

Gordon E. Moore Named ECS Honorary Member

GORDON E. MOORE (at left in photo below), Chairman Emeritus of Intel Corporation and long-time ECS member, was recently awarded with Honorary Membership status, an award granted to only a few ECS members. ECS President **MARK ALLENDORF** (at right in photo below) presented Dr. Moore with a scroll commemorating his election to Honorary Membership in ECS, and said, "Moore's tremendous achievements in this field have had a strong and lasting influence on ECS, its members, and the work that they perform."

Moore co-founded Intel in 1968 and is widely known for "Moore's Law": In 1965 he predicted that the number of transistors the industry would be able to place on a computer chip would double every year. In 1975, he updated his prediction to once every two years. While originally intended as a rule of thumb in 1965, it has become the guiding principle for the

industry to deliver ever-more-powerful semiconductor chips at proportionate decreases in cost.

Dr. Moore has been the subject of a number of stories in *Interface*, including coverage of his delivering the ECS Lecture at two ECS meetings (1981 and 1997), as well as the cover story for the spring 1997 issue of *Interface*. Moore has been a member of ECS for 48 years. In recognition of his accomplishments and contributions to the solid state science and technology that the Society's covers, in 2006, ECS established the Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology. Originally the Society's Solid State Science and Technology Award, the newly-named Medal was made possible by a \$150,000 endowment from Intel Corporation in honor of its co-founder.

ECS is proud to hail Dr. Moore as an Honorary Member and to continue its relationship with this important scientist.



In Memoriam



Bruce E. Deal 1927-2007

*"Give me a large enough furnace
and a place to stand
and I'll oxidize the world."*

— **BRUCE DEAL**

BRUCE E. DEAL passed away on April 17, 2007, in Palo Alto, California. He was born in Lincoln, Nebraska on September 20, 1927 to parents Roy W. Deal and Edith Fiddock Deal. Dr. Deal received an AB degree from Nebraska Wesleyan University in 1950, and MS and PhD degrees in physical chemistry from Iowa State University in Ames, Iowa in 1953 and 1955 respectively. He served in the 392nd Army Band at Camp Lee, Virginia from 1946 to 1947.

In 1950, Dr. Deal married Rachel V. Birmingham. They had three children: Donald (born 1954 in Ames, IA), Michael (born 1957 in Spokane WA), and Diane (born 1961 in Palo Alto CA). Deal joined Kaiser Aluminum and Chemical Corporation's Department of Metallurgical Research in Spokane, WA in 1955 as a Research Chemist. In 1959, Deal and family moved to Palo Alto, CA and he spent the rest of his career in Silicon Valley. He first conducted semiconductor research at Rheem Semiconductor in Mountain View, the first spin-off of Fairchild Semiconductor. In 1963, he joined Fairchild's R&D Laboratory in Palo Alto, initially as a Member of Technical Staff and later as a Research Manager/Department Director.

Dr. Deal was known throughout the world for his research involving silicon oxidation and passivation. In the 1960s, he worked at Fairchild with Andy Grove, Gordon Moore, and other scientists in developing processes leading to the manufacture of stable MOS semiconductor devices and circuits and the explosive growth of the MOS integrated circuit industry in the early 1970s. A specific paper published

in 1965, co-authored with Grove, concerning the mechanism of silicon thermal oxidation, was one of a series over a 15 year period or so and has been one of the most cited publications in the semiconductor field.

After Moore and Noyce founded Intel in 1968, Deal remained at Fairchild until the company was sold to National Semiconductor in 1977. He spent a year at National as Principal Technologist, and then joined Advantage Production Technology as Vice-President of Development. Advantage developed vapor phase wafer cleaning equipment. Deal retired when the company closed in 1992. Subsequently, he was self-employed as a consultant for several semiconductor-related companies, and also participated in a number of patent infringement lawsuits as a technical expert. Deal was concurrently a consulting professor at Stanford and Santa Clara Universities for more than twenty five years.

Dr. Deal has authored or co-authored nearly 100 technical publications and patents and lectured throughout the world. Deal became a member of ECS in 1955 and was active in many affairs of the Society. At the San Francisco Section level, he served as Membership Chair, Secretary, Executive Chairman, and Councillor. He was active in the Electronics and Photonics Division, where he served as Publicity Chair, Nominating Committee Chair, Vice-Chair/Semiconductors, and Member-at-Large of the Executive Committee. He also served on or chaired numerous Society committees: Membership, Council of Sections, Long Range Planning, Publication, Nominating, Technical Affairs, Ways and Means, and Centennial. He served as President of ECS (1988-89).

Bruce Deal was the recipient of several of the most prestigious ECS awards: ECS Fellow (1991), the ECS Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology (1993), and the ECS Edward Goodrich Acheson Award (2002). Deal was a Fellow in the Institute for Electrical and Electronic Engineers, a Fellow in the American Association for the Advancement of Science, a Life Fellow in The Franklin Institute, and a member of Sigma Xi. He received several awards for his research on silicon oxidation and passivation, including the 1998 Lifetime Achievement Award presented by Semiconductor Equipment and Material, International, in San Jose, California. He received several ECS Divisional awards, including the Electronics & Photonics Division Award (1974) and the DS&T Division's Thomas D Callinan Award (1982).

Deal was an accomplished French horn player, a stamp collector and genealogist, and was active in the Boy Scouts. He was a member of the Menlo Park Presbyterian Church. Survivors include Rachel, his wife of 56 years; children Donald Deal of Chanhassen, MN, Michael Deal of Palo Alto, and Diane Paulson, also of Palo Alto; eight grandchildren; brothers Ervin Deal of Fort Collins, CO, and Marvin Deal of Florida; and a sister, Aletha Deal, of Fort Collins, CO. ■

This notice was prepared by the family of Bruce Deal, with additional input from Howard Huff. The fall 2007 issue of Interface will commemorate the 50th anniversary of the epochal Frosch and Derick paper (September 1957, Journal of The Electrochemical Society) on the silicon-dioxide protective (electrically passivating) layer and its impact on the semiconductor industry. The issue will be dedicated to the memory of Bruce Deal and will also contain Dr. Deal's last published article.

In Memoriam



Hans Thurnauer 1908-2007

HANS THURNAUER, a long-time ECS member, died this past February. Dr. Thurnauer became a member of the Society in 1935. His interests were in technical ceramics both for dielectric and high temperature applications. He served on the Finance and Perkin Medal committees of the Society, and he was elected Vice-President of the Society in 1953 and President in 1956.

Dr. Thurnauer graduated from the Royal Technical College of Charlottenburg, now called the Technical University Berlin, in chemical engineering. He attended the University of Illinois as an exchange student from Germany in 1930. After

completing his master's degree, he returned to Germany where he worked in the ceramics industry, pursuing a PhD. After one year, he had to leave Germany for England because of the Nazi regime. In 1935 he was invited to join the American Lava Corporation in Chattanooga, Tennessee, and thus immigrated to the U.S. in 1935. In turn, he was able to assist a number of people to immigrate to the U.S.

Hans Thurnauer had a distinguished and productive career at the American Lava Corporation. He authored many patents and publications on ceramics for high-temperature, wear-resistant, and electronic applications. During 1935-54 he served as a ceramic engineer, research director, vice-president and director of the company. He consulted for several U.S. government agencies and was sent to investigate ceramic plants in Germany in 1945 after World War II.

In 1955, when 3M Corporation acquired American Lava Corporation, Dr. Thurnauer moved to St. Paul, Minnesota to head the inorganics section of the 3M Central Research Laboratory. In 1958, he was granted his delayed PhD from the Technical University of Berlin.

He retired from 3M in 1964 and took a United Nations position as director of the Israel Ceramic and Silicate Institute of Haifa. He spent two years in the U.N. post and then moved to Boulder in 1967 to work as consultant for Coors Porcelain Company, Golden, CO. He retired again in 1972 and began a new career as a consultant and volunteer executive for the International Executive Service Corps, furthering ceramic endeavors in South Korea, Indonesia, and Turkey.

His professional honors include Fellow of the American Ceramic Society, ACerS (1945); ACerS Edward Orton Jr. Memorial Lecture (1977); the Alumni Award for Distinguished Service in Engineering from the University of Illinois (1987); and ACerS Distinguished Life Member (1996).

Hans Thurnauer was a resident of Boulder for 40 years. He was an avid hiker and cross-country skier. An active member of the Colorado Mountain Club, he joined club members to climb Mt. Kilimanjaro well into his second retirement. His dedicated service to the community included volunteering as consultant for SCORE and Boulder Meals on Wheels, and serving on the Board of Directors of Attention Homes and Mary Sandoe House. He supported

(continued on page 25)

People News

(continued from page 21)

the University of Colorado College of Music and the Colorado Music Festival. He endowed a professorship and student scholarships in the Department of Materials Science and Engineering at the University of Illinois.

He was preceded in death by his first wife, Lotte Oettinger Thurnauer (d. 1959); his second wife, Elba

Dolores Benedict Thurnauer (d. 2001); and his son, Peter Thurnauer (d. 1976). He is survived by his daughters: Dorothy Kaplan and husband Donald (Kensington, CA), Marion Thurnauer and husband, Alexander Trifunac (Boulder); six grandchildren: Thomas, Eric, Monica, and Marita Thurnauer, and Andrew and Timothy Kaplan; two great-grandchildren: Frances and Cole Thurnauer-Montesano; and daughter-in-law Milena Renshaw. ■

THE ELECTROCHEMICAL SOCIETY MONOGRAPH SERIES

The following volumes are sponsored by ECS, and published by John Wiley & Sons, Inc. They should be ordered from: ECS, 65 South Main St., Pennington, NJ 08534-2839, USA.

Fundamentals of Electrochemical Deposition (2nd Edition)

Edited by M. Paunovic and M. Schlesinger (2006)

373 pages. ISBN 0-471-71221-3.

Fundamentals of Electrochemistry (2nd Edition)

Edited by V. S. Bagotsky (2005)

722 pages. ISBN 0-471-70058-4.

Electrochemical Systems (3rd edition)

by John Newman and Karen E. Thomas-Alyea (2004)

647 pages. ISBN 0-471-47756-7.

Modern Electroplating (4th edition)

by M. Schlesinger and M. Paunovic (2000)

832 pages. ISBN 0-471-16824-6.

Atmospheric Corrosion (2nd edition)

by C. Leygraf and T. Graedel (2000)

354 pages. ISBN 0-471-37219-6.

Uhlig's Corrosion Handbook (2nd edition)

by R. Winston Revie (2000)

1300 pages. ISBN 0-471-15777-5.

Semiconductor Wafer Bonding

by Q. -Y. Tong and U. Gösele (1998)

297 pages. ISBN 0-471-57481-3.

Fundamentals of Electrochemical Deposition

by M. Paunovic and M. Schlesinger (1998)

301 pages. ISBN 0-471-16820-3.

Corrosion of Stainless Steels (2nd edition)

by A. J. Sedriks (1996)

437 pages. ISBN 0-471-00792-7.

Synthetic Diamond: Emerging CVD Science and Technology

Edited by K. E. Spear and J. P. Dismukes (1994)

688 pages. ISBN 0-471-53589-3.

Electrochemical Oxygen Technology

by K. Kinoshita (1992)

444 pages. ISBN 0-471-57043-5.

ECS Members will receive a discount. Invoices for the cost of the books plus shipping and handling will be sent after the volumes have been shipped. All prices subject to change without notice.