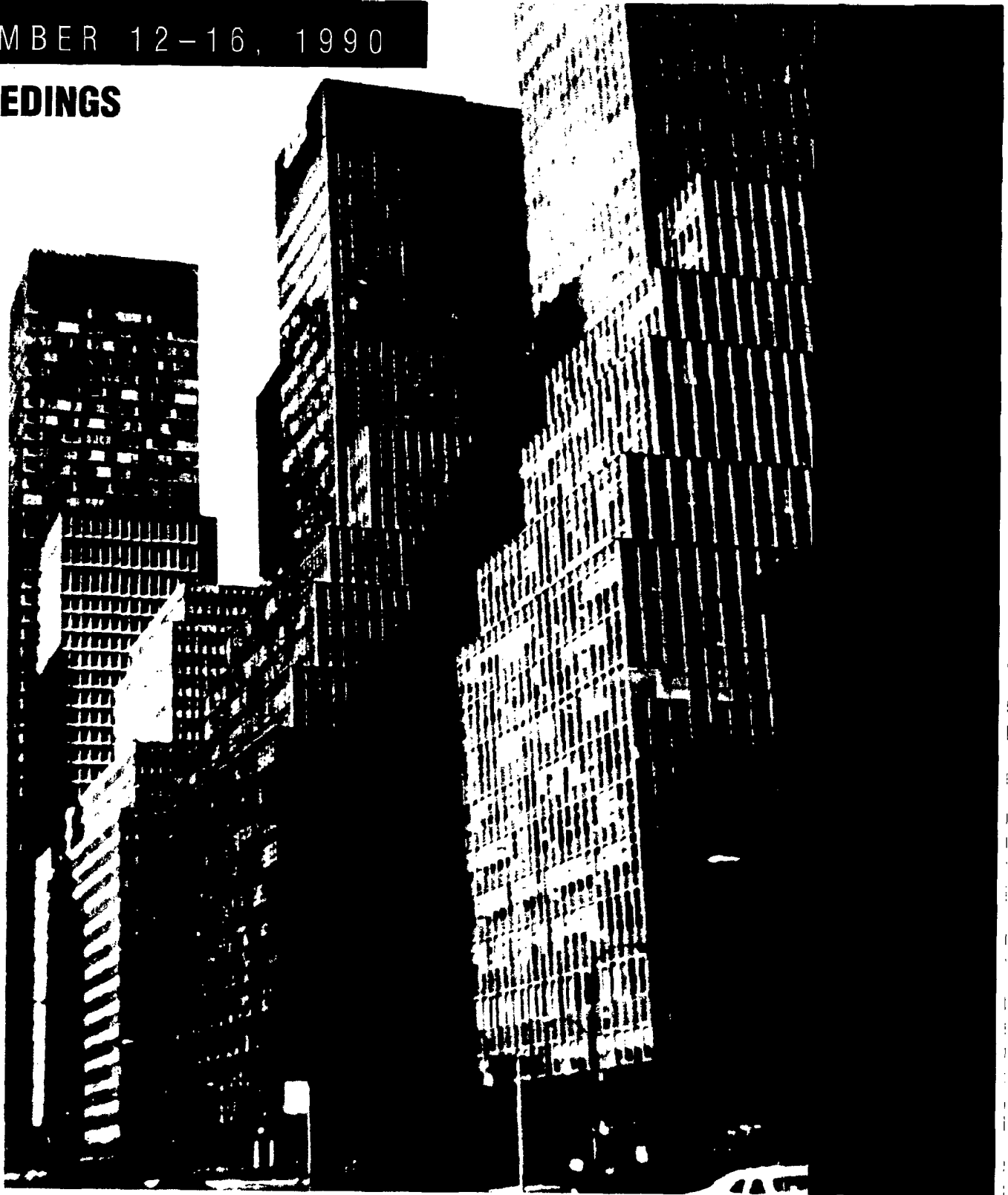


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NEW YORK HILTON AT ROCKEFELLER CENTER, NY, NY



SUPERCOMPUTING '90

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SUPERCOMPUTING '90

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FOREWORD – SC '90

Supercomputing '90 is the third in a continuing series of annual conferences sponsored by the Computer Architecture and Supercomputer Applications Technical Committee of the IEEE Computer Society and ACM SIGGRAPH. It has been developed in cooperation with Los Alamos and Lawrence Livermore National Laboratories, NASA Ames Research Center, the National Center for Atmospheric Research, the Supercomputing Research Center, the National Science Foundation Supercomputing Centers, and SIAM's Activity Group on Supercomputing. From its inception, this series has been shaped by leaders from these organizations who are dedicated to forging a single community from the disparate groups involved in high performance computing. Intended not only as a forum for sharing new research results, but also for examining trends and directions in research, policy, and development arenas, and for exploring new hardware and software products, these conferences are provided with significant challenges and opportunities.

Supercomputing is a composite field and speciality conferences exist for most of its sub-specialties. The challenge for this conference is to blend the best from those different areas, finding a single voice with which to speak for supercomputing, and a common language to share information across disciplines.

Dr. D. Allan Bromley, Science Advisor to President George Bush and head of the U.S. Office of Science and Technology Policy, recently issued a charge to scientists and technologists within the United States:

It is simply no longer possible for the scientific and technology communities of this nation to expect someone else to make the case for science and technology. We need your help so we can better help you and this nation.

This charge to the community applies equally well in a global context. As a community, we have a mission to define the value of supercomputing capabilities and to find avenues for transferring our knowledge and technological awareness for future scientific, commercial, and social benefit. In this Proceedings, we document the efforts of leading scientists to tackle this mission in 1990.

The Program Committee, comprised of individuals from academic, government, and commercial sectors and representing a cross-section of the disciplines involved in supercomputing, strived to represent the breadth of supercomputing. Appreciating the need to enhance system usability through software, performance tools, user environments, and visualization techniques -- to develop applications aggressively -- and to drive advances in architectures and technology areas, the committee evolved the program along six tracks: Applications, Algorithms, Architecture, Tools, Systems and System Management, and Performance. The Proceedings are organized to correspond with the Conference Program.

Recognizing that much of tomorrow's success depends on today's students, we have encouraged student participation by highlighting their research contributions. Five student papers have been selected by the Program Committee to receive special merit awards and are identified in the Proceedings.

Finally, because our challenges are ongoing, we have included in this publication the Call for Participation for Supercomputing '91, which will be held in Albuquerque, New Mexico, November 18-22, 1991. We will continue to explore the Science of Supercomputing at the Conference of Supercomputing and hope to see you there.

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SESSION 3A PANEL: U.S. INTERNET, 1990's

William L. Schrader – Moderator
Performance Systems International, Inc.

Kenneth M. King
President, Educom

David J. Farber
University of Pennsylvania

Stephen S. Wolff
National Science Foundation

ABSTRACT

The panel is intended for supercomputer managers, researchers/users, and government/commercial/academic funders. Current visions for the future and the alternatives will be discussed, based on the key underlying and enabling technologies which they require. We shall cover the research going on in the U.S. Internet; past, present, and future. Alternative structures to the National Research and Education Network will be discussed as well.

SESSION 6A PANEL: SUPERCOMPUTERS IN THE UNIVERSITY

Charles Bender – Moderator
Ohio Supercomputing Center

Lawrence Lee
North Carolina Supercomputing Center

John Connolly
University of Kentucky

John Steele
Purdue University

Michael Levine
Pittsburgh Supercomputer Center

James Woodward
University of North Carolina

ABSTRACT

Leaders of national, state, and university supercomputer centers will discuss the status and future of academic supercomputing centers. Following a brief overview of academic high-performance computing in the United States by representatives of the National Association of State Universities and Land-Grant Colleges (NASULGC), Higher Education and Technology Committee (HETC), and the Coalition of Academic Supercomputer Centers (CASC); panel members will discuss the future of these centers, the impact of administration and congressional initiatives in high performance computing, future funding models, the NSF "green stamp" program, etc. The panel will speculate on the state of academic high performance computing during the next decade (1990s); particularly, what services will be provided, on which type of hardware, using which operating systems software, and various funding models.

SESSION 7A PANEL: COMPUTER SCIENCE EDUCATION FOR THE SOFTWARE WORLD

David Farber – Moderator
University of Pennsylvania

David Parnas
Queens University, Canada

David Crocker
Digital Corporation, Palo Alto

Joseph Touch
University of Pennsylvania (student)

Manny Farber
Cornell University (student)

ABSTRACT

As the convergence of computers and communications continues to impact the new applications and underlying architectures, it is reasonable to ask whether our educational establishments are addressing the right set of educational issues that are needed in the future and whether we are indeed educating our future leaders. Also, the well established decline in the number of students entering the science and engineering fields suggests that we may have dual crises – fewer people, and with the wrong education, at that.

We have brought together a panel of vocal, opinionated people who will address the state of computer science education and its strengths and weaknesses.

SESSION 10A: PORTRAYING PROGRAM EXECUTION ON MASSIVELY PARALLEL ARCHITECTURES

Cherri M. Pancake – Moderator
Auburn University

Dan Reed
University of Illinois

Janice Cuny
University of Massachusetts

Michael Heath
Oak Ridge National Laboratory

Alva Couch
Tufts University

Jim Salem
Thinking Machines Corporation

ABSTRACT

The advent of massively parallel architectures has challenged our ability to conceptualize the behavior of parallel systems. Although some techniques for portraying serial performance have been extended to multiprocessors successfully, it has become clear that the simple replication of these mechanisms is inappropriate when a system involves hundreds or thousands of processors. This panel surveys recent developments in the visualization of massively parallel behavior for use in programming, debugging, and performance evaluation activities. The viewpoints of algorithm designers, applications programmers, tool developers, and system designers will be contrasted.

SESSION 11A PANEL: STANDARDS IN SUPERCOMPUTING

Ken Neves – Moderator
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A. Erisman
Boeing Corporation

Justin Ratner
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Bob Ewald
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Karen Schaeffer
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Ken Kennedy
Rice University

ABSTRACT

The pressure for supercomputers to distinguish themselves from the rest of the pack in terms of performance, will put increasing necessity to use more parallelism in CPUs and memory. Users, by simple observation, can see no trend in computer architecture, and consequently there is little headway being made in software. Huge investments in new software designs will be worthless if there is no understanding of the target computer characteristics which are changing significantly every three to five years. The software design cycle exceeds the life of most computer systems, which further exacerbates the problem.

Issues: Standards are both a positive and a negative. Without standards very little in our daily lives would be tolerable. Every time we plug in an appliance, make a phone call, drive to work, take a train, or replace a door knob, we depend on some set of standards. On the other hand, standards can be an inhibitor to innovation. Is there a common ground between polar positions of laissez faire computing developments and rigid standards that will prevent progress?

PANEL THEME: THE ROLE OF STANDARDS IN:

- 1. Architecture Design*
- 2. Operating Systems and Communication*
- 3. Application Software*
- 4. Languages and Development Tools*