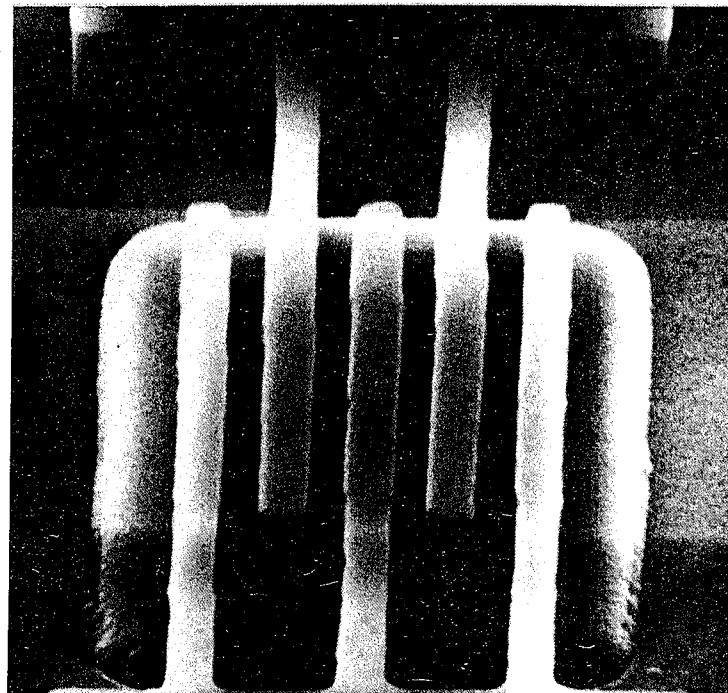


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ELECTRONIC MATERIALS  
SYMPOSIUM

Dr. John M. Pierce  
National Semiconductor  
M/S E-100, P. O. Box 58090  
Santa Clara, CA 95052-8090



Si/SiGe Heterojunction Bipolar Transistor.

THE 18th ANNUAL  
**ELECTRONIC MATERIALS  
SYMPOSIUM**

A One-Day Symposium on Electronic Materials  
Featuring Outstanding Authorities  
in Their Respective Fields

MARRIOTT HOTEL  
GREAT AMERICA PARKWAY  
SANTA CLARA, CALIFORNIA

Monday  
March 26, 1990  
7:30 A.M.

**PROGRAM**

Monday, March 26, 1990  
Marriott Hotel

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- 7:30 Registration
- MORNING SESSION** (California Ballroom - Center)
- Session Chair: Dr. Chiu H. Ting  
Intel Corporation  
Santa Clara, CA
- 8:30 **Welcoming Remarks and Introduction**  
Dr. John M. Pierce  
National Semiconductor, Santa Clara, CA
- 8:40 **"Nanoelectronics: Problems and Promises."**  
Dr. John Randall  
Texas Instruments, Dallas, TX
- 9:30 **"Recent Advances in Resist Materials."**  
Dr. C. Grant Willson  
IBM Research, San Jose, CA
- 10:20 **REFRESHMENTS** (California Ballroom - Right)
- 10:50 **"Progress in Controlling and Understanding Si/SiGe Heterojunctions for High-Speed Bipolar Applications."**  
Dr. Martin Scott  
Hewlett-Packard, Palo Alto, CA
- 11:45 **LUNCHEON** (California Ballroom - Left)
- 12:20 **The sixteenth annual Ross Tucker Award**
- 12:30 **"Voyager: Grand Tour of the Solar System."**  
Dr. David Morrison  
NASA Ames Research Center, Moffett Field, CA
- AFTERNOON SESSION** (California Ballroom - Ctr)
- Session Chair: Prof. John E. Sanchez, Jr.  
University of California at Berkeley  
Berkeley, CA
- 1:30 **"Diamond and Carbide Devices."**  
Mr. Max N. Yoder  
Office of Naval Research, Arlington, VA
- 2:15 **"Mechanical Properties in Deposited Thin Films."**  
Dr. Masanori Murakami  
IBM Research, Yorktown Heights, NY
- 3:00 **REFRESHMENTS** (California Ballroom - Right)
- 3:30 **"Microstructural Mechanisms for Failure in Solder Joints."**  
Prof. John Morris  
University of California, Berkeley, CA
- 4:15 **"Reliable Gate Dielectrics for Future VLSI."**  
Prof. Chenming Hu  
University of California, Berkeley, CA
- 5:00 **HOSTED COCKTAIL PARTY**  
(California Ballroom - Right)

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**VENDOR'S SHOW** (California Ballroom - Right)

8:00 - 5:00 Vendor's Exhibits

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**GENERAL INFORMATION**

The registration to the Symposium covers admission to the Symposium sessions, abstracts of the Symposium presentations, luncheon, a vendor's exhibit, and a partially hosted cocktail hour following the Symposium. Beverage tokens for the cocktail hour will be available in the vendor area during the afternoon sessions. Physical limitations require that attendance be limited to the first 400 registrants.

Costs for the Symposium have been kept to a minimum to encourage attendance. A discounted registration fee is available until March 19, 1990 because of the lower cost of handling preregistration and early arrangements commitments. To reserve your place at the Symposium and the luncheon, we urge you to register early by mail, using the attached form. No refunds of registration fees will be made after Monday, March 19, 1990.

During the Symposium, the sixteenth annual Ross N. Tucker Memorial Awards will be presented to two Bay Area students in recognition of excellence in research.

We are honored to have Dr. David Morrison of the NASA Ames Research Center as our luncheon speaker. Dr. Morrison will recount the odyssey of Voyager culminating in the encounter with Neptune.

The Symposium features a Vendor's exhibit. Information and displays of new materials, processing equipment, and analytical instruments will be presented by representatives of the manufacturers.

A partially hosted cocktail hour will follow the Symposium presentations. This provides an opportunity for informal discussions with symposium speakers, vendors, and attendees.

Registration material and abstracts of the Symposium presentations will be provided at the registration booth.

The opening session will begin promptly at 8:30 A.M. Registration begins at 7:30 A.M. The vendor area will be available for setup at 7:00 A.M.

Further questions regarding the Symposium should be directed to Dr. John M. Pierce, National Semiconductor M/S E-100, P.O. Box 58090, Santa Clara, CA 95052-8090. (408) 721-7436.

**ABOUT THE COVER**

A scanning electron micrograph of a Si-Si<sub>1-x</sub>Ge<sub>x</sub> heterojunction bipolar transistor designed for high-speed applications. (Photo courtesy of Martin Scott, Hewlett-Packard Laboratories.)

## ABOUT THE SPEAKERS

**Prof. Chenming Hu** received his B.S. degree from the National Taiwan University, and his M.S. and Ph.D. in electrical engineering from the University of California, Berkeley in 1970 and 1973, respectively. From 1973 to 1976 he was an assistant professor at Massachusetts Institute of Technology. In 1976 he joined the University of California, Berkeley, as professor of electrical engineering and computer sciences. His present research areas include VLSI devices, hot electron effects, thin dielectrics, device reliability, nonvolatile semiconductor memories, power semiconductor devices, and GaAs devices. He has authored or co-authored two books and over 200 research papers. He is Director of the Joint Services Electronics Program at Berkeley; an Honorary professor of Beijing University, China; Board Chairman of East San Francisco Bay Chinese School; and a Fellow of IEEE.

**Prof. John W. Morris, Jr.** is at the Dept. of Materials Science and Mineral Eng., UC Berkeley, and is also Program Leader, Structural Materials, Center for Advanced Materials, Lawrence Berkeley Laboratory. He was born in Birmingham, Alabama, June 7, 1943. He received a B.S. in Met. Eng. (1964) and an ScD in Mat. Sc. (1969), both from MIT. He came to Berkeley in 1971 after work at Bell Aerospace. His group's research has focussed on the systematic design of engineering materials, including alloy steels, advanced aluminum alloys, and reliable interconnects for electronic devices. Current research is on the mechanisms of fatigue of Pb-Sn solder contacts and the mechanisms of electromigration failures in thin-film aluminum conductors. Professor Morris group has graduated more than 25 PhD's. His awards include the Hardy Gold Medal of the AIME, the Bradley Stoughton Teaching Award of the ASM, the AT&T Foundation Award of the ASEE, a Miller Research Professorship and a Distinguished Teaching Award, UCB. He is the author or co-author of more than 200 technical papers.

**Dr. David Morrison** is a planetary scientist and Chief of the Space Science Division at NASA Ames Research Center. He received his Ph.D. in astronomy from Harvard University in 1969. His previous positions include Professor of Astronomy and Vice Chancellor for Research at the University of Hawaii, Director of the 3-m IRTF telescope in Hawaii, and Deputy Administrator for Space Science at NASA Headquarters. He is an investigator on the Voyager, Galileo, and Comet Rendezvous missions, and he chaired the NASA Solar System Exploration Committee. In the past, he has been President of the Astronomical Soc. of the Pacific, Councilor of the American Astronomical Soc., and Chair of the Astronomy Sect. of the AAAS, and he currently serves on several advisory committees to NASA, NSF, and the National Academy of Science. Morrison is the author of 8 books and more than 100 research papers. His books include four undergraduate textbooks in astronomy and planetary science and his most popular publication is *Cosmic Catastrophes*, with Clark Chapman. An asteroid, 2410 Morrison, is also named after him.

**Dr. Masanori Murakami** received his BS in 1966, his MS in 1968, and his PhD in 1971, all in materials science from Kyoto University, Japan. He was a post-doctoral fellow at UCLA from 1971 to 1975. He joined the IBM Thomas J. Watson Research Center in 1975 and is currently a manager of Thin Film and Contact Metallurgy Group. He has over 80 technical publications and 20 disclosures in the areas of phase transformation in Al alloys, diffusion and mechanical properties in thin films, and reliability of electrode materials used in superconductive Josephson and GaAs devices. He received the W. Hofman Memorial Award in 1982 from the International Lead Development Association, the Z. Jeffries Award in 1982 and the Meritorious Honor Award in 1986, the latter both from the Japan Institute of Metals.

**Dr. John Randall** joined Texas Instruments in 1985 and is a member of the technical staff of the Advanced Concepts Branch of the System Components Laboratory in the Central Research Laboratories. He is presently responsible for microfabrication of quantum effect devices. Other work at TI has concerned masked ion beam lithography, including development and modeling of ion beam masks. At the U. of Houston he fabricated sub-tenth micrometer structures with e-beam and x-ray lithography to be used in an e-beam memory system. After receiving his Ph.D., he was at Lincoln Laboratory for three and one-half years, involved primarily with masked ion beam lithography, but also reactive ion etching, x-ray lithography, low pressure CVD, and other microfabrication techniques. Dr. Randall has published over 40 papers. He holds a B.S. in EE (1975), a M.S. in EE (1977), and a Ph.D. in EE (1981), all from the University of Houston. He is a Member of IEEE, AVS, and SPIE.

**Dr. Martin P. Scott** received his B.S. degree in Materials Science and M.E. from Rice University in 1976 and his Ph.D. in Materials Science from Stanford University in 1980. He joined HP Laboratories in 1981 where his research focussed on characterizing crystalline defects in semiconductors, including in-situ observations of dislocations at high temperature using synchrotron radiation. His research continued in the characterization of processing induced defects with an increasing emphasis on the correlation of defects to device properties in both silicon VLSI and III-V applications. He is currently Project Manager of the Materials Characterization group in Circuit Technology R&D where he is also responsible for evaluating advanced epitaxy for high performance bipolar applications.

**Dr. C. Grant Willson** holds a Ph.D. in Organic Chemistry from UC Berkeley (1973), a MS from San Diego State U. (1976), and a BS from UCB. He is a member of ACS, SPIE, AAAS, SPE and Sigma Xi. He is a principal editor of *J Materials Research* and is on the editorial staff of others. He was elected Member at Large and is on the Executive Committee of the Polymeric Materials, Sci. and Eng. Div. of the ACS. He came to the IBM Research Lab. in 1978 from UCSD, where he was Assist. Professor of Chem. He is currently Manager of the Polymer Science and Technology Function at the IBM Almaden Research Center in San Jose. Dr. Willson's nearly 100 publications are in organic chemistry including synthetic methods, peptide hormone chemistry, radiation chemistry and resist materials design. He is coauthor of the books *Introduction to Microlithography* and *Materials for Microlithography* and coinventor of more than 25 IBM patents. He was elected IBM Fellow in 1985, has been recognized with the Arthur K. Doolittle Award by the ACS, and in 1988 was given the Alexander von Humboldt Senior American Scientist Award.

**Mr. Max N. Yoder** is with the U.S. Office of Naval Research where he supervises R&D programs in semiconductor materials, materials growth techniques, electro-optical device structures, pseudomorphic structures, monolithic integrated circuits, and applications to military electromagnetic systems. He currently manages the SDIO Innovative Science and Technology Initiative in diamond technology and is active in the management of their electro-optical and SBIR programs. He received his BSEE degree from Purdue U. and his MSE degree from George Washington U. As a naval officer, he secured the first Navy R&D funding in microelectronics in 1962 and achieved the first microwave acoustic delay line exhibiting octave instantaneous bandwidth. Currently he is pursuing new approaches to refractory semiconductors, atomic layer epitaxy, and strained layer semiconductor structures. He has published and presented in SS materials, ohmic contacts, praterasonics, MMICs, and E<sub>m</sub> systems applications. He holds 19 patents. Mr. Yoder has served on numerous conference committees and is an active reviewer for a number of journals. He is a member of Eta Kappa Nu, Tau Beta Pi, and IEEE.

## 1990 Ross Tucker Award Recipients

(to be announced)

## SYMPOSIUM COMMITTEE

<i>Kent Carey</i>	<i>John E. Sanchez, Jr.</i>
Hewlett-Packard	University of Calif. Berkeley
<i>David F. Kyser</i>	<i>Michael E. Thomas</i>
Philips Research	National Semiconductor
<i>Eugene Meieran</i>	<i>Robert L. Thornton</i>
Intel	Xerox
<i>Aare Onton</i>	<i>Chiu H. Ting</i>
IBM	Intel
<i>Fernando Ponce</i>	<i>Cary Yang</i>
Xerox	Santa Clara University
<i>Lynn M. Roylance</i>	
Hewlett-Packard	

## SYMPOSIUM CHAIR

*John M. Pierce*  
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## SYMPOSIUM SUPPORT

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Symposium date: March 26, 1990	Registration Fee	Pre-registration by March 19, 1990			
Regular Registration (please circle)	\$75			\$55	
Full-Time Registered Student	\$40			\$20	

Make check payable to: "Electronic Materials Symposium", and send with the above information to: Dr. John M. Pierce, National Semiconductor M/S E-100, P.O. Box 58090, Santa Clara, CA 95052-8090. (408) 721-7436. Do not send purchase orders. Please make sure your name and affiliation are clearly identified.