It is my pleasure to welcome you to the second Hot Chips Symposium. Last year, through the initiative of Dr. Robert Stewart and Professor Glen Langdon as members of the Technical Committee on Microprocessors and Microcomputers of the IEEE Computer Society, the first Hot Chips Symposium was organized and held in May at Stanford University. The goal of the symposium was to provide a forum to present the latest high performance chips used to build high performance workstations and systems. The Symposium was extremely well received.

This year's symposium follows the footsteps of last year's symposium and expands its scope slightly to include broader issues, such as performance, software, and interconnects. This year's program features a banquet on the first evening, with a distinguished guest speaker from the venture capital community, Mr. John Doerr. Mr. Doerr is a General Partner with Kleiner Perkins Caufield and Byers. He also serves on the Board of Directors for Sun Microsystems and Cypress. We all look forward to hearing an interesting presentation on the direction of high performance chips and the views of the venture capital community about it.

I would like to express my gratitude to a number of people who made this year's symposium possible. First I would like to thank the two Program Co-Chairmen Alan J. Smith and John Crawford who have managed to put together through the efforts of their Program Committee an excellent technical program. I would also like to thank the members of the Organizing Committee, Doug Marquardt for the many hours he has spent in planning and setting up the local arrangements, Stacy Pena and Andy Goforth for the meticulous and hard work they have put in pulling together the publicity for this symposium, Nam Ling for keeping the process of registering the large number of attendees under control with the little secretarial help he's got, Cynthia Wirtz for planning and working out the details for putting together the Digest of Presentations, Bob Stewart for handling the treasury and volunteering to help in resolving so many other unimaginable details for organizing this symposium, Martin Freeman for his valuable advice, and Glen Langdon, the TCMM Chairman, for passing his experience along to the new members of the Organizing Committee.

I wish you a good time at Hot Chips II.

Sincerely yours,

Hasan S. AlKhatib
General Chairman
FOREWORD

The most exciting frontier in the computer and electronic industries is the development of powerful single chip (or chipset) processors of various types. Only recently has it become possible to put mainframe levels of computing on single chips, and to place on a desk a level of computing performance that exceeds what was available in even the largest computer centers 15 years ago. This conference was first offered last year in order to provide a forum for the presentation of up-to-the-minute, state-of-the-art presentations about the most exciting developments in the chip and chip-set world - i.e. "hot chips". The enormous response in 1989, of about 500 attendees, confirms the excitement that many of us feel about current developments.

This year, we received about 50 submissions and selected the 26 that we found most interesting. We would like to have accepted more, but squeezing even the existing program into two days has been a challenge; we dropped plans for keynote speakers and panel sessions in order to accommodate interesting product talks. We also made an effort to broaden the coverage of the conference, and we are happy to note the presence of sessions and talks on topics such as packaging, routing, systolic and array processors, video and data compression processors, and benchmarking, in addition to the usual coverage of high performance microprocessors and floating point and DSP chips. Many of the submittals were accompanied with notes indicating that the material was confidential until the conference; some of the presentations are the first public discussions of those products. We have been disappointed that we weren't able to attract more submissions from outside the United States; we hope that this conference will have more of an international component in the future. We urge those of you reading this foreword to consider proposing a talk when the call for proposals appears next year.

Many of the presenters at this conference will be asked to prepare papers for consideration by IEEE MICRO, and those papers selected will appear in the Spring of 1991.

We'd like to thank the conference organizing committee for setting everything up, making local arrangements, doing publicity, publishing the program, paying the bills, doing registration, reminding the program committee that it was time to create a program, and performing many other tasks that we don't even want to think about. We'd also like to thank the members of the program committee for their efforts in attracting and soliciting a good set of proposals, and in working with the presenters to ensure high quality presentations of substantial technical content.

Alan Jay Smith
John Crawford
Program Co-Chairs
August 20, 1990 – Mayer Theater, Santa Clara University
On-site registration 8:00 - 9:00 am

9:00-9:30 Welcome and Opening Remarks
Hasan Alkhatib, General Chair
Alan Jay Smith and John Crawford, Program Co-Chairs

9:30-11:00 High Performance Processors – I Session Chair: David Ditzel
- GaAs SPARC RISC Processor
  Gary McMillian, Systems & Processes Engineering Corp., Austin, TX
- The SPARC Lighting Processor
  Bruce Lightner, Metaflow Technologies, San Diego, CA
- The MIPS R/6000 Microprocessor
  George Taylor, MIPS Corporation, Sunnyvale, CA

11:00-11:30 Coffee Break

11:30-12:30 Performance Session Chair: Alan Jay Smith
- The SPEC and Perfect Club Benchmarks: Promises & Limitations
  Rafael Saavedra-Barrera, University of California, Berkeley
- Performance Characteristics of the 1960CA Superscalar Microprocessor
  Steven McGeady, Intel Corporation, Santa Clara, CA

12:30-2:00 Lunch

2:00-2:30 Special Memorial Presentation on Dr. Robert Noyce
Dr. Gordon Moore, Chairman of the Board, Intel Corp., Santa Clara, CA

2:45-4:15 Video and Graphics Session Chair: Hasan Alkhatib
- A Video Compression Chip Set
  Peter Ruetz, LSI Logic Corp., Milpitas, CA
- C_Cube CL550 Image Coprocessor
  Steven Purcell, C_Cube Corporation, San Jose, CA
- DVI and 1750 Chip Set
  Sanjay Vinekar, Intel Corporation, Princeton, NJ

4:15-4:45 Soda Break

4:45-5:45 Packaging Session Chair: Theresa Meng
- Dense Stack
  John Forthun, Dense-Pac Microsystems, Inc., Garden Grove, CA
- Silicon Multichip Modules
  Donald Benson, nChip Inc., San Jose, CA

5:50-6:50 Floating Point Session Chair: Theresa Meng
- A 120 MFLOP CMOS Floating Point Unit
  Alan Quek, Weitek Corporation, San Jose, CA
- A 100MHz Floating Point/Integer Processor
  Gregory Taylor, Bipolar Integrated Technology, Inc., Beaverton, OR

7:30 Banquet with Speaker John Doerr, General Partner with Kleiner Perkins Caufield & Byers

Organizing Committee for the HOT Chips Symposium II:
Hasan Alkhatib, General Chair, Santa Clara University
John Crawford, Program Chair, Intel Corporation
Alan Jay Smith, Program Chair, U.C. Berkeley
Robert Stewart, Treasurer, Past General Chair, Stewart Research Enterprises
Nam Ling, Registration Chair, Santa Clara University
Doug Marquardt, Local Arrangements Chair, Santa Clara Univ.
Cynthia Wirtz, Publications Chair
Martin Freeman, TCMM Member Chair
Andy Goforth, Publicity Chair, NASA Ames Research Center
Glen Langdon, TCMM Chair & Publicity Chair, U.C. Santa Cruz
Stacy Peña, Publicity Chair
CrossCheck Technology Chair
Jack Grimes, Past Program Co-Chair, Mass Microsystems
August 21, 1990 – Mayer Theater, Santa Clara University
On-site registration 8:00 – 8:45 a.m.

8:45–10:45 High Performance Microprocessors - II
Session Chair: Martin Freeman

• 96-bit General Purpose IEEE 754 Floating Point Dual Port Processor
  Terry Schultz, Motorola, Anaheim, CA

• A Single Chip Integer VLIW Processor Core
  Gerrit Slavenburg, Philips Research, Sunnyvale, CA

• The Clipper Super Scalar CMOS Chip Set
  Howard Sachs, Integraph Corporation, Palo Alto, CA

• Experience with the I860 CPU
  John Casey, Hauppauge Corporation, Hauppauge, NY

10:45–11:15 Coffee Break

11:15–12:45 Systolic and Arrays Session Chair: John Crawford

• The Touchstone DELTA Prototype: A 30 Gigaflop Scalable Parallel Computer
  Justin Rattner and others, Intel Corporation, Aloha, OR

• 100 MOP LlW Microprocessor for Multicomputers
  Craig Peterson, iWarp Group, Intel Corporation, Aloha, OR

• DataWave - a Data Driven Video Signal Array Processor
  Ulrich Schmidt, ITT Intermetall, Freiburg, Germany

12:45–2:15 Lunch

2:15–3:45 Routing and Interconnect Session Chair: Forest Baskett

• Caltech Mesh-Routing Chips
  Charles Seitz, California Institute of Technology, Pasadena, CA

• Get Off the Bus and Call a Taxi
  Paul Scott, Advanced Micro Devices, Sunnyvale, CA

• Hot Rod: 1 Gbit/sec. Data Communications
  Johnathan Zierk, Gazelle Microcircuits, Inc., Santa Clara, CA

3:45–4:15 Soda Break

4:15–5:45 IBM's New Superscalar RISC Session Chair: David Patterson

• RISC System/6000 Architecture, Implementation, and Performance
  B. Bakoglu and R. Oehler, IBM Watson Res. Ctr., Yorktown Heights, NY

• Compiling for the RISC System/6000 Branch Unit
  Martin Hopkins, IBM Watson Research Ctr., Yorktown Heights, NY

• RISC System/6000 Floating Point Unit
  Troy N. Hicks, Oscar R. Mitchell, and Richard E. Fry, IBM Advanced Workstation Div., Austin, TX

5:45 Closing Remarks

Program Committee for the HOT Chips Symposium II:
Alan Jay Smith and John Crawford, Program Co-Chairs

Forest Baskett
Silicon Graphics Computer Sys.

John Hennessy
Stanford University

David Ditzel
Sun Microsystems

Teresa Meng
Stanford University

David Patterson
U. C. Berkeley

Mario Tokoro
Keio University, Japan