CHEMICAL HERITAGE FOUNDATION

HENRY I. SMITH

Transcript of an Interview
Conducted by

Cyrus Mody

at

Cambridge, Massachusetts

on

25 October 2005

(With Subsequent Corrections and Additions)

ACKNOWLEDGEMENT

This oral history is part of a series supported by the Center for Nanotechnology in Society (CNS), University of California, Santa Barbara, under the National Science Foundation Grant No. SES 0531184. Scholars and other people using this interview should acknowledge in all written publications. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the interviewee and interviewer and do not necessarily reflect the views of the National Science Foundation.

This oral history series is an important resource for the history of nanotechnology, documenting the lives and career of key scientists and engineers that shaped and contributed to the contemporary practice of science and technology.

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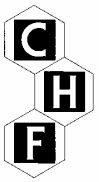

HENRY I. SMITH

1937	Born in Jersey City, New Jersey

Education

1958	B.S., physics, Holy Cross College
1960	M.S., physics, Boston College Graduate School
1966	Ph.D., physics, Boston College Graduate School

Professional Experience

	U.S. Air Force Cambridge Research Laboratory
1960-1963	1st Lieutenant
	Boston College
1966-1968	Assistant Professor of Physics
	Massachusetts Institute of Technology
1968-1977	Staff Member, Lincoln Laboratory
1977-1980	Group Leader, Lincoln Laboratory
1977-1980	Adjunct Professor of Electrical Engineering
1977-present	Director, Nanostructures Laboratory
1980-present	Professor of Electrical Engineering
1990-2005	Keithley Professor of Electrical Engineering

Honors

1960	Member of American Physical Society
1966	Member of Sigma Xi
1978	Member of Materials Research Society [MRS]
1980	Member of American Vacuum Society [AVS]
1987	Institute of Electrical and Electronics Engineers [IEEE] Fellow
1989	Member of National Academy of Engineering
1990	Member of Optical Society of America [OSA]
1995	IEEE Cledo Brunetti Award
2003	The International Society for Optical Engineering [SPIE] Bacus Award

ABSTRACT

Henry I. Smith begins the interview with a description of his childhood in New Jersey, his early aptitude in science, and his decision to pursue the sciences. After obtaining an undergraduate degree at Holy Cross College, Smith enrolled in Boston College Graduate School to pursue his interest in physics. Upon receiving his master's degree, Smith took a research position at the Air Force Cambridge Research Laboratory (AFCRL) in order to fulfill his ROTC requirement. At AFCRL he worked with top scientists and proved himself an able researcher. Smith returned to Boston College following his stint at the Air Force to pursue his Ph.D. His research in x-ray diffraction formed the basis for his pioneering work on x-ray lithography later in his career. While working at the MIT Lincoln Laboratory, Smith realized the importance of fabrication technology and submitted a grant proposal to the National Science Foundation for building a national research and fabrication center. Despite his unsuccessful proposal, Smith established a Submicron Structures Laboratory with MIT funding. Migrating to MIT's campus, Smith investigated a variety of lithography methods such as x-ray, conformable photomask, interferiometric immersion-projection, and zone plate array lithography. He concludes the interview by offering some insights on the semiconductor industry, and how to best develop a research culture that stimulates innovation.

INTERVIEWER

Cyrus Mody is the manager of the Nanotechnology and Innovation Studies programs in the Center for Contemporary History and Policy at the Chemical Heritage Foundation. He has a bachelor's degree in mechanical and materials engineering from Harvard University and a Ph.D. in science and technology studies from Cornell. He was the 2004-2005 Gordon Cain Fellow at CHF before becoming a program manager. Mody has published widely on the history and sociology of materials science, instrumentation, and nanotechnology.

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NOTES

1. M. S. Gussenhoven and H. I. Smith, "Adhesion of Polished Quartz Crystals Under Ultrahigh Vacuum," *Journal of Applied Physics* Vol. 36 Issue 7 (1965): 2326.

2. D. A. Buck and K. R. Shoulders, *Proceedings of the Eastern Joint Computer Conference,* Philadelphia, PA 3-5 December 1958, Am Inst. Elect. Engineers.

3. R. P. Feynman, "There's Plenty of Room at the Bottom," *Engineering and Science* California Institute of Technology, Pasadena, CA 1960).

4. The National Science Foundation commissioned the following three workshops: "Opportunities and Requirements for a National Center for Research on Submicron Structures," St. Louis, Missouri, 3 May 1976; "Needs for a National Research and Resource Center in Submicron Structures," Philadelphia, Pennsylvania, 10 May, 1976; "Needs for a National Research and Resource Center in Submicron Structures," Salt Lake City, Utah, 21 May, 1976.

5. Albert A. Michelson received the Nobel Prize in Physics in 1907, http://nobelprize.org/physics/laureates/1907/ (accessed 8 March, 2006).

6. H. I. Smith, "Fabrication Techniques for Optical and Acoustical Microelectronic Devices," Proc. of the Symposium on Optical and Acoustical Micro-electronics, ed. J. Fox (New York: Polytechnic Press, April 1974): 221-232. Paper presented at "The Symposium on Optical and Acoustical Micro-electronics," Newport Beach, California, 1973.

7. H. I. Smith, "Fabrication Techniques for Surface-Acoustic-Wave and Thin-Film Optical Devices," *Proceedings of the IEEE* Vol. 62 Issue 10 (1974): 361-1387.

8. S. Y. Chou, R. F. W. Pease, H. I. Smith, "Nanopatterning for High-Complexity, High-Functionality Systems" (summary report of the workshop organized by Chou, Pease, and Smith, Washington, D.C., 13 September 2005): 1.

9. *Gladiator*. Directed by Ridley Scott. Glendale, CA: Dreamworks Studio, 2000.

10. R. F. Pease and H. I. Smith, "Reaching for the bottom: The evolution of EIPBN," *Journal of Vacuum Science & Technology B* Vol. 22 Issue 6 (NOV-DEC 2004): 2882-2884.

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