CHEMICAL HERITAGE FOUNDATION

THOMAS E. EVERHART

Transcript of an Interview
Conducted by

David C. Brock and Cyrus Mody

As a phone interview and in

Santa Barbara, California

on

28 March 2007 and 3 May 2011

(With Subsequent Corrections and Additions)

ACKNOWLEDGMENT

This oral history is part of a series supported by grants from the Gordon and Betty Moore Foundation. This series is an important resource for the history of semiconductor electronics, documenting the life and career of Gordon E. Moore, including his experiences and those of others in Shockley Semiconductor, Fairchild Semiconductor, Intel, as well as contexts beyond the semiconductor industry.

This oral history is made possible through the generosity of
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THOMAS E. EVERHART

1932 Born in Kansas City, Missouri, on 15 February

Education

1953 A.B., Harvard College, Physics
1955 M.Sc., University of California, Los Angeles, Applied Physics
1958 Ph.D., Clare College, University of Cambridge, Engineering

Professional Experience

Hughes Aircraft Company, Research and Development Laboratories
1953-1955 Member of the Technical Staff, research on microwave tubes

Watkins-Johnson Company
1960 Research and development, microwave electron tubes
1960-1961 Consultant, mm-wave low noise tubes

Westinghouse Research Laboratories
1961 Research and development, electron beams as applied to semiconductor analysis and fabrication

Ampex Research and Development Laboratories
1961-1970 Consultant, electron beam recording

Hughes Research Laboratory
1965-1980 Consultant, problems of electron optics and electron physics

University of California, Berkeley
1958-1962 Assistant Professor, Electrical Engineering
1962-1967 Associate Professor, Electrical Engineering and Computer Science
1967-1978 Professor, Electrical Engineering and Computer Science
1972-1977 Department Chairman, Electrical Engineering and Computer Science

Cornell University
1979-1984 Professor, Electrical Engineering and Applied Physics and Joseph Silbert Dean of Engineering

University of Illinois, Urbana-Champaign

1984-1987	Chancellor and Professor of Electrical and Computer Engineering
	California Institute of Technology
1987-1997	President and Professor, Electrical Engineering and Applied Physics
1997-present	Board of Trustees
	University of Cambridge
1998	Pro-Vice-Chancellor

Leadership Positions

	Lawrence Berkeley Laboratory
1978-1985	Scientific and Educational Advisory Committee
1980-1985	Chairman, Scientific and Educational Advisory Committee
	Yale University
1983-1985	Council Committee on Physical Science and Engineering
	National Research Council, Commission on Engineering and Technical Systems
1984-1986	Engineering Research Board
	State of Illinois
1985-1987	Steering Committee for the Superconducting Super Collider
	National Association of State Universities and Land Grant Colleges
1986-1987	Commission on Education for the Engineering Professions, Class of 1987
	U.S. Department of Energy
1987-1988	Site Selection Committee for the Superconducting Super Collider
	General Motors
1980-1989	Scientific Advisory Committee
1984-1989	Chairman, Scientific Advisory Committee
1989-2002	Board of Directors
	R. R. Donnelly
1981-1989	Technical Advisory Council
	KCET
1989-1997	Board of Directors

	Council on Competitiveness
1989-1999	Executive Committee
1990-1996	Vice Chairman
	The Franklin Institute
1989-1992	Board of Advisors, The Bower Award and Prize for Achievement in Science, the Benjamin Franklin National Memorial
	United States Department of Energy
1990-1993	Chairman, Secretary of Energy Advisory Board
	Corporation for National Research Initiatives
1990-present	Board of Directors
	Hewlett Packard Company
1991-1999	Board of Directors
	Reveo, Inc.
1994-2002	Board of Directors
	Saint-Gobain Company
1996-2008	Board of Directors
	Australian National University
1997-2001	Advisory Council, Institute of Advanced Studies
	Raytheon Company
1997-2006	Board of Directors
	California Institute of Technology
1998-present	Board of Directors
	Electric Power Research Institute
1998-2002	Board of Directors
	Hughes Electronics Corporation
1998-2002	Board of Directors
	Harvard University
1999-2005	Board of Overseers
2004-2005	President of Board of Overseers
	Agilent Technologies
1999-2002	Board of Directors
	Acorn Technology

2001-present	Board of Directors
	Kavli Foundation
2001-present	Board of Directors and Investment Committee
	Novelx
2006-2010	Board of Directors
	W. M. Keck Foundation
1998-present	Senior Scientific Advisor
2007-present	Board of Directors

Visiting Professorships

	Institüt für Angewandte Physik
1966-1967	Guest Professor
	Waseda University
1974	Visiting Professor, Applied Physics
	Osaka University
1974	Visiting Professor, Applied Physics
	Clare Hall, Cambridge
1975	Visiting Fellow

Honors

1949-1953	William Scott Gerrish Scholarship, Harvard College
1953	Phi Beta Kappa
1953	Sigma Xi Associate Member
1953	A.B. Magna cum laude qui adseculus est summos honores
1955-1958	Marshall Scholar, Cambridge University
1958	Sigma Xi, University of California, Berkeley
1962	Distinguished Teaching Award, University of California, Berkeley
1966-1967	National Science Foundation Senior Post-doctoral Fellowship
1969	Fellow, Institute of Electrical and Electronics Engineers
1969-1970	Miller Research Professor, University of California, Berkeley
1974-1975	John Simon Guggenheim Memorial Fellowship
1978	National Academy of Engineering
1984	IEEE Centennial Medal
1984	Scientific Member, Böhmische Physical Society
1988	Fellow, American Association for the Advancement of Sciences

1989	ASEE Benjamin Garver Lamme Award
1990	Honorary Doctor of Laws, Illinois Wesleyan University
1990	Honorary Doctor of Laws, Pepperdine University
1990	Honorary Doctor of Engineering, Colorado School of Mines
1990	Microbeam Analysis Society Presidential Science Award
1990	Foreign Member, Royal Academy of Engineering
1992	Clark Kerr Award, University of California, Berkeley
1993	Professional Achievement Award, Alumni Association, University of California, Los Angeles
1993	ASEE Centennial Medallion
1995	Founder's Award, Energy and Resources Group, University of California, Berkeley
2002	IEEE Founders Medal
2002	Okawa Prize

ABSTRACT

Thomas E. Everhart's oral history begins with a discussion of his work with the scanning electron microscope (SEM). Everhart talks about Gordon E. Moore's contributions to the electronics world. He describes his time as president of California Institute of Technology (Caltech). At the end of the first session, Everhart discusses his admiration for Moore.

His second interview starts with his childhood in Missouri. He discusses his family, hobbies, and school. He talks about work, the Methodist Youth Fellowship, where he met his future wife, and his desire to go to Harvard.

Everhart entered Harvard University and shortly after starting was offered the Gerrish Scholarship, for all four years. At Harvard he played intramural basketball; was active in the Wesley Foundation; helped found the Crimson Key Society; and became engaged. He majored in physics, helped set up laboratories, but had no opportunities for research. After graduation he went to University of California, Los Angeles (UCLA) for a master's degree, in conjunction with Hughes Aircraft Company, where he focused on applied physics and engineering. There he first began working with electron beams. For his PhD he went to Clare College, University of Cambridge, funded by Marshall Scholarship, and working in Charles W. Oatley's lab. His dissertation dealt with SEM contrast formation, observed voltage contrast across P-N junctions, and explored potential applications.

PhD in hand, Everhart became an assistant professor of electrical engineering at University of California, Berkeley. Initially working on microwave tubes. With Donald O. Pederson and Paul L. Morton, they founded the first integrated circuit (IC) lab. During his years at Berkeley, Everhart consulted for Watkins-Johnson, Ampex, Westinghouse Research Laboratories, and Hughes Aircraft Company. He took leave to help Oliver Wells build a SEM at Westinghouse Research Labs. He built his own SEM, the first with transistorized circuits. He had funding from the Air Force, the National Institutes of Health (NIH); and from the National Science Foundation (NSF). He also progressed to full professor and then to chairman of the electrical engineering and computer science (EECS) department. While he was chairman of EECS, the NSF wanted to establish an accessible microfabrication facility. Berkeley did not take advantage of this opportunity, instead the lab went to Cornell University.

Everhart left Berkeley to become Dean of Engineering at Cornell University. He felt he greatly improved the engineering college's morale, faculty, and financial position. During his tenure, the Knight Laboratory, the Snee building, and the Pew Engineering Quadrangle were dedicated. He worked on the advisory committee for the submicron facility, funded by NSF. After six and a half years at Cornell, Everhart was offered the chancellorship of the University of Illinois. There he started new programs, helped get personal computers for faculty, and improved the facilities for semiconductors. He also encouraged the founding of the Beckman Institute.

After three years, Everhart was chosen to be president of Caltech, a position he held for ten years. At Caltech he was also on the advisory committee for micro devices at the Jet Propulsion Laboratory (JPL). Throughout the interview Everhart explains his relationships with many scientists and their work. He remains amazed by the speed of evolution of transistors to integrated circuits and he exclaims over the continued validity of Moore's Law.

INTERVIEWERS

David C. Brock is a senior research fellow with the Center for Contemporary History and Policy of the Chemical Heritage Foundation. As an historian of science and technology, he specializes in oral history, the history of instrumentation, and the history of semiconductor science, technology, and industry. Brock has studied the philosophy, sociology, and history of science at Brown University, the University of Edinburgh, and Princeton University (respectively and chronologically). His most recent publication is *Understanding Moore's Law: Four Decades of Innovation* (Philadelphia: Chemical Heritage Press), 2006, which he edited and to which he contributed.

Cyrus Mody teaches the history of science, technology, and engineering at Rice University. His own research focuses on the history of *very* recent physical and engineering sciences (~1970 to the present), with particular emphasis on the creation of new communities and institutions of research in the late Cold War and the post-Cold War periods, especially in fields related to the semiconductor industry. His book, *Instrumental Community: Probe Microscopy and the Path to Nanotechnology* (2011, MIT Press) explores the co-evolution of an experimental technology (the scanning tunneling microscope and atomic force microscope and their variants) and the community of researchers who built, bought, used, sold, theorized, or borrowed these instruments. Currently, he is working on a history of the communities and institutions of nanotechnology, in collaboration with colleagues at the Center for Nanotechnology in Society at the University of California – Santa Barbara, the Chemical Heritage Foundation in Philadelphia, and at Rice.

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