

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)

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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.

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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

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

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

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

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

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

1958-1962 University of California, Berkeley
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

1979-1984 Cornell University
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

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

TABLE OF CONTENTS

Early Research	1
UC, Berkeley. SEM. Westinghouse Research Labs. Fairchild Semiconductor. Andy Grove. Technology advancement; metal oxide semiconductor transistors and circuits; electron beam lithography. Gordon Moore.	
Leadership and Management	9
Caltech; integrated circuit revolution. Cornell University submicron laboratory. Entrepreneurship. Growth at Caltech. Arnold Beckman.	
After California Institute of Technology	19
The Moore Foundation's impact on Caltech.	
Childhood	23
Growing up. Family life. Hobbies, sports, faith, and work. Education.	
College Years	28
Harvard; scholarships; work; and sports. Summers. Wesley Foundation. Student Council. Crimson Key Society. Edward Purcell; physics major. Rhodes Scholarship.	
Graduate School Years	40
UCLA Master's Degree. Microwave tubes. Simon Ramo. Dean Wooldridge. Richard Johnson. Tony Siegman. John Whinnery. PhD at Clare College, University of Cambridge. Charles Oatley's lab. Dennis McMullan, Oliver Wells, Fabian Pease, Alec Broers. Louis Marton. IEEE. Robert Bakish. Instrumentation.	
First Academic Job	59
UC, Berkeley. First integrated circuit lab at Berkeley. Donald Pederson. Wright Patterson Air Force Base. Westinghouse Research Laboratories. Ernest Sternglass. Consulting. Ken Shoulders. Funding and promotions. Simulation Program with Integrated Circuit Emphasis (SPICE). Electron beam lithography. Sabbatical in G. Moellenstedt's lab. Electron beam imaging system (EBIS) at Bell Laboratories. Three beams conference. Growth of field. SEMATECH and SRC.	
Cornell University Years	86
Cornell. Noel MacDonald. James Mayer. Ilesamni Adesida. Funding.	
University of Illinois	94
Chancellorship. Industry affiliates. Donald Greenberg.	
President of California Institute of Technology (Caltech)	97
President. Advisory committee at JPL. Nanotechnologies advancing.	

Thoughts about Small	100
Atoms on planar surfaces. Erwin Müller' field ion microscope. Mini parallel beams. LIGO. Ahmed Zemail and femtosecond pulses. Nobel Prize. Cryogenic electron microscope. International science.	
Index	106

INDEX

A

Adesida, Ilesamni, 123
Ahmed, Haroon, 73
Alberts, Larry, 18
Alberts, Richard, 81
AMPEX, 93, 102
Angelakos, Diogenes J., 111
Aplysia californica, 100
Apple, Inc., 115
Arizona State University, 123
Arkansas, 48
Atomic Energy Commission, 71
Australia, 68

B

Bair, Glenn O., 51, 53
Bakish, Robert A., 72, 83
Ballantyne, Joseph M., 111, 112, 126
Baltimore, David, 33
Baltimore, Maryland, 17
Baños, Alfredo, Jr., 60
Bardeen, John, 125
Bechtel, Stephen D., 28
Beck, A.H.W., 73
Becker, George, 81
Beckman Institute, 34
Beckman, Arnold O., 34, 35
Beer, Samuel H., 57, 58
Belgium, 72
Bell Laboratories, 21, 22, 26, 66, 90, 104, 107, 108, 109, 123
Beloit, Kansas, 54
Beowulf, 57
Berlin, West Germany, 80
bin Laden, Osama, 94
Binnig, Gerd, 128
Birdsall, Charles K., 61, 64, 65
Block, Eric, 116, 117
Bloembergen, Nicolaas, 56
Boston, Massachusetts, 48, 52, 54
Boulder, Colorado, 67, 112
Bourne, Henry, Jr., 113
Boyde, Alan, 67
Brewer, George, 61
Broers, Sir Alec, 21, 68, 105
Brookline, Massachusetts, 51
Burns, Rev. Jackson, 55

C

California, 93, 100, 107, 123
California Institute of Technology, 15, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 50, 59, 60, 61, 66, 80, 109, 117, 122, 123, 124, 127, 128, 130, 132
Caltech. *See* California Institute of Technology
Cambridge Instruments, 92, 98
Cambridge, England, 56, 92
Cambridge, Massachusetts, 52, 92
Canalco, 99
Cannon, Robert H., Jr., 27
Carnegie Institute of Technology, 88
Carnegie Mellon University, 87
Castaing, Raimond, 71
Cavendish Laboratory, 66, 70
Chameau, Jean-Lou, 33
Champaign-Urbana, Illinois, 28
Chicago, Illinois, 47, 48
Chillicothe, Missouri, 41, 42, 49
China, 89, 133
Churchill College, 68
Classical Mechanics, 60
Cleveland, Ohio, 28
Colorado, 28, 48
Concord, Massachusetts, 52
Concord, New Hampshire, 108
Cornell University, 26, 27, 60, 68, 90, 109, 111, 112, 113, 114, 116, 117, 118, 119, 120, 122, 123, 124, 125, 127, 131
Cortland County, New York, 123
Cosslett, Vernon E., 70, 71, 73
Crewe, Albert V., 112
Crimson Key, 55
Cultural Revolution, 89
Currie, Malcolm R., 62, 64, 81

D

Dalman, G. Conrad, 120
DARPA. *See* Defense Advanced Research Projects Agency
Dartmouth College, 92
Davis, Robert, 18
Defense Advanced Research Projects Agency, 26, 27, 114
DNA, 110, 130
Duncumb, Peter, 70, 71

E

EBIS. *See* electron beam imaging system
Egypt, 132
Eigler, Don, 130
electron beam, 16, 20, 21, 22, 63, 64, 70, 71, 72, 76, 77, 82, 93, 95, 103, 104, 105, 106, 107, 109, 113, 126, 132
electron beam imaging system, 21, 104, 108
electron microscopy, 66, 70, 71, 72, 73, 80, 101, 131, 132
Electron Microscopy Society of America (EMSA), 105
Emporia College, 48
Emporia, Kansas, 49, 52
England, 50, 57, 62, 66, 67, 68, 92
English Village, 57
Europe, 71
Evans and Sutherland Computer Corporation, 127
Everhart, Betty Ann (sister), 42
Everhart, Carol Diane (sister), 42
Everhart, Doris (wife), 61, 88
Everhart, Elizabeth Ann West (mother), 40
Everhart, Mamie (paternal grandmother), 40
Everhart, William Elliott (father), 40

F

Fainsod, Merle, 57
Fairchild Company, 24
Fairchild Semiconductor, 16, 20, 22, 23, 24, 74, 107, 116
Fieser, Louis F., 55
Forrest, Anne, 88
Forrest, Michael, 88
France, 71
Fujikawa, Dr., 43

G

gallium phosphide, 77
Genentech, 31
General Electric, 25, 72
Germany, 50, 104, 116
Gibbons, James F., 88, 89, 90, 118
Gibbons, Lynn, 88
Gibson, Harry C., 51
Girard High School, 43, 45
Girard, Kansas, 43, 44, 46, 47, 49
Goldstein, Herbert, 60
Google, 116
Google Earth, 94
Gordon and Betty Moore Foundation, 36
Gordon Research Conferences, 108, 109
Grandview, Missouri, 40, 41
Gray, William (maternal half-uncle), 40

Greenberg, Donald P., 127
Grey, Pearl Zane, 44
Grove, Andrew S., 16, 20, 23, 24, 25, 26, 107

H

Haag, Clinton (maternal half-aunt), 40
Haeff, Andrew V., 59
Harris, Jay H., 113
Harvard University, 40, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 62, 92, 122
Hatzakis, Michael, 109
Hawaii, 38, 123
Heilmeyer, George H., 114
Herzog, Richard, 103
Hewlett Packard, 24, 26, 30
Hodges, David A., 19, 111, 124
Holland, 56, 71
Holonyak, Nick, Jr., 125
Homans, George C., 57
Houghton Mifflin Press, 52
HP. *See* Hewlett Packard
Hu, Evelyn, 109
Hughes Aircraft Company Research and Development Laboratories, 56, 58, 60, 61, 62, 63, 64, 66, 70, 75, 81, 90, 102, 108, 123
Husher, John D., 87

I

IBM. *See* International Business Machines
IC. *See* integrated circuit
IEEE. *See* Institute of Electrical and Electronics Engineers
Institute of Electrical and Electronics Engineers, 72
integrated circuit, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 35, 74, 77, 81, 82, 85, 86, 95, 96, 97, 99, 101, 102, 103, 107, 109, 110, 111, 124, 126, 130, 131
Intel, 16, 22, 23, 24, 25, 26, 29, 32, 38, 96, 107, 109, 115
International Business Machines, 21, 22, 26, 68, 105, 107, 109, 110, 116, 117, 123, 130
International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication (EIPBN), 105, 106, 108, 109
Iowa, 62
Isaacson, Michael S., 112, 120
Ithaca, New York, 50, 119

J

Japan, 50, 68, 101, 108, 114, 133
Japanese Ministry of International Trade and Industry, 114
JEOL, Ltd., 98

Johnson, H. Richard, 59, 61, 64, 75, 91
JPL. *See* National Aeronautics and Space
Administration:Jet Propulsion Laboratory

K

Kaczynski, Ted [Unabomber], 111
Kansas, 45, 48, 62
Kansas City, Missouri, 40, 41, 42, 44, 49, 54
Kansas State Teachers College, 43
Kennedy, W. Keith, 119
Keyes, Robert W., 109
Kittel, Charles, 56
klystrons, 64, 65
Kompfner, Rudolf, 66
Kraft Foods Company, 41
Kuckenen, Carl, 127

L

Lake Michigan, 48
Langenberg, Don, 61
Langer, James S., 87
laser interferometry gravity wave observatory
(LIGO), 130
Lawrence Berkeley National Laboratory, 124
Lawrence, Kansas, 51, 52
Le Poole, J.B., 71
Lewis, Edwin R., 100
Lichtenberg, Allan J., 58
Lincoln Laboratory, 93
Linville, John, 89
lithography, 21, 22, 93, 103, 104, 105
Los Angeles, California, 27, 59

M

MacDonald, Noel C., 16, 21, 99, 107, 109, 120, 122,
124
MacIntosh, Ian, 18
March, Adrian, 15, 73
Marshall Scholarship, 62, 88
Martin City, Missouri, 41, 44, 49
Marton, Clara, 72
Marton, Louis L., 72
Maslach, George J., 111
Massachusetts Institute of Technology, 56, 92, 93,
108, 112, 119
Mayer, Betty, 123
Mayer, James W., 122
McMullan, Dennis, 67, 69, 70, 79
Mead, Carver A., 26, 27, 109, 114
Meieran, Eugene S., 106, 107
Meindl, James D., 96
Mettler, Donna, 28
Mettler, Ruben F., 28, 29, 30

microfabrication, 106, 108, 109, 111, 125, 129
microwave tubes, 56, 59, 61, 63, 65, 81, 91
Military Authorization Act
Mansfield Amendment, 111
Mill, John Stuart, 57
Minnesota, 122
Mississippi River, 42, 48
Missouri, 48
MIT. *See* Massachusetts Institute of Technology
Moellenstedt, G., 104
Montana, 51, 111
Moore, Betty I., 32, 37, 38
Moore, Gordon, 15, 16, 19, 20, 22, 23, 24, 25, 26,
27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,
107, 119
Moore's Law, 22, 25, 104, 130
Morton, Paul L., 18, 81, 82
MOS. *See* transistors
Mt. Vernon, Missouri, 42
Müller, Erwin W., 128

N

nanofabrication, 110, 114
nanotechnology, 114, 116, 129, 130, 132
NASA. *See* National Aeronautics and Space
Administration
National Academy of Engineering, 59
National Academy of Sciences, 59, 88
National Aeronautics and Space Administration, 127
Jet Propulsion Laboratory, 66, 127, 128
National Bureau of Standards, 72
National Geospatial-Intelligence Agency, 94
National Institute of General Medical Sciences, 100
National Institute of Standards and Technology, 112
National Institutes of Health, 100, 101
National Science Foundation, 100, 101, 111, 112,
113, 114, 117, 125, 126
Needham, Tom, 43
New York, 119, 123
Nigeria, 124
NIH. *See* National Institutes of Health
Nixon, William C., 68
Nobel Prize, 33, 35, 55, 56, 130, 131, 132
North American Rockwell, 122
Noyce, Robert N., 16, 24, 26, 35, 74, 107
NPN junction diode, 77
NSF. *See* National Science Foundation
nuclear magnetic resonance, 55

O

Oatley, Sir Charles W., 65, 66, 67, 73, 74, 91
Obama, President Barack H., 132
Oklahoma, 48

Oldham, William G., 96
Only the Paranoid Survive, 25

P

Pakistan, 94
Palm Springs, California, 32
Parke, Charles D., 51
passivation, 16, 74, 77
patents, 21, 65, 91, 92
Pease, R. Fabian W., 21, 68, 90, 99, 104, 108
Pederson, Donald O., 18, 19, 81, 82, 102
Peierls, Rudolf E., 88
Perkin-Elmer Corporation, 122
Peterson, Rudy, 98
Pfeiffer, Hans C., 21
Philadelphia, Pennsylvania, 83, 124
Pierce, John R., 64, 66
Piers Plowman, 57
Pittsburgh, Kansas, 43
Pittsburgh, Pennsylvania, 17, 88
PN junction diode, 74, 75, 76, 77, 81, 132
PNP junction diode, 77
polio, 54
Post Office Telephone Laboratory, 78
President's Science Advisory Committee, 132
Princeton University, 123
Purcell, Edward M., 55, 56

Q

Quate, Calvin F., 128

R

Radio Corporation of America, 72
Ramo, Simon, 28, 59, 72
Ramo-Wooldridge Corporation, 59
RCA. *See* Radio Corporation of America
religion, 44, 45, 47, 51, 55
Rhode Island, 51
Rhodes Scholarship, 62
Rohrer, Heinrich, 128
Russia, 57

S

Sack, Edgar A., 18
San Francisco, California, 19, 37, 38, 108
Santa Barbara, California, 37
Santa Cruz, California, 37
Santa Monica, California, 60
scanning electron microscope, 15, 16, 17, 66, 67, 68,
70, 71, 73, 75, 78, 79, 81, 82, 85, 90, 91, 98, 101,
103, 106, 107
Schwartz, Charles, 110

Scroope House, 67, 69
SEM. *See* scanning electron microscope
SEMATECH, 113, 114
Shockley Semiconductor, 35
Shockley, William H., 35
Shoulders, Ken, 92, 128
Siegman, Anthony E., 58, 61, 64, 89, 90
Simulation Program with Integrated Circuit
Emphasis (SPICE), 19, 102
Skilling, Hugh H., 89
Slichter, Charles P. (maternal cousin), 40
Slichter, Edith (maternal grandmother), 40, 42
Slichter, Sumner (maternal cousin), 40
Smith, George, 61
Smith, Henry I., 108
Smith, Kenneth C.A., 67, 69, 70, 73, 75
Smoke Tree Ranch, 32
Spreadbury, Peter J., 67, 78, 84
SRC, 114
SRI. *See* Stanford Research Institute
St. Joseph, Missouri, 42
Stalin, Joseph V., 57
Stanford Research Institute, 92, 93
Stanford University, 21, 31, 56, 58, 61, 62, 65, 66,
68, 88, 89, 90, 96, 107, 114, 118, 128
State University of New York College at Cortland,
123
Sterling, John Ewart Wallace, 62
Sternglass, Ernest, 87
Stewart, A.D. Gary, 68
Stopenhagen, Rev. Paul, 55
Summerfield Scholarship, 51
Sun Microsystem, 116
Sutherland, Ivan E., 26, 27, 114
Switzerland, 128
Syracuse University, 124
Syracuse, New York, 124

T

Tarzan, 44
Tempe, Arizona, 123
tenure, 30, 33, 112, 122
The Accidental Entrepreneur, 30
Thomas, Gareth, 15, 21, 106
Thompson Products, 59
Thompson Ramo-Wooldridge Incorporated, 28, 59
Thompson, Larry F., 109
Thorne, Kip S., 130
Thornley, Richard F.M., 67, 79
Three-Beams. *See* International Conference on
Electron, Ion, and Photon Beam Technology and
Nanofabrication (EIPBN)
transistors, 16, 20, 21, 23, 25, 69, 74, 75, 78, 97, 98,
101, 107

Truman, President Harry S., 40
Turing, Alan M., 73

U

U.S. Congress, 113
UCLA. *See* University of California, Los Angeles
UCSB. *See* University of California, Santa Barbara
Unabomber, 111
United Kingdom, 74
United States of America, 43, 45, 56, 71, 72, 74, 81, 82, 88, 98, 101, 114, 118, 124, 132, 133
University of Birmingham, 88
University of California, Berkeley, 15, 16, 18, 19, 21, 25, 26, 31, 50, 56, 57, 58, 61, 62, 71, 74, 80, 81, 82, 83, 85, 86, 87, 88, 89, 90, 91, 92, 93, 95, 96, 99, 101, 102, 104, 105, 107, 108, 110, 111, 112, 113, 115, 117, 118, 122, 123, 124, 128, 132
University of California, Los Angeles, 58, 59, 60, 61, 62, 100
University of California, Santa Barbara, 88, 124
Institute for Theoretical Physics, 88
University of Cambridge, 15, 60, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 78, 80, 82, 83, 84, 88, 89, 90, 91, 92, 99
University of Chicago, 112
University of Illinois, 26, 27, 34, 40, 90, 109, 118, 122, 123, 124, 125
University of Kansas, 51
University of Pennsylvania, 132
University of Pittsburgh, 87
University of Southern California, 59, 71
USC. *See* University of Southern California

V

very large scale integration, 114
Virginia Polytechnic Institute, 121

VSLI. *See* very large scale integration

W

W.K. Kellogg Company, 41
W.M. Keck Foundation, 32, 59, 132
Washington, D.C., 111, 131
Watkins, Dean A., 59, 61, 64, 89
Watkins-Johnson Company, 59, 91
Wayland, Walter, 43
Wells, Oliver, 15, 67, 73, 77, 78, 82, 99, 101, 106
WesleyFellowship, 55
West, Faith Arlene (maternal aunt), 40
West, John (maternal uncle), 40
Westinghouse Research Laboratories, 15, 16, 17, 18, 22, 25, 50, 77, 82, 83, 84, 85, 86, 87, 95, 96, 98, 99, 101
Wharton, Ralph N., 51
Whinnery, John R., 61, 62, 81, 88, 89
Wichita High School East, 45, 49
Wichita, Kansas, 45, 46, 49, 51, 53, 54
William Scott Gerrish Scholarship, 52
Wittry, David B., 71
Wolf, Edward, 27, 108, 112, 119, 124, 125, 127
Wolfboro, New Hampshire, 108
Wong, Theodore, 60
Wooldridge, Dean E., 59
World War II, 42, 69, 73
Wright Patterson Air Force Base, 18, 81, 100

Y

Yates, James, 65

Z

Zewail, Ahmed H., 131
Zworykin, Vladimir K., 72