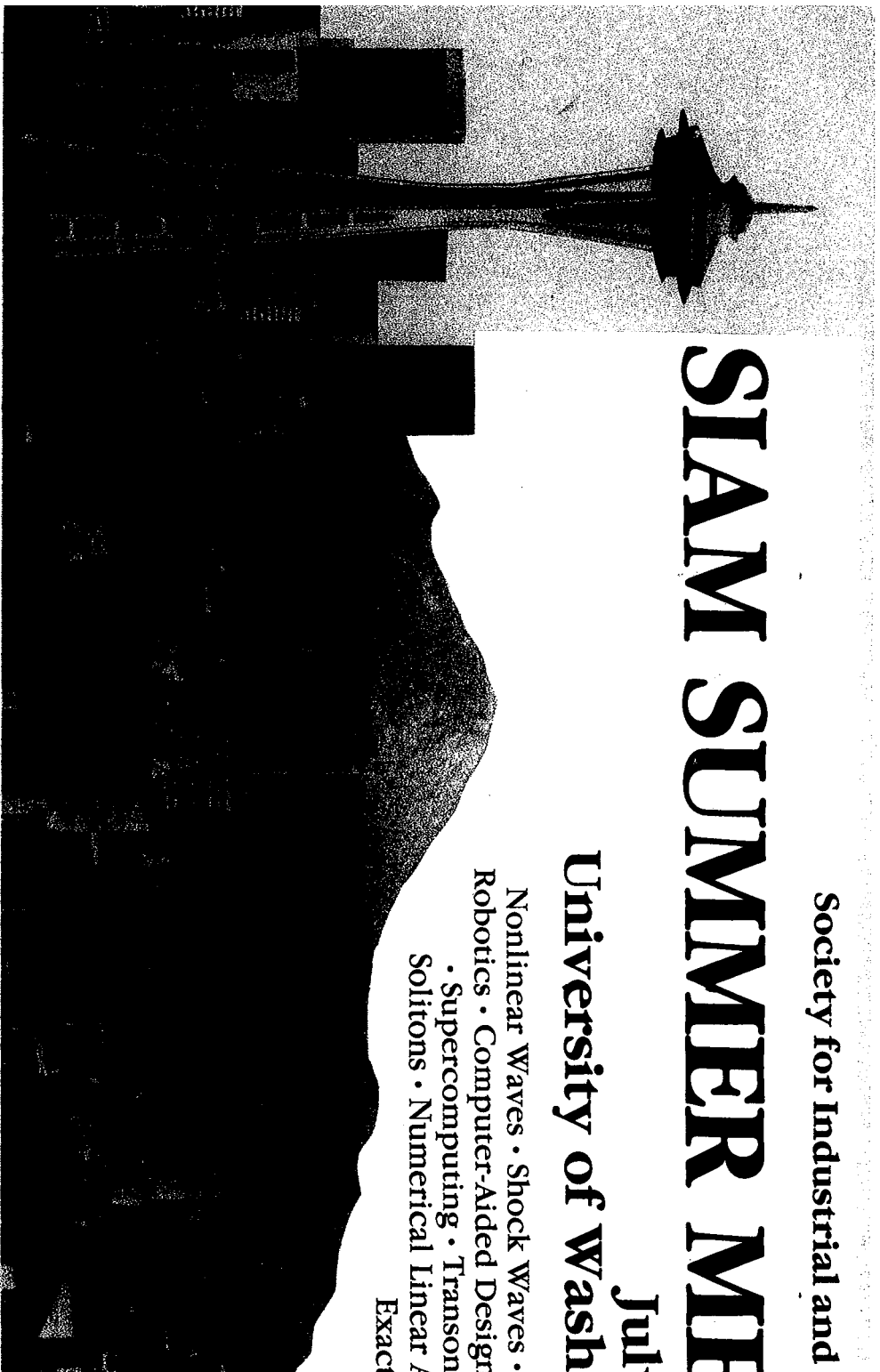
Society for Industrial and Applied Mathematics

SIAM SUMMER MEETING

July 16-20, 1984

University of Washington, Seattle

Nonlinear Waves • Shock Waves • Numerical Optimization •
Robotics • Computer-Aided Design • Computational Statistics
• Supercomputing • Transonic Flow • Stability Theory •
Solitons • Numerical Linear Algebra • Microprocessors •
Exact Computation • Elasticity •
Dynamical Systems •
Mathematics Education



MEETING HIGHLIGHTS

Monday, July 16, 8:30 - 9:15 AM
Invited Presentation. 1

Iterative Methods for Linear Systems

The speaker will present a survey of some of the iterative methods that are being developed for solving sparse systems of equations which arise in applications, e.g. the numerical solution of elliptic partial differential equations. Emphasis will be placed on the use of the conjugate gradient method in connection with various pre-conditioners. Several aspects of domain decomposition will be discussed.

Gene H. Golub
Computer Science Department
Stanford University

Monday, July 16, 9:15 - 10:00 AM
Invited Presentation. 2

Symmetric Difference Schemes for Singularly Perturbed Boundary Value Problems in Ordinary Differential Equations

The merits and limitations of general purpose difference schemes based on adaptive mesh selection strategies for singularly perturbed boundary value problems in ordinary differential equations will be discussed. Also, results on problems with unbounded inverses and on continuation with respect to ϵ will be presented.

Richard Weiss
Institute of Applied Mathematics and Numerical Analysis
Technical University of Vienna, Austria

Tuesday, July 17, 8:30 - 9:15 AM
Invited Presentation. 3

Mathematical Methods of Nonlinear Waves

Nonlinear wave theory, as exemplified by hyperbolic partial differential equations or dispersive equations, such as those arising in the study of surface waves on deep water, has manifold applications in fluid mechanics, optics, plasma physics, traffic flow theory, biology, and other areas. Frequently, some consideration of dissipative or diffusive effects is required to obtain a complete and realistic physical picture. Other phenomena where dissipation plays a major role have been found to have a somewhat similar mathematical description. Examples are found in population models, the interaction of chemical reactions with diffusion, and in the evolution of patterns of thermal convection. Some problems of the latter type have recently been studied as examples of continuous systems in which chaotic phenomena can be demonstrated.

The speaker will examine some results and techniques of nonlinear wave theory, relevant to non-conservative systems, especially to situations where the existence of wave-like behavior is

dependent on the interaction of dissipation and non-conservative driving mechanisms. He will also examine mathematical techniques for studying basically conservative systems.

Louis N. Howard
Department of Mathematics
Florida State University

Tuesday, July 17, 9:15 - 10:00 AM
Invited Presentation. 4

Some Recent Developments in Finite Elasticity

Although finite elasticity is an old branch of continuum mechanics, it experienced a major revitalization about forty years ago.

Among the important and difficult issues of current interest to applied mathematicians are the study of singular problems (such as those involving cracks) of interest in the mechanics of fracture of solids, and the study of the effect of "material instabilities" brought into play in some elastic materials in the presence of severe deformations.

The speaker will focus on these problems, and in particular on problems common to both of them. He will describe some recent studies of singular problems in finite elasticity, as well as some more recent results relating to deformation-induced, abrupt alterations in material properties and the attendant mathematical issues.

James K. Knowles
Division of Engineering and Applied Science
California Institute of Technology

Tuesday, July 17, 10:30 - 11:30 AM
Invited Presentation. 5

The John von Neumann Lecture

Recent Developments in the Theory of Hamiltonian Systems

The stability of a Hamiltonian system can, as a rule, be established only for systems sufficiently close to $2n$ integrable ones, as one moves away from such an integrable system, one observes a breakdown of stability, a phenomenon not yet fully understood. It has been mainly studied for systems with two degrees of freedom, more specifically for monotone twist mappings.

The lecturer will describe the recent results by J. Moser, Aubrey, and A. Katok and their relation to earlier work on geodesics of class A by Morse and Hedlund, as well as results on integrable Hamiltonian systems.

Jürgen Moser
Eidgenössische Technische Hochschule
Zürich, Switzerland

Wednesday, July 18, 8:30 - 9:15 AM
Invited Presentation. 6

Convergence Properties of Algorithms for Nonlinear Optimization

Two main objectives when developing optimization algorithms are to force convergence from starting approximations that are far from the solution, and to achieve a fast final rate of convergence. The speaker will review the features of algorithms that are intended to give these properties, because practical experience suggests that they are successful but theoretical analysis is incomplete. Unfortunately there are some exceptional cases that do not have the nice convergence properties that are usually obtained. For example, the use of "trust regions" can prevent a superlinear rate of convergence in algorithms for constrained optimization calculations, and the conjugate gradient algorithm for unconstrained optimization may fail to converge.

M. J. D. Powell
Department of Applied Mathematics and Theoretical Physics
University of Cambridge, England

Wednesday, July 18, 9:15 - 10:00 AM
Invited Presentation. 7

Current Developments in Computational Statistics

Personal computers, supercomputers, expert systems, artificial intelligence, 5th generation systems, and computer animation are current media buzzwords. The effect of these new technologies on statistics has been to open up the exciting new field of computational statistics. This field exploits innovations in computer hardware and software to develop new statistical methodology and promote good data analysis.

Examples of this burgeoning technology are "bootstrapping", methods of assessing variability, and real-time problems for displaying high dimensional data. The goals of this session are to summarize the current state-of-the-art in computational statistics, highlight where future progress is likely to be made, and indicate the role of mathematics in this new domain.

Daryl Pregibon
AT&T Bell Laboratories
Murray Hill

Thursday, July 19, 8:30 - 9:15 AM
Invited Presentation. 8

Computer Modeling of Solids

Most current systems for computer-aided design of solid mechanical parts use lines in 2-space or 3-space to represent solids. A given line representation usually can represent multiple mechanical parts and requires human interpretation to resolve ambiguities.

A solid geometry system, on the other hand, provides a complete and unambiguous computer representation of the part. Such systems provide very powerful design tools and at the same time make possible many computer analyses of designed parts. Systems which provide capabilities for design and analysis of solid mechanical parts have required more than a decade of research and development. Success has depended on the solution of a number of difficult mathematical, representational, database, and human factors problems. This talk will summarize the evolution of the GMSolid system at General Motors as well as solid modeling developments elsewhere and will indicate areas where research is still required to realize the full potential of solid modeling.

John W. Boyse
Computer Science Department
General Motors Research Laboratories

Thursday, July 19, 9:15 - 10:00 AM
Invited Presentation. 9

The Impact of Microprocessors on Numerical Computation

Microprocessors are changing the nature of machines on which much numerical computation is done. The characteristics of these new machines make them suitable for new kinds of problems, as well as for new methodologies in solving traditional problems — new kinds of algorithms, data structures, machine interaction, and problem decomposition. The speaker will consider the microcomputer in its many guises from supercalculator through home computer to powerful work-stations — the common thread is that the microcomputer serves a single user. He will also consider the parallelism brought about by cheap and small processors and the custom architectures that are becoming available to solve specific problems.

W. Morren Gentelman
Division of Electrical Engineering
National Research Council, Ottawa

Thursday, July 19, 10:30 - 11:00 AM
Invited Presentation. 10

The Theodore von Kármán Prize Presentation

"Final" Transonic Flow

The deep and continuous study of a physical area at the forefront of science often leads to the discovery of new mathematics or a better understanding of parts of older mathematics. Examples occur in the study of gasdynamics, plasticity theory, and more recently solitons. Transonic flow theory also falls into this category.

A survey of the theory of transonic flow will be given by the speaker, which traces its historical development to contemporary problems. Emphasis will be on the wide variety of mathematical ideas that have to be used to make an impact on transonic problems. Applications are shown for singular perturbation methods, theory of equations of mixed type, shock wave theory, similarity methods, numerical analysis, variational methods, and computational algorithms. The blend of these needed to solve some current problems will be discussed.

Julian D. Cole
Department of Mathematical Sciences
Rensselaer Polytechnic Institute

Friday, July 20, 8:30 - 9:15 AM
Invited Presentation. 11

Advances in Supercomputers and Their Impact on Problem Formulation and Programming

Among the principal applications of the supercomputer are the execution of large-scale numerical simulations, the numerical integration of large systems of partial differential equations, and the collection and processing of data. Such computers will release scientists and engineers from real-world constraints and expand classes of problems they can address.

The speaker will review and evaluate the characteristics and expected benefits of the new generation of supercomputers with examples, and consider the kinds of problems requiring such capabilities. He will examine the trends in supercomputer architecture, including multiprocessor systems, and explore the difficulties such systems present in applying them. He will also discuss the issues in making these computers available to the scientific community, including the problems of networking and distribution of functionality.

Bill L. Buzbee
Los Alamos National Laboratory

Friday, July 20, 9:15 - 10:00 AM
Invited Presentation. 12

Mathematical Aspects of Robotics

The rapidly developing field of robotics makes contact with mathematics at many points and will offer interesting challenges to the applied mathematician. Many problems in geometry, mechanics, frictional motion, control theory, geometric modeling, and computational geometry have already become apparent. The speaker will review a few of these problems in a tutorial spirit.

Jacob T. Schwartz
Computer Science Department
Courant Institute of Mathematical Sciences

MEETING HIGHLIGHTS

Minisymposia

1. The Use of High Order Elements in the Numerical Solution of Partial Differential Equations I. Norman Katz, Department of Systems Science and Mathematics, Washington State University
2. Advances in Direct Methods for Solving Sparse Linear Algebraic Equations John G. Lewis, Boeing Computer Services, Seattle
3. Mathematical Problems in Nonlinear Viscoelastic Solids and Fluids John A. Nohel, Mathematics Research Center, University of Wisconsin, Madison
4. Mathematical Developments in Ship Hydrodynamics Marshall P. Tulin, Department of Mechanical and Environmental Engineering, University of California, Santa Barbara
5. Recent Advances in the Analysis of Multiphase Flow Russel E. Caflisch, Courant Institute of Mathematical Sciences, New York University
6. Perturbation Methods for Partial Differential Equations Jirair Kevorkian, Applied Mathematics Program, University of Washington
7. Numerical Computation in Shock Wave Theory—New Developments and Application Marshall Stenrod, Department of Mathematical Sciences, Rensselaer Polytechnic Institute
8. Matrix Methods for Queueing Models William J. Stewart Department of Computer Science, North Carolina State University, Raleigh
9. Applications of Reaction-Diffusion Systems Patrick S. Hagen, Exxon Research and Engineering Company, Corporate Research Science Laboratories, Annandale
10. Saint-Venant's Principle and Boundary Layer Phenomena in Elasticity Cornelius O. Hoger, College of Engineering, Department of Metallurgy Mechanics and Materials Science, Michigan State University
11. Inflight Interval Methods in Global Optimization, Numerical Analysis, and Computing Ramon E. Moore, Mathematics Department, University of Texas, Arlington
12. Matrix Computations in Statistics Robert C. Ward, Mathematics and Statistics Research, Engineering and Physics Division, Oak Ridge National Laboratory, Oak Ridge
13. Constructive and Computational Geometry David Ferguson, Boeing Computer Services, Tukwila
14. Computational Results on the Interaction of Solitary Waves George J. Majda and Chai-Hsing University
15. Modern Nonlinear Dynamics and the Nature and Treatment of Chaos in Real Systems Alan C. Newell, Program in Applied Mathematics, University of Arizona
16. Mathematics Education in Transition Robert M. Thrall, Department of Mathematics Sciences, Rice University
17. Applications of Exact Computation in Linear Algebra Robert Todd Gregory, Department of Computer Science and Mathematics, University of Tennessee, Knoxville

18. Problem Solving—Math with a Purpose Herbert J. Greenberg, Department of Mathematics, University of Denver
19. Applications of Supercomputers Kenneth W. Neves, Boeing Computer Services, Seattle
20. Computational Implementation of the Elementary Function—Recent Developments Fred G. Gustavson, IBM T. J. Watson Research Center, Yorktown Heights

Events

Monday, July 16, 10:30 - 11:30 AM

Special Panel

Federal Support for the Mathematical Sciences

Representatives of the Air Force Office of Scientific Research, Army Research Office, Department of Energy, National Science Foundation and Office of Naval Research will provide short overviews of federal programs in the mathematical sciences and discuss future funding opportunities.

Chairman and Organizer

David W. Fox
Mathematical and Information Sciences
Air Force Office of Scientific Research
Washington

Speakers to be announced

Friday, July 20, 10:30 AM - 12:15 PM

Film Series. 1

Mathematics at Work in Society

Four 20-minute television video tapes, distributed by the Mathematical Association of America, featuring men and women in careers depending on mathematics:

An Actuary — What's That?

Actuaries and others at a large life insurance company describe the mathematics needed for the insurance business.

Mathematics in Space

Employees at NASA's Johnson Space Center talk about the mathematics needed to prepare space flights.

Mathematics: The Language of Research

An applied mathematician at Bell Laboratories describes her research on integrated circuits.

Mathematics: Where Will I Ever Use It?

A high school mathematics teacher talks about the rewards of her job and what it takes to be a good teacher. Other mathematics-dependent careers featured on this tape are the meteorologist, cryptanalyst, geologist, carpenter, architect, and nurse.

Tapes will be shown continuously in the order indicated.

Friday, July 20, 10:30 - 12:15 PM
Industry Forum. 1

Representatives of local industry explain the uses of mathematics at their companies. These discussions will be formatted as poster presentations.

Seren L. Washburn
Weyerhaeuser Technical Center
Tacoma, Washington

Modeling and analysis in lumber manufacturing including problems involving experimental design, Monte Carlo simulations, adaptive schemes in numerical integration, and use of graphic systems in modelling.

Ralph W. Mercalfe
Flow Research Company
Kent, Washington

Numerical analysis of turbulent flow; contour plotting of vorticity and chemical reactivity; modelling of transonic flow; statistical analysis of complex, nonlinear flows.

David R. Ferguson
Boeing Computer Services
Seattle, Washington

The use of mathematics in the design and construction of the 757/767, including aerodynamic analysis, surface fitting and propulsion studies, cockpit design, baggage handling and crew scheduling.

Harlan P. Foote and James A. Shortlemyre
Geosciences Department
Battelle Pacific Northwest Laboratory
Richland, Washington

Use of interactive graphics and database management in geospatial and environmental analysis; use of analytical and numerical modelling in hazardous waste management; examples of microcomputer-based software in the physical sciences.

Wesley L. Nicholson
Statistics Section
Battelle Pacific Northwest Laboratory
Richland, Washington

Use of statistical graphics for visual exploration of data in more than two dimensions. Methodology includes the interaction of color, glyphs, stereo, and motion to simultaneously display several dimensions. Applications include acid rain and particle physics. Additional participants to be announced.

Friday, July 20, 3:45 PM - 5:00 PM
Industry Forum. 2

Film Series. 2
(continuation of the morning sessions)

Special Functions

For The Palate

Welcoming Reception
Sunday Evening, July 15
A pleasant and convenient place to meet your colleagues before the meeting.

SIAM Activity Group on Linear Algebra Buffet

Monday Evening, July 16
Dinner and planning meeting for SIAM Activity Group on Linear Algebra. Robert J. Plemmons, North Carolina State University, Raleigh, Chairman. Buy tickets at the SIAM registration desk onsite.

Wine and Cheese Party

Tuesday Evening, July 17
An evening get-together featuring imported cheeses and wine from Washington's Sec. Michelle Winery, with trays of seasonal fresh fruit and a variety of fresh breads, including croissants, French loaves, and sour dough. Pre-registration on SIAM Advance Registration Form and full payment required. Cost: \$10.00.

Tillamook Island Cruise and Northwest Pacific Salmon Bake

Wednesday Evening, July 18
A cruise to an island of the past in Puget Sound for a traditional baked salmon dinner in a spectacular cedar longhouse. The boat will depart at 5:30 PM from the University of Washington Oceanography Dock. Transportation will be provided from the conference site. A must for all attendees. Evenings can be cool, so bring a sweater. Pre-registration on SIAM advance registration form and full payment required. Cost: \$28.00, includes transportation.



Symbol for the preservation of the North Pacific Coast Indian culture

PROGRAM-AT-A-GLANCE

SUNDAY PM, JULY 15

8:00 PM Welcoming Reception

MONDAY AM, JULY 16

8:15 AM Opening Remarks

8:30 AM Invited Presentation. 1
Iterative Methods for Linear Systems
Gene H. Golub
Computer Science Department
Stanford University

9:15 AM Invited Presentation. 2
Symmetric Difference Schemes for
Singularly Perturbed Boundary Value
Problems in Ordinary Differential
Equations
Richard Weiss
Institute of Applied Mathematics and Numeri-
cal Analysis, Technical University of Vienna

10:00 AM Coffee

10:30 AM Special Panel

Federal Support for the Mathematical
Sciences
Chairman and Organizer
David W. Fox
Air Force Office of Scientific Research
Washington

11:30 AM Lunch

MONDAY PM, JULY 16

1:00 PM Minisymposia
(Concurrent Sessions)

1. The Use of High Order Elements in the
Numerical Solution of Partial Differential
Equations
Chairman and Organizer
I. Norman Katz
Washington University
St. Louis

2. Advances in Direct Methods for Solving
Sparse Linear Algebraic Equations

Chairman and Organizer
John G. Lewis
Boeing Computer Services
Seattle

3. Mathematical Problems in Nonlinear
Viscoelastic Solids and Fluids
Chairman and Organizer
John A. Nohel
Mathematics Research Center
University of Wisconsin, Madison

4. Mathematical Developments in Ship
Hydrodynamics
Chairman and Organizer
Marshall P. Tulin
Department of Mechanical and Environ-
mental Engineering
University of California, Santa Barbara

3:00 PM Coffee

3:30 PM Contributed Papers
(Concurrent Sessions)

1. Partial Differential Equations
2. Numerical Solution of Ordinary Differen-
tial Equations. I
3. Stochastic Processes and Statistics
4. Shock Waves
5. Numerical Linear Algebra. I
6. Numerical Solution of Partial Differential
Equations. I
7. Computer-Aided Design. I: Construction
and Analysis of Curves

3:30 PM Poster Presentations
Session I: Fluid Dynamics

6:30 PM SLAM Activity Group on
Linear Algebra
Buffet and Planning Session

TUESDAY AM, JULY 17

8:30 AM Invited Presentation. 3
Mathematical Methods of Nonlinear Waves
Louis N. Howard
Department of Mathematics
Florida State University

9:15 AM Invited Presentation. 4

Some Recent Developments in Finite
Elasticity
James K. Knowles
California Institute of Technology

10:00 AM Coffee

10:30 AM Invited Presentation. 5
The John von Neumann
Lecture

Recent Developments in the Theory of
Hamiltonian Systems
Jurgen Moser
Eidgenössische Technische Hochschule
Switzerland

11:30 AM Lunch

TUESDAY PM, JULY 17

1:00 PM Minisymposia
(Concurrent Sessions)

5. Recent Advances in the Analysis of
Multiphase Flow
Chairman and Organizer
Russell E. Caflisch
Courant Institute of Mathematical Sciences
New York University

6. Perturbation Methods for Partial Differen-
tial Equations
Chairman and Organizer
Jirair Keyorkian
University of Washington

7. Numerical Computation in Shock Wave
Theory — New Developments and
Applications
Chairman and Organizer
Marshall Stenrod
Rensselaer Polytechnic Institute

8. Matrix Methods for Queuing Models
Chairman and Organizer
William J. Stewart
North Carolina State University, Raleigh

3:00 PM Coffee

3:30 PM Contributed Papers
(Concurrent Sessions)

8. Solid Mechanics. I
9. Optimization and Control

10. Numerical Solution of Ordinary Differen-
tial Equations. II

11. Numerical Linear Algebra. II
12. Numerical Solution of Partial Differential
Equations. II
13. Computer-Aided Design. II: Analysis
Techniques and Surfaces

3:30 PM Poster Presentations
Session II: Numerical
Linear Algebra

8:00 PM Wine and Cheese Party

WEDNESDAY AM, JULY 18

8:30 AM Invited Presentation. 6
Convergence Properties of Algorithms for
Nonlinear Optimization
M. J. D. Powell
University of Cambridge
England

9:15 AM Invited Presentation. 7
Current Developments in Computational
Statistics
Daryl Pregibon
AT&T Bell Laboratories
Murray Hill

10:00 AM Coffee

10:30 AM SLAM Business Meeting

11:30 AM Lunch

WEDNESDAY PM, JULY 18

1:00 PM Minisymposia
(Concurrent Sessions)

9. Applications of Reaction-Diffusion Systems
Chairman and Organizer
Patrick S. Hagan
Exxon Research and Engineering Company
Annandale, New Jersey

10. Saint-Venant's Principle and Boundary
Layer Phenomena in Elasticity

PROGRAM-AT-A-GLANCE

Chairmen and Organizers

Cornelius O. Horgan
Michigan State University
East Lansing

F. Y. M. Wan
University of Washington
Seattle

11. Infalible Interval Methods in
Global Optimization, Numerical Analysis
and Computing
Chairman and Organizer
Ramon E. Moore
University of Texas, Arlington

12. Matrix Computations in Statistics
Chairman and Organizer
Robert C. Ward
Oak Ridge National Laboratory

3:00 PM Recess

5:30 PM Tillicum Island Cruise and
Northwest Pacific Salmon
Bake

THURSDAY AM, JULY 19

8:30 AM Invited Presentation. 8

Computer Modeling of Solids
John W. Boyse
Computer Science Department
General Motors Research Laboratories

9:15 AM Invited Presentation. 9

The Impact of Microprocessors on
Numerical Computation
W. Morven Gentleman
National Research Council
Ottawa

10:00 AM Coffee

10:30 AM Invited Presentation. 10
The Theodore von
Kármán Prize

"Final" Transonic Flow
Julian D. Cole
Department of Mathematical Sciences
Rensselaer Polytechnic Institute

11:30 AM Lunch

THURSDAY PM, JULY 19

1:00 PM Minisymposia
(Concurrent Sessions)

13. Constructive and Computational Geometry
Chairman and Organizer
David R. Ferguson
Boeing Computer Services
Tukwila, Washington

14. Computational Results on the Interaction
of Solitary Waves
Chairmen and Organizers
George J. Majda and Chau-Hsing Su
Division of Applied Mathematics
Brown University

15. Modern Nonlinear Dynamics and the
Nature and Treatment of Chaos in Real
Systems
Chairman and Organizer
Alan C. Newell
Program in Applied Mathematics
University of Arizona

16. Mathematics Education in Transition
Chairman and Organizer
Robert M. Thrall
Department of Mathematical Sciences
Rice University

3:00 PM Coffee

3:30 PM Contributed Papers
(Concurrent Sessions)

14. Numerical Solution of Partial Differential
Equations. III
15. Computer-Aided Design. III: Construction
Techniques for Surfaces
16. Solid Mechanics. II

17. Fluid Mechanics. I
18. Ordinary Differential Equations
19. Bifurcation, Turning Point and Singular
Perturbation Problems
20. Matrix Theory

3:30 PM Poster Presentations
Session III: Numerical
Analysis

FRIDAY AM, JULY 20

8:30 AM Invited Presentation. 11
Advances in Supercomputers and Their
Impact on Problem Formulation and
Programming
Bill L. Buzbee
Los Alamos National Laboratory

9:15 AM Invited Presentation. 12
Mathematical Aspects of Robotics
Jacob T. Schwartz
Courant Institute of Mathematical Sciences
New York University

10:00 AM Coffee

10:30 AM Industry Forum. 1
Applied Mathematics in
Local Industry

Film Series. 1
Mathematics at Work in
Society

10:30 AM Contributed Papers
(Concurrent Sessions)

21. Numerical Solution of Partial Differential
Equations. IV
22. Computer-Aided Design. IV: Robotics
23. Fluid Mechanics. II
24. Applied Analysis
25. Parallel Numerical Algorithms
26. Electromagnetics, Magnetohydrodynamics
and Plasma Physics

FRIDAY PM, JULY 20

12:15 PM Lunch

1:30 PM Minisymposia
(Concurrent Sessions)

17. Applications of Exact Computation in
Linear Algebra
Chairman and Organizer
Robert Todd Gregory
Department of Computer Science and
Mathematics
University of Tennessee, Knoxville

18. Problem Solving — Math with a Purpose

Chairman and Organizer
Herbert J. Greenberg
University of Denver and
Chairman, SIAM Subcommittee on
Pre-College Math Education

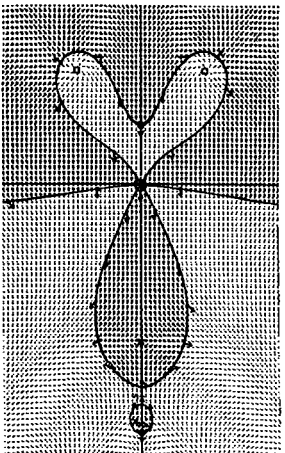
19. Applications of Supercomputers
Chairman and Organizer
Kenneth W. Neves
Boeing Computer Services
Seattle

20. Computational Implementation of the
Elementary Function — Recent Develop-
ments
Chairman and Organizer
Fred G. Gustavson
IBM Thomas J. Watson Research Center

3:30 PM Industry Forum. 2
Applied Mathematics in
Local Industry

Film Series. 2
Mathematics at Work in
Society

Repeat of morning sessions



MINISYMPOSIUM

Monday, July 16, 1:00 - 3:00 PM
Minisymposium 1

The Use of High Order Elements in the Numerical Solution of Partial Differential Equations

In two approaches (the p and h - p versions of the finite element method, and the spectral method) to the numerical solution of partial differential equations, the use of high order polynomials has recently become the subject of intensive study both in practical computations and in theory. In the p -version, the partition of the domain into elements is fixed and accuracy is achieved by increasing the degree p of the elements. This is in contrast to the conventional h -version where the degree p is fixed and accuracy is achieved by refining the partition. The h - p version simultaneously increases the degree of the elements and changes the partition.

In the spectral method interpolating polynomials (instead of local basis functions) approximate space derivatives in transient problems, and a collocation procedure is applied. High order polynomials have been found to yield excellent results especially for compressible fluid flow.

The papers presented here discuss the theoretical and practical aspects of the current state-of-the-art in these two basic approaches.

Chairman and Organizer

I. Noriman Katz
Department of Systems Science and Mathematics
Washington University

The H-P Version of the Finite Element Method

I. Babuška, W. Gu, and B. Guo
Institute for Physical Science and Technology
University of Maryland
B. Szabo and K. Izadpanah
Department of Civil Engineering
Washington University

A Pseudospectral Legendre Method for Hyperbolic Equations

David Gottlieb and Hillel Tal-Ezer
School of Mathematical Sciences
Tel Aviv University, Israel

Approximation Theory for the p -Version of the Finite Element Method and Its Implications for the Solution of Elliptic Problems on Polygonal and Polyhedral Domains

Milo R. Dorr
Mathematics and Statistics Division
Lawrence Livermore National Laboratory
Robustness of Higher Order Elements for Boundary Value Problems with Multiplier Constraints
Michael Vogelius
Institute for Physical Science and Technology
and Department of Mathematics
University of Maryland

Monday, July 16, 1:00 - 3:00 PM
Minisymposium 2

Advances in Direct Methods for Solving Sparse Linear Algebraic Equations

The standard problem of solving sparse linear algebraic equations has been extensively treated in recent years. But, there is also the continuing evolution and development of new familiar methods, resulting from extensions to new applications. The speakers will discuss some new developments in direct methods for solving sparse linear algebraic problems.

Chairman and Organizer

John G. Lewis
Boeing Computer Services
Seattle

Solution of Sparse Underdetermined Systems of Linear Equations

Michael T. Heath
Oak Ridge National Laboratory
J. Alan George and Esmond G. Y. Ng
Department of Computer Science
University of Waterloo

To be presented by Michael T. Heath

Predicting Fill-in in Sparse Gaussian Elimination with Partial Ordering

J. Alan George and Esmond G. Y. Ng
Department of Computer Science
University of Waterloo

Rules for Direct Methods in Reservoir Simulation

Andrew H. Sherman
J. S. Nolan & Associates
Houston

A Nested Dissection Frontal Method for Very Large Systems of Linear Equations

To be presented by Chairman.

Monday, July 16, 1:00 - 3:00 PM
Minisymposium 3

Mathematical Problems in Nonlinear Viscoplastic Solids and Fluids

The mechanical properties of viscoplastic materials are of fundamental importance in a wide variety of real world problems that continue to pose new and challenging questions for interdisciplinary research involving rheologists, mechanicians, and mathematicians. The speakers will examine a diversity of views on constitutive theories, mathematical modeling, analytical and numerical methods, and comparisons between theory and experiment.

Chairman and Organizer

John A. Nohel
Mathematics Research Center
University of Wisconsin, Madison

Global Existence and Asymptotics in One-Dimensional Nonlinear Viscoplastic Solids of the Boltzmann Type

William J. Hrusa
Carnegie-Mellon University and
Mathematics Research Center,
University of Wisconsin, Madison

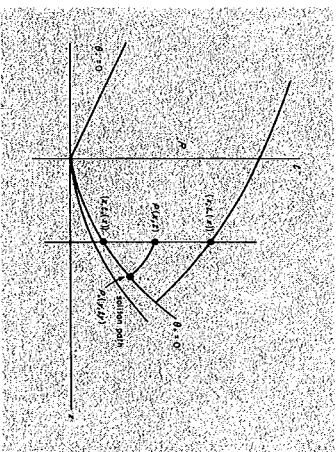
Development of singularities for Smooth Solutions of Nonlinear Conservation Laws with Memory

To be presented by Chairman
Finite Element Computation of Steady Plane Flow Solutions for Fluids with Memory

David S. Malkus
Illinois Institute of Technology and
Mathematics Research Center and
Department of Engineering Mechanics
University of Wisconsin, Madison

Hyperbolicity and Change of Type in the Flow of Viscoplastic Fluids

Daniel D. Joseph
Department of Aerospace Engineering
and Mechanics
University of Minnesota



Monday, July 16, 1:00 - 3:00 PM
Minisymposium 4

Mathematical Developments in Ship Hydrodynamics

Problems related to ship hydrodynamics have historically provided very important stimulation of applied mathematical developments in the past. Here are four talks on a variety of current subjects in hydrodynamics, chosen to demonstrate a range of mathematical techniques. The speakers will provide a view of engineering problems of great technological importance and high complexity for which mathematical treatment has proven effective and important — damage and noise due to cavitation bubbles, ship waves, ship and platform motions in a seaway, supercavitating propeller and hydrofoil flows.

Chairman and Organizer

Marshall P. Tulin
Department of Mechanical and
Environmental Engineering
University of California, Santa Barbara

Collapsing Cavities, Cloud Cavitation, and Asymptotic Matching Methods

George L. Chahine
Fluid Mechanics and
Materials Science Division
TACOR Hydroautics
Laurel, Maryland

The Critical Speed in Restricted Channels — Nonlinearities and Solitons

Susan Cole
Department of Mathematics
Pomona College, Claremont

Free Surface Problems and Analytic Function Methods

To be presented by Chairman
Mathematical Methods and Ship Motions
Paul D. Sclavounos
Department of Ocean Engineering
Massachusetts Institute of Technology

Tuesday, July 17, 1:00 - 3:00 PM
Minisymposium 5

Recent Advances in the Analysis of Multiphase Flow

Fluid flows with more than one component occur in a variety of natural and engineering phenomena. Some examples are bubbly liquids, suspensions of solid particles in fluid, fluids in porous media, mixtures of fluids, and granular flows. Many of the resulting mathematical questions are quite difficult, but important results have been obtained for problems such as averaging methods, boundary conditions, stability and well-posedness, and analytic and numerical solutions. These problems need more attention from the applied mathematics community.

Chairman and Organizer

Russel E. Caflisch
Courant Institute of Mathematical Sciences
New York University

Two-Phase-Flow — Microscopics and Mesoscopics

Donald A. Drew
Department of Mathematical Sciences
Rensselaer Polytechnic Institute

Centrifugal Separation of Mixtures

Harvey P. Greenspan
Department of Mathematics
Massachusetts Institute of Technology

Wave Propagation in Bubbly Liquids

George C. Papanicolaou
Courant Institute of Mathematical Sciences
New York University

Modelling of Two-Phase Flow in the Analysis of Nuclear Safety Problems

Milton S. Plesset
Engineering Science Department
California Institute of Technology and
School of Engineering and Applied Science
University of California, Los Angeles
Ivan Caton
School of Engineering and Applied Science
University of California, Los Angeles

Tuesday, July 17, 1:00 - 3:00 PM
Minisymposium 6

Perturbation Methods for Partial Differential Equations

A minisymposium on several areas of ongoing research on applying perturbation techniques in partial differential equation problems. Topics to be discussed include nonlinear wave and diffusion problems; the techniques combine various aspects of matched asymptotic expansion, multiple scale methods as well as classical asymptotics.

Chairman and Organizer
Jirar Kevorkian
Applied Mathematics Program
University of Washington

The Asymptotic Evaluation of Short Wavelength Reflection Coefficients

William L. Kah
Applied Mathematics Department
California Institute of Technology
Application of Singular Perturbation Methods to Nonlinear Diffusion Problems
Charles G. Lange
Department of Mathematics
University of California, Los Angeles

Nonlinear Cusped Caustics for Dispersive Waves

Richard Haberman and Ren-ji Sun
Department of Mathematics
Southern Methodist University

To be presented by Richard Haberman
Wave Propagation in the Cochlea
Mark H. Holmes and Julian D. Cole
Department of Mathematical Sciences
Rensselaer Polytechnic Institute
To be presented by Mark H. Holmes

Tuesday, July 17, 1:00 - 3:00 PM
Minisymposium 7

Numerical Computation in Shock Wave Theory — New Developments and Applications

In recent years, there has been a renaissance in the theory of shock waves and related numerical computation. Since the early days at Los Alamos, the

theory of shock waves has been developed along with new computational methods and new physical problems. The new developments have had a large impact on combustion theory, phase transitions, and multidimensional shock wave problems.

Chairman and Organizer
Marshall Stenrood
Department of Mathematical Sciences
Rensselaer Polytechnic Institute
Shock Wave Diffraction — Numerical Results
Harland M. Glaz
Naval Surface Weapons Center
White Oak, Maryland

Adaptive Finite Element Methods for Shock Problems in Solids

Joseph E. Flaherty
Department of Mathematical Sciences
Rensselaer Polytechnic Institute

Rarefaction Shocks in Reacting Gases

Ashwani K. Kapila
Department of Mathematical Sciences
Rensselaer Polytechnic Institute

Anomalous Shock Problems in Mechanics

To be presented by Chairman

Tuesday, July 17, 1:00 - 3:00 PM
Minisymposium 8

Matrix Methods for Queueing Models

For many years, queueing models have been used to analyze a large variety of complex systems; their use is continuing to grow. The speakers will consider the extent to which matrix methods can be applied to such models, and in particular how the stationary behavior of queueing models can be captured from the left eigenvector corresponding to the dominant eigenvalue of the model's underlying transition matrix. Consideration will be given to stability and to the importance of the ordering imposed on the equations. Different approaches to obtaining the stationary probability vector will be examined.

Chairman and Organizer
William J. Stewart
Department of Computer Science
North Carolina State University, Raleigh
Updating LU Factorizations for Computing Stationary Distributions

R. E. Fundellic
Oak Ridge National Laboratory
R. J. Plemmons
Department of Mathematics
and Computer Science
North Carolina State University, Raleigh
To be presented by R. E. Fundellic

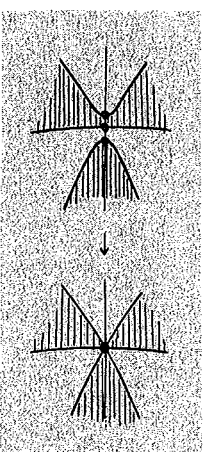
An Introduction to Queueing Network Modelling
To be presented by Chairman

Numerical Methods for Computing Steady-State Distributions

Linda Kaufman
AT&T Bell Laboratories
Murray Hill

Differentiation of the Stationary Probabilities in a Finite Ergodic Markov Chain

G. H. Golub
Computer Science Department
Stanford University
C. D. Meyer
Department of Mathematics
North Carolina State University, Raleigh



Wednesday, July 18, 1:00 - 3:00 PM
Minisymposium 9

Applications of Reaction-Diffusion Systems

A wide variety of physical systems are governed by reaction-diffusion equations. Analysis of the underlying reaction-diffusion equations often shows that the physical system supports a rich structure of solutions. The speakers will describe some current investigations of reaction-diffusion equations that arise in four different physical fields — metallurgy, combustion, biology-ecology, and polymer sorption.

Chairman and Organizer
Patrick S. Hagan
Exxon Research and Engineering Company
Corporate Research Science Laboratories
Annandale, New Jersey

The Transition from Internal to External Oxidation in Binary Alloys
To be presented by Chairman

Cascading Bifurcation to Pulsating Cellular Flame Fronts
Thomas Erneux and Bernard J. Matkowsky
Departments of Engineering Sciences
and Applied Mathematics
The Technological Institute
Northwestern University

A Nonlinear Model for Waves of Spreading Cortical Depression

Robert M. Miura
Department of Mathematics
and Pharmacology and Therapeutics
University of British Columbia, Vancouver
Nonlinear Diffusion Problems in Polymer Chemistry

Donald S. Cohen
Applied Mathematics Department
California Institute of Technology

Wednesday, July 18, 1:00 - 3:00 PM
Minisymposium 10

Saint-Venant's Principle and Boundary Layer Phenomena in Elasticity

Saint-Venant's Principle was first introduced in the context of linear elasticity theory to justify consideration of global boundary conditions rather than pointwise prescription of boundary data. The principle is concerned with the resulting boundary layer phenomena involved in such approximations. It has several far-reaching consequences in elasticity theory itself, as well as in applications to theories for rods, plates and shells.

Similar issues arise for linear and nonlinear elliptic partial differential equations. Considerable progress has occurred in recent years in the analysis of such issues using qualitative methods from the theory of partial differential equations. The lectures in this minisymposium will review these developments and describe new applications in plate and shell theories.

Chairman and Organizers
Cornelius O. Horgan
Department of Metallurgy, Mechanics and Materials Science
Michigan State University
F. Y. M. Wan
Applied Mathematics Program
University of Washington

Saint-Venant's Principle and Asymptotic Behavior — An Overview
To be presented by Cornelius O. Horgan
Boundary Conditions for Plate Theories and Saint Venant's Principle

R. D. Gregory
Department of Mathematics
University of Manchester
England
F. Y. M. Wan
Applied Mathematics Program
University of Washington
To be presented by R. D. Gregory

Decay Estimates of Saint Venant Type for Quasilinear Equations in Two and Three Dimensions

Lawrence E. Payne
Department of Mathematics
Cornell University

MINISYMPOSIUM cont'd

Wednesday, July 18, 1:00 - 3:00 PM
Minisymposium 11

Infallible Interval Methods in Global Optimization, Numerical Analysis, and Computing

Four speakers from the North, South, East, and West will discuss recent developments in reliable (in fact, infallible) computational mathematics. Areas covered will include global optimization, integral equations, numerical linear algebra, and mathematical software.

Chairman and Organizer

Ramon E. Moore

Mathematics Department

University of Texas, Arlington

Constrained Global Optimization

Eldon Hansen

Lockheed Missiles & Space Co., Inc.

Sunnyvale

Applications of Interval Integration

Louis B. Rall

Mathematics Research Center

University of Wisconsin, Madison

New Mathematical Software for Reliable Scientific Computing

To be presented by Chairman

Least-Squares Estimates

David M. Gay

AT&T Bell Laboratories

Murray Hill

AT&T Bell Laboratories

Murray Hill

AT&T Bell Laboratories

Murray Hill

AT&T Bell Laboratories

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Murray Hill

Roy E. Weisich
 Sloan School of Management
 Massachusetts Institute of Technology

Symbolic Givens Reduction in Large Sparse Least Squares Problems

George Ostrouchov

Engineering Physics and Mathematics Division

Oak Ridge National Laboratory

Jackknife and Bootstrap Methods for Concurrent Computing

Virginia Klema

Statistics Center

Massachusetts Institute of Technology

The Grand Tour — A Method for Exploratory Data Analysis

Andreas Buja

Department of Statistics

University of Washington

Daniel Asimov

Mathematics Department

University of California, Berkeley

Thursdays, July 19, 1:00 - 3:00 PM

Minisymposium 13

Constructive and Computational Geometry

Curves and surfaces play a key role in the CAD/CAM process. Two important aspects are: the construction and the extraction of information from these objects. This symposium will attempt to highlight various areas where problems exist. There will be a discussion of qualitative ideas for constructing a "nice" curve or surface. Tensor product splines are sometimes inadequate as a surface model and more general models such as bivariate splines may be needed. There will be a talk on the elementary properties of general bivariate splines. The question of extraction of information will be discussed in terms of using algebraic geometry techniques to obtain this information. Finally, there will be a talk dealing with some of the problems that industrial users constantly come up against and that need resolution.

Chairman and Organizer

David Ferguson

Computer Services

Tukwila, Washington

Shape Control for Curves and Surfaces

To be presented by Chairman

Some Algebraic Geometry Techniques Applied to CAD/CAM Related Problems

Miriam L. Lucian

Boeing Commercial Airplane Company

Seattle

Bivariate Splines — Theory and Techniques

C. K. Chui

Department of Mathematics

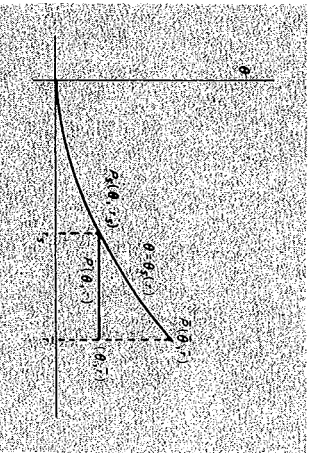
Texas A&M University

Paper title to be announced

Mike Demcan

Lockheed Corporation

Seattle



Thursdays, July 19, 1:00 - 3:00 PM

Minisymposium 14

Computational Results on the Interaction of Solitary Waves

The combination of singular perturbation methods and computer calculations shows that in an overtaking collision of two solitary waves, the waves come out intact even in higher order approximation than KDV. This differs from the situation of a head-on collision that is always accompanied by secondary wave trains.

Computational results will be presented for (1) generation of solitons by a moving boundary, their propagation and mutual interaction; (2) head-on collisions between solitary waves in a stratified liquid; (3) interaction of solitary waves in a two-dimensional rotating channel; and (4) overtaking collision of two solitary waves based on the water wave equation.

Chairman and Organizers

George J. Maeda and Chau-Hsing Su

Division of Applied Mathematics

Brown University

Solitons Induced by Boundary Conditions

C. K. Chu

Department of Applied Mathematics

Columbia University

A Series Expansion for the Solitary Wave

Stephen A. Penell

Department of Mathematics

University of Lowell

Head-on Collisions of Internal Solitary Waves by Symbolic Computer Package

Rida M. Mifre

Department of Mathematical Sciences

University of Petroleum and Minerals

Dhahran, Saudi Arabia

Overtaking Collisions of Two Solitary Waves

To be presented by Chau-Hsing Su

The Interaction of Solitary Waves in a Rotating Channel

J. D. Fenton

Max Planck Institut für Meteorologie

Germany

Thursdays, July 19, 1:00 - 3:00 PM

Minisymposium 15

Modern Nonlinear Dynamics and the Nature and Treatment of Chaos in Real Systems

During the past decade, there have been significant advances in both theory and experiment relating to turbulence. The major new theoretical idea has been the strange attractor, which can account for chaotic behavior in systems in relatively few degrees of freedom. The major experimental breakthroughs are due to extremely careful control of external conditions over long periods of time and to the accuracy of laser Doppler measurement. The speakers will explore the status of these new ideas in several physical and engineering contexts.

Chairman and Organizer

Alan C. Newell

Program in Applied Mathematics

University of Arizona

Noise and Chaos in Hydrodynamics

P. C. Hohenberg

AT&T Bell Laboratories

Murray Hill

Dynamical Systems and Information Theory

Roy L. Adler

IBM Thomas J. Watson Research Center

Yorktown Heights

Nonlinear Resonance and Chaotic Motion in Impact Print Hammers

Ferdinand Hendiks

IBM Thomas J. Watson Research Center

Yorktown Heights

Solitary Waves and Fixed Points and Chaotic Reactors in Nonlinear Optics

To be presented by Chairman

Thursday, July 19, 1:00 - 3:00 PM
 Minisymposium 16
*Sponsored by the SIAM Committee on
 Mathematics Education*

Mathematics Education in Transition

Although the number of math majors has been decreasing, the number of computer science majors is growing rapidly. More and more math departments are increasing the time they spend on remedial instruction and service teaching for other departments, especially computer science. Some departments are modifying their programs to reverse this trend. Some feel that computing needs to be integrated into the math program and that useful math must be taught. In all cases, the programs need to be designed with a better understanding of career goals.

Chairman and Organizer

Robert M. Thrall
 Department of Mathematical Sciences
 Rice University

Integrating the Computer with Math Education at a Large State University

Ramesh A. Gangoli
 Department of Mathematics
 University of Washington

PANEL PRESENTATIONS

Involving Industry in the Master's Program

Donald A. Drew
 Department of Mathematical Sciences
 Rennecker Polytechnic Institute

Using the Local Environment to Create an Applied Orientation in the Math Program

Charles M. Biles
 Department of Mathematics
 Humboldt State University

The Master's in Math Sciences — Is It Viable?

Clayton V. Aucoin
 Department of Mathematical Sciences
 Clemson University

The "SOO" Program — A Decade Later

James A. Cochran
 Department of Mathematics and Computer Sciences
 Washington State University

Friday, July 20, 1:30 - 3:30 PM
 Minisymposium 17
*Sponsored by the SIAM Activity Group on
 Linear Algebra*

Applications of Exact Computation in Linear Algebra

Exact computations in linear algebra are used in algebraic coding theory, in computational group and ring theory, and more recently in public key cryptography. Such computations play a role in traditionally continuous mathematics including, for example, the fast Fourier transform and the

generation of pseudo-random numbers for numerical integration. The speakers will consider algorithms for solving several of the basic problems in such exact computations — arithmetic in finite fields, polynomial matrix computations, and exact solution of linear equations with polynomial coefficients.

Chairman and Organizer

Robert Todd Gregory
 Department of Computer Science
 and Mathematics
 University of Tennessee, Knoxville

A Finite Number System for Exact Computation with Rational Operands

To be presented by Chairman

Exact Computation and ILIAC4

Morris Newman
 Department of Mathematics
 University of California, Santa Barbara

Hensel's Methods in Polynomial Matrix Computation

E. V. Krishnamurthy
 Department of Applied Mathematics
 India Institute of Science
 Bangalore

Exact Solution of Linear Systems of Equations with Univariate Polynomial Coefficients

Stanley Gabay
 Department of Computing Science
 The University of Alberta

Friday, July 20, 1:30 - 3:30 PM
 Minisymposium 18
*Sponsored by the SIAM Subcommittee on
 Pre-College Math Education*

Problem Solving — Math with a Purpose

Presentations and panel discussion about math education in the schools. Math for the non-college bound, math for the college-bound, math in the real world, the computer in the classroom, and problem solving are some of the topics to be addressed.

Chairman and Organizer

Herbert J. Greenberg
 Department of Mathematics
 University of Denver and Chairman,
 SIAM Subcommittee on Pre-College Math Education

Elden Egbers
 State Supervisor of Mathematical Programs
 State of Washington

Jack Beale

Department of Education
 University of Washington and
 President, Washington State Council

Thomas Sedgewick
 Lincoln High School
 Tacoma

Bill L. Buzbee
 Los Alamos National Laboratory

Friday, July 20, 1:30 - 3:30 PM
 Minisymposium 19

Applications of Supercomputers

The supercomputers of today and tomorrow are employing parallelism in their architecture to achieve computational speed improvements. These designs use pipelining and true parallelism. Such architectural features pose new constraints on numerical algorithms and scientific software. As more and more industries move toward vector and parallel machines, the potential to "compute" what was formerly not feasible, is being realized. The speakers in this session reflect the experience of those industries and agencies that have had some time to explore the power of supercomputing and wrestle with the peculiarities of vector processing.

Chairman and Organizer

Kenneth W. Neves
 Boeing Computer Services
 Seattle

Supercomputing in Aerodynamic Analysis

Paul Rubbert
 Boeing Commercial Airplane Company
 Seattle

Supercomputing in Reservoir Simulation — Current Status and Future Needs

B. T. Woo
 Chevron Oil Fields Research Company
 La Habra

Numerical Simulation of Stochastic Processes on Vector Computers

Leslie Peterson
 AT&T Bell Laboratories
 Murray Hill

Algorithms on Vector Computers

Jack J. Dongarra
 Applied Mathematics Division
 Argonne National Laboratories

Friday, July 20, 1:30 — 3:30 PM
 Minisymposium 20

Computational Implementation of the Elementary Function — Recent Developments

The advent of micro, mini, large-scale supercomputers and the proposed IEEE standard for floating-point has generated new interest in the computation of elementary functions. Accuracy, execution speed, storage and transportability all influence elementary function software. The history of such software and how these constraints are modified in the new environment is the subject of the first talk.

The second talk focuses on what one calls the "integrity" of elementary function subroutines which will be illustrated by a new measurement tool called the ULP plot package. Both scalar and vector algorithms will be covered.

A new class of elementary function algorithms which provide correctly rounded results between 95 and 100% of the time, and in all cases with error no worse than the last bit, is the subject of the third talk. These algorithms were tested on a variety of 370 machines and were found to run faster than existing routines, sometimes by a factor of two.

The last talk will include several detailed examples on how the producers of numerical software might enhance their programs for elementary transcendental functions using the IEEE standard.

Chairman and Organizer

Fred G. Gustavson
 IBM Thomas J. Watson Research Center
 Yorktown Heights

Software for the Elementary Functions: History and Philosophy

W. J. Cody
 Mathematics and Computer Science Division
 Argonne National Laboratory

A New Look at Software for Computing Elementary Mathematical Functions

Cleve Moler
 Department of Computer Science
 University of New Mexico, Albuquerque

Fast Elementary Function Algorithms for 370 Machines: Accurate to the Last Bit and Correctly Rounded 95 - 100% of the Time

To be presented by Chairman

Elementary Transcendental Functions to go with the IEEE Standard Arithmetic

W. M. Kahan
 Department of Electrical Engineering
 and Computer Science
 University of California at Berkeley

CONTRIBUTED PAPERS

Monday, July 16, 3:30 PM
Contributed Papers. 1

Partial Differential Equations

Identification of Discontinuous Coefficients in Parabolic and Hyperbolic Distributed Systems
Patricia Daniel Lamm and Katherine A. Murphy, Southern Methodist University

Diffusion Approximation of the Time-Dependent Transport Equation
Akira Ishimaru, University of Washington

On the Instability of the Flow in a Squeeze Lubrication Film

J. T. Stuart, Imperial College, London; R. C. DiPrima, Rensselaer Polytechnic Institute; P. M. Eagles, City University, London

Subharmonic Solidification Fronts

Gregory A. Kriegerman and Edward L. Reiss, Northwestern University; Alex C. Warn-Varnas, Naval Ocean Research and Development Activity Bay, St. Louis

Moving Grid Methods for Hyperbolic Conservation Laws

Bradley Loefer, Purdue University

Symmetry Solutions to the Vector Helmholtz Equation

Craig Lindberg, Institute of Geophysics and Planetary Physics, University of California, San Diego; R. Kipper-Wyss, Kirkland, Washington

Solution of Nonlinear Systems

G. Adomian, University of Georgia

Finite Elements in ϵ^* Lattice Problems
Peter Nwoye O. Mbaeyi, University of Tuebingen, West Germany

Diffusion Models in Atomic Spectroscopy
S. L. Pavent-Fonana, Istituto Universitario Navale, Italy

Monday, July 16, 3:30 PM

Contributed Papers. 2

Numerical Solution of Ordinary Differential Equations. I

On Some Computational Methods for the Solution of Differential Equations for the Renal Concentrating Mechanism
Reginald P. Tewarson, Maria Garcia, and Yin Zhang, State University of New York at Stony Brook; John L. Stephenson, Cornell Medical School, New York

Symmetric Difference Schemes for Singularly Perturbed Boundary Value Ordinary Differential Equations

Uri M. Ascher, University of British Columbia, Canada

Uniformly High Order Methods for Singularly Perturbed Two-Point Boundary Value Problems
Eugene C. Gartland, Jr., Southern Methodist University

Numerical Methods for Stiff Boundary Problems for Ordinary Differential Equations with Turning Points
David L. Brown and H. O. Kreiss, California Institute of Technology

Difference Methods for Problems with Different Time Scales

Robert E. Schied, Jr., California Institute of Technology

Asymptotic Expansion of the Global Error for the Box Scheme in Case of a Singularity Perturbed Model Problem

M. van Veldhuizen, Free University, The Netherlands

An Adaptive Boundary Value Runge-Kutta Solver for First Order Boundary Value Problems
Suchitra Gupta, Pennsylvania State University

Modified Deflation Algorithm for the Multiple Roots of Nonlinear Multipoint Boundary Value Problems

Takao Ojika, Osaka Kyoiku University, Japan

Pseudolinear Equations, Successive

Approximations and a posteriori Error Bounds for Two-Point Boundary Value Problems
John E. Lavery, Case Western Reserve University

Monday, July 16, 3:30 PM

Contributed Papers. 3

Stochastic Processes and Statistics

An Uniqueness Theorem in the Markovian Decision Processes
Chau Song Ou, St. John's University, New York

Analysis of Uncertainty and Extreme Values in Physical Phenomena
C. S. Hirtzel, Rensselaer Polytechnic Institute

Response-Time Distribution for a

Processor-Sharing System
John A. Morrison, AT&T Bell Laboratories, Murray Hill

Variables Continuous Sampling

Dan Kenneth Fitzsimmons, Boeing/Aerospace Company

Real Time Model Selection and Estimation for Signal Processing

Dennis D. Cox, University of Wisconsin, Madison; John E. Ehrenberg, Seattle

Extrapolations for Successive Approximations in Markov Decision Processes

Jeffrey L. Popzyak, Drexel University

Diffusion Approximations for Markov Jump Processes Scaled by Large System Sizes

James R. Brannan, Clemson University

Detection and Identification of Topology Errors in Measured Electric Networks
Kevin A. Clements and Paul W. Davis, Worcester Polytechnic Institute

On the Weighted Least Square for Forecasting
Chau Song Ou, St. John's University, New York

Monday, July 16, 3:30 PM

Contributed Papers. 4

Shock Waves

A Comparison of Numerical and Perturbation Solutions of Shock Wave Propagation in an Inhomogeneous Fluid
Eric N. Fenn and John B. Bdzil, Los Alamos National Laboratory

Slowly Varying Solitary Wave Tails, Focusing

Cusped Caustics, Wave Number Shocks and Birth of Tails
Richard Haberman and Darrell Allgaier, Southern Methodist University

Asymptotics of Propagating Front Formation in Diffusion Kinetics
Isaak Rubinstein, Weizmann Institute of Science, Israel

Nonlinear Waves in Pellet Fusion
Vincent Ervin and William F. Ames, Georgia Institute of Technology

Shock Wave Structure in Gas Mixtures with

Disparate Masses
Juan Fernandez De La Mora, Yale University

A Fluid System and Evolution Equation Exhibiting Interfacial Waves and Wave Breaking
Fred J. Hickernell, University of Southern California

Strong Shock Wave Generation in a Confined Gas Due to Rapid Heat Addition at the Boundary
J. F. Clarke, Cranfield Institute of Technology, England; N. Riley, University of East Anglia, England; D. R. Kassoy, University of Colorado, Boulder

Shock Propagation in a Euler Fluid with a Periodic Initial Density
John B. Bdzil and Eric N. Fenn, Los Alamos National Laboratory

Monday, July 16, 3:30 PM

Contributed Papers. 5

Numerical Linear Algebra. I

A Conjugate Gradient Type Method for Sparse Unsymmetric Linear Equations

Elizabeth L. Yip and Horst Simon, Boeing Computer Services, Tukwila, Washington; Michael Saunders, Stanford University

A Preconditioned Conjugate Gradient Type Method Applied to the Full Potential Equation
Elizabeth L. Yip, Boeing Computer Services, Tukwila, Washington

A Multigrid-Type Method Suitable for Multiprocessors
Anne Greenbaum, Lawrence Livermore National Laboratory

Relaxation Schemes for Spectral Multigrid Methods
M. Y. Hussaini, T. N. Phillips and T. A. Zang, NASA Langley Research Center

Theoretical and Experimental Aspects of a Highly Compact High Order Multigrid Method
Arthur S. Shieh, EG&G Idaho, Inc., Idaho Falls

Estimates of the Convergence Rate for a Class of Multigrid Iterations in Variational Problems
Jean-François Maure and François Musy, Ecole Centrale De Lyon, France

Out-of-Core Solution of Symmetric Linear Equations Based on Quotient Tree Orderings
Roger G. Grimes and John G. Lewis, Boeing Computer Services, Tukwila, Washington

Monday, July 16, 3:30 PM

Contributed Papers. 6

Numerical Solution of Partial Differential Equations. I

A Finite Elements Method for 3-D Potential Problems
Vigal Gur, Diconix, A Kodak Company, Dayton

Preconditioned Iterative Methods for Non-Self-Adjoint or Indefinite Elliptic Boundary Value Problems
James H. Bramble, Cornell University; Joseph E. Pasciak, Brookhaven National Laboratory

A Boundary Integral Numerical Scheme for Maxwell's Equations with Coupled Interfaces
Kirk E. Jordan and Ping Sheng, Exxon Research and Engineering Company; Gerard R. Richter, Rutgers University

On the Use of Contraction Mappings in Boundary Integral Equation Analysis
W. Scott Dunbar, Burnaby, Canada

On Stability of Factored Discretizations of the Laplacian for a Rectangular Mesh
Werner Liniger, IBM Research Center, Yorktown Heights, New York

Numerical Solutions for Inverse Problems
S. I. Hartharan, University of Tennessee, Knoxville

Finding the Location of the Moving Boundary Interface in the Neumann Problem
Robert S. Fisk, Colorado School of Mines

CONTRIBUTED PAPERS cont'd

Moving Finite Elements in 1-D
Richard F. Sincovec and Soheil Aslam, University of Colorado, Colorado Springs

Taylor Vortex Flows by Multigrid Methods
J. H. Bolstad and H. B. Keller, California Institute of Technology

Numerical Solution of Partial Differential Equations on Irregular Grids
C. David Levermore, Lawrence Livermore National Laboratory; Thomas A. Mantueff and Andrew B. White, Jr., Los Alamos National Laboratory

Tuesday, July 17, 3:30 PM
Contributed Papers, 13

Computer-Aided Design. II: Analysis Techniques for Surfaces

Algebraic Functions on Parametric Surfaces
Miriam L. Lucian and Robert W. Shannon, Boeing Commercial Airplane Company, Seattle

Implementation of a Divide-and-Conquer Method for Intersection of Parametric Surfaces
Elizabeth G. Houghton, Robert F. Emmett, James D. Factor and Chaman L. Sabharwal, McDonnell Douglas Automation Company, St. Louis

Closed-Form Intersections for Elementary Free-Form Surfaces
Dennis S. Aron, Purdue University; Thomas W. Seiderberg, Brigham Young University

On Intersecting Rays with Surfaces
Matthew Hackman, Boeing Military Airplane Company, Seattle

On the Definiteness Properties of Matrices of the Form $\|x_i - x_j\|^2$
L. P. Bos and K. Sakauskas, University of Calgary, Canada

Thursday, July 19, 3:30 PM
Contributed Papers, 14

Numerical Solution of Partial Differential Equations. III

Direct, Formal Integration of Simulated Airfoil Flows
Fred R. Payne, University of Texas at Arlington

Fourier Methods with Extended Stability Intervals for the Korteweg-de Vries Equation
Tony F. Chan and Tom Kerkhoven, Yale University

TVD Finite Difference Schemes and Artificial Viscosity
Stephen F. Davis, NASA Langley Research Center

On Comparison Between Numerical Schemes Which Are Based on the Inverse Scattering Transform and Other Known Numerical Schemes for Certain Nonlinear Evolution Equations
Thab R. Taha, University of Georgia; Mark J. Ablowitz, Clarkson College of Technology

An Unconditionally Stable Second Order Finite Difference Method for the Time Dependent Simulation of P-N Junction Devices
Christian A. Ringhofer, University of Wisconsin, Madison

Using Sparse Iterative Techniques in Method of Lines Partial Differential Equation Software
Gary K. Leaf and Michael Minkoff, Argonne National Laboratory

Stable Explicit Schemes for the Equation of the Schrödinger Type
Tony F. Chan and Shen Longjun, Yale University; Ding Lee, Naval Underwater Systems Center

A Numerical Method for Nonlinear Vibrations with Damping
W. Mark Courtney, Louisiana Tech University

Jacobian Construction for Implicit-in-Time Numerical Solution of Partial Differential Equations with Implicitly Defined Coefficients: Chemical-Flooding Case
Julio Cesar Diaz, Mobil Research & Development Corporation; Andreas Griewank, Southern Methodist University



Thursday, July 19, 3:30 PM
Contributed Papers, 15

Computer-Aided Design. III: Construction Techniques for Surfaces

BIMOND: A New Algorithm for Monotone Bivariate Interpolation
Frederick N. Fritsch and Ralph E. Carlson, Lawrence Livermore National Laboratory

Smooth Interpolation of Multidimensional Data
R. E. Barnhill and A. J. Worsey, University of Utah

An Algorithm for the Computation of Surfaces of Prescribed Mean Curvature
D. M. Anderson and L. E. Scriven, University of Minnesota

Triangular Extrapolation
Peter Alfeld, University of Utah

Adaptive Planar Mesh Generation Using the Delaunay Triangulation
William H. Frey and James C. Cavendish, General Motors Research Laboratories, Warren, Michigan

An Approach to Automatic Three-Dimensional Mesh Generation
James C. Cavendish, David A. Field and William H. Frey, General Motors Research Laboratories, Warren, Michigan

Thursday, July 19, 3:30 PM
Contributed Papers, 16

Solid Mechanics. II

Effect of Viscosity on Adiabatic Shear Instability
T. J. Burns, Sandia National Laboratories

Some Numerical Methods for Determining the Stability of Solutions to a Nonlinear Initial Value Problem
Deborah Frank Lockhart, Michigan Technological University

Probe Waveforms and the Experimental Determination of Elastic Green's Functions
Alfred S. Carriso and Nelson N. Hsu, National Bureau of Standards, Washington, DC

Mathematical Properties of a Class of Elastic Waves from a Null Frame-Frame Invariant Analysis
A. J. Fenemly, Teledyne Brown Engineering, Huntsville

Asymptotic Analysis of Elasto-Hydrodynamic Lubrication
Edward J. Bisset, General Motors Research Laboratories, Warren, Michigan

Asymptotic Analysis of a Propagating Phase Boundary in an Elastic Bar
Thomas J. Pence, University of Wisconsin, Madison

Diffraction of Elastic Waves in a Rigidly Clamped Wedge
Michael Papadopoulos, Eastern Washington University

The Reflection and Transmission of Waves at a Viscoclastic Interface
Michael J. Pound, Lawrence Livermore National Laboratory

Thursday, July 19, 3:30 PM
Contributed Papers, 17

Fluid Mechanics. I

Weakly Nonlinear Rossby Waves in a Rotating Spheroidal Shell
Steven D. London, University of Houston

Long Nonlinear Internal Waves in a Rotating Fluid
Roger Grimshaw, University of Melbourne, Australia

Application of Multiple-Scale Technique to Barotropic and Baroclinic Instability of a Current with Slow Zonal Variation
Melinda S. Peng and Roger T. Williams, Naval Postgraduate School

A Bifurcation Diagram for Axisymmetric Taylor Vortex Flows
Rita Meyer-Spasche, MPI für Plasmaphysik, West Germany; Herbert B. Keller, California Institute of Technology

Transient Multiple Vertical Wave Number Convective Instability — A Numerical Study
C. Quon, Bedford Institute of Oceanography, Canada

Far-Field Boundary Conditions for Incompressible Flow
John C. Strikwerda, University of Wisconsin, Madison

Burner Stabilized Flames in Fluids
Hans G. Kaper and Gary K. Leaf, Argonne National Laboratory; Mistic Mazon and Bernard J. Matkowsky, Northwestern University

Global Bounds for Solutions of the One-Dimensional System for a Viscous Reactive Gas
J. Bebernes, University of Colorado, Boulder; A. Bressan, University of Wisconsin, Madison

Thursday, July 19, 3:30 PM
Contributed Papers, 18

Ordinary Differential Equations

A New Theory for Multistep Discretizations of Stiff Ordinary Differential Equations
George Majda, Brown University

A Taylor Series Method for Singular Linear Systems
Stephen L. Campbell, North Carolina State University

Turning Point Behavior in Singularly Perturbed Nonlinear Systems
Mark Allen O'Donnell, Daniel H. Wagner Associates, Yorktown, Virginia

Dynamics of a Two-Parameter Family of Maps
Thomas D. Rogers and J. R. Ponder, University of Alberta, Canada

Periodic Solutions of Periodically Perturbed Non-Degenerate Systems
Alan R. Hausarth, Boise State University; Raul F. Manservich, Universidad de Chile

The Isospectral Classes of $u = \lambda \mu = 0$ on an Interval
Walter Frangier, DePaul University, Chicago

CONTRIBUTED PAPERS cont'd

Eigenvalues of Weakly Correlated Random Strain-Flow Problems
William E. Boyce, Rensselaer Polytechnic Institute; Ning-mao Xia, East China Institute of Chemical Technology, Peoples Republic of China

Passage Through Resonance in a Linear Mass-Spring System
R. C. Y. Chin and G. W. Hedstrom, Lawrence Livermore National Laboratory; F. A. Howes, University of California, Davis

Perturbation Solutions of Difference Equations
Ronald E. Mickens, Atlanta University

Thursday, July 19, 3:30 PM
Contributed Papers. 19

Bifurcation, Turning Point and Singular Perturbation Problems

The Role of the Tangent Map in Analyzing Bifurcation Behavior
James P. Fink and Werner C. Rheinboldt, University of Pittsburgh

Ignition of a Reactant by a Finite-Sized Hot Plug
Peter J. Tonello and Paul C. Fife, University of Arizona

The Eigenfunction Problem for Integral and Differential Operators in Higher Dimensions
Lawrence Storch, Rockefeller University; Bruce W. Knight, Brown University

Classification of Nonlinear Singular Boundary Value Problems
William L. Kath, California Institute of Technology

Domain Decomposition and Singularly Perturbed Convection-Diffusion Equations
R. C. Y. Chin, G. W. Hedstrom and G. H. Rodriguez, Lawrence Livermore National Laboratory; Edna E. Reiter, California State University, Hayward

Direct Method of Computing Non-Simple Turning Points
Zhong-Hua Yang and H. B. Keller, California Institute of Technology

A Trial Function Method for Solving Partial Differential Equations
Daniel Dicker, State University of New York, Stony Brook

Wilson Ripples Phenomenon with a Background Current
Yan-Chow Ma, TRW Space and Technology Group, Redondo Beach, California

Thursday, July 19, 3:30 PM
Contributed Papers. 20

Matrix Theory

A Simple Algorithm to Determine the Angle-Optimal Quaternion to Transform Sets of Vectors Between Two Coordinate Systems
John N. Johnson, Boeing Computer Services, Tukwila, Washington

Inverse Generalized Eigenvalue Problems in Control System Design
Jaroslav Kautsky, Flinders University, Australia; Nancy K. Nichols, University of Reading, Great Britain

Reconstruction of Periodic Jacobi Matrices From Spectral Data and Related Problems
Daniel Boley, University of Minnesota; Gene H. Golub, Stanford University

On the Eigenvalue Problem for a Class of Band Matrices Including Those with Toeplitz Inverse
William F. Trench, Drexel University

Upper Bounds on the Maximum Modulus of Subdominant Eigenvalues of Nonnegative Matrices
Urel G. Rothblum, Yale University; Choon Peng Tan, University of Malaya

Eigenvalues for Infinite Diagonally Dominant Tridiagonal Matrices
P. N. Shivakumar, University of Manitoba, Canada; N. Rudraiah, Bangalore University, India

Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers. 21

Numerical Solution of Partial Differential Equations. IV

Numerical Aspects of a Singularly Perturbed Parabolic Equation
R. C. Y. Chin and G. W. Hedstrom, Lawrence Livermore National Laboratory; F. A. Howes, University of California, Davis

Moving Finite Elements for Transport Processes
G. F. Carey, University of Texas, Austin; A. Mueller, Flow Research, Inc., Kent, Washington

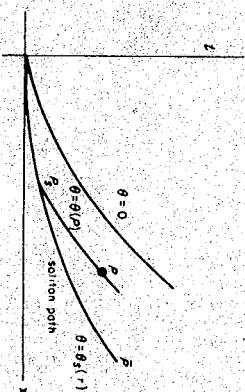
A Conservative Uniformly Accurate Difference Method for a Singular Perturbation Problem in Conservation Form
Alan E. Berger, Naval Surface Weapons Center, Silver Spring, Maryland

Remarks on the Calculation of Small-Amplitude Periodic Solutions in Parabolic Partial Differential Equations
V. Hlavacek and R. Seydel, State University of New York, Buffalo

Radiation Boundary Conditions for Difference Approximations to Hyperbolic Partial Differential Equations
Robert L. Higdon, Oregon State University

Computation of Transonic Turbulent Boundary Layers by a Semidiscrete Galerkin Method
Antonios Liakopoulos, System Dynamics, Gainesville, Florida

The Kompaneets Equation, a Singularly Perturbed Evolution Equation with a Singular Point
C. D. Levermore, R. C. Y. Chin, and G. W. Hedstrom, Lawrence Livermore National Laboratory; F. A. Howes, University of California, Davis



Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers. 22

Computer-Aided Design. IV: Robotics

Collaboration Between the Mathematician and Engineer in Computer-Aided Design and Manufacturing
Thomas J. Langan and Rameswar Bhatnagar, United States Naval Academy

The Role of Mathematics in Computer-Aided Design/Computer-Aided Manufacturing System Development, and Real World Engineering
Leon H. Seitelman, Pratt & Whitney Aircraft

Suction Control of Nonlinear Systems, with Applications to Robot Manipulators
Jean-Jacques Slotine, AT&T Bell Laboratories, Holmdel, New Jersey

Probabilistic Stable Orientations of Mechanical Components
T. C. Woo, J. D. Wolter and R. A. Volz, University of Michigan

Aspect Graphs and Robot Vision System Design
Carol G. Crawford, United States Naval Academy

Determining Two-Dimensional Robot Paths Using Voronoi Diagrams
Sally E. Howe, Richard M. Bourgin, and Kathryn Rensendrick, National Bureau of Standards, Washington, DC; Elsie M. Clark, National Bureau of Standards, Washington, DC, and Howard University

Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers. 23

Fluid Mechanics. II

Computational Aspects of Aortic Bifurcation Flows
Louis W. Ehrlich and Morton H. Friedman, Johns Hopkins University

Nonlinear Interfacial Waves
Jean-Marc Vanden-Broeck and Robert E. L. Turner, University of Wisconsin, Madison

Wave Fitting in a One-Dimensional Hydrocode
Michael J. Dunning and Joseph F. McGrath, KMS Fusion, Inc.; Ann Arbor; Darrell L. Hicks, Michigan Technological University

The Application of Spectral Numerical Methods to Reacting Flow Problems
Ralph W. Metcalfe, Flow Research Company; James J. Riley, Flow Research Company and University of Washington

Asymptotic Boundary Conditions and Adaptive Finite Element Analysis for the Molecular Theory of Fluid Structure and Stress
Robert E. Benner, Jr., Sandia National Laboratories; L. E. Scriven and H. Ted Davis, University of Minnesota

Classical Free-Streamline Flows via Conformal Mapping
Lloyd N. Trefethen, Courant Institute of Mathematical Sciences; Alan R. Elcrat, Wichita State University

Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers. 24

Applied Analysis

Stability Analysis of Reducible Quadrature Methods for Volterra Integral Equations of the Second Kind
Zdzislaw Jackiewicz, University of Arkansas, Fayetteville

A New Series Expansion for the Bessel Function Cross-Product
Henry E. Ferris, Mountain View, California

On Oscillatory Properties of Errors in Numerical Solutions of Volterra Integral Equations
John M. Bownds, University of Arizona

CONTRIBUTED PAPERS cont'd

POSTER PRESENTATIONS

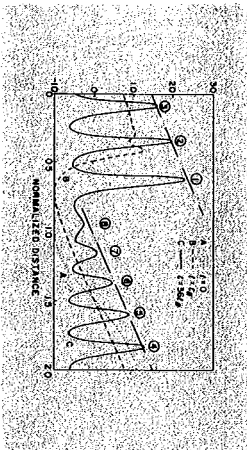
Generalized Clausen Functions Whose Arguments are Rational Fractions of π
Henry E. Fettis, Mountain View, California

Interpolatory Rules for Multiple Integrals
Alan Genz, Washington State University

Bounds on Singular Values of Integral Operators
Vance Faber and G. Milton Wing, Los Alamos National Laboratory

Numerical Studies and Application of the Distributional Multipole Series I
Ira L. Karp, IORAI Electronics, New York; Anthony S. Cantone, HARRIS Corporation, Florida

Numerical Studies and Application of the Distributional Multipole Series II
Ira L. Karp, IORAI Electronics, New York; Anthony S. Cantone, HARRIS Corporation, Florida



Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers, 25

Parallel Numerical Algorithms

Polynomial Preconditioning
Thomas A. Mantueffel, Los Alamos National Laboratory

Iterative Methods for Matrices Partitioned into Block Form on Supercomputers
Axelsson Owe, University of Nijmegen Toernooiveld, The Netherlands

A Frontal Elimination Algorithm for Finite Element Analysis on Vector Processors
Robert E. Benner, Jr., Sandia National Laboratories

A Parallel Method for the Solution of Weighted Linear Least Squares Problems
Ilse C. F. Ipsen, Yale University

Local Uniform Mesh Refinement on Parallel Processors
William Gropp, Yale University

Parallel Methods for Solving Boundary Value Problems
Melvin R. Scott, Sandia National Laboratories

Parallel Processing of Nonlinear Partial Differential Equations
Paul D. Manhardt, Computational Mechanics Consultants, Inc., Knoxville

Friday, July 20, 10:30 AM - 12:15 PM
Contributed Papers, 26

Magnetohydrodynamics and Plasma Physics

On the Behaviour of Acceleration Waves in Radiation Magnetogasdynamics
Rama Shankar, IIT Delhi, India

Electromagnetic Eigenvalues and Mode Shapes for a Slender Body of Revolution
James Geer, State University of New York, Binghamton

Magnetospheric Waves from a Localized Source
John Adam, Old Dominion University

Relations Between Scattered Fields Corresponding to Different Incident Fields for a Disk
F. Ammicht and A. K. Gauresen, Iowa State University

A Contour Dynamics Model of Ionospheric Plasma Clouds
Edward A. Overman II and Norman J. Zabusky, University of Pittsburgh

Instability and Bifurcation of Equilibrium Shapes of Fluid Interfaces in Electric Fields
A. G. Boudouvis and L. E. Scriven, University of Minnesota

An Electromagnetic Inverse Problem for Dispersive Media
R. J. Krueger, Iowa State University; R. S. Beezley, University of Nebraska

Simultaneous Newton's Iteration and Related Algorithms for the Eigenvalue Problem
Francoise Chacelin, Laboratoire Circuits et Systemes, IMAG, France

Implementation Details in a New Nonlinear Least Squares Algorithm
Richard J. Hanson, Sandia National Laboratories; Fred T. Krogh, Jet Propulsion Laboratory

An Iterative Solution Method for the Helmholtz Equation
Alvin Bayless, Exxon Research and Engineering Company; Charles I. Goldstein, Brookhaven National Laboratory; Eli Turek, Tel Aviv University, Israel

Monday, July 16, 3:00 PM

Poster Presentations, 1

Fluid Dynamics

A Method for Parameter Estimation in Partial Differential Equations
Frank H. Mathis, Baylor University

Scheme Independent Stability Criteria for Difference Approximations of Fluid-Structure Interaction Problems
Hanoeh Neishlos, National Institute for Aeronautics and Systems Technology, South Africa

Convergence of a Periodic Matrix-Valued Continued Fraction
Wyman Fair, University of North Carolina, Wilmington; Robert C. Busby, Drexel University

On the Convergence of a Matrix Algorithm
Charles R. Crawford, York University, Canada

On Always Finding All Solutions to General Larger, Sparse Nonlinear Systems of Algebraic Equations
Ralph Baker Kearfoot, University of Southern Louisiana

Parallel Computation Technique for Eigenvalue Analysis in MSC/Nastran
Louis Komzsk, The MacNeal-Schwendler Corporation, Los Angeles

Tuesday, July 17, 3:00 PM

Poster Presentations, 2

Numerical Linear Algebra

An Analysis of a Rotating Fluid in a Multiply-Connected Domain
Houshun G. Wood III, University of Virginia; Max D. Gunzburg, Carnegie-Mellon University

Simple Contact Condition for Coupling Between a Weak Compressible Fluid and a Deformable Structure
Hanoeh Neishlos, National Institute for Aeronautics and Systems Technology, South Africa

A Synergistic Study of Limiting Steady-State Solutions of the 2-D Euler Equations
Edward A. Overman II and Norman J. Zabusky, University of Pittsburgh

On the Propagation of Nonlinear Waves in Electrically Conducting Fluids
Bishnu D. Pandey, University of New Mexico; Rishi Ram, Banarasi Hindu University, India

The Solution of an Evolution Equation Describing Certain Types of Mechanical and Chemical Interaction
Kenneth L. Kuttler, John W. Hilger and Thomas H. Courtney, Michigan Technological University

Nearly Integrable Systems
Yuji Kodama, Nagoya University, Japan, and Ohio State University

Thursday, July 19, 3:00 PM

Poster Presentations, 3

Numerical Analysis

Computer-Aided Design/Computer-Aided Manufacturing at Boeing — Surface Representation and Construction
Richard E. Rice, Boeing Commercial Airplane Company, Seattle

Computer-Aided Design/Computer-Aided Manufacturing Geometry at Boeing — Surface/Surface Intersections
Eugene T. Y. Lee, Boeing Commercial Airplane Company, Seattle

Computer-Aided Design/Computer-Aided Manufacturing Geometry at Boeing — Rational B-Spline Curves
Robert M. Blomgren, Boeing Commercial Airplane Company, Seattle

Efficient Integration Over Polytopes
W. G. Rudd, Chien T. Wang and Wu Peng, Louisiana State University

A Simulation Model to Compare the Tail Probabilities of the Traditional and Conservatively Chi-Square Tests
Douglas Y. Rowland, Prospective Decision Models, Inc., Beachwood, Ohio; Sara M. DeBanne, Case Western Reserve University

Efficient Algorithms Useful in Coding Nonlinear Partial Differential Equations When Using a Fourier Series Spectral Method
Ralph E. Melendez, Lawrence Livermore National Laboratory

Multiple Time-Scale Analysis of the Free van der Pol Equation
James Geer, State University of New York, Binghamton; Carl M. Andersen, College of William and Mary

The Method of Clenshaw Sums of the Legendre Series in the Geopotential Evaluation Theories of Deprit and Tscherning, Kapp and Goad
Peter J. Melvin, Boeing Computer Services, Tukwila, Washington

WHERE TO GO, HOW TO GET THERE

TRANSPORTATION INFORMATION

By Air

SIAM and Dikemen Travel have joined to provide guaranteed 30 percent savings on United Airlines full coach fare to Seattle for SIAM's national meeting, July 16-20, 1984. The discount offer applies to United Airlines' flights to and from Seattle, July 12-22. This special offer is available only to meeting registrants and not to the general public. To take advantage of these savings, call 1-800-521-4041 and mention special account #415U, or, for special arrangements, contact Dikemen Travel: (206) 447-9535.

Dikemen Travel is the official coordinator of travel arrangements for the meeting. The week-long meeting is being held at the University of Washington. Other major airlines that service Seattle are Northwest, Delta, and TWA.

To the University area, take the Everett Airporter bus to the Sherwood Inn, which is a short walk from the University Towers Hotel. Shuttle service will be provided at nominal cost to the University Towers, the dormitories and the Travelodge.

To downtown Seattle, take the Gray Lines Airporter. Get off at the Crown Plaza Hotel and walk one block to the Seattle Hilton, or get off at the Western and walk one block to the 6th Avenue Motor Hotel and two blocks to the Towne Motor Hotel. Clip the coupons on page 17 for a 75¢ discount each way.

Taxis are available at the airport to transport attendees to all points. You can save money by sharing a taxi from the airport to your destination. Wear a red sticker on your left shoulder and find other SIAM registrants at the taxi stand to share a ride. Advance registrants whose registration forms reach SIAM prior to July 6 will be sent red self-adhesive stickers.

By Car

From Portland and points south, take I-5 north to Seattle and take the 45th, 50th Street exit. Turn right at the light onto 45th Street and go less than a mile to 15th Avenue. Turn right on 15th Avenue and go four blocks to the Central Plaza Parking Garage on the left hand side at 15th Avenue and 41st Street. Look for the sign that says Visitor Parking.

From points east, take I-90 to I-5 and follow the above-mentioned instructions.

Parking: Park in the Central Plaza garage under Red Square shown on the map at 15th Avenue and 41st Street. Look for the sign that says Visitor Parking. Parking permits are cheap and can be obtained at the SIAM registration desk. Parking permits for the dormitory garage can be obtained at the McCarty Hall Conference Planning Center.

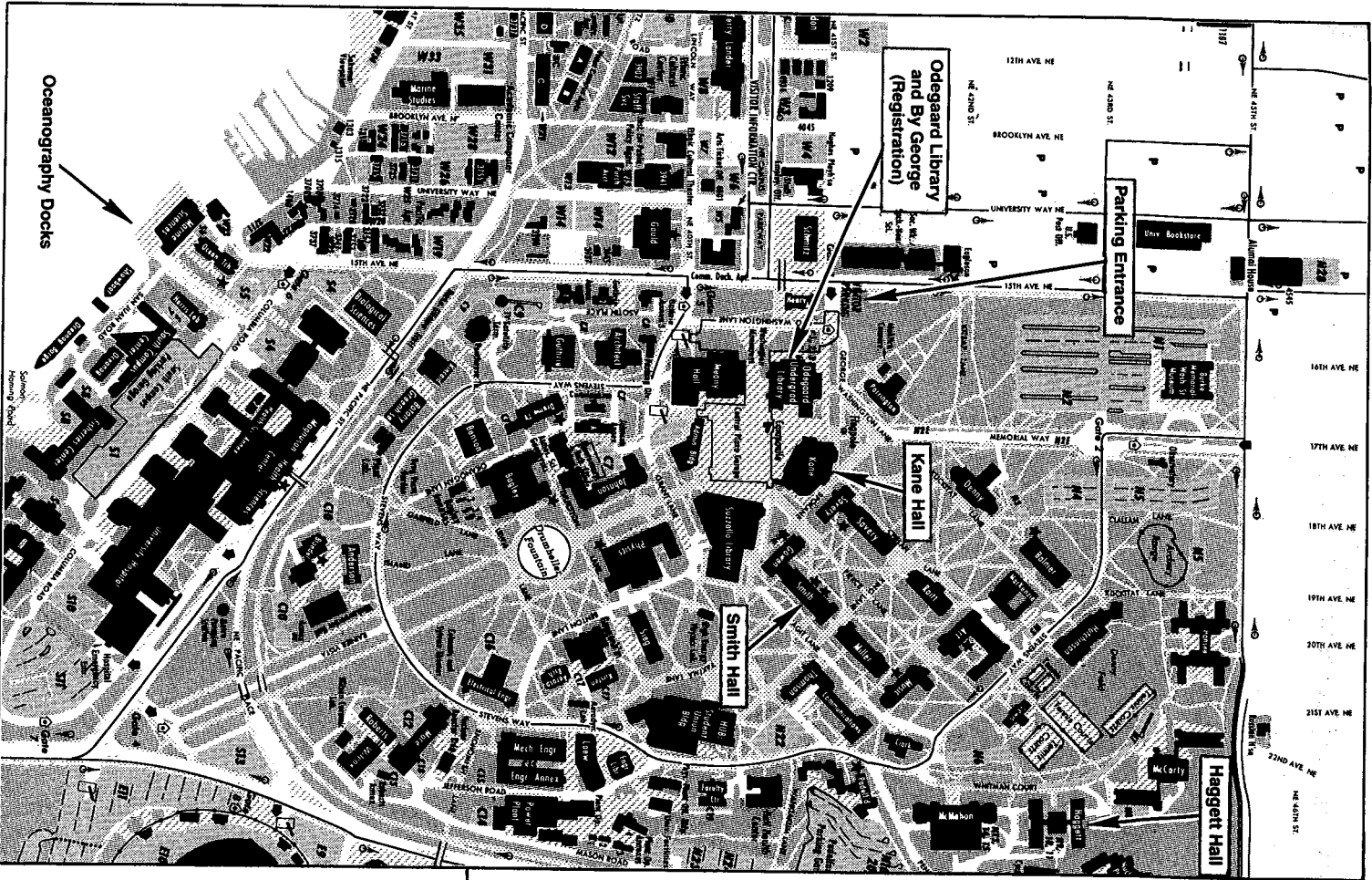
Car Rentals

Special discounts by Avis to all who mention that they are attending the SIAM Summer Meeting and give discount number A/B 599323. Economy and subcompacts (\$33.00), compacts and intermediate size (\$36.00) and full size (\$39.00) per day. Call toll free (800) 331-1600 for reservations.

Rent a 1977-1981 used car from Rent-A-Dent for \$14.36 per day and \$90.00 per week. Advance registration required (800) 426-5243. They will pick you up at the airport and drive you the short distance to their office. Remember to mention that you are attending the SIAM Summer Meeting.

To and From the Conference Site

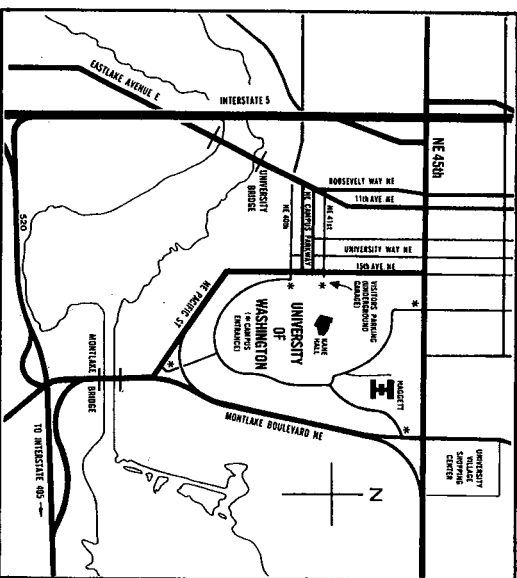
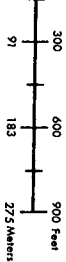
Shuttle service will be provided every morning and afternoon between the downtown hotels and the conference site.



KEY TO MAP SYMBOLS

- building
- Path/Sidewalk
- Campus entrance
- Field
- Bridge/overpass
- Campus parking area
- Public parking area
- Bus route
- Bus stop
- Automatic parking gate
- Garagehouse (with emergency phone)
- Campus area
- Pavement, brick, gravel
- Road gate
- Branch library

SCALE



WHERE TO STAY

On Campus Housing

A block of dormitory rooms has been reserved in modern Haggert Hall for singles, couples and families. Rooms are small but comfortable and daily housekeeping services are provided, including linens and towels. No telephones or televisions are in the rooms, although pay and credit-card phones are located in communal areas. Bathrooms are shared, although segregated according to gender.

Conferees must take at least a full 5-day package for July 15 (check-in) - July 20 (check-out), or equivalent, although early arrivals (2 days) and extensions (2 days) are available. Prices include full buffet breakfast daily.

Registration and full payment must be received by June 25, with a 50% refund for no-shows, 10% charge for cancellations within 2 weeks of arrival, and full refund for cancellations 2 weeks or more prior to arrival. Checks only, no credit cards please. Confirmation letters and arrival instructions will be mailed to all registrants.

	Per day	July 15-20
Single	\$22.15	\$110.75
Double	18.90 per person	94.50 per person

Information: (206) 543-7636

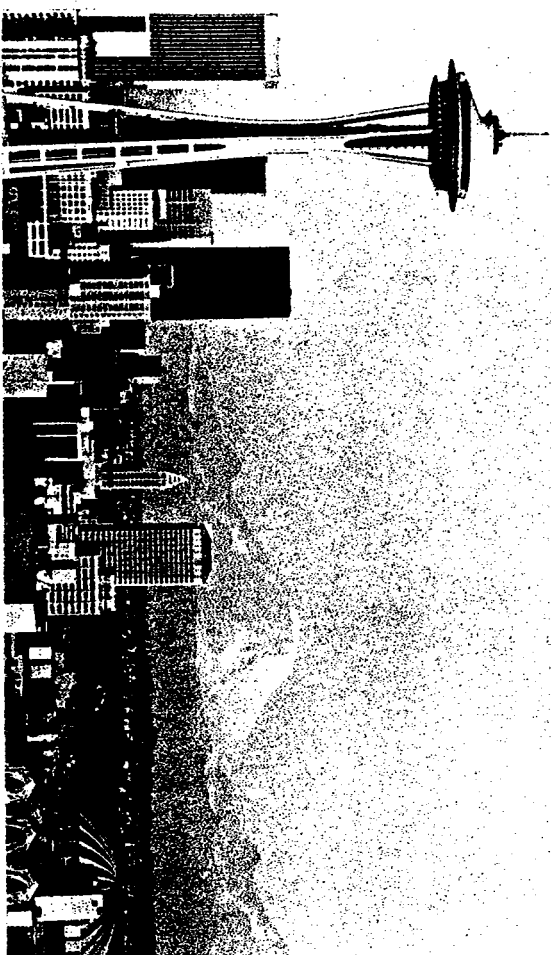
On Campus Food Service

Breakfast, lunch and dinner will be offered in the Haggert Hall dining room for all SIAM conferees.

Breakfast \$3.65, Lunch \$5.50, Dinner \$7.35.

Pay at the door.

Lunch may also be obtained daily at the Student Union Building (HUB).



Downtown Seattle

Off Campus Housing

SIAM has blocked rooms at six hotels in the University of Washington and downtown Seattle areas. The hotels will hold these rooms at reduced rates until June 23 for SIAM attendees only, after which they will become available to the general public.

In order to reserve a room at the hotel of your choice, we urge you to make your reservation as soon as possible, either by telephone or via the enclosed business reply card. When making reservations by telephone, be certain to identify yourself as an attendee at the SIAM Summer Meeting. When making reservations by mail, please rank the hotels in order of preference; if your hotel of first choice is full, the concierge will forward your request to other hotels.

Rooms have been blocked for attendees who wish to arrive a few days early and/or depart a few days late at the University Towers, the Sherwood and the Seattle Hilton. If you plan to check in after 5:00 PM, please notify the hotel to hold your room for late arrival, and enclose one night's deposit. All reservations will be confirmed by mail.

University Area*

The University Tower Hotel 45th & Brooklyn Avenue, NE Seattle, WA 98105 (206) 634-0606	Single Double (one bed) Double-Double (two double beds)	\$50.00 58.00 61.00
Sherwood Town & Country Inn 400 N.E. 45th Street Seattle, WA 98105 (206) 634-0100	Single Double (one bed) Double-Double	\$45.00 48.00 52.00
Travelodge University** 4725 25th Avenue, NE Seattle, WA 98105 (206) 525-4612	Single (queen)** Double - Twin (one bed) Double-Double	\$34.00 38.00 42.00

* Listed in order of distance from the campus; the University Tower Hotel is the closest.
** One night's deposit required for all reservations at the Travelodge

Downtown Seattle

Seattle Hilton P. O. Box 1927 6th & University Seattle, WA 98111 (800) 426-0535 (out of state) (800) 542-7700 (in Washington)	Single Double (one bed) Double (two beds) (A Staal!!)	\$45.00 55.00 55.00
Sixth Avenue Motor Hotel 2000 6th Avenue Seattle, WA 98121 (206) 682-8300	Single (twin) Single (queen) Double (one bed) Double-Double	\$37.00 45.00 51.00 55.00
Towne Motor Hotel 2205 7th Avenue Seattle, WA 98121 (206) 622-3434	Single Double (one bed) Double-Double	\$41.00 47.00 53.00

Shuttle service will be provided at minimal cost to transport attendees from downtown hotels to the conference site.

MAKE YOUR RESERVATIONS

ON CAMPUS HOUSING

SIAM SUMMER MEETING, JULY 16-20, 1984

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Single _____ Double _____

NOTE: Conferencees must register for at least 5 nights during the period July 13-22.

Arrival date _____ Check-out date _____

Rates* Per day _____ July 15-20 _____

Single \$22.15 \$110.75

Double 18.90 per person 94.50 per person

*Includes breakfast

Check enclosed for \$ _____ FULL ADVANCE PAYMENT REQUIRED.

MAIL TO: Housing and Food Services Conferences and Special Services Office
McCarty Conference Center
U-24 McCarty Hall, GR. 10
University of Washington
Seattle, WA 98195

Information: (206) 543-7636

OFF CAMPUS HOUSING

SIAM SUMMER MEETING, JULY 16-20, 1984

Blocks of rooms for this conference are being held only until June 23. Reservations will be confirmed on a space available basis. Your reservation is not confirmed until acknowledged in writing or verified by phone. Please rank order your hotel preferences. If space is not available at your hotel of first choice, the concierge will forward your request to your other choice(s).

Please Reserve (check one)

Single _____ Double (1 bed) _____ Double (2 beds) _____

Arrival Date _____ Check-out _____ Arrival Time _____

One night's advance deposit or credit card account * needed to hold reservation past 4:00 pm.

Name _____ Please Print _____

Address _____

City _____ State _____ Zip _____

Phone (Area Code) _____

Deposit enclosed to guarantee reservation for late arrival @ \$ _____

— Please charge — VISA — American Express — MasterCard

Expiration Date _____ My credit card number is _____

Signature _____

GRAY LINES AIRPORTER DISCOUNT

Clip these coupons and save

SIAM

75¢ Off Gray Lines Airporter
One-Way from Seattle Airport
to Downtown Seattle
Valid: July 12-22, 1984

SIAM

75¢ Off Gray Lines Airporter
One-Way from Downtown Seattle
to Seattle Airport
Valid: July 12-22, 1984

RANK UNIVERSITY AREA			
_____	The University Tower Hotel 45th & Brooklyn Avenue, NE Seattle, WA 98105 (206) 634-0606	Single Double (one bed) Double-Double (two double beds)	\$50.00 58.00 61.00
_____	Sherwood Town & Country Inn 400 N.E. 45th Street Seattle, WA 98105 (206) 634-0100	Single Double (one bed) Double-Double	\$45.00 48.00 52.00
_____	Travelodge University* 4725 25th Avenue, NE Seattle, WA 98105 (206) 525-4612	Single (Queen)* Double—Twin (one bed) Double-Double	\$34.00 38.00 42.00
DOWNTOWN SEATTLE			
_____	Seattle Hilton P. O. Box 1927 6th & University Seattle, WA 98111 (800) 426-0535 (out of state) (800) 542-7700 (in Washington)	Single Double (one bed) Double (two beds) (A Seattle)	\$45.00 51.00 55.00
_____	Sixth Avenue Motor Hotel 2000 6th Avenue Seattle, WA 98121 (206) 682-8500	Single (twin) Queen Double (one bed) Double-Double	\$37.00 45.00 51.00 55.00
_____	Towne Motor Hotel 2203 7th Avenue Seattle, WA 98121 (206) 622-3434	Single Double (one bed) Double-Double	\$41.00 47.00 53.00

*One night's deposit required for all reservations at the Travelodge

Shuttle vans will be provided at minimal cost to transport attendees from downtown.

Daily Activities

For the Exercisers

The 12.5 mile Burke-Gillman hiking and bicycling trail follows the shore of Lake Union and borders the University of Washington campus. Through a special arrangement with SIAM, conference attendees will have access to the Intramural Activities Complex for swimming, racketball, tennis, saunas, and track (tweels, locker, tennis balls). Fee is \$2.50 each access. You must show your SIAM name tag for admission.

Pike's Place Market

Family oriented shopping all under one roof. Featuring fresh produce stands, flea markets, an arts and crafts fair and sophisticated boutiques. A good place to take the kids, young and old. A great place to visit if it rains!

Pioneer Square

Book stores, apparel shops and specialty pavilions, including a kite store, craft emporiums, and antique galleries. Eating facilities also located in the area. Take a tour of the "Seattle Underground", beneath the square, and see the original buildings of old Seattle. Depart from Doc Maynard's Public House.

Pacific Science Center

Explore the world of ancient China at an exclusive showing of "China: 7,000 Years of Discovery". The program features demonstrations by artisans from the People's Republic of China, and some China firms — silk embroidery, the drawloom, movable type, wood frame buildings, the seismograph, the first compass, and the first aerobic exercise lessons.

Day Trips

Take any of the following day trips and discover Seattle, the Emerald City, and beautiful Washington State.

- Scenic Seattle \$ 8.00
- Water Cruise from Lake Washington to Puget Sound \$ 8.00
- Mt. Rainier \$15.00
- Ste. Michelle Winery \$ 8.00

Many other day trips and extended tours are available, including Shogunvalme Falls and Lodge, Gillman Village, Waterfront Wonderland, Victoria Island and Vancouver cruises. Pick-ups at downtown hotels. Call Gray Line Tours toll free for pre-registration and information 1-800-426-7552, or register at the Gray Lines booth at the conference site. Be sure to identify yourself as an attendee at the SIAM Summer Meeting!

Other points of interest include the Seattle Waterfront, the Museum of Science and Industry, the Rainier Brewery, Chittenden Locks, Ballard Locks Salmon Ladder, the Wagner Festival by the Seattle Opera Association, numerous art museums, and the University of Washington Arboretum.

Special Functions

Wine and Cheese Party

Tuesday Evening, July 17

An evening get-together featuring imported cheeses and wine from Washington's Ste. Michelle Winery, with trays of seasonal fresh fruit and a variety of fresh breads, including croissants, french loaves, and sour dough. Pre-registration on SIAM Advance Registration Form and full payment required. Cost: \$10.00.

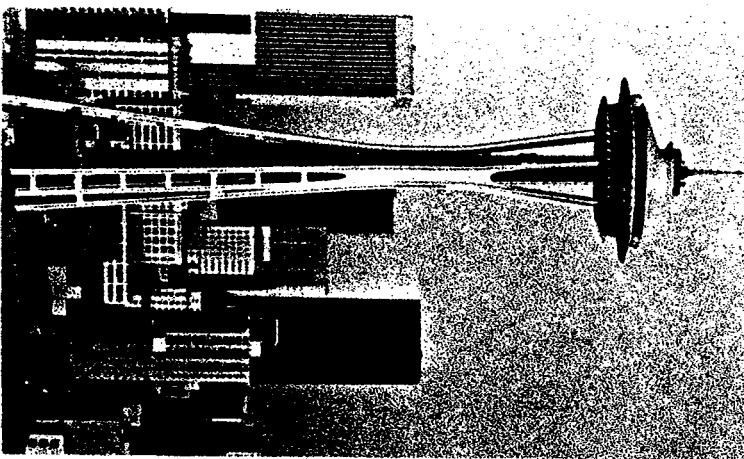
Tillamook Island Cruise and Northwest Pacific Salmon Bake

Wednesday Evening, July 18

A cruise to an island of the past in Puget Sound for a traditional baked salmon dinner in a spectacular cedar longhouse. The boat will depart at 5:30 PM from the University of Washington Oceanography Docks. Transportation will be provided from the conference site. A must for all attendees. Evenings can be cool, so bring a sweater. Pre-registration on SIAM advance registration form and full payment required. Cost: \$28.00, includes transportation.

Before and After

For those who have never been to the northwest, and even for those who have, a vacation before or after the conference offers the opportunity for boating, fishing, hiking and mountain climbing, as well as an introduction to the wonders of the Northwest Pacific Coast. A ferryboat to Vancouver, a trip to Banff and Lake Louise, camping in the Cascades, bicycling on the San Juan Islands or in the wilderness of the Olympic Peninsula and, of course, salmon fishing in the lakes, streams and off-coast waters of the beautiful state of Washington.



REGISTER NOW

REGISTRATION INFORMATION

The registration desk will be located in "By George" (by the statue of George Washington) on the first floor of the Odegaard Library. The library is located on "Red Square" next to Kane Hall, and is directly above the Central Plaza parking lot.

Registration will commence at 12:00 noon on Sunday, July 15, and will continue until 10:00 PM. On Monday, July 16, registration will be from 7:00 AM to 6:00 PM. All other conference days, the registration desk will be staffed from 7:30 AM to 6:00 PM.

Conferees must wear their SIAM name tags at all times to gain admission to conference sessions.

The telephone number at the registration desk is 206-543-0210. Messages should be left at this number and will be posted nearby.

	SIAM Member	Non-Member	Full-time Student
Advance	\$60.00	\$ 85.00	\$10.00
Onsite	\$80.00	\$105.00	\$10.00

To register, detach the form below and insert it in the envelope provided.

ADVANCE REGISTRATION FORM

SIAM SUMMER MEETING University of Washington, Seattle July 16 - 20, 1984
Advance registration must be received at the SIAM office by July 6, 1984.

Special Functions

Wine and Cheese Party, July 17
Please reserve _____ tickets at \$10.00 each.
Northwest Pacific Salmon Bake, July 18
Please reserve _____ tickets at \$28.00 each.

Registration and Special Functions total \$ _____

Please check: ☐ I plan to attend the SIAM Activity Group on Linear Algebra Buffer and planning meeting.

Name _____

Affiliation _____

Department _____

Address _____

City _____

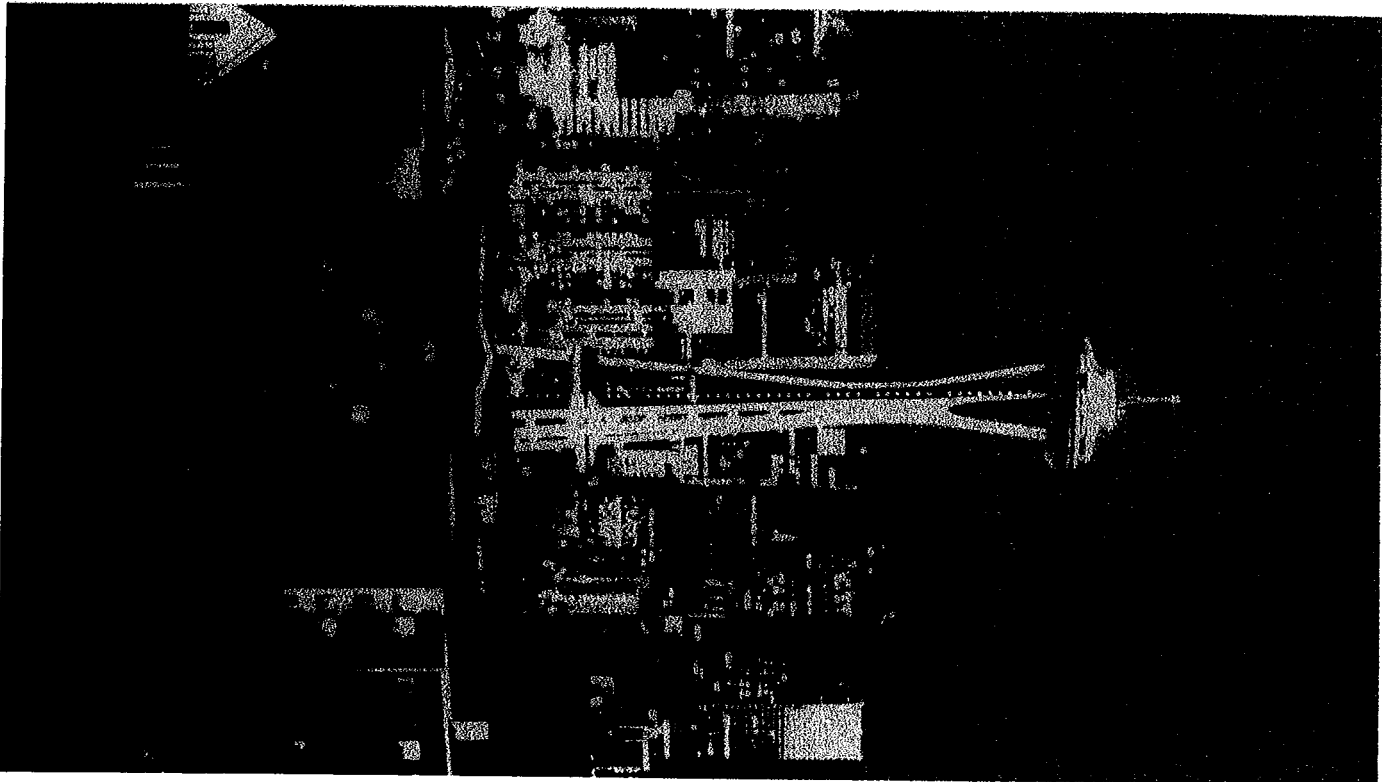
State _____

Zip _____

Phone (Area Code) _____ I am a member of _____ SIAM _____ AAS _____ ACM _____ AMS _____ APS _____ ASME

* Non-members who join SIAM when they register for this conference receive the member discount on the conference registration fee.





SIAM SUMMER MEETING

July 16-20, 1984
University of Washington, Seattle

Conference Program

A week-long SIAM meeting featuring topics in applied mathematics of broad interest, plus a trip to the Northwest with opportunities for boating, hiking, camping, bicycling, fishing, tennis and good eating.