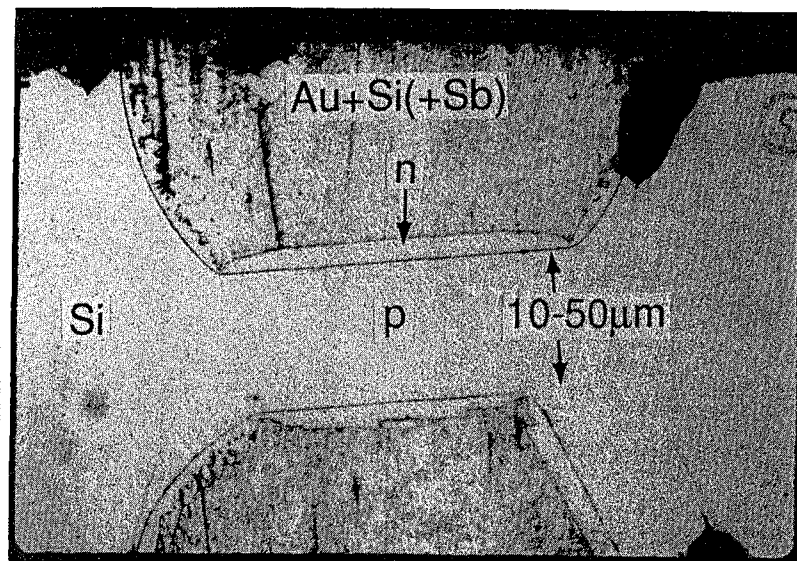


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The
 NORTHERN CALIFORNIA
 ELECTRONIC MATERIALS
 SYMPOSIUM



THE 21st ANNUAL
**ELECTRONIC MATERIALS
 SYMPOSIUM**

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

LE BARON HOTEL
 1350 N. FIRST STREET
 SAN JOSE, CALIFORNIA

Monday
 March 15, 1993
 8:00 AM

PROGRAM

Monday, March 15, 1993

Le Baron Hotel

- 8:00 Registration
- MORNING SESSION (Fiesta Ballroom)**
- Session Chair: Prof. Emily Allen
SJSU
San Jose, CA
- 8:30 **Welcoming Remarks and Introduction**
Dr. Jerry Hurst
IBM, Almaden, CA
- 8:40 **"Charging Effects During Plasma Processing"**
Prof. James McVittie
Stanford University, Stanford, CA
- 9:25 **"Trends in Ultrapure Semiconductor Materials:
Water, Gases and Chemicals"**
Donald L. Tolliver
Motorola/Sematech, University of Arizona, Tucson, AZ
- 10:10 **REFRESHMENTS (Vendor Exhibit Area)**
- 10:40 **"Advanced Non-Linear Optical Materials:
From the Laboratory to the Marketplace"**
Prof. Robert Byer
Stanford University, Stanford, CA
- 11:30 **LUNCHEON**
- 12:15 **The nineteenth annual Ross Tucker Award**
- 12:25 **"The Beginning of Silicon Technology"**
Dr. John Moll
Hewlett-Packard, Palo Alto, CA
- AFTERNOON SESSION (Fiesta Ballroom)**
- Session Chair: Dr. Martin Scott
Hewlett-Packard
Palo Alto, CA
- 1:30 **"Materials Issues in Thin Film Magnetic
Recording Head and Media"**
Dr. Tu Chen
KOMAG, Milpitas, CA
- 2:15 **"Bonding by Atomic Rearrangement: An
Alternative Approach to Optoelectronic Integration"**
Dr. Rajaram Bhat
Bellcore, Red Bank, NJ
- 3:00 **REFRESHMENTS (Vendor Exhibit Area)**
- 3:30 **"A Low Thermal Expansion Al-3%Ge Alloy for
Vias and Interconnects"**
Dr. King N. Tu
IBM, Yorktown Heights, NY
- 4:15 **"TEOS-Ozone Oxide for Multilevel Metallization"**
Dr. Chiu H. Ting
Intel, Santa Clara, CA
- 5:00 **HOSTED COCKTAIL PARTY**
(Vendor Exhibit Area)

VENDOR'S SHOW

8:00 - 5:00 Vendor's Exhibits

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 400 registrants.

Costs for the Symposium have been kept to a minimum to encourage attendance. A discounted registration fee is available until March 8, 1993 because of the lower cost of handling pre-registration 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 8, 1993.

During the Symposium, the nineteenth 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. John Moll of Hewlett-Packard as our luncheon speaker. Dr. Moll began the effort at Bell Labs to move from germanium to silicon semiconductor devices during his tenure there between 1952 and 1958. He spent time at Stanford University and Fairchild Camera and Instruments before coming to Hewlett-Packard in 1974. The pioneering work he and his co-workers performed at Bell Labs will be the subject of his talk.

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 8:00 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. Jerry Hurst, IBM Almaden Research Center K65/802, 650 Harry Rd., San Jose, CA 95120-6099, (408) 927-2942.

ABOUT THE COVER

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 Pictured is one of the first silicon *npn* transistors fabricated at Bell Laboratories by Dr. J. L. Moll and Dr. D. K. Wilson in 1954.
 (Photo courtesy of Dr. John L. Moll, Hewlett-Packard)
 XX

ABOUT THE SPEAKERS

Dr. Rajaram Bhat received his B.Tech. from the Indian Institute of Technology in Madras, M.E. from the Indian Institute of Science in Bangalore, and Ph.D. from Rensselaer Polytechnic Institute, Troy, NY in electrical engineering in 1969, 1972 and 1977, respectively. He worked at the General Electric Company, Syracuse, NY from 1976 to 1979 on light emitting diodes for opto-coupler applications. He joined Bell Laboratories, Murray Hill, NJ in 1979 to work on organometallic vapor phase epitaxy (OMVPE) of GaAs and AlGaAs. Upon the divestiture of AT&T in 1984 he transferred to Bellcore and developed the OMVPE technique for the deposition of InP-based materials for high speed and optoelectronic device applications. He is currently the manager for all of Bellcore's III-V epitaxial deposition efforts. He has authored or co-authored numerous papers on III-V materials growth and characterization and devices.

Prof. Robert Byer received his Ph.D. in 1969 in Applied Physics at Stanford University and has been a professor in that department during the intervening period. He has made many contributions in the area of laser development and in the use of lasers as measurement tools. In 1980 he initiated research in advanced slab geometry solid state laser sources and since 1984 has centered his research interests on diode pumped solid state lasers. Prof. Byer is a Fellow of the Optical Society of America, the IEEE, the American Physical Society and the American Association for the Advancement of Science. He was elected to the National Academy of Engineering in 1987. From 1987 to 1993 he served as Vice Provost and Dean of Research at Stanford University. Prof. Byer has co-founded two companies, Quanta Ray Inc. in 1975 and Lightwave Electronics Corporation in 1984. He has published more than 200 scientific papers and holds 20 patents in the fields of lasers and nonlinear optics.

Dr. Tu Chen Dr. Tu Chen received a B.S. in Metallurgical Science from Cheng Kung University in Taipei, Taiwan, in 1958, and a Ph.D. in Metallurgical Engineering from the University of Minnesota in 1967. From 1971 to 1983 he was a principal scientist at the Xerox Palo Alto Research Center. In 1983, he founded Komag Inc. and developed the company into a world leading supplier of thin film hard disks. Currently, Komag employs 2200 people domestically with annual sales approaching \$300 million. Dr. Tu Chen has authored over 50 technical publications and is credited with more than 15 patents. Dr. Tu Chen was recognized for his accomplishments at Komag with the "1988 Entrepreneur of the Year Award" from Venture Magazine and Arthur Young.

Prof. James McVittie Dr. McVittie is a Senior Research Scientist in the Stanford University Center for Integrated Systems. He received the B.S. (EE) degree from the University of Illinois and the M.S. (EE) and the Ph.D. (EE) degrees, respectively, from Stanford University. From 1972 to 1974 he was at MIT Lincoln Laboratory. In 1974 he joined the Xerox Palo Alto Research Center group where he worked on MOS interfaces and CCDs. He returned to Stanford in 1981 as a permanent member of the research staff in the Integrated Circuit Laboratory. Since 1985 he has headed a research group responsible for process development and modeling in CVD and plasma etch processes. Currently his group is focusing on plasma diagnostics, process induced device damage and the development of SPEEDIE, a feature scale profile simulator for etching and deposition. Dr. McVittie has co-authored over 85 papers in areas which include plasma etching, LPCVD, metallization, oxidation, and semiconductor devices.

Dr. John L. Moll received his B.S. in Physics in 1943 at Ohio State University. After spending 2 years at RCA Labs in Lancaster, Pennsylvania Moll returned to Ohio State and received his Ph.D. there in Electrical Engineering in 1952. From 1952 to 1958 Dr. Moll worked at Bell Laboratories in Murray Hill, New Jersey. During this period Dr. Moll began the first work on silicon semiconductor devices and co-developed the "Ebers and Moll model for large signal behavior of transistors" in 1954. He left Bell Laboratories to become a professor at Stanford University in 1958 then went on to Fairchild Camera and Instruments in 1969 where he became Technical Director of the Opto-electronics Division. In 1974 Dr. Moll moved to Hewlett-Packard where he became Director of Integrated Circuits Structures Research. Since 1990 he has held the title of Distinguished Contributor on the technical staff at Hewlett-Packard Laboratories. Dr. Moll has received numerous awards including Guggenheim Postdoctoral Fellow, 1964, IEEE Ebers Award, 1971, Life Fellow of the IEEE, 1986, and the IEEE Edison Metal, 1991. He authored the book *Physics of Semiconductors* in 1964 and co-authored *Computer Aided Design in VLSI Development* in 1985.

Donald L. Tolliver has been with Motorola Semiconductor Products since 1960. Don Currently holds the title of Industrial Researcher for SEMATECH as a Motorola Assignee located at the University of Arizona, Tucson, Arizona. He is on the technical ladder in the Semiconductor Sector and is a Member of the Technical Staff. He is responsible for technology transfer and industrial support for the SEMATECH Center of Excellence and the Center for Microcontamination Control at the University of Arizona. He serves on the editorial advisory board of *Microcontamination Magazine* and the technical review board for the Microcontamination Conference and Exposition. In 1988 Don provided, as Editor, one of the first books in the industry dealing with contamination control: *Handbook of Contamination Control in Microelectronics*. He assumed the office of President of the Institute of Environmental Sciences for a one-year term in July 1988. Don has published a number of articles in the field of semiconductor processing and contamination control technology. He is a graduate of the University of Arizona, with a B.S. in Chemistry and Mathematics.

Dr. Chiu Ting has been a Program Manager/Senior Scientist in the Technology Development Group at Intel Corporation, Santa Clara, California since 1981. He leads a group working on a variety of advanced integrated-circuit processing technologies, with emphasis on advanced lithography and multilayer interconnection. From 1961 to 1981 he was at IBM Corporation facilities in San Jose, California, East Fishkill, New York and Yorktown Heights, New York, working on electron beam lithography, bipolar and MOS integrated-circuit processing technologies, e-beam mask and magnetic bubble device fabrication. He received his B.S.E.E. degree from the University of California at Berkeley and his Ph.D. from Stanford University.

Dr. King N. Tu is a research staff member at IBM Thomas J. Watson Research Center. He received his B.Sc. degree from National Taiwan University and his Ph.D. in Applied Physics from Harvard University. He has pioneered the systematic study of the formation and properties of metal silicides on silicon. Dr. Tu has been President of the Materials Research Society, a Fellow of the American Physical Society and the Metallurgical Society, an Overseas Fellow of Churchill College and has spent two sabbatical years at the Cavendish Laboratory of Cambridge University.

1993 Ross Tucker Award Recipients

(two awards to be announced this year)

SYMPOSIUM COMMITTEE

<i>Emily Allen</i> SJSU	<i>Fernando Ponce</i> Xerox
<i>Kent Carey</i> Hewlett-Packard	<i>Mahmudur Rahman</i> Santa Clara University
<i>Paul Flinn</i> Intel	<i>Martin Scott</i> Hewlett-Packard
<i>Eugene Haller</i> LBL	<i>John Shott</i> Stanford
<i>Dah-Bin Kao</i> National Semiconductor	<i>Robert Thornton</i> Xerox
<i>David Kyser</i> AMD	<i>Chiu Ting</i> Intel
<i>Eugene Meieran</i> Intel	<i>John Yue</i> AMD
<i>John Pierce</i> National Semiconductor	

SYMPOSIUM CHAIR

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Symposium Date: March 15, 1993	Registration Fee	Pre-registration by March 8, 1993
Regular Registration (please circle)	\$75	\$55
Full-Time Registered Student	\$40	\$20

Make check payable to: **Electronic Materials Symposium** and send the above information to: Dr. Jerry Hurst, IBM Almaden Research Center K65/802, 650 Harry Rd., San Jose, CA 95120-6099, (408) 927-2942. Do not send purchase orders. The Tax ID number for the Symposium is: 25-1484913. Please make sure your name and affiliation are clearly identified.