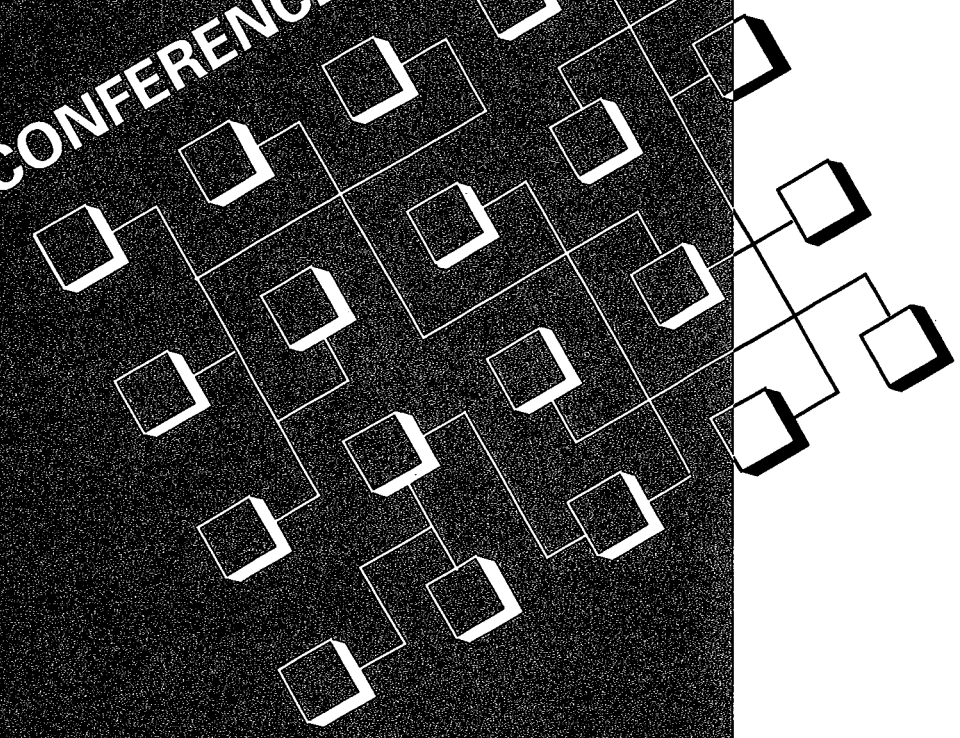
CONFERENCE PROGRAM



Seventh SIAM Conference on PARALLEL PROCESSING FOR • SCIENTIFIC • COMPUTING

Sponsored by SIAM Activity Group on Supercomputing

FEBRUARY 15-17, 1995
HOTEL NIKKO
SAN FRANCISCO, CA

And immediately preceding the conference ...

FEBRUARY 14, 1995

SIAM Short Courses on:

- Message Passing Using MPI: from Fundamentals to Applications
- High Performance Fortran in Practice

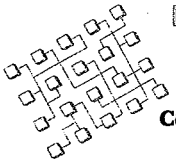
SIAM®

Society for Industrial and Applied Mathematics

CONFERENCE THEMES

- Parallel Programming Systems
- The MPI Message Passing Standard
- High Performance Fortran
- Distributed Computing
- High Speed Networking
- Visualization
- Scalable Parallel Algorithms and Implementations
- Parallel Matrix Computation
- Scheduling, Load Balancing, Graph Partitioning
- Ocean and Climate Modeling
- Grand Challenges in Biology and Medicine
- Parallel Processing in Information Retrieval
- Parallel Processing in Mathematics

CONTENTS



DEADLINE DATES

Hotel Reservation
Monday, January 30, 1995

Conference Preregistration
Monday, January 30, 1995

ORGANIZING COMMITTEE

Robert S. Schreiber (Chair)
Research Institute for Advanced Computer Science

David H. Bailey
NASA Ames Research Center

Petter E. Bjørstad
University of Bergen, Norway

John R. Gilbert
Xerox Palo Alto Research Center

Michael V. Mascagni
Supercomputing Research Center, IDA

Anthony Skjellum
Mississippi State University

Horst D. Simon
NASA Ames Research Center/CSC

Virginia J. Torczon
Rice University

Layne T. Watson
Virginia Polytechnic Institute and State University

FUNDING AGENCY

SIAM would like to thank the National Science Foundation for its partial support in conducting this conference.

GET-TOGETHERS

SIAM Poster Session and Welcoming Reception
Wednesday, February 15, 1995
5:15 PM - 7:15 PM
Nikko Ballroom 2 & 3
Complimentary beer, wine, sodas and chips/dip will be available.

PROGRAM OVERVIEW

Following are subject classifications for the sessions. The codes in parentheses designate session type and number. The session types are: contributed presentations (CP), invited presentations (IP), minisymposia (MS). For the Poster presentations, see page 12 - 13.

Applications of Parallel Computing

Computational Fluid Dynamics (CP8; page 15)
Computational Physics (CP17, page 19)
Data Parallel and Message Passing Programming: Experiences in the Real World (IP7, page 17)
FFT and Wavelets (CP1, page 9)
Geophysics, Ocean, and Atmosphere Modeling (CP3, page 9)
Mathematical Applications (CP6, page 11)
Optimization and Control (CP16, page 19)
Parallel Computation on the Genome: From DNA Sequence to Biological Function (IP5, page 14)
SVD, Imaging, Information Retrieval (CP11, page 16)

Distributed Computing

Domain Decomposition (CP13, page 18)
Dynamic Load Balancing (CP12, page 18)
Massively Parallel Number Crunching on the Internet (IP4, page 14)
Parallel N-body Solvers (MS1, page 8)
Parallel Programming (CP7, page 15)
Performance Tools (CP15, page 19)
Programming Libraries for Distributed-Memory Computers (MS2, page 9)
Ubiquitous Computing (IP2, page 8)

Grand Challenges in Biology and Medicine

FFT and Wavelets (CP1, page 9)
Parallel Computation on the Genome: From DNA Sequence to Biological Function (IP5, page 14)

High Performance Fortran

Compilers (CP4, page 10)
High Performance Fortran in Practice (Short Course, page 5)
Parallel Programming (CP7, page 15)
What's Wrong with High Performance Fortran? (IP3, page 10)

High Speed Networking

Performance Tools (CP15, page 19)

Ocean and Climate Modeling

Geophysics, Ocean, and Atmosphere Modeling (CP3, page 9)
Operational Prediction of Thunderstorms: Turning Vision into Reality with Massively Parallel Processors (IP1, page 8)

Parallel Matrix Computation

Domain Decomposition (CP13, page 18)
Eigenvalues (CP14, page 19)
Large Symmetric Eigenvalue Problems: Algorithms and Applications (MS7, page 17)
Parallel Sparse Direct Methods: Recent Progress (MS5, page 15)
Programming Libraries for Distributed-Memory Computers (MS2, page 9)
Sparse Direct Solvers (CP5, page 10)
Sparse Iterative Methods (CP9, page 16)
SVD, Imaging, Information Retrieval (CP11, page 16)

Parallel Processing in Information Retrieval

SVD, Imaging, Information Retrieval (CP11, page 16)
Ubiquitous Computing (IP2, page 8)

Parallel Processing in Mathematics

Mathematical Applications (CP6, page 11)
Massively Parallel Number Crunching on the Internet (IP4, page 14)
Parallel Computing and Applications Based on Cellular Automata and Lattice Gas (MS8, page 18)
Parallel Processing in Mathematics (MS4, page 14)

Parallel Programming

Compilers (CP4, page 10)
Compiler Optimization for Parallel Computers (MS6, page 16)
Optimizing Compilers and Their Effect on Scientific Programmers (IP6, page 15)
Parallel Programming (CP7, page 15)
Performance Tools (CP15, page 19)
Programming Libraries for Distributed-Memory Computers (MS2, page 9)
What's Wrong with High Performance Fortran? (IP3, page 10)

Scalable Parallel Algorithms

Domain Decomposition (CP13, page 18)
Eigenvalues (CP14, page 19)
Large Symmetric Eigenvalue Problems: Algorithms and Applications (MS7, page 17)
N-body Problems (CP10, page 16)
Parallel Computing and Applications Based on Cellular Automata and Lattice Gas (MS8, page 18)
Parallel N-body Solvers (MS1, page 8)
Parallel Sparse Direct Methods: Recent Progress (MS5, page 15)
Programming Libraries for Distributed Memory Computers (MS2, page 9)
Is Scalable Parallel Computing a Myth? (Panel Discussion, page 17)
Sparse Direct Solvers (CP5, page 10)
Sparse Iterative Methods (CP9, page 16)

Scheduling, Load Balancing, Graph Partitioning

Domain Decomposition (CP13, page 18)
Dynamic Load Balancing (CP12, page 18)
Mesh Partitioning (CP2, page 9)

The MPI Message Passing System

Message Passing Using MPI: Fundamentals to Applications (Short Course, page 4)

Visualization

Operational Prediction of Thunderstorms: Turning Vision into Reality with Massively Parallel Processors (IP1, page 8)
Performance Tools (CP15, page 19)
Scientific Visualization (MS3, page 10)

Dear Colleagues:

Welcome to San Francisco and the Seventh SIAM Conference on Parallel Processing for Scientific Computing!

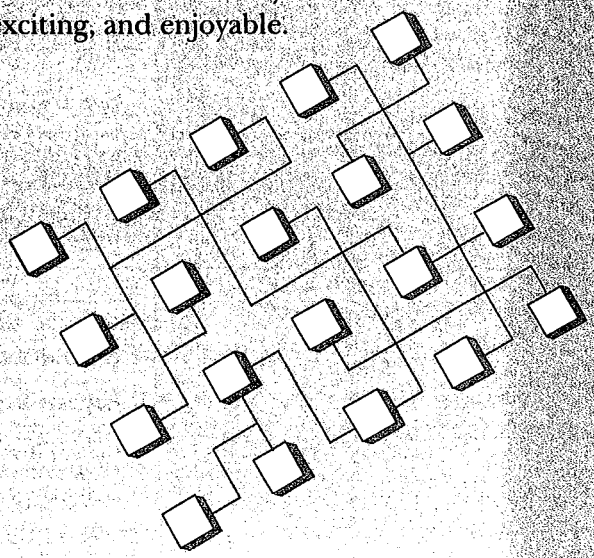
In the program, you will find seven invited presentations; a panel discussion on scalability; eight minisymposia; seventeen sessions of contributed papers; and a poster session. The conference has a strong group of speakers and minisymposia in areas that should be quite interesting to SIAM members: parallel computer systems, applications of parallel computing in mathematics, and several other important application domains. Immediately preceding the conference are two short courses: Message Passing Using MPI: from Fundamentals to Applications, and High Performance Fortran in Practice.

As at the six previous conferences in this series, the papers contributed to the conference by the SIAM community reflect the wide range of important and innovative work that SIAM's members are doing in parallel computing. We received far more high-quality contributions than we could possibly accommodate as contributed papers, and many of these are being presented as posters. The quality of the posters at this meeting is unusually high; we recommend them to you. You are also invited to the welcoming reception which will take place during the poster session on Wednesday, February 15 from 5:15-7:15 PM.

The organizing committee and I hope that the conference and your visit to this wonderful city are stimulating, exciting, and enjoyable.

See you all in SF!

Rob Schreiber
Conference Chair



Message Passing Using MPI: from Fundamentals to Applications

Tuesday Morning, February 14, 1995 ▪ Hotel Nikko ▪ San Francisco, CA

Organizer: David W. Walker, Oak Ridge National Laboratory

Description

This short course will describe the features of the MPI message passing standard, and will show how to use MPI in applications. The course will be divided into three main parts. The first part will give an overview of MPI, describe how it came about, and will discuss the basic point-to-point and collective communication capabilities of MPI. The second part will describe advanced features in MPI, in particular, the management of groups and communication contexts, and use of derived data types, persistent communication requests, process topologies, and the profiling interface. The third part will be devoted to the presentation of application kernels and examples written using MPI.

The course is 33% introductory, 34% intermediate, and 33% advanced.

Objectives and Rationale

This short course will show how to use the basic features of MPI to convert existing message passing programs to MPI, thereby making them portable to a variety of concurrent computers. The course will also show how to use the more expressive advanced features of MPI to write modular and efficient applications and software libraries. At the end of the course all attendees should have a good understanding of all of the main features of MPI, and be better able to plan and execute future projects using MPI.

MPI is a new and powerful message passing standard developed by a broadly based committee of parallel computer vendors, library writers and application specialists. It was designed for developing applications and libraries for distributed memory environments. This short course affords an opportunity for researchers to learn how to use MPI, and how to convert existing message passing programs to the MPI standard.

Who Should Attend

This course will mostly benefit researchers with some experience of writing applications using message passing. However, since all aspects of MPI will be covered, the course will also be of interest to novices. Those interested in developing software libraries for use on message passing computers will also benefit from attending.

Recommended Background

Some previous experience with message passing on concurrent computers would be an advantage, but is not a pre-requisite. Good preparation for the course would be a read the articles in Parallel Computing, Vol. 20, No. 4, which is entirely devoted to message passing.

Instructors

Ewing Lusk is a senior computer scientist in the Mathematics and Computer Science Division at Argonne National Laboratory. His current research interests are in automated reasoning, logic programming, and parallel computing, particularly visualization of parallel program execution. He is part of the team providing a portable, public implementation of MPI.

Marc Snir is a senior manager at IBM T. J. Watson Research Center, where he leads research on scalable parallel software and on scalable parallel architectures. He recently led the design and prototyping of the parallel operating environment for the IBM 9076 Scalable POWERparallel System.

David W. Walker is a research staff member in the Mathematical Sciences Section at Oak Ridge National Laboratory, and an adjunct associate professor in the Department of Computer Science of the University of Tennessee, Knoxville. His research interests include the development of software libraries, algorithms, and applications for high performance computers.

PROGRAM

7:00 AM	Registration		
8:00 AM-9:20 AM	**Part 1.**	**Fundamentals of MPI**	*Marc Snir*
	1.0	Overview	
	1.1	The Need for MPI and its Scope	
	1.2	Historical Background	
	1.3	Point-to-point Communication	
	1.3.1	Blocking Behavior	
	1.3.2	Communication Modes	
	1.4	Collective Communication	
	1.4.1	Data Movement Routines	
	1.4.2	Global Computation Routines	
9:20 AM-10:00 AM	**Part 2.**	**Advanced Features of MPI**	*Ewing Lusk*
	2.1	Persistent Communication Requests	
	2.2	Derived Datatypes	
	2.3	Process Groups	
	2.4	Profiling and Visualizing MPI Programs	
	2.5	Communication Contexts	
	2.6	Process Topologies	
10:00 AM-10:30 AM	Coffee		
10:30 AM-11:10 AM	**Part 2.**	**Advanced Features of MPI** (continued)	*Ewing Lusk*
11:10 AM-12:30 PM	**Part 3.**	**Using MPI in Applications**	*David Walker*
	3.1	Communicating Boundary Data	
	3.2	Particle Migration	
	3.3	Matrix Transposition	
	3.4	Gather and Scatter Communication	
12:30 PM	Short Course adjourns.		

Registration Fees*

	SIAG/SC**	SIAM Member	Non-Member	Student
Preregistration *(before 1/30/95)*	$90	$90	$105	$30
Registration *(after 1/30/95)*	$105	$105	$120	$30

*Include short course notes.
**Member of SIAM Activity Group on Supercomputing.
To register, please complete the Preregistration Form located on inside back cover of program.

The short course will be held in Grey Pearl Room. Coffee breaks will be in Nikko Ballroom 3 Foyer.

High Performance Fortran in Practice

Tuesday Afternoon, February 14, 1995 ▪ Hotel Nikko ▪ San Francisco, California

Organizer: Charles Koelbel, Rice University

Description

This course will cover the basics of programming in High Performance Fortran (HPF). After a brief overview of parallel architectures and the data-parallel programming paradigm, HPF features will be presented in some detail. These include the parts of Fortran 90 relevant to parallel programming, the FORALL statement, the INDEPENDENT directive, and the DISTRIBUTE and ALIGN directives. All features will be illustrated with short examples typical of scientific applications. The course will conclude with a brief discussion of HPF implementations and a slightly longer presentation of their implications for programmers.

The course is 30% introductory, 60% intermediate, and 10% advanced.

Objectives and Rationale

Introduction to data-parallel computation; understanding goals, syntax, and semantics of HPF (including relevant parts of Fortran 90); and explaining efficiency issues in HPF programming.

High Performance Fortran has gained much attention as a portable, efficient language for writing data-parallel programs. This course will introduce the basics of the language to potential users and offer tips for its efficient use. Attendees will then have the background to apply this language to their own practical applications.

Who Should Attend

Researchers and practitioners interested in data-parallel computation for scientific problems.

Recommended Background

Knowledge of Fortran 77 (or other imperative sequential language). Basic knowledge of parallelism useful, but not required.

Instructor

Charles Koelbel received his Ph.D. in Computer Science from Purdue University in 1990. His thesis was one of the first to study compilation for distributed memory parallel architectures. He is continuing work in that area at the Center for Research on Parallel Computation at Rice University.

PROGRAM

1:30-2:00 PM — I. **Introduction to Data-Parallelism**
- A. Parallel Machines
- B. Data-Parallel Model

2:00-2:30 PM — II. Fortran 90 Features

2:30-3:30 PM — III. **HPF Parallel Features**
- A. INDEPENDENT Directive
- B. FORALL Statements and Array Operations
- C. Library and Intrinsic Functions
- D. PURE Functions

3:30-4:00 PM — Coffee

4:00-5:00 PM — IV. **HPF Data Mapping Features**
- A. DISTRIBUTE Directive
- B. ALIGN Directive
- C. Dynamic Mapping
- D. Subroutine Linkage

5:00-6:00 PM — V. **Efficient Programming in HPF**
- A. Compiler Implementation
- B. Implications for Programmers

6:00 PM — Short Course adjourns.

Registration Fees*

	SIAG/SC**	SIAM Member	Non-Member	Student
Preregistration (before 1/30/95)	$90	$90	$105	$30
Registration (after 1/30/95)	$105	$105	$120	$30

*Include short course notes.

**Member of SIAM Activity Group on Supercomputing.

To register, please complete the Preregistration Form located on inside back cover of program.

The short course will be held in Pearl Grey Room. Coffee will be in Nikko Ballroom 3 Foyer.

To register for either Short Course or both and/or the conference, please complete the Preregistration Form on page 27 and mail it with your payment to the SIAM office.

The registration desk will be located at the entrance of the Nikko Ballroom on the third floor. The registration desk will be open as listed below:

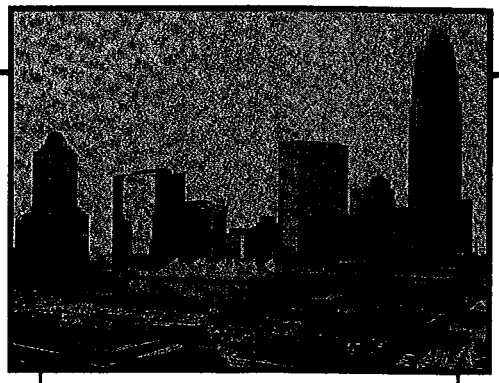
Monday, February 13	5:00 PM - 7:00 PM
Tuesday, February 14	7:00 AM - 7:00 PM
Wednesday, February 15	7:30 AM - 3:30 PM
Thursday, February 16	8:00 AM - 3:30 PM
Friday, February 17	8:00 AM - 1:00 PM

Announcing . . .

1995 SIAM Annual Meeting

October 23 – 26, 1995

Adam's Mark Hotel
Charlotte, North Carolina



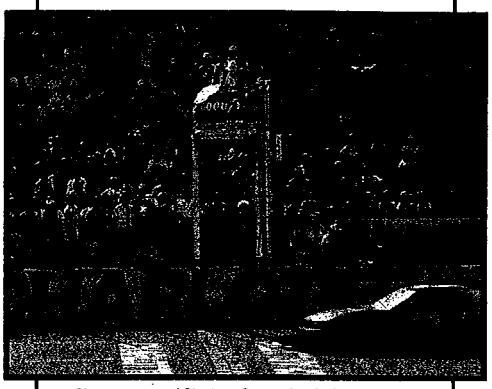


Photo courtesy of Charlotte Convention & Visitors Bureau.

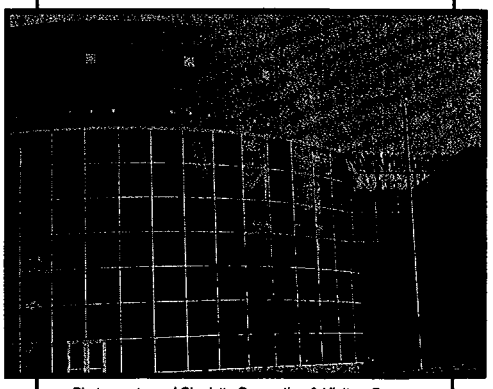


Photo courtesy of Charlotte Convention & Visitors Bureau.

MAIN MEETING THEME

Computational Science and Engineering

PRELIMINARY TOPICS

Education — CSE Degree Programs
Multi-Disciplinary Design Optimization
Computational Biology
Control of Large Systems
Numerical Algorithms
Numerical Software

DEADLINE FOR SUBMISSION OF ABSTRACTS:
April 24, 1995

Organizing Committee:

Danny C. Sorensen (Chair), Rice University
John E. Dennis, Jr., Rice University
Carl T. Kelley, North Carolina State University
Barbara Lee Keyfitz, University of Houston
Ahmed H. Sameh, University of Minnesota, Minneapolis
L. Ridgway Scott, University of Houston

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Gopher: gopher.siam.org

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Society for Industrial and Applied Mathematics

Program-At-A-Glance

	Tuesday, February 14	Wednesday Morning, February 15	Thursday Morning, February 16	Friday Morning, February 17
7:00	Registration for Short Course opens* *Nikko Ballroom 3 Foyer*			
7:30		**Registration opens** *Nikko Ballroom Foyer*		
8:00	**Short Course on Message Passing Using MPI: Fundamentals to Applications** *Grey Pearl Room*		**Registration opens** *Nikko Ballroom Foyer*	**Registration Opens** *Nikko Ballroom Foyer*
8:15		**Opening Remarks and Announcements** Robert S. Schreiber *Nikko Ballroom 1 & 2*		
8:30		**IP1 Operational Prediction of Thunderstorms: Turning Vision into Reality with Massively Parallel Processors** Kelvin K. Droegemeier *Nikko Ballroom 1 & 2*	**IP4 Massively Parallel Number Crunching on the Internet** Arjen K. Lenstra *Nikko Ballroom 1 & 2*	**IP7 Data Parallel and Message Passing Programming: Experiences in the Real World** Thomas J.R. Hughes *Nikko Ballroom 1 & 2*
9:15		**IP2 Ubiquitous Computing** Mark Weiser *Nikko Ballroom 1 & 2*	**IP5 Parallel Computation on the Genome: From DNA Sequence to Biological Function** Jacob V. Maizel, Jr. *Nikko Ballroom 1 & 2*	**Panel Discussion: Is Scalable Parallel Computing a Myth?** Moderator: Robert S. Schreiber *Nikko Ballroom 1 & 2*
10:00	**Coffee** / *Nikko Ballroom 3 Foyer*	**Coffee** / *Nikko Ballroom 3*	**Coffee** / *Nikko Ballroom 3*	**Coffee** / *Nikko Ballroom 3*
10:30	**Short Course on MPI continues**	**Concurrent Sessions** **MS1 Parallel *N*-body Solvers** Organizers: John Salmon *Nikko Ballroom 2* **MS2 Programming Libraries for Distributed-Memory Computers** Organizers: William Gropp and Elizabeth Jessup *Grey Pearl Room* **CP1 FFT and Wavelets** *White Pearl Room* **CP2 Mesh Partitioning** *Nikko Ballroom 1* **CP3 Geophysics, Ocean, and Atmosphere Modeling** *Pink Pearl Room*	**Concurrent Sessions** **MS4 Parallel Processing in Mathematics** Organizer: Andrew Odlyzko *Grey Pearl Room* **MS5 Parallel Sparse Direct Methods: Recent Progress** Organizer: Alex Pothen *Nikko Ballroom 1 & 2* **CP7 Parallel Programming** *Pink Pearl Room* **CP8 Computational Fluid Dynamics** *White Pearl Room*	**Concurrent Sessions** **MS7 Large Symmetric Eigenvalue Problems: Algorithms and Applications** Organizers: Christian Bischof and Anna Tsao *Grey Pearl Room* **MS8 Parallel Computing and Applications Based on Cellular Automata and Lattice Gas** Organizer: Z. George Mou *White Pearl Room* **CP12 Dynamic Load Balancing** *Nikko Ballroom 1 & 2* **CP13 Domain Decomposition** *Pink Pearl Room*
	Tuesday Afternoon, February 14	**Wednesday Afternoon, February 15**	**Thursday Afternoon, February 16**	**Friday Afternoon, February 17**
12:30	**Short Course on MPI adjourns**	**Lunch**	**Lunch**	**Lunch**
1:30	**Short Course on High Performance Fortran in Practice** *Grey Pearl Room*			
2:00		**IP3 What's Wrong with High Performance Fortran?** Guy L. Steele *Nikko Ballroom 1 & 2*	**IP6 Optimizing Compilers and Their Effect on Scientific Programmers** Michael Wolfe *Nikko Ballroom 1 & 2*	**Concurrent Sessions** **CP14 Eigenvalues** *Pink Pearl Room* **CP15 Performance Tools** *Grey Pearl Room* **CP16 Optimization and Control** *White Pearl Room* **CP17 Computational Physics** *Nikko Ballroom 1 & 2*
2:45		**Coffee** / *Nikko Ballroom 3*	**Coffee** / *Nikko Ballroom 3*	
3:15		**Concurrent Sessions** **MS3 Scientific Visualization** Organizer: Kristina Miceli *Grey Pearl Room* **CP4 Compilers** *White Pearl Room* **CP5 Sparse Direct Solvers** *Nikko Ballroom 1* **CP6 Mathematical Applications** *Pink Pearl Room*	**Concurrent Sessions** **MS6 Compiler Optimization for Parallel Computers** Organizer: Monica Lam *Nikko Ballroom 1 & 2* **CP9 Sparse Iterative Methods** *Grey Pearl Room* **CP10 N-body Problems** *Pink Pearl* **CP11 SVD, Imaging, Information Retrieval** *White Pearl Room*	
3:30	**Coffee** / *Nikko Ballroom 3 Foyer*			
4:00	**Short Course on HPF continues**	**4:00 Poster Set Up** *Nikko Ballroom 2 & 3*		**Conference Adjourns**
5:00	**5:00 PM-7:00 PM Registration for Conference opens** *Nikko Ballroom Foyer*			Times allowed for each presentation, including discussion: 20 minutes for Contributed Presentation (CP) 20 minutes for Minisymposium (MS) 45 minutes for Invited Presentation (IP)
5:15		**Poster Session and Welcoming Reception** *Nikko Ballroom 2 & 3*		The Conference Organizing Committee expects every speaker of accepted papers to attend the conference and give the presentation. If it becomes inevitable for a speaker to cancel a presentation, the speaker is expected to find an alternate or one of the speaker's co-authors will give the presentation.
5:30			**Business Meeting** SIAM Activity Group on Supercomputing *Grey Pearl Room*	

* Registration for the Short Course also takes place from 5:00 PM - 7:00 PM on Monday Evening, February 13, in the Nikko Ballroom 3 Foyer.

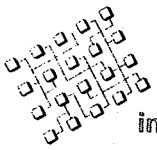
7:30/Nikko Ballroom Foyer

Registration opens

8:15/Nikko Ballroom 1 & 2

Opening Remarks and Announcements

Robert S. Schreiber, Research Institute for Advanced Computer Science



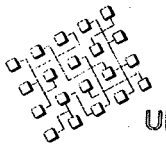
8:30/Nikko Ballroom 1 & 2

IP1/Chair: John R. Gilbert, Xerox Palo Alto Research Center

Operational Prediction of Thunderstorms: Turning Vision into Reality with Massively Parallel Processors

The Center for Analysis and Prediction of Storms (CAPS), an NSF Science and Technology Center at the University of Oklahoma, is redefining the notion of local weather forecasts by developing techniques for the numerical prediction of individual thunderstorms and their related weather. In this presentation, the speaker will describe the scientific and technological challenges associated with this effort, and focus on the program's key element - a new scalable parallel weather model, called the Advanced Regional Prediction System (ARPS), that has been designed specifically for broad classes of parallel architectures. The ARPS utilizes new coding and documentation strategies to ensure simplicity of use, readability, rapid interfacing with other physical models, and quick optimization. The utility and success of the ARPS will be demonstrated through comparative timings on parallel platforms ranging from the CM-5 to the Cray T3D to workstation clusters. In addition, he will discuss results from recent operational tests conducted by the National Weather Service and present a series of storm simulation videos that demonstrate the importance of uniformly high spatial resolution in obtaining solutions that are numerically converged and thus able to faithfully represent the highly energetic, turbulent features associated with severe storms.

Kelvin K. Droegemeier
School of Meteorology and Center for Analysis and Prediction of Storms
University of Oklahoma, Norman



9:15/Nikko Ballroom 1 & 2

IP2/Chair: John R. Gilbert, Xerox Palo Alto Research Center

Ubiquitous Computing

Inspired by the social scientists, philosophers, and anthropologists at PARC, we have been trying to take a radical look at what computing and networking ought to be like. We believe that people live through their practices and tacit knowledge so that the most powerful things are those that are effectively invisible in use. This is a challenge that affects all of computer science. Our preliminary approach, "activate the world", provides hundreds of wireless computing devices per person per office, of all scales (from 1 inch to wall-sized displays). This has required new work in operating systems, user interfaces, networks, wireless communication, displays, and many other areas. We call our work "ubiquitous computing". This is different from PDA's, dynabooks, or information at your fingertips. It is invisible, everywhere computing that does not live on a personal device of any sort, but is in the woodwork everywhere. In this talk, the speaker will describe what is wrong with existing approaches to computing, why ubiquitous computing is inevitable, and some of the things we have learned from our research.

Mark Weiser
Computer Science Laboratory
Xerox Palo Alto Research Center

10:00/Nikko Ballroom 3

Coffee

10:30 AM-12:30 PM

Concurrent Sessions

MS1/Nikko Ballroom 2

Parallel *N*-body Solvers

N-body problems can arise from the discretization of a system of equations describing transport. They arise in astrophysics, CFD, or from direct physical models, e.g., molecular dynamics. Techniques for computing the "interactions" between all pairs of bodies in an *N*-body system in time much less than $O(N^2)$ are the subject of considerable interest, and have analogs in other problem domains where all pairs of discrete set of *N* objects "interact", e.g., boundary integral methods. The speakers in this minisymposium will discuss their experiences with parallel *N*-body methods in a variety of disciplines and on a variety of hardware platforms.

Organizer: John K. Salmon
California Institute of Technology

10:30 Scalable Variants of Multipole-based Algorithms for Molecular Dynamics Applications
John Board, Duke University

10:50 GRAPE-4: A Special-Purpose Computer for Gravitational *N*-body Problems
Junichiro Makino, University of Tokyo, Japan

11:10 The Fast Solution of Three-Dimensional Fluid Dynamical *N*-body Problems using Parallel Tree Codes: Vortex Element Method (VEM) and Boundary Element Method (BEM)
Grégoire S. Winckelmans, University of Sherbrooke, Canada; John K. Salmon, Organizer; Michael S. Warren, Los Alamos National Laboratory; and Anthony Leonard, California Institute of Technology

11:30 Cosmological *N*-body Simulation
George Lake, University of Washington

11:50 Adaptive Hierarchical *N*-body Methods on Shared-Address-Space Multiprocessors: Barnes-Hut, Fast Multipole, and Radiosity
Jaswinder Pal Singh, Stanford University

12:10 A Parallel, Portable and Versatile Treecode
Michael Warren, Los Alamos National Laboratory

The Conference Organizing Committee expects every speaker of accepted papers to attend the conference and give the presentation. If it becomes inevitable for a speaker to cancel a presentation, the speaker is expected to find an alternate or one of the speaker's co-authors will give the presentation.

For papers with multiple authors, the speaker is shown in *italics* if known at press time.

10:30 AM-12:30 PM

Concurrent Sessions

MS2/Grey Pearl Room

Programming Libraries for Distributed-Memory Computers

The wide variety of rapidly evolving parallel architectures gives rise to a fundamental problem: how to develop efficient software that can be ported from one machine to another without significant redesign.

The speakers in this minisymposium address the feasibility of machine-independent parallel programming models that are easy to use and still efficient for different applications on different architectures. Each will discuss a different library developed to aid programming of distributed-memory computers. Some of the issues they will discuss are problems in design and evaluation of libraries, portability, efficiency, and ease of use.

Organizers: William D. Gropp
Argonne National Laboratory and
Elizabeth R. Jessup, University of Colorado, Boulder

Part I: Directions in Library Design: The Future

10:30 Data-Structure-Neutral Design for Libraries for Distributed-memory Parallel Computers
William D. Gropp, Co-organizer and Barry F. Smith, University of California, Los Angeles

10:50 A Case Study of MPI: Portable and Efficient Libraries
Steven Huss-Lederman, Supercomputing Research Center; Christian H. Bischof and Xiaobai Sun, Argonne National Laboratory; and Anna Tsao, Supercomputing Research Center

11:10 Driving Issues in Scalable Libraries: Poly-Algorithms, Data Distribution Independence, Redistribution, Local Storage Schemes
Anthony Skjellum and Purushotham V. Bangalore, Mississippi State University

Part 2: Experience with Existing Systems: Response to Part 1

11:30 Modularity, Reuse and Efficiency with Message Driven Libraries
L.V. Kale, University of Illinois

11:50 The PMESC Parallel Programming Paradigm and Library
Silvia Crivelli, University of Colorado, Boulder and Elizabeth R. Jessup, Co-organizer

12:10 The LPARX System
Scott Baden and Scott R. Kohn, University of California, San Diego

CP1/White Pearl Room

FFT and Wavelets

Chair: David H. Bailey, NASA Ames Research Center

10:30 Parallel Discrete Wavelet Transform on the Paragon MIMD Machine
Mahn-Ling Woo, University of British Columbia, Canada

10:50 Vector and Parallel Wavelet Transforms for the Analysis of Time-Varying Signals
Andreas Uhl, University of Salzburg, Austria

11:10 Parallel Algorithms for Space-Time Adaptive Processing
Serge Olszanskyj, *James Lebak,* and Adam Bojanczyk, Cornell University

11:30 Cross Ambiguity Functions on the Maspar MP-2
David A. Carlson and Daniel V. Pryor, Supercomputing Research Center

11:50 Efficient Algorithms for Some Specific FFT's on a Massively Parallel Computer
Avi Purkayastha and Jaime Seguel, University of Puerto Rico

12:10 A Parallel, Compact FFT for Real Symmetric Sequences
Richard B. Pelz, Rutgers University

CP2/Nikko Ballroom 1

Mesh Partitioning

Chair: Marsha Berger, Courant Institute of Mathematical Sciences, New York University

10:30 A Generic Approach to Automatic Domain Decomposition for Parallel Finite Element Calculations
Denis Vanderstraeten and R. Keunings, Universite Catholique de Louvain, Belgium; and Charbel Farhat, University of Colorado, Boulder

10:50 Parallel Algorithms for Dynamically Partitioning Unstructured Grids
Pedro Diniz, Steve Plimpton, Bruce Hendrickson and Robert Leland, Sandia National Laboratories

11:10 Parallel Graph Partitioning
Michael T. Heath, Jesus Izaguirre, and Padma Raghavan, University of Illinois, Urbana

11:30 A Graph Contraction Algorithm for the Fast Calculation of the Fiedler Vector of a Graph
Rafael Van Driessche and Dirk Roose, Katholieke Universiteit Leuven, Belgium

11:50 Parallelizing Multilevel RSB for Dynamic Mesh Partitioning
Stephen T. Barnard and Horst D. Simon, NASA Ames Research Center

12:10 Parallel Algorithms for Unstructured Mesh Computation
Mark T. Jones, University of Tennessee, Knoxville; and Paul E. Plassmann, Argonne National Laboratory

CP3/Pink Pearl Room

Geophysics, Ocean, and Atmosphere Modeling

Chair: Robert Street, Stanford University

10:30 Comparison of Massively Parallel Computers Using Air Pollution Models
J. Wásniewski, Technical University of Denmark, Denmark

10:50 Parallel Algorithms for Semi-Lagrangian Transport in Global Atmospheric Circulation Models
John B. Drake and *Patrick H. Worley,* Oak Ridge National Laboratory, Ian T. Foster and John Michalakes, Argonne National Laboratory

11:10 A Data Parallel Implementation of the NCAR Community Climate Model (CCM2)
John M. Dennis, *Steven W. Hammond* and Richard K. Sato, National Center for Atmospheric Research, Richard D. Loft, Thinking Machines Corporation

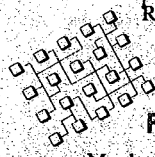
11:30 Modeling Groundwater Flow on Massively Parallel Computers
Steven Ashby, Lawrence Livermore National Laboratory

11:50 MP Unstructured Finite Element Simulations of Chemically Reacting Flows
John Shadid, Scott Hutchinson, Harry Moffat and Gary Hennigan, Sandia National Laboratories

12:10 An Efficient Boundary Condition Processing Method for Three-Dimensional Acoustic Wave Propagation on the CM-5
Philippe Klein and Laurent Anné, Institut Français du Pétrole, France

12:30
Lunch

2:00/Nikko Ballroom 1 & 2
IP3/Chair: Robert S. Schreiber, Research Institute for Advanced Computer Science



What's Wrong with High Performance Fortran?

Maybe nothing; maybe everything. High Performance Fortran promises to promote portability among parallel platforms as well as conventional sequential and vector processors. In addition to all the benefits of Fortran 90, it provides additional support for data parallel programming and an interface to "MIMD" or "multiple-threaded" code. Is this enough? The speaker will examine a number of useful programming strategies and assess the suitability and portability of High Performance Fortran.

Guy L. Steele
Thinking Machines Corporation

2:45/Nikko Ballroom 3
Coffee

3:15-5:15
Concurrent Sessions

MS3/Grey Pearl Room
Scientific Visualization

Scientific visualization is a important tool for analyzing the results of large, complex datasets such as those produced by simulations on parallel architectures. However, current workstation environments cannot always generate computationally intensive visualizations at interactive speeds. The use of parallel processing for graphics rendering can provide the greater performance required for real-time visualization. This minisymposium explores the use of parallel architectures for scientific visualization. The speakers will discuss algorithmic and implementation issues and describe the current state-of-the- art.

Organizer: Kristina D. Miceli
Computer Sciences Corporation, NASA Ames Research Center

3:15 **Parallel Particle Tracing for 3D Unsteady Flow Visualization**
David A. Lane, Computer Sciences Corporation, NASA Ames Research Center

3:35 **Massively Parallel Visualization: Parallel Rendering**
Charles D. Hansen and Michael Krogh, Los Alamos National Laboratory

3:55 **High Level Graphic and Visual Environments for the Intel Paragon**
Richard Frost, San Diego Supercomputer Center, University of California, San Diego

4:15 **Parallel Terrain Rendering and Interactive Dataset Exploration**
Steven L. Groom, Daniel F. Stanfill, IV, and *Stephen H. Watson*, Jet Propulsion Laboratory

4:35 **Highly Parallel Vector Visualization Using Line Integral Convolution**
Brian Cabral and Casey Leedom, Silicon Graphics Computer Systems

4:55 **Parallel Visualization of 3D FEA Data**
Shyh-Kuang Ueng and K. Sikorski, University of Utah

CP4/White Pearl Room
Compilers

Chair: Siddhartha Chatterjee, University of North Carolina, Chapel Hill

3:15 **Integrating Data Distribution and Loop Transformations for Distributed Memory Machines**
J. Ramanujam and A. Narayan, Louisiana State University

3:35 **The Impact of Cache Effects on Resource Scheduling in Distributed Parallel Processing Systems**
Vijay K. Naik and Mark S. Squillante, IBM T.J. Watson Research Center

3:55 **Efficient Multiprocessor Parallelism via Hierarchical Tiling**
Larry Carter and Jeanne Ferrante, IBM T.J. Watson Research Center, Susan Flynn Hummel, Polytechnic University and IBM T.J. Watson Research Center

4:15 **A Compiler Blockable Algorithm for QR Decomposition**
Steve Carr, Michigan Technological University and Richard Lehoucq, Rice University

4:35 **Rearranging the Iteration Space to Eliminate the True Sharing Trashing in Parallel Processing Systems**
Guohua Jin, *Xiaomei Li* and Fujie Chen, Changsha Institute of Technology, People's Republic of China

CP5/Nikko Ballroom 1
Sparse Direct Solvers

Chair: Esmond Ng, Oak Ridge National Laboratory

3:15 **A Scalable 2-D Parallel General Sparse Solver**
S.C. Kothari and Simantha Mitra, Iowa State University

3:35 **A Scalable Parallel Block Algorithm for Band Cholesky Factorization**
Ramesh Agarwal, Fred Gustavson, Mahesh Joshi and Mohammad Zubair, IBM T.J. Watson Research Center

3:55 **A Balanced Decomposition Algorithm for Parallel Solutions of Very Large Sparse Systems**
A.I. Zečević and *D.D. Šiljak*, Santa Clara University

4:15 **Data Parallel Sparse LU Factorization**
John M. Conroy, Steven G. Kratzer and *Robert F. Lucas*, Supercomputing Research Center

4:35 **An Efficient Implementation of Sparse Matrix Factorization**
Anshul Gupta and Vipin Kumar, University of Minnesota, Minneapolis

4:55 **A Generalized Criterion for the Early Termination of *r*-Cyclic Reduction and Divide and Conquer for Recurrences**
Josep-Lluis Larriba-Pey, Angel Jorba, and Juan J. Navarro, Universitat Politecnica de Catalunya, Spain

3:15-5:15
Concurrent Sessions

CP6/Pink Pearl Room
Mathematical Applications

Chair: Jesse Barlow, Pennsylvania State University

3:15 **A Parallel Algorithm for the Enumeration of Costas Sequences**
Oscar Moreno, *John G. Ramírez,* and Pei Pei, University of Puerto Rico

3:35 **Parallel Global Adaptive Quadrature**
M. Napierala and Ian Gladwell, Southern Methodist University

3:55 **Parallel Computation of Steiner Minimal Trees**
Frederick C. Harris, Jr., Clemson University

4:15 **Adaptive Integration of Singular Functions Over a Triangularized Region on a Distributed System**
Ricolindo Cariño, University of the Philippines at Los Baños, Philippines; Ian Robinson, La Trobe University, Australia; and *Elise de Doncker,* Western Michigan University

4:35 **Techniques for Testing the Quality of Parallel Pseudorandom Number Generators**
Steven A. Cuccaro, Michael Mascagni, and Daniel V. Pryor, Supercomputing Research Center

4:00/Nikko Ballroom 1 & 2
Poster Set Up

5:15-7:15/Nikko Ballroom 1 & 2
Poster Session and Welcoming Reception

Performance Models

Performance Modeling of Distributed Memory Systems for Parallel Computing
Ai Li, University of Victoria, Canada; Gudjon Hermannsson, Renaissance Technologies Co.; and Larry Wittie, State University of New York, Stony Brook

A Model for Instrumentation System Management in Concurrent Computer Systems
Abdul Waheed, Vincent Melfi, and *Diane T. Rover,* Michigan State University

Improving Scalability by Communication Latency Hiding
Volker Strumpen and Peter Arbenz, Swiss Federal Technical Institute of Technology, Switzerland

Speed of n-ary Tree Networks
Emile Haddad, Virginia Polytechnic Institute and State University

Comparative Performance of Various Parallel Systems and Programming Paradigms
Bodo Parady and Siamak Hassanzadeh, Sun Microsystems Computer Corporation

Is Scalability Relevant? A Look at Sparse Matrix-Vector Product
Bowen Alpern and *Larry Carter,* IBM T.J. Watson Research Center

CMP: A Memory-Constrained Scalability Metric
Mark Fienup, University of Northern Iowa and S.C. Kothari, Iowa State University

Scalable Algorithms

Performance of a Distributed Pipelined Multijoin Algorithm in a Distributed Heterogeneous Supercomputing Environment
Zahira S. Khan, Bloomsburg University and Eugene Kwatny, Temple University

A Scalable Divide-and-Conquer Parallel Algorithm for Finite State Automata and Its Applications
Z. George Mou and *Sevan G. Ficici,* Brandeis University

A Parallel/Vector Implementation and Statistical Analysis of the Bucket Sort on a Vector-Parallel Distributed Memory System: Lessons Learned in the Integer Sort NAS Parallel Benchmark
Bracy H. Elton and Kenichi Miura, Fujitsu America, Inc.

Parallel Methods

A Class of Asynchronous Block Methods for Nonlinear Systems of Equations
Jianjun Xu, Huazhong University of Science and Technology, People's Republic of China and Houghui Wan, Carleton University, Canada

Parallel Solution of Optimal Shape Design Problem Governed by Helmholtz/Potential Flow Equations
Raino A.E. Mäkinen, University of Jyväskylä, Finland

A Highly Parallel Interior Point Algorithm
George Karypis, Anshul Gupta and Vipin Kumar, University of Minnesota, Minneapolis

The Convergence of Asynchronous Monotone Newton Iteration on Distributed Computer
Jie Hu and Tadao Nakamura, Tohoku University, Japan, and *Lei Li,* Aomori University, Japan

Parallel Multisplittings for Optimization
Rosie A. Renaut and Hans D. Mittelmann, Arizona State University

Recent Advances in a Parallel Algorithm for Multiple Objective Linear Programs
Hong Zhang, ICASE, NASA Langley Research Center, and Malgorzata M. Wiecek, Clemson University

Parallel Processing for Mathematical Applications

Parallel Methods for Finding Trigonometric Sums
Marcin Paprzycki, University of Texas of the Permian Basin and Przemyslaw Stpiczynski, Maria Curie-Sklodowska University, Poland

Parallel Computation of Invariant Measures of High Dimensional Transformations
Jiu Ding, The University of Southern Mississippi

Matrix Formalism for Dynamical Systems as a Base of Dynamical Modeling
Serge Andrianov, St. Petersburg University, Russia

Parallel Programming Systems

Towards Programming of Numerical Problems within the System Providing Automatic Parallelizing
Igor A. Nesterov and Igor V. Suslov, PSI Research Centre for Multiprocessor Systems, Russia

MPP and Loop-Based Parallelism: A Contradiction?
Greg Astfalk, Convex Computer Corporation

Automatic Code Generation for Parallel Finite Element Solvers
J.J. Heijstek, National Aerospace Laboratory NLR, The Netherlands; F.N.C. Slothouber, and V.V. Goldman, University of Twente, The Netherlands

Performance Improvement of Asynchronous Iterations by Nonuniform Load Distributions
J. Nieplocha, Pacific Northwest Laboratory; T. Mai, The University of Alabama, Tuscaloosa

Toward Scalable Parallel Software: Interfacing to Non-von Neumann Programming Environments
George K. Thiruvathukal, R.R. Donnelley and Sons Company; William T. O'Connell, AT&T Bell Laboratories; and Thomas W. Christopher, Illinois Institute of Technology

5:15-7:15/Nikko Ballroom 1 & 2

Poster Session and Welcoming Reception

CAL: A Cellular Automata Language
Z. George Mou, Brandeis University

A Compile-Time Technique to Eliminate the False Sharing Trashing in Parallel Processing Systems
Guohua Jin, *Xiaomei Li,* and Fujie Chen, Changsha Institute of Technology, People's Republic of China

Distributed Computing

Asynchronous PVM Network Computing
Mark E. Cavender and Xiaodong Zhang, University of Texas, San Antonio

Parallel Filter Estimation Maximization Algorithm for Segmentation on a Lan of Workstation
Blaise Chamaret, *Stéphane Ubéda* and H. Chéréfi, Université Jean-Monnet, France

A Comparative Message Passing Performance Analysis of Intel Paragon, IBM SP1 and Cray T3D Using PVM
Joseph W. Manke and James C. Patterson, Boeing Computer Services

Distributed Optimization of Variational Wave Functions Using the DP Library
David Arnow and Paula Whitlock, City University of New York, Brooklyn College

Scheduling, Load Balancing, Graph Partitioning

Estimation of the Graph Partitioning for a Hierarchical System
Alexander Y. Tetelbaum, Michigan State University

Optimal Scheduling and Balancing of Multiprogrammed Loads over Heterogeneous Processors
Emile K. Haddad, Virginia Polytechnic Institute and State University

A Distributed Load Balancing Algorithm Based on Spanning Trees
Chin Ling Chen and Ruay Shiung Chang, National Taiwan Institute of Technology, Republic of China

Granularity Management for a Large-Grain Data Flow Multiprocessor
Amr Zaky and Greg Negelspach, Naval Postgraduate School

Efficient Multiple-Way Graph Partitioning Algorithms
Ali Dasdan and *Cevdet Aykanat,* Bilkent University, Turkey

Weighting the Recursive Spectral Bisection Algorithm for Unstructured Grids
Darryl Allen and *Garry Rodrigue,* University of California, Davis, and Lawrence Livermore National Laboratory; and Evi Dube, Lawrence Livermore National Laboratory

Parallel Discrete Variational Grid Generation for Elliptic Problems
José E. Castillo, San Diego State University and *John Richardson,* NRAD, San Diego

Slices: A Scalable Partitioner for Unstructured Finite Element Meshes
Hong Q. Ding and Robert D. Ferraro, Jet Propulsion Laboratory

A Polynomial-time Task Scheduling Algorithm for Minimizing Processor Synchronization Delay
Aida Dharmakadar, Virginia Polytechnic Institute and State University

Combining Dynamic Load Balancing Techniques on Shared Memory Parallel Processors
Charles Severance, Richard Enbody and Richard Purdy, Michigan State University

Ocean and Climate Modeling

The Junction: A Tool to Parallelize Ocean Models by a Domain Decomposition, to Connect Different Kind of Models and to Impose Open Sea Boundary Conditions
Jean-Marie Beckers and *Francois Schmitz,* University of Liege, Belgium

Dynamic Memory Control in a Parallel Implementation of an Operational Weather Forecast Model
Rupert W. Ford, David Snelling, University of Manchester, United Kingdom; and Alan Dickinson, Meteorological Office, United Kingdom

Applications

A Class of Preconditioners for the Navier-Stokes Equations
Rémi Choquet, IRISA, France

A Methodology for Parallelizing PDE Solvers: Application to Semiconductor Device Simulation
Bruce P. Herndon, N.R. Aluru, Arthur Raefsky, Ronald J.G. Goossens, Kincho Law, and Robert W. Dutton, Stanford University

Parallel Acoustic Wave Propagation and Generation of a Seismic Dataset
B. David Semeraro, Oak Ridge National Laboratory; Ron Oldfield and John VanDyke, Sandia National Laboratories

A Parallel Least-Squares Finite Element Method for Subsonic and Supersonic Flows
Daniel C. Chan, Rockwell International Corporation and University of Southern California

Core-Wide Parallel Implementation of the Interface Current and Current Coupling Collision Probability Methods
Emilio Fuentes and Paul J. Turinsky, North Carolina State University

Shorten Turnaround Time for Two-Dimensional Plasma Processing Simulations via Vectorization and Parallelization Techniques
Chwan-Hwa "John" Wu, Auburn University; Fongray Frank Young, Fong Chia University, Taiwan, ROC; and Nian-Feng Tzeng, University of Southwestern Louisiana

Performance Study of 3D Integral Equation Computations for Incompressible and Compressible Flows on CM-5
Terry G. Logan and *Hong Hu,* Hampton University

A Parallel Implementation of a Projection Method for Solving Incompressible Navier-Stokes Equations with Multigrid Iterations
John Z. Lou, Jet Propulsion Laboratory

Accelerator Design and Analysis on a Parallel Computer
Xiaowei Zhan, Stanford University; Kwok Ko and Roger Miller, Stanford Linear Accelerator Center

A Discrete Simulation of 2-D Fluid Flow on TERASYS
Patrick D. Krolak and *Patrick G. Mullins,* University of Massachusetts, Lowell

Direct Numerical Simulation of High Speed Turbulent Flow on Parallel Architectures
Sarkar Sutanu, University of California, San Diego and *Carl Scarbnick,* San Diego Supercomputer Center

FFT

Parallelization Aspects of a Fourier Method Applied to the Poisson Problem
John Martine, IBM Corporation, Kingston

A Portable 3D FFT Package for Distributed Memory Parallel Architectures
Hong Q. Ding, Robert D. Ferraro and Donald B. Gennery, Jet Propulsion Laboratory

Parallel Pseudospectral Solution of the Kadomtsev-Petviashvili (K-P) Equation
Javad Abdollahi-Alibeik, University of Michigan, Ann Arbor

Partial Differential Equations

Parallel Computing Via Multidomain Techniques for Three-Dimensional Nonsymmetric Problems
Seongjai Kim, Purdue University, West Lafayette

Performance on Distributed Memory Multicomputers of Domain Decomposition Solvers
José M. Cela, Jesus Labarta, and Juan J. Navarro, Universitat Politecnica de Catalunya, Spain

Combining SAS with FSM for Plate-bending Problems
Hsin-Chu Chen, University of Southwestern Louisiana

Parallel Implementation of Domain Decomposition Methods for the Solution of Elliptic Boundary Value Problems
Giovanna Gazzaniga and Gianni Sacchi, Istituto di Analisi-C.N.R., Italy

Parallel Element-by-Element Performance for Navier-Stokes Computations
E. Barragy, Intel and *Graham R. Carey,* University of Texas, Austin

5:15-7:15/Nikko Ballroom 1 & 2

Poster Session and Welcoming Reception

A Direct Domain Decomposition Procedure for Elliptic Problems
Mauricio Kischinhevsky, Universidade Federal Fluminense, Brazil

Boundary Conditions and Domain Decomposition for a Three-Dimensional Finite Difference Time Domain Code on a Cray T3D
Coert Olmsted, David Covey, and Antonius Otto, University of Alaska, Fairbanks

Parallel Element-by-Element Spectral Multilevel Techniques for Finite Elements
Myron Davis, University of Texas, Austin

Implementation of Parallel ADI and Hopscotch Methods on KSR1
T. Basaruddin, University of Indonesia, Indonesia

Using Domain Decomposition in the Multigrid NAS Parallel Benchmark on the Fujitsu VPP500
Jason C.H. Wang, Han Lung and Yasunori Katsumata, Fujitsu Systems Business of America, Inc., Santa Clara; and Takahiro Ishigai, Fujitsu Limited, Japan

Iterative Solvers for Linear Systems

Spatial Domain Decomposition Parallelization of DADI and Preconditioned CG Methods for the Iterative Solution of the Steady State Diffusion Equation: A Comparative Study
Mike Lambert and *Garry Rodrigue,* University of California, Davis, and Lawrence Livermore National Laboratory

High Performance Numerical Solutions for Generalized Krylov Subspace Problem
Tong J. Lee and Vassilis L. Syrmos, University of Hawaii at Manoa

The Iterative Solution of Lyapunov Equations
Jenny Rawson and Rajendra Katti, North Dakota State University

Convergence Results for Parallel Linear Computations
John C. Strikwerda and Zhan Deng, University of Wisconsin, Madison

Multisplitting Methods for Band Matrices
Günter Mayer, University of Rostock, Germany; Götz Alefeld and Ingrid Lenhard, University of Karlsruhe, Germany

A New Multisplitting Asynchronous Iterative Method for Linear System
Da-Wei Chang, Shaanxi Normal University, People's Republic of China

Efficient Parallelization of the Relaxation Iterative Methods for Solving Banded Linear Systems on Multiprocessors
Pedro Diniz and *Tao Yang,* University of California, Santa Barbara

A General Purpose Sparse Matrix Parallel Solver
Hong Q. Ding and Robert D. Ferraro, Jet Propulsion Laboratory

Direct Solvers for Linear Systems

A Comparative Analysis of Parallel Sparse Cholesky Factorizations
Wen-Yang Lin and Chuen-Liang Chen, National Taiwan University, Republic of China

Direct Methods for Banded Linear Systems on Massive Parallel Processors
Peter Arbenz and Walter Gander, Swiss Federal Technical Institute of Technology, Switzerland

Implementation and Performance of BLAS and LAPACK on SGI Power Challenge
Mimi Celis and *Jack Perry,* Silicon Graphics, Inc.

Block Data Distribution for Parallel Nested Dissection
P. Charrier, L. Facq and *J. Roman,* Université Bordeaux I, France

A Parallel Algorithm for Direct Solution of Large Scale Five-Diagonal Linear Systems
Weizhong Dai, The University of Iowa

Solving Large Linear Systems in a Distributed Computing Environment
Arno Liegmann and Wolfgang Fichtner, Swiss Federal Institute of Technology, Switzerland

A Divide-and-Conquer Parallel Algorithm for Banded Linear Systems
Z. George Mou, Brandeis University

Restructuring and Ordering for the Parallel Solution of Sparse Matrix Systems
Hai Xiang Lin, Delft University of Technology, The Netherlands

Multi-block LU Decomposition Algorithms for Dense and Banded Matrices
David L. Littlefield, Southwest Research Institute

Eigenvalue Problems

Isolating Gerschgorin Disks of Symmetric Tridiagonal Matrices
Gregory B. Hill and Elizabeth R. Jessup, University of Colorado, Boulder

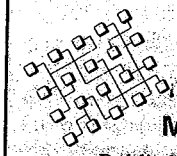
A Parallel Algorithm for the Nonsymmetric Eigen-Problems
T.Y. Li, Richard Enbody, and *Xiaozhuo Yang,* Michigan State University

A Continuation Method for Solving Symmetric Large Sparse Eigenproblems
Liang Jiao Huang, Rockford College

A Fast Algorithm for the Diagonalization of Complex Symmetric Matrices, with Applications to Quantum Dynamics
Victor Ryaboy and Ilan Bar-on, Technion, Israel Institute of Technology, Israel

8:00/Nikko Ballroom Foyer

Registration opens



8:30/Nikko Ballroom 1 & 2

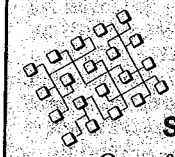
IP4/Chair: Michael Mascagni, Supercomputing Research Center

Massively Parallel Number Crunching on the Internet

Public key cryptography is an important method for information and privacy protection. The strength of the protection offered by some of the most popular public key cryptosystems depends on certain classical number theory problems: because these problems are believed to be hard to solve, the information is assumed to be well protected.

To design practical cryptosystems and to evaluate their effectiveness, we need to know the limits of our capabilities to solve the underlying number theory problems. In this talk, the speaker will discuss the progress we have made over the last few years, which is partially based on massive parallelism on the Internet.

Arjen K. Lenstra
Bellcore



9:15/Nikko Ballroom 1 & 2

IP5/Chair: Michael Mascagni, Supercomputing Research Center

Parallel Computation on the Genome: From DNA Sequence to Biological Function

One of the great challenges in biology is to understand how the linear sequences of genes can be expressed into the molecules, functions and complex dynamic systems of organisms. High performance, parallel computing is essential to this problem in both the analysis of experimental data, and in theory-based predictive modeling. We established the Frederick Biomedical Supercomputing Center to apply this technology to biomedical, and related, problems. Specific examples of results will be given to illustrate the applicability to my research on predicting structure from sequence, and in molecular comparisons. Structure prediction and analysis requires well integrated large memory, and high cpu performance. Sequence comparisons can be embarassingly parallel, and optimized on several architectures, whose advantages will be discussed. A review of ongoing work by others at the center will touch on wide range of areas including xray structure determination of proteins and nucleic acids, structure-based drug design, molecular dynamics of enzymes, and mathematical modelling of physiological processes and genetics. Commentary on future requirements and benefits of performance at petaflops levels will be presented.

Jacob V. Maizel, Jr.
Laboratory of Mathematical Biology
Frederick Cancer Research and Development Center
National Cancer Institute

10:00/Nikko Ballroom 3

Coffee

10:30 AM-12:30 PM

Concurrent Sessions

MS4/Grey Pearl Room

Parallel Processing in Mathematics

Because of their significance for cryptography, advances in integer factorization have received extensive publicity, and it is widely known that both new algorithms and large-scale distributed computations have been essential for the latest accomplishments in this area. There are many other applications of parallel processing in mathematics, and the speakers in this minisymposium will present a selection of current research. They will discuss a range of applications from areas that have traditionally been associated with computation, such as symbolic algebra and number theory, to more exotic ones, such as the search for closed-form expressions for sums and quantum mechanics.

Organizer: Andrew Odlyzko
AT&T Bell Laboratories

10:30 Finding New Number-Theoretic Identities by Supercomputers
David H. Bailey, NASA Ames Research Center

10:50 Elliptic Curves and Cryptography
Johannes Buchmann, Universität des Saarlandes, Germany

11:10 Parallel Computations and Complex Analytic Approximations: from Diophantine Approximations to Quantum Mechanics
David Chudnovsky and *Gregory Chudnovsky,* Columbia University

11:30 Factoring High-degree Polynomials on a Computer Network
Erich Kaltofen, Rensselaer Polytechnic Institute

11:50 Parallel Polynomial Computation
Paul Pedersen, Cornell University

10:30 AM-12:30 PM

Concurrent Sessions

MS5/Nikko Ballroom 1 & 2

Parallel Sparse Direct Methods: Recent Progress

The design of parallel algorithms for solving linear systems of equations by sparse direct methods is a challenging task due to the irregular nature of the storage access and communication requirements. Nevertheless, a great deal of progress has been made recently in developing efficient parallel algorithms for linear systems of equations and least-squares problems. The talks will describe some of the achievements in parallel computation of Cholesky factorization, LU factorization with pivoting, QR factorization, the solution of triangular systems of equations, and the computation of good orderings for matrix factorizations.

Organizer: Alex Pothen
Old Dominion University
and ICASE, NASA Langley Research Center

10:30 Parallel Sparse Matrix Factorizations: A Brief Survey
Esmond Ng and Barry W. Peyton, Oak Ridge National Laboratory

10:50 Improved Load Distribution in Parallel Sparse Cholesky Factorization
Ed Rothberg, Intel Supercomputer Systems Division and *Robert Schreiber,* Research Institute for Advanced Computer Science

11:10 Ordering Sparse Matrices for Parallel Factorization
Alex Pothen, Organizer; *Ed Rothberg,* Intel Supercomputer Systems Division; Horst Simon, Computer Sciences Corporation, NASA Ames Research Center; and Lie Wang, IBM Toronto Research Center

11:30 An Approach for Parallelizing any General Unsymmetric Sparse Matrix Algorithm
Tim Davis and Tariq Rashid, University of Florida, Gainesville

11:50 Parallel Multifrontal Solution of Sparse Linear Least Squares Problems on Distributed-Memory Multiprocessors
Chunguang Sun, Cornell University

12:10 Parallel Nested Dissection
Padma Raghavan, University of Illinois, Urbana

CP7/Pink Pearl Room

Parallel Programming

Chair: Vijay Naik, IBM T. J. Watson Research Center

10:30 DOLIB: Distributed Object Library
E.F. D'Azevedo and C.H. Romine, Oak Ridge National Laboratory

10:50 Language and Environment Support for Parallel Array Object I/O on Distributed Environments
Jenq Kuen Lee and Ing-Kuen Tsaur, National Tsing-Hua University, Taiwan, and San-Yih Huang, Industrial Technology and Research Institute, Taiwan

11:10 Compiling High Performance Fortran
Zeki Bozkus, Larry Meadows, Steven Nakamoto, Vincent Schuster, and Mark Young, The Portland Group, Inc.

11:30 Expressing Direct Simulation Monte Carlo Methods in High Performance Fortran
Dave Middleton, *Piyush Mehrotra,* and John van Rosendale, ICASE, NASA Langley Research Center

11:50 Exploiting Parallelism in Multidisciplinary Applications Using Opus
Mathew Haines and *Piyush Mehrotra,* ICASE, NASA Langley Research Center

12:10 Run-time Data Distribution for Block-Structured Applications on Distributed Memory Computers
Stephen J. Fink and Scott B. Baden, University of California, San Diego

CP8/White Pearl Room

Computational Fluid Dynamics

Chair: Timothy Barth, NASA Ames Research Center

10:30 Implementing a Parabolized Navier-Stokes Flow Solver on Massively Parallel, Scalable Computer Systems
Alan K. Stagg, Cray Research, Inc.; Douglas D. Cline and Graham F. Carey, University of Texas, Austin

10:50 Implementation of a Spectral-Finite Difference Method for Simulation of Stratified Turbulent Flows on Distributed Memory Multiprocessors
Rajat P. Garg, Joel H. Ferziger, Stephen G. Monismith, Stanford University

11:10 Parallel Processing for High Performance Simulations of Hypersonic Flows
Pierre Charrier and L. Flandrin, Université Bordeaux I, France; and Bruno Dubroca, CEA/CESTA, France

11:30 High-Order Finite Difference Formulations for the Incompressible Navier-Stokes Equations on the CM-5
Danesh Tafti, University of Illinois, Urbana

11:50 Parallel Multi-Block Methods for Computational Fluid Dynamics
M.L. Sawley, J.K. Tegnér, and P. Corbett, Ecole Polytechnique Fédérale de Lausanne, Switzerland

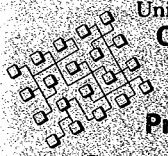
12:10 The Use of Inexact ODE Solver in Waveform Relaxation Methods on a Massively Parallel Computer
Wai-Shing Luk and Omar Wing, The Chinese University of Hong Kong, Hong Kong

12:30

Lunch

2:00/Nikko Ballroom 1 & 2

IP6/ Chair: Monica Lam, Stanford University



Optimizing Compilers and Their Effect on Scientific Programmers

Generating high performance scientific programs requires a collaboration between the programmer and the compiler. Vectorizing compilers would generate good performance for programs that were written in a certain style, the "vectorizable subset" of Fortran or C. These compilers would feed back performance prediction information to encourage this style. Such a collaboration is likely to be the most successful way to program highly parallel computer systems of the future.

Michael Wolfe
Oregon Graduate Institute

2:45/Nikko Ballroom 3

Coffee

3:15-5:15
Concurrent Sessions

MS6/Nikko Ballroom 1 & 2

Compiler Optimization for Parallel Computers

As today's high-performance computer architectures rely heavily on hardware optimization techniques such as parallelism, pipelining and memory hierarchies, compiler optimization becomes ever more important. Compilers shield the users from low level machine details and, perhaps more importantly, enhance the portability of users' software. This minisymposium brings together researchers in compiler optimization for high-performance systems to inform the user community of the state-of-the-art research results.

Organizer: Monica Lam
Stanford University

3:15 **Automatic Detection of Parallelism and the Polaris Restructurer**
David Padua, University of Illinois, Urbana-Champaign

3:35 **An Interprocedural Parallelizer: Design and Experience**
Mary Hall, Stanford University and California Institute of Technology

3:55 **Advances in Data-Parallel Compilers**
Charles Koelbel, Rice University

4:15 **Locality, Communication, and Code Generation for Array-Parallel Languages**
Siddhartha Chatterjee, University of North Carolina, Chapel Hill

4:35 **Automatic Data and Computation Mapping for Scalable Parallel Machines**
Jennifer Anderson, Stanford University

4:55 **Region Analysis for MPP Code Optimization**
Francois Irigoin, Ecolé des Mines de Paris/CRI, France

CP9/Grey Pearl Room

Sparse Iterative Methods

Chair: Steven Ashby, Lawrence Livermore National Laboratory

3:15 **Parallel Sparse Matrix Computations in Iterative Solvers on Distributed Memory Machines**
Achim Basermann, Central Institute for Applied Mathematics Research Centre Jülich GmbH, Germany

3:35 **Parallel Block Iterative Solvers for Heterogeneous Computing Environments**
Leroy Anthony Drummond, CERFACS, France; I.S. Duff, CERFACS and Rutherford Appleton Laboratory, United Kingdom; and Daniel Ruiz, ENSEEIHT, France

3:55 **Effective Parallel Preconditioning with Sparse Approximate Inverses**
Marcus Grote, Stanford University; and Thomas Huckle, Universität Würzburg, Germany

4:15 **Coarse Grain Preconditioned Conjugate Gradient Solver for Large Sparse Systems**
Elise de Doncker and Ajay Gupta, Western Michigan University

4:35 **Parallel Solvers for Reservoir Simulation on MIMD Computers**
E. Piault, Institut Français du Pétrole, France; F-X. Roux, Office Nationnal d'Etudes et Recherches Aérospatiales, France; and *F. Willien,* Institut Français du Pétrole, France

4:55 **Preconditioning with a Decoupled Rowwise Ordering on the CM-5**
Sivan Toledo, Massachusetts Institute of Technology

CP10/Pink Pearl Room

N-body Problems

Chair: John K. Salmon, California Institute of Technology

3:15 **Parallelizing the Fast Multipole Method for the Helmholtz Equation**
Mark A. Stalzer, Hughes Research Laboratories

3:35 **A Portable Parallel *N*-body Solver**
Calvin Lin, Lawrence Snyder and George Turkiyyah, University of Washington

3:55 **Comparison of an $O(N)$ and an $O(N \log N)$ *N*-Body Solver**
Gavin Pringle, Napier University, Scotland

4:15 **GRAPE-4: A Special-Purpose Computer for Gravitational N-body Problems**
Junichiro Makino, Makoto Taiji, Toshikazu Ebisuzaki and Daiichiro Sugimoto, University of Tokyo, Japan

4:35 **Performance Analysis of Parallel Strategies for Localized *N*-Body Solvers**
Silvia M. Figueira and Scott B. Baden, University of California, San Diego

4:55 ***N*-Body Simulations on Message Passing Parallel Computers**
Ananth Y. Grama, Vipin Kumar and Ahmed Sameh, University of Minnesota, Minneapolis

CP11/White Pearl Room

SVD/Imaging/Information Retrieval

Chair: James C.T. Pool, California Institute of Technology

3:15 **Modifying the Singular Value Decompositions on the Connection Machine**
Peter A. Yoon and Jesse L. Barlow, Pennsylvania State University

3:35 **The Computational Complexity of Alternative Updating Approaches for an SVD-Encoded Indexing Scheme**
Michael W. Berry and Gavin W. O'Brien, University of Tennessee, Knoxville; Susan T. Dumais, Bellcore

3:55 **Opportunities for Parallel Solutions in Diffuse Tomography**
Sarah K. Patch, University of California, Berkeley

4:15 **Distributed Maximum Intensity Projection Algorithm for Visualizing Medical Data**
H.T. Nguyen and R. Srinivasan, National University of Singapore, Singapore

4:35 **Distributed and Massively Parallel Methods for the Reconstruction of SPECT Images**
Stefano Foresti, University of Utah

4:55 **A Parallel Algorithm for the Singular Value Problem in Bidiagonal Matrices**
C. Trefftz, *P.K. McKinley,* T.Y. Li, and Z. Zeng, Michigan State University

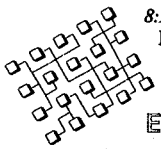
5:30-6:30/Grey Pearl Room

Business Meeting

SIAM Activity Group on Supercomputing

8:00/Nikko Ballroom Foyer

Registration opens



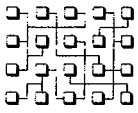
8:30/Nikko Ballroom 1 & 2

IP7/Chair: Horst D. Simon, Computer Sciences Corporation, NASA Ames Research Center

Data Parallel and Message Passing Programming: Experiences in the Real World

The engineering research community has done much investigation into parallel computation using message passing and data parallel constructs. Centric has successfully implemented portable, scalable message passing and data parallel paradigms in its 300,000 line commercial multiphysics based simulation application. On real, customer problem sets this multilevel parallel architecture provides excellent performance and scalability with the number of computation nodes available. Additionally, with the distributed memory available, solutions are possible for problems previously too large for a single computer system. The combination of these features allows design engineers to tackle problems of previously impossible size and complexity providing simulation solutions more closely representing the products being designed and manufactured. *(This is a joint work with M. Eldredge, B. Herndon, and A. Raefsky of the Centric Engineering Systems, Palo Alto; and S. Daly with the Thinking Machines Corporation, Cambridge, MA).*

Thomas J.R. Hughes
Division of Applied Mechanics
Stanford University



9:15/Nikko Ballroom 1 & 2

Panel Discussion

Is Scalable Parallel Computing a Myth?

There is a certain appeal to the ideal of perfect scalability: if technique A has asymptotically linear speed-up or scale-up as a function of the number of processors, while technique B is sublinear, then there will be some (possibly large) number of processors beyond which technique A outperforms technique B.

As appealing as the notion of scalability may be, is it appropriate to reject techniques that do not scale?

Is it really reasonable to expect actual performance to scale perfectly?
If not, what should we expect of parallel machines and parallel algorithms?
What kinds of problems should we even be attacking with these machines and algorithms?

Furthermore, is it reasonable to expect that automatic tools can realize performance gains from massively parallel systems?
If not, how much effort should we expect, or be willing, to invest?
How should this investment be measured in terms of the performance finally realized?
And could new tools help reduce this effort?

These are some of the many questions up for discussion.
Audience participation is encouraged.

Moderator: Robert S. Schreiber, Research Institute for Advanced Computer Science

Panelists: Bowen Alpern, IBM T. J. Watson Research Center
Greg Astfalk, Convex Computer Corporation
David H. Bailey, NASA Ames Research Center
Jack J. Dongarra, University of Tennessee, Knoxville
John Hennessy, Stanford University
Vipin Kumar, University of Minnesota, Minneapolis

10:00/Nikko Ballroom 3

Coffee

10:30 AM-12:30 PM

Concurrent Sessions

MS7/Grey Pearl Room

Large Symmetric Eigenvalue Problems: Algorithms and Applications

Because of the fundamental role of eigenvalue computations in high performance computing, the development of scalable and stable algorithms for dense eigenvalue problems and their robust implementation on large-scale parallel multiprocessors is of great importance. In this minisympolsium, two speakers focus on applications and give an overview of advances and the challenges at hand. Other speakers discuss the algorithmic research and software development that is taking place in the context of the PRISM and SCALAPACK projects to develop portable scalable eigensolvers. They will touch on the algorithmic approaches explored in these projects, namely Bisection, Cuppen's Method and Invariant Subspace Decomposition. Novel approaches to bandreduction and tridiagonalization, a fundamental kernel in this context, will also be presented.

Organizers: Christian H. Bischof
Argonne National Laboratory and
Anna Tsao
Supercomputing Research Center

10:30 Large Eigenvalue Problems in 1995
Alan Edelman, Massachusetts Institute of Technology

10:50 Parallel Studies of the Invariant Subspace Decomposition Approach for Banded Symmetric Matrices
Christian H. Bischof, Co-organizer; Steven Huss-Lederman, Supercomputing Research Center; Xiaobai Sun, Argonne National Laboratory; *Anna Tsao*, Co-organizer; and Thomas Turnbull, Supercomputing Research Center

11:10 Parallel Dense Eigenroutines in SCALAPACK
Jaeyoung Choi, University of Tennessee, Knoxville; *James Demmel*, and Inderjit Dhillon, University of California, Berkeley; Jack Dongarra, University of Tennessee, Knoxville, and Oak Ridge National Laboratory; Ming Gu, and Ken Stanley, University of California, Berkeley

11:30 Successive Band Reduction, Tridiagonalization, and Eigenvalue Computations
Christian H. Bischof, Co-organizer and *Xiaobai Sun*, Argonne National Laboratory

11:50 Modeling the Performance of Dense Symmetric Eigensolvers on Distributed Memory Computers
James Demmel and *Ken Stanley*, University of California, Berkeley

12:10 Parallel Eigensolvers in Chemistry Applications
George Fann and Richard J. Littlefield, Pacific Northwest Laboratory, Richland, WA

10:30 AM-12:30 PM

Concurrent Sessions

MS8/White Pearl Room

Parallel Computing and Applications based on Cellular Automata and Lattice Gas

Cellular automata (CA) are discrete mathematical systems that can model dynamic systems found in mathematics, physics, biology, and other fields. Lattice gases (LGA) constitute a distinct subclass of cellular automata that can simulate complex fluid dynamics governed by non-linear equations such as the Navier-Stokes equation. Computations based on CA and LGA's are inherently parallel since they contain millions or more computational nodes with local and uniform interactions. The speakers in this minisymposium will review the recent advances in applications based on CA and LGA's in computational fluid dynamics and other areas, implementations of the applications on parallel machines such as CM, MP, and CAM8, and the recent development of languages and architectures supporting CA and LGA's based parallel computations.

Organizer: Z. George Mou
Brandeis University

10:30 Ultimate Computers
Norman Margolus, Massachusetts Institute of Technology

10:50 Cellular Automata and Complex Dynamics of Driven Elastic Media
S.N. Coppersmith and P.B. Littlewood, AT&T Bell Laboratories

11:10 New Computer Modeling Capabilities Using Lattice Boltzmann Method
Gary Doolen, Los Alamos National Laboratory

11:30 Fine Grained Models and Massively-Parallel Architectures: the Case for Programmable Matter
Tommaso Toffoli and Norman Margolus, Massachusetts Institute of Technology

11:50 Crystallization in Long-Range Lattice-Gases
Jeffrey Yepez, Phillips Laboratory

12:10 An Exact Theory of Lattice Gas Hydrodynamics
Bruce Boggosian, Thinking Machines Corporation

CP12/Nikko Ballroom 1 & 2

Dynamic Load Balancing

Chair: Paul Plassmann, Argonne National Laboratory

10:30 Runtime Support and Dynamic Load Balancing Strategies for Structured Adaptive Applications
Bongki Moon, Alan Sussman, Robert Bennett, and Joel Saltz, University of Maryland; Gopal Patnaik, David Fyfe, and K. Kailasanth, Naval Research Laboratory; and Craig Douglas, Yale University

10:50 Scheduling Iterative Task Computation on Message- Passing Architectures
Tao Yang and Pedro Diniz, University of California, Santa Barbara; and Apostolos Gerasoulis, Rutgers University

11:10 Refinement Tree Based Partitioning for Adaptive Grids
William F. Mitchell, National Institute of Standards and Technology

11:30 Dynamic Load Balancing for Parallel Finite Element Methods with Adaptive *h*- and *p*- Refinement
Karen D. Devine, Sandia National Laboratories, Albuquerque, and Joseph E. Flaherty, Rensselaer Polytechnic Institute

11:50 Dynamic Load Balancing for Finite Element Calculations in Plasticity on Parallel Computers
Eddy Pramono, Weidlinger and Associates; *Horst D. Simon*, Computer Sciences Corporation - NASA Ames Research Center

12:10 An Unconventional Method for Load Balancing
Yuefan Deng and R. Alan McCoy, State University of New York, Stony Brook; Ronald F. Peierls and Robert B. Marr, Brookhaven National Laboratory

CP13/Pink Pearl 2

Domain Decomposition

Chair: Petter Bjørstad, University of Bergen, Norway

10:30 BPX on Convex's MPP: An Astrophysical Application
Thomas Kioustelidis, University of Tübingen, Germany

10:50 Parallel Performance of a Newton-Krylov-Schwarz Algorithm for the Nonlinear Potential Equation of Aerodynamics
Xiao-Chuan Cai, University of Colorado, Boulder and William D. Gropp, Argonne National Laboratory

11:10 Adaptive Multigrid in Parallel
Linda Stals, Australian National University, Australia

11:30 An Analysis of the Parallel Computation of Arbitrarily Branched Cable Neuron Models
Josep-L.Larriba-Pey, Universitat Politècnica de Catalunya, Spain; Michael Mascagni, Supercomputing Research Center; Angel Jorba and Juan J. Navarro, Universitat Politècnica de Catalunya, Spain

11:50 Numerical Experiments with an Overlapping Additive Schwarz Solver for 3-D Parallel Reservoir Simulation
Luca F. Pavarino and Marcelo Ramé, Rice University

12:10 Parallel Implementation of Non-Linear Evolution Problems using Parabolic Domain Decomposition
Amir Averbuch, Tel Aviv University, Israel; Moshe Israeli and Lev Vozovoi, Technion-Israel Institute of Technology, Israel

12:30

Lunch

2:00-4:00

Concurrent Sessions

CP14/Pink Pearl Room

Eigenvalues

Chair: Anna Tsao, Supercomputing Research Center

2:00 **A Parallel Iterative Method for Exponential Propagation**
Chuck Baldwin, Lawrence Livermore National Laboratory; Roland Freund, AT&T Bell Laboratories; and E. Gallopoulos, University of Illinois, Urbana

2:20 **New Distributed-memory Parallel Algorithms for Solving Nonsymmetric Eigenvalue Problems**
Liwei Wu and Eleanor Chu, University of Guelph, Canada

2:40 **A Parallel Unsymmetric Inverse Iteration Solver**
Greg Henry, Intel, Beaverton, Oregon

3:00 **The Parallelization of an Adaptive Multigrid Eigenvalue Solver with LPARX**
Scott R. Kohn and Scott B. Baden, University of California, San Diego

3:20 **A Parallel Algorithm for Banded Eigenvalue Problems**
Kuiyuan Li, University of West Florida; and Zhonggang Zeng, Northeastern Illinois University

3:40 **Eigenvectors of Tridiagonal Matrices**
K. Vince Fernando, NAG, Ltd., United Kingdom and Beresford N. Parlett, University of California, Berkeley

CP15/Grey Pearl Room

Performance Tools

Chair: Kathy Yelick, University of California, Berkeley

2:00 **Message Compression for High Performance**
Bowen Alpern and Larry Carter, IBM T.J. Watson Research Center

2:20 **An Analytical Model for Communication in Parallel Processing Environments**
Ion Stoica and Florin Sultan, Old Dominion University and *David E. Keyes,* Old Dominion University, and ICASE, NASA Langley Research Center

2:40 **BATMAN: A High Speed Network for Heterogeneous Computing**
Oliver McBryan and *Charbel Farhat,* University of Colorado, Boulder

3:00 **PET: A Parallel Performance Estimation Tool**
Kattamuri Ekanadham, Vijay K. Naik and Mark S. Squillante, IBM T.J. Watson Research Center

3:20 **Automated Instrumentation, Monitoring and Visualization of PVM Programs**
Pankaj Mehra, Brian Van Voorst and Jerry Yan, Recom Technologies - NASA Ames Research Center

3:40 **Simulated Console Lights for Parallel Programs**
Ming C. Hao and *Alan H. Karp,* Hewlett-Packard Laboratories, Palo Alto, CA

CP16/White Pearl Room

Optimization and Control

Chair: Virginia J. Torczon, Rice University

2:00 **A Parallel Global Optimization Method for Solving Molecular Cluster and Polymer Conformation Problems**
Richard H. Byrd, Elizabeth Eskow, André van der Hoek, and *Robert Schnabel,* University of Colorado, Boulder; and Klaas P.B. Oldenkamp, Erasmus University Rotterdam, The Netherlands

2:20 **Iterative Solution of the Lyapunov Equation on a Massively Parallel Computer**
E. Gallopoulos, University of Illinois, Urbana

2:40 **A Decomposition-Coordination Approach for Large-Scale Optimization**
Liam Murphy, Javier Contreras, and Felix F. Wu, University of California, Berkeley

3:00 **Distributed Homotopy Algorithms for H square/H infinity Controller Synthesis**
Yuzhen Ge, Butler University; *Layne T. Watson,* Virginia Polytechnic Institute and State University; and Emmanuel G. Collins, Harris Corporation

3:20 **A Massively Parallel Algorithm for the Optimal Control of Systems Governed by Elliptic PDEs**
Jean-David Benamou, INRIA, France

3:40 **A Coarse Grained Variable-Complexity Approach to MDO for HSCT Design**
Susan Burgee, Anthony A. Giunta, Bernard Grossman, Raphael T. Haftka, and Layne T. Watson, Virginia Polytechnic Institute and State University

CP17/Nikko Ballroom 1 & 2

Computational Physics

Chair: Patrick H. Worley, Oak Ridge National Laboratory

2:00 **3-D Plasma Simulations on Massively Parallel Processors**
V. Gopinath, T.A. Grotjohn, *Diane T. Rover,* and Y-K. Chu, Michigan State University

2:20 **Parallel Object Oriented Implementation of a 2D Bounded Electrostatic Plasma Simulation**
Charles D. Norton and Boleslaw K. Szymanski, Rensselaer Polytechnic Institute; Victor K. Decyk, University of California, Los Angeles, and NASA Jet Propulsion Laboratory

2:40 **Integrating the QMR Method with First Principles Material Science Application Code**
Noël M. Nachtigal and *William A. Shelton,* Oak Ridge National Laboratory

3:00 **Scalable Parallel Numerical Methods and Software Tools for Material Design**
Eric J. Bylaska, Scott R. Kohn, *Scott B. Baden,* M. Elizabeth G. Ong, and John H. Weare, University of California, San Diego; Alan Edelman, Massachusetts Institute of Technology; and Ryoichi Kawai, University of Alabama, Birmingham

3:20 **Computational Electromagnetics and Parallel Dense Matrix Computations**
K. Forsman, Tampere University of Technology, Finland; William Gropp, Argonne National Laboratory; L. Kettunen, Tampere University of Technology, Finland; and *David Levine,* Argonne National Laboratory

3:40 **Distributed Computational Electromagnetics Systems**
G. Cheng, K.A. Hawick, Syracuse University; G. Mortensen, Syracuse Research Corporation; X. Shen and G.C. Fox, Syracuse University

4:00

Conference adjourns.

Speaker Index

CP = Contributed Presentation
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CP = Contributed Presentation
IP = Invited Presentation
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Organizer: Kenneth L. Clarkson, AT&T Bell Laboratories

February 8–10, 1995
Third SIAM Conference on Mathematical and Computational Issues in the Geosciences
St. Anthony Hotel, San Antonio, TX
Sponsored by SIAM Activity Group on Geosciences
Conference Chair: James G. Glimm, State University of New York, Stony Brook

February 11, 1995
SIAM Short Course on Software and Algorithms for Parallel Scientific Computing
St. Anthony Hotel, San Antonio, TX
Organizer: Ken Kennedy, Center for Research in Parallel Computation, Rice University

February 14, 1995
SIAM Short Course on Message Passing Using MPI: from Fundamentals to Applications
Hotel Nikko, San Francisco, CA
Organizer: David W. Walker, Oak Ridge National Laboratory

February 14, 1995
SIAM Short Course on High Performance Fortran in Practice
Hotel Nikko, San Francisco, CA
Organizer: Charles H. Koelbel, Rice University

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Hotel Nikko, San Francisco, CA
Sponsored by SIAM Activity Group on Supercomputing
Organizer: Robert S. Schreiber, Research Institute for Advanced Computer Science

April 27–29, 1995
Third SIAM Conference on Control and Its Applications
Adam's Mark Hotel, St. Louis, MO
Sponsored by SIAM Activity Group on Control and Systems Theory
Abstract Deadline: October 7, 1994
Organizer: John E. Lagnese, Georgetown University

May 20, 1995
SIAM Short Course on Chaos: Theory and Numerics
Snowbird Ski and Summer Resort, Snowbird, Utah
Organizers: Robert L. Devaney, Boston University
James W. Yorke, University of Maryland, College Park

May 21-24, 1995
Third SIAM Conference on Applications of Dynamical Systems
Snowbird Ski and Summer Resort, Snowbird, Utah
Sponsored by SIAM Activity Group on Dynamical Systems
Abstract Deadline: November 7, 1994
Organizers: John David Crawford, University of Pittsburgh and James D. Meiss, University of Colorado, Boulder

October 23-26, 1995
1995 SIAM Annual Meeting
Adam's Mark Hotel, Charlotte, NC
Abstract Deadline: April 24, 1995
Organizer: Danny C. Sorensen, Rice University

November 6-9, 1995
Fourth SIAM Conference on Geometric Design
Loews Vanderbilt Plaza Hotel, Nashville, TN
Abstract Deadline: May 8, 1995
Organizers: Rosemary E. Chang, Silicon Graphics Computer Systems and Larry L. Schumaker, Vanderbilt University

Industrial Mathematics

"This is REAL. It has a different spirit. It gives students the distinct feeling that they could go into industry and actually work on problems like those in this book. The standard teaching of 'here is the mathematics, use it to solve this problem' has been replaced with 'here is a problem, use mathematics to solve it.' This book refreshes the interest of students in mathematics and motivates them to learn more of it. It helps them understand the nature and the importance of mathematics in real world applications."
– Oscar Bruno, Georgia Institute of Technology.

A Course in Solving Real-World Problems

Avner Friedman and Walter Littman

Are calculus and "post" calculus (such as differential equations) playing an important role in research and development done in industry? Are these mathematical tools indispensable for improving industrial products such as automobiles, airplanes, televisions, and cameras? Do they play a role in understanding air pollution, predicting weather and stock market trends, and building better computers and communication systems? This book was written to convince the reader, by examples, that the answers to all the above questions is YES!

Industrial mathematics is a fast growing field within the mathematical sciences. It is characterized by the origin of the problems that it engages; they all come from industry: research and development, finances, and communications. The common feature running through this enterprise is the goal of gaining a better understanding of industrial models and processes through mathematical ideas and computations. The authors of this book have undertaken the approach of presenting real industrial problems and their mathematical modeling as a motivation for developing mathematical methods that are needed for solving the problems.

Each chapter presents and studies, by mathematical analysis and computations, one important problem that arises in today's industry. This book introduces the reader to many new ideas and methods from ordinary and partial differential equations, integral equations, and control theory. It brings the excitement of real industrial problems into the undergraduate mathematical curriculum.

The problems selected are accessible to students who have taken the first two-year basic calculus sequence. A working knowledge of Fortran, Pascal, or C language is required.

Partial Contents

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- ❑ Other

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Education (Highest degree)

Institution	Major / Degree / Year

Primary Professional Interests (Check no more than 3)

- ❑1. Linear algebra and matrix theory.
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- ❑3. Ordinary differential equations including dynamical systems.
- ❑4. Partial differential equations including inverse problems.
- ❑5. Discrete mathematics and graph theory including combinatorics, combinatorial optimization, and networks.
- ❑6. Numerical analysis (theory).
- ❑7. Computational mathematics including scientific computing, parallel computing, and algorithm development.
- ❑8. Computer science including computer architecture, computer hardware, computational complexity, applied logic, database, symbolic computation.
- ❑9. Applied probability including stochastic processes, queueing theory, and signal processing.
- ❑10. Statistics including data analysis and time series analysis.
- ❑11. Control and systems theory including optimal control.
- ❑12. Optimization theory and mathematical programming including discrete and numerical optimization and linear and nonlinear programming.
- ❑13. Communication theory including information theory and coding theory.
- ❑14. Applied geometry including computer-aided design and related robotics.
- ❑15. Image processing including computer graphics, computer vision, related robotics, and tomography.
- ❑16. Classical mechanics of solids including elasticity, structures and vibrations, and constitutive models.
- ❑17. Fluid mechanics including turbulence, aeronautics, and multiphase flow.
- ❑18. Quantum physics, statistical mechanics, and relativity.
- ❑19. Geophysical sciences including reservoir modeling, seismic exploration, and petroleum engineering.
- ❑20. Atmospheric and oceanographic sciences.
- ❑21. Chemical kinetics, combustion theory, thermodynamics, and heat transfer.
- ❑22. Biological sciences including biophysics, biomedical engineering, and biomathematics.
- ❑23. Environmental sciences.
- ❑24. Economics.
- ❑25. Social sciences.
- ❑26. Functional analysis and operator equations, and integral and functional equations.
- ❑27. Management sciences including operations research.
- ❑28. Applied mathematics education (K-12, undergraduate curriculum, graduate study and modeling courses).
- ❑29. Astronomy, planetary sciences, and optics.
- ❑30. Simulation and modeling.
- ❑31. Materials science, polymer physics, and structure of matter.
- ❑32. Electromagnetic theory, semiconductors, and circuit analysis.
- ❑Other_____

SIAM use only

F/M _____
CR# _____
Inv.# _____
CML/CM_____
rebilling_____

Please Complete Reverse

Society Memberships
(Check all that apply)

ACM_____ AIAA_____ AMS_____ APS_____ ASA_____ ASME_____
IEEE_____ IMS_____ MAA_____ ORSA_____ TIMS_____ Other_____

Membership Benefits

Dues cover the period January 1, 1995 through December 31, 1995. Members will receive all issues of *SIAM Review* and *SIAM News*. Members are entitled to purchase one each of no more than four SIAM journals, for their personal use only, at member discount prices. Members can join any of the SIAM Activity Groups at $10 per group. Members are entitled to 20% off list prices on all SIAM books, and receive member discounted registration at SIAM sponsored meetings.

Student members have the same benefits as regular members. Students receive one activity group membership free; additional activity group memberships are $10 each.

Associate members are spouses of current regular members and are entitled to all privileges of regular members except that they do not receive *SIAM Review*. Associate members should indicate the full name of their spouse below.* New associate members must complete a separate application.

Fees and Subscriptions

Compute payment as follows:

Dues (Regular Members): $89.00 _____

Dues (Student Members): $20.00 _____

Dues (Associate Members): $18.00 *(spouses of regular members only)* _____

Dues (Activity Groups): $10.00 per group checked below: _____

Control and Systems Theory _____ Discrete Mathematics _____ Dynamical Systems _____

Geometric Design _____ Geosciences _____ Linear Algebra _____ Optimization _____

Orthogonal Polynomials and Special Functions _____ Supercomputing _____

SIAM Journal on . . .	Member Prices: USA, Canada, Mexico/Elsewhere	
Applied Mathematics (bimonthly)	$58/$63	_____
Computing (bimonthly)	$58/$63	_____
Control and Optimization (bimonthly)	$58/$63	_____
Discrete Mathematics (quarterly)	$48/$51	_____
Mathematical Analysis (bimonthly)	$58/$63	_____
Matrix Analysis and Applications (quarterly)	$48/$51	_____
Numerical Analysis (bimonthly)	$58/$63	_____
Optimization (quarterly)	$48/$51	_____
Scientific Computing (bimonthly)	$58/$63	_____
Theory of Probability and Its Applications (quarterly)	$99/$102	_____
1994-95 Combined Membership List	$12	_____

TOTAL $ _____

Application for Membership

I apply for membership in SIAM:

Signature _____

*Spouse's Name (If applying for Associate Membership) _____

Student Status Certification

CERTIFICATION (student members only)

I hereby certify that the applicant is actively engaged in a degree program and is a full-time student, teaching/research assistant, or fellow:

Name of College or University _____

Department Chair (signature please) _____ Date _____

Please enclose payment with this application and mail to: SIAM, P.O. Box 7260, Philadelphia, PA 19101-7260

MEMBERS OUTSIDE THE USA

For SIAM members residing outside the USA, SIAM will accept payment of membership dues and subscription fees by American Express, MasterCard, and VISA. Because SIAM incurs considerable cost in obtaining payment via credit cards, please use credit cards only when other methods of payment are difficult to arrange.

❑ American Express ❑ MasterCard ❑ VISA

Credit Card # _____ Expiration date_____

For further information, please contact SIAM Customer Services:
Telephone: 215-382-9800 / Toll-free (U.S. only): 800-447-SIAM / Fax: 215-386-7999
E-mail: service@siam.org / Address: 3600 University City Science Center, Philadelphia, PA 19104-2688

HOTEL INFORMATION

HOTEL NIKKO
222 Mason Street
San Francisco, CA 94102
Telephone (415)-394-1111
Fax (415)-394-1159

SIAM is holding a block of rooms at the Hotel Nikko. These rooms are being held on a first come, first served basis at $95.00 single or double room. **These rooms will be held for our exclusive use only until Monday, January 30, 1995, after which date, reservations will depend on availability.**

We urge you to make your reservations as soon as possible. You may do so by calling the Hotel Nikko, faxing your reservation or mailing in the Hotel Reservation Form located on the back of this program. When making your reservation via phone, please be certain to identify yourself as an attendee at the SIAM Conference on Parallel Processing to receive the discounted rate.

Location: The Hotel Nikko is located in the heart of San Francisco – 2 blocks west of Union Square, 9 blocks from Chinatown, and 1-1/2 miles from Fisherman's Wharf. It is 20 minutes from San Francisco International Airport and just blocks from the cable cars and shopping areas.

Deposit: To confirm your reservation, a deposit equivalent to one night's room rate is required at the time you make the reservation. Payment can be made by either AMEX, MC, Visa, Diner's Club or check.

Arrivals and Departures: Check-in time is 3:00 PM and check-out time is 12:00 Noon.

Cancellations: If you need to change or cancel your reservation, you must contact the hotel by 1:00 PM Western Standard Time on your stated date of arrival to avoid any unnecessary charges.

Dining: The Nikko has three restaurants. Cafe 222: Regional American cuisine; Benkay: Classic Japanese cuisine with a spectacular view of San Francisco; and Fountain Lounge/Bar: serving light lunch and cocktails. There are many other restaurants which offer a variety of cuisines within walking distance of the hotel.

Recreational Facilities: The hotel has a fully equipped Fitness Center along with San Francisco's only indoor, glass-enclosed swimming pool. Cost for hotel guests is $11.00 per day.

Parking: Hotel Nikko has 24-hour parking available at a rate of $22.00 per day. There are many parking garages available within two blocks in any direction of the Nikko.

TRANSPORTATION INFORMATION

BY AIR

Official Carrier for Continental USA and Canada

SIAM has selected **USAir** as the official carrier for this meeting. **Discounts are available to meeting attendees from February 8 - 22, 1995.**

By flying USAir you become eligible for the following discounts:

- 5% off of the Supersaver Fares (21 day advance purchase with a Saturday night stayover)
- 10% off of Standard Coach Fares (7 day advance purchase with no Saturday night stayover)
- 45% off of Full Coach Fare (less than 7 day advance purchase and no Saturday night stayover)

SIAM has selected **Get-A-Way Travel** agency to assist attendees in making travel arrangements. Get-A-Way Travel will make your reservations on USAir or any airline of your choice. To take advantage of the USAir discounts, you must book your reservation through Get-A-Way Travel by calling 1-800-223-3863 or 215-379-6800. Be sure to mention that you are attending the 1995 SIAM Conference on Parallel Processing. Get-A-Way Travel will issue your tickets and mail them to you.

CAR RENTAL

Dollar Rent A Car has been selected as the official car rental agency for this meeting. The following rates are available to attendees between February 8 - 21, 1995. Dollar is located in-terminal at San Francisco's International Airport. Attendees will also earn frequent flyer miles from United, TWA or Continental Airlines when renting from Dollar Rent A Car. All rentals include unlimited mileage.

Type of Car	Daily Rate (1-4 days)	Weekly Rate (5-7 days)
Compact	$31.00	$155
Intermediate	$34.00	$170
Standard	$35.00	$175
Luxury	$44.00	$220
MiniVan	$45.00	$225

Additional charges:

$9.00/day Loss Damage Waiver
$4.95/day Personal Accident Insurance & Personal Effects Protection

RESERVATIONS

We encourage you to make advance reservation, as on-site availability cannot be guaranteed. Make reservations by calling Dollar Rent A Car at (800) 800-0044. Be sure to mention that you are attending the 1995 SIAM Conference on Parallel Processing, February 15-18, 1995 in San Francisco, California, in order to receive the discounted rates.

- Cars must be picked up and returned to the same location.
- You must be at least 25 years of age and have a valid U.S. or International Drivers License.
- You must have one of the following credit cards to rent a car: American Express, MasterCard, or VISA.
- Refueling charges, collision insurance, and taxes are not included in the above rates.

On occasion, the car rental agency may offer special rates that are lower than rates quoted above. As an attendee, you are eligible for the lower of the two rates. In most instances, the symposium discount rates are lower than those quoted to the general public.

AIRPORT TRANSPORTATION

A number of airport shuttle vans stop at the island on the Ground Transportation Level of the airport. Lorries Airport Service and Super Shuttle depart every twenty minutes and cost approximately $12.00 one way. A local taxi will cost approximately $28.00.

DRIVING DIRECTIONS TO THE NIKKO HOTEL

From the Airport:

Take 101 North towards the Bay Bridge to San Francisco. Before reaching the Bay Bridge, you will exit at 7th Street. 7th Street will divide and become Bryant Street so stay in the right hand lane. Stay on Bryant Street for 2 blocks. Make a left on 5th Street. Follow 5th Street for about 6 blocks until you pass over Market Street for 1-1/2 blocks, make a left on Ellis Street. The Nikko parking entrance is to your immediate right.

REGISTRATION FEES

Preregistration deadline: Monday, January 30, 1995.

		SIAG/SC*	SIAM Member	Non-Member	Student
†Conference:					
Before 1/30		$150	$155	$185	$55
After 1/30		$180	$185	$215	$55
**Short Courses					
MPI Short Course	*Before 1/30*	$90	$90	$105	$30
	After 1/30	$105	$105	$120	$30
Fortran Short Course	*Before 1/30*	$90	$90	$105	$30
	After 1/30	$105	$105	$120	$30
SAVE by registering to attend both short courses!					
Before 1/30		$160	$160	$185	$50
After 1/30		$175	$175	$200	$50

* Member of SIAM Activity Group on Supercomputing.
** Fees include short course notes. Each course is half-day long and no lunch included.
† Fees include a copy of the proceedings which will be available at the conference.

To register, complete the Preregistration Form in the back of this program and return it with your payment to SIAM. You can also register in any of the following ways:

- Telephone: 215-382-9800; Toll free-800-447-7426 (USA only).
- E-mail: meetings@siam.org
- Fax: 215-386-7999

We urge attendees to preregister and save!. To qualify for the preregistration fee, the Preregistration Form and payment must be received at the SIAM Office by Monday, January 30, 1995.

Preregistration received at the SIAM office after Monday, January 30, will be subject to the difference between the preregistration and the on-site registration fees. The difference will be charged to your credit card or collected from you on-site.

There will be no prorated fees. No refunds will be issued after Monday, February 13, 1995.

On-site registration begins on Tuesday, February 14, 1995. If your preregistration payment arrives at SIAM after the conference has started, that payment will returned to you. Your on-site registration will be processed.

CANCELLATION POLICY

Cancellation prior to:	
January 29, 1995	Full refund
January 30 - February 13, 1995	$25.00 Cancellation Fee
After February 13, 1995	No Refund

Hotel Roommate-Sharing List

SIAM is keeping an e-mail list of attendees who may wish to share a room with another attendee at the conference to cut down on expenses. To be placed on this list, you should forward the following information via e-mail to: degiulio@siam.org or by fax: 215-386-7999.

Name:

Address:

Phone: Fax:

E-mail:

Gender:

Smoker/Non-Smoker

Arrival/Departure Dates

SIAM will forward a list to any attendee who requests one. It is the responsibility of the attendee to make the contacts and arrangements with attendees on the list.

The registration desk will be located at the entrance of the Nikko Ballroom on the third floor. The registration desk will be open as listed below:

Monday, February 13 5:00 PM - 7:00 PM
Tuesday, February 14 7:00 AM - 7:00 PM
Wednesday, February 15 7:30 AM - 3:30 PM
Thursday, February 16 8:00 AM - 3:30 PM
Friday, February 17 8:00 AM - 1:00 PM

NON-SIAM MEMBERS

(For Preregistration Only)

Non-SIAM members are encouraged to join SIAM to obtain the member rate for meeting registration and enjoy all the other benefits of SIAM membership. Join SIAM by returning your completed membership application form (see page 23 - 24) and your Preregistration Form to SIAM. Be sure to include both membership dues and preregistration fees with your forms and return these to SIAM by Monday, January 30, 1995. This offer applies to preregistrants only. Offer expires after that date.

CREDIT CARDS

SIAM accepts VISA, MasterCard and American Express. Please indicate credit card type, account number and the expiration date on the Preregistration Form.

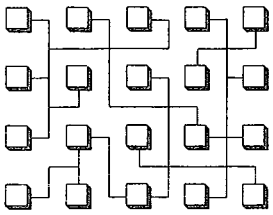
SIAM Corporate Members

Non-member attendees who are employed by the following institutions are entitled to the SIAM member registration fees.

Amoco Production Company
AT&T Bell Laboratories
Bellcore
The Boeing Company
Cray Research, Inc.
E.I. du Pont de Nemours & Company
Eastman Kodak Company
Exxon Research and Engineering Company
General Motors Corporation
GTE Laboratories Inc.
IBM Corporation
ICASE
IDA Center for Communications Research
MacNeal-Schwendler Corporation
Martin Marietta Energy Systems
Mathematical Sciences Research Institute
NEC Research Institute
Supercomputing Research Center, a Divisionof Institute for Defense Analyses
United Technologies Corporation
Visual Numerics, Inc.

Telephone Messages

The telephone number of the Hotel Nikko is 415-394-1111. The Nikko will either connect you with the SIAM registration desk or forward a message to the attendees room.



Seventh SIAM Conference on
PARALLEL PROCESSING
FOR • SCIENTIFIC • COMPUTING

FEBRUARY 15-17, 1995
HOTEL NIKKO
SAN FRANCISCO, CA 94102

Detach this card and enclose it in an envelope with postage and mail to:
Reservations
Hotel Nikko
222 Mason Street
San Francisco, California 94102

HOTEL RESERVATION FORM

*Specially discounted rooms are being held for our exclusive use until **Monday, January 30, 1995.** After that date, reservations will depend on availability. Your reservation is not confirmed until acknowledged in writing by the hotel or verified by phone. A deposit in the amount of one night's room rate is required in order to confirm your reservation. When making reservations by phone, be certain to identify yourself as an attendee at the SIAM Conference on Parallel Processing. The Hotel Nikko telephone: 415-394-1111 or fax: 415-394-1159.*

Please send me a confirmation

PLEASE PRINT

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Please reserve a [ ] $95/Single [ ] $95/Double

Arrival Date _____ Arrival Time _____ Departure Date _____

❑ I am a disabled participant and require appropriate accommodations

I am enclosing my deposit for the first night's room rate. I choose to pay by:
❑ American Express ❑ MasterCard ❑ Visa ❑ Personal Check

Credit Card Number _____ Exp. Date _____ Deposit $ _____

Signature _____

PREREGISTRATION FORM

Preregistration deadline: Monday, January 30, 1995.

Registration Fees		SIAG/SC*	SIAM Member	Non-Member	Student
†Conference					
Before 1/30		$150	$155	$185	$55
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**Short Courses					
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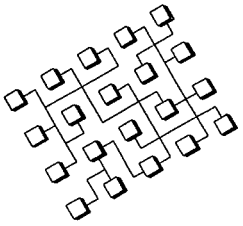
	After 1/30	$105	$105	$120	$30
Fortran Short Course	*Before 1/30*	$90	$90	$105	$30
	After 1/30	$105	$105	$120	$30
Save by registering to attend both short courses!					
Before 1/30		$160	$160	$185	$50
After 1/30		$175	$175	$200	$50
Total amount paid		$	$	$	$

* Member of SIAM Activity Group on Supercomputing.
** Fees include short course notes. Each course is half-day long and no lunch included.
† Fees include a copy of the proceedings which will be available at the conference.



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For your convenience, you can register in any of the following ways:

By Phone: 215-382-9800; Toll free: 800-447-7426 (USA Only)

By E-mail: meetings@siam.org

By Fax: 215-386-7999

By Mail. Complete and return this form and payment to: SIAM Conference Department, 3600 University City Science Center, Philadelphia, PA 19104-2688 U.S.A.

No refunds will be issued after Monday, February 13, 1995.

PLEASE PRINT:
Name _____

Organization _____

Department _____

Business Address _____

City _____ State _____ Zip _____

Telephone _____ Fax _____ E-Mail _____

Home Address _____

City _____ State _____ Zip _____

Please send all SIAM correspondence to the following address: ❑ Home ❑ Business

Please update my SIAM records to reflect the above: ❑ Yes ❑ No

❑ I am a disabled participant and require appropriate accommodations.

I wish to pay by: ❑ AMEX ❑ VISA ❑ MasterCard ❑ Check (payable to SIAM)

Credit Card # _____ Expiration Date _____ Signature _____

Preregistration Form and payment must be received at the SIAM offfice by Monday, January 30, 1995.

Society for Industrial and Applied Mathematics
3600 University City Science Center
Philadelphia, PA 19104-2688

POSTMASTER PLEASE DELIVER TO:

Science and Industry Advance with Mathematics
If you should get multiple copies of this program, please pass the extras along to your colleagues.