# CHEMICAL HERITAGE FOUNDATION

# ROBERT M. HAYES

Transcript of an Interview Conducted by

Colin B. Burke

at

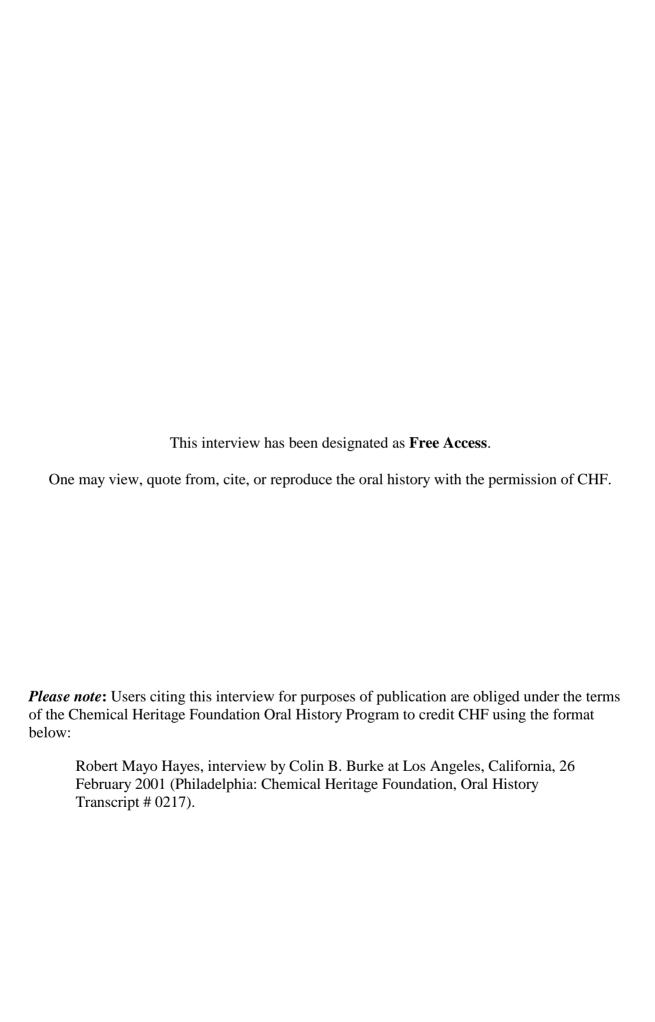
Los Angeles, California

on 26 February 2001

(With Subsequent Corrections and Additions)

# CHEMICAL HERITAGE FOUNDATION Oral History Program FINAL RELEASE FORM

with re	This document contain	ns my understanding and agreement with Chemical Heritage Foundation in a tape-recorded interview conducted by
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	B. Colin B	
I have		ied by Chemical Heritage Foundation.
1.	will be maintained by	anscript, photographs, and memorabilia (collectively called the "Work") Chemical Heritage Foundation and made available in accordance with earch and other scholarly purposes.
2.	in the Work, including	and transfer to Chemical Heritage Foundation all right, title, and interest the literary rights and the copyright, except that I shall retain the right to the Work in part or in full until my death.
3,	The manuscript may be read and the tape(s) heard by scholars approved by Chemical Heritage Foundation subject to the restrictions listed below. The scholar pledges not to quote from, cite, or reproduce by any means this material except with the written permission of Chemical Heritage Foundation.	
4.	I wish to place the conditions that I have checked below upon the use of this interview. I understand that Chemical Heritage Foundation will enforce my wishes until the time of my death, when any restrictions will be removed.	
	Please check one:	
	aX	No restrictions for access.  NOTE: Users citing this interview for purposes of publication are obliged under the terms of the Chemical Heritage Foundation Oral History Program to obtain permission from Chemical Heritage Foundation, Philadelphia, PA.
•	b	Semi-restricted access. (May view the Work. My permission required to quote, cite, or reproduce.)
	c	Restricted access. (My permission required to view the Work, quote, cite, or reproduce.)
	This constitutes my enti	ire and complete understanding.
		(Signature) Robert M. Hayes
		(Date) 28 Feb 2003



# ROBERT M. HAYES

1926	Born in New York, New York on 3 December
	Education
1947 1949 1952	B.A., mathematics, University of California at Los Angeles M.A., mathematics, University of California at Los Angeles Ph.D., mathematics, University of California at Los Angeles
	Professional Experience
1949-1952	National Bureau of Standards Mathematician
1952-1954	Hughes Aircraft Corporation Technical Staff Member
1954-1955	National Cash Register Company Applications Division
1955-1960	Magnavox Corporation Head of the Business Systems Group
1959-1960	American University Visiting Lecturer
1960-1962	Advanced Information Systems, Incorporated President
1960-1962	University of Washington Visiting Lecturer
1960-1963	Electrada, Incorporated Vice-President and Research Director
1954-1964 1964 1965-1970	University of California at Los Angeles Adjunct Lecturer Professor, School of Library Services Director, Institute for Library Research

1974-1989	Dean, Graduate School of Library Service, School of Library and Information Science	
1969-1973 1993-1996	Becker and Hayes, Incorporated Vice-President Vice President	
1970	University of Illinois Windsor Lecturer	
1979	White House Conference on Libraries and Information Sciences Advisory Council Member	
1979, 1993	University of New South Wales Visiting Professor	
1987, 1994	Japanese Universities Visiting Professor	
1989	Loughborough University Visiting Professor	
1990	Online Computer Library Center, Incorporated Consultant	
1994	Khazar University Visiting Professor	
<u>Honors</u>		
1971 1985 1986 1990 1993	Best Information Science Book Award, ASIS Beta Phi Mu Award, American Library Association Professional Achievement Award, UCLA Alumni Association First Tezak Award, University of Zagreb, Croatia Award of Merit, American Library Association	

#### ABSTRACT

Robert M. Hayes begins the interview with a discussion of his father's and his stepfather's affect on his life. He describes how he traveled frequently because of his stepfather's acting career, attending over sixteen different high schools before receiving his diploma. Hayes graduated from UCLA in 1947 with a B.A. in mathematics, and afterwards was drafted into the Navy. He recounts his acceptance into the Navy's V-12 program, and the courses he took for that program at the University of Colorado at Boulder. After the War, Hayes returned to UCLA, where he earned his M.A. in mathematics in 1949, and his Ph.D. in mathematics in 1952. While earning his Ph.D., Hayes worked on information science at the National Bureau of Standards. In 1952, he decided to move into industry, and was hired at Hughes Aircraft. He describes his work at Hughes, where he programmed a computer to fly an airplane. Further, he recounts his teaching responsibilities in UCLA's University-extension program, which he continued in parallel with his experiences at Hughes. In 1954, Hayes began working at the National Cash Register Company, and a year later he moved to Magnavox Research Labs. He discusses the important developments in information storage and retrieval at Magnavox, such as the Minicard and the Magnacard systems, and his realization that his efforts at Magnavox could be taught to students. Eventually, Hayes was teaching at locations all over the United States, including American University, the University of Washington, and Wright Patterson Air Force Base. In 1960, Hayes was invited to join the Electrada Corporation, which he did, as vice-president. Hayes relates how, soon after joining Electrada, he and John Postley created Advanced Information Systems as a subsidiary of Electrada. Hayes also explains why he became a fulltime professor at UCLA at that time, and discusses his roles in the formation of the School of Library Service and the Institute for Library Research. In 1969, Joseph Becker and Robert Hayes started Becker and Hayes Incorporated, with the purpose of creating an interlibrary network for the State of Washington. Haves discusses the obstacles he and Becker overcame to accomplish that task, and goes on to recount his work with NCLIS and the SILC system. Haves concludes the interview with his interpretation of the relationship between information science and library science, and the importance of libraries and librarians.

#### **INTERVIEWER**

Colin B. Burke had recently retired from the history department at the University of Maryland at Baltimore County and held a research fellowship at Yale University when he came to CHF. He spent his residency working on his book on the history of computer-based scientific information systems and related government policies, from the 1950s through the early 1990s. He received his Ph.D. from Washington University in St. Louis and currently serves as Associate Professor Emeritus at the University of Maryland. He also served as a Fulbright Scholar in Poland and as a Scholar-in-Residence at the National Security Agency.

#### TABLE OF CONTENTS

# 1 Family, Education, and Early Career

Recollections of his father and stepfather. Moving to California and attending UCLA. Being drafted into the Navy and joining the V-12 program. Earning his B.A., M.A., and Ph.D. at UCLA. Working on the mathematical-tables project for division 11 of the Institute for Numerical Analysis.

# 5 Returning to UCLA

Getting a fellowship at UCLA. Being taught by Grace Hopper. Programming computers. Being in a class with Richard P Feynman. Going to work at Hughes Aircraft Company. Teaching through the University-extension program. Working at the National Cash Register Company, and then for Hughes Dynamics.

## 9 Magnavox Research Laboratories

Working on the Minicard system for information storage and retrieval. The success of the magnetic disk. Studying the various forms of information storage. Teaching information science at various institutions. Meeting Mortimer Taube at Documentation Incorporated. The Magnacard system.

# 13 From Electrada to Becker and Hayes, Inc.

Being invited to join Electrada. Creating AIS with John A. Postley. Becoming a fulltime professor at UCLA. The creation of Hughes Dynamics. The founding of the School of Library Service and the Institute for Library Research. Forming Becker and Hayes to develop a library network. Rationalizing the funds for a national library network.

#### 18 Conclusion

Writing the SILC report. The public-sector/private-sector taskforce. Discussing the difference between information and library science. Affirming the importance of libraries and librarians.

- 22 Notes
- 23 Index

## **NOTES**

- 1. Liberty Magazine. Vol. 22, 17 November 1945.
- 2. Joseph Becker and Robert M. Hayes. *Information Storage and Retrieval: Tools, Elements, and Theories.* (New York: Wiley, 1963).
- 3. Joseph Becker and Robert M. Hayes. *Handbook of Data Processing for Libraries*. (New York: Becker and Hayes, 1970).
- 4. Robert M. Hayes. *A System for Inter-library Communication (SILC)*. {Washington: Association of Research Libraries, 1974); Robert M. Hayes. *A Final Report on a Study of a System for Inter-library Communication (SILC)*. (Los Angeles: Becker and Hayes, 1974).
- 5. *Public Sector-Private Sector Task Force Report*. (National Commission on Libraries and Information Science, 1982).

#### **INDEX**

# A Adkinson, Burton W., 19 Advanced Information Systems, Inc. [AIS], 13-16 Advanced Research Projects Agency Network [ARPANET], 17 Aerospace industry, 12-13 Air Force, United States, 10, 12, 15 Allen, Kenneth, 19 American University, 12 Arrow Company, 2 Association of Research Libraries [ARL], 19 В Bauer, Walter F., 6 Becker and Hayes, Inc., 17 Becker, Joseph, 12-13, 16-17 Berkeley, University of California at, 16 Borel, Paul A., 13 Boulder, University of Colorado at, 3-4 Bush, Vannavar, 10 $\mathbf{C}$ Celestial navigation, 3-4 Central Intelligence Agency [CIA], 10, 12, 17 Chemical Abstracts, 19 Computer Research Company [CRC] Digital analog machine, 9 Computer Research Corporation [CRC], 9 Cornell University, 4 D Database management system, 14 Department of Education, 19 Desk calculator, 5 Digital computers, 7, 10 Division 11. See Mathematical-tables project Documentation Incorporated, 11, 13 Uniterm system, 11 $\mathbf{E}$

Eastman Kodak Company, 10 Minicard system, 10-11

Eckdahl, Donald E., 9

```
Educational Resources Information Center [ERIC], 19
Educom TS, Inc., 17
Electrada Corporation, 13-15
Elsevir Science Publishers, 19
Excerpta Medica, 19
\mathbf{F}
Fairthorne, Robert, 3
Feynman, Richard P., 7
  See Also Quantum electrodynamics
Fort Wayne, Indiana, 9
G
Georgia Institute of Technology[Georgia Tech], 12
Granada Hills, California, 2
Great Depression, 1-2
H
Handbook of Data Processing for Libraries, 17
Hayes, Robert Mayo, 1
  father [Dudley Lyman Hayes], 1
  great-grandfather, 2
  mother, 1
  stepfather [William Henry Forrest (Bill)], 1
    as advertising model, 2
    as auto lecturer, 2
    as character actor, 2
Herrick, Samuel, 4
Hopper, Grace, 6
Horn, Andrew H., 14-15
Hughes Aircraft Company, 8-9, 15
Hughes Dynamics Company, 15
Hughes Electronics Corporation, 15
Hughes Tool Company, 15
Hurd, Cuthbert C., 8
Husky, Harold D., 10
Hydro Air Inc., 13
  Anti-skid system, 13
IBM [International Business Machines Corporation], 8, 10
Index Medicus, 19
Informatics, Inc., 15
Information science, 6, 10, 13, 16, 20
Information Storage and Retrieval, 16
```

Institute for Library Research, 15-16 as a University-wide institute, 15 Institute for Numerical Analysis [INA], 4-7, 10 Intelligence community, 10-12

#### J

Jimmy Carter administration, 18

#### K

Kac, Marc, 4 Kant, Alan, 11

#### L

Leontief matrix, 5

Liberty Magazine, 2

Library management, 20

Library science, 20

Library Services and Construction Act, 17

Lockheed Martin Aeronautics Company, 13

Gross, Robert [president], 13

Los Angeles, California, 1

Los Angeles, University of California at [UCLA], 2-7, 12-15, 17

University-extension program, 9, 12

Western Data Processing Center, 13, 17

#### M

Magnacard system, 10, 13
Magnavox Corporation, 9
Magnavox Research Labs, 9-11, 13-14
Maron, Melvin E. [Bill], 16
Mathematical-tables project, 5
Memex machine, 10
Michigan, University of, 1
Mooer, Calvin N., 11

#### N

National Bureau of Standards [NBS], 4-10
National Cash register Company [NCR], 9
National Commission of Library Information Science [NCLIS], 18, 20
National Library of Medicine, 19
National Science Foundation [NSF], 19
National Security Administration [NSA], 10
Navy V-12 program, 3-4
mathematics department chairman, 4
Navy, United States, 3

### Northrup Aircraft Company, 9

#### $\mathbf{O}$

Office of Management and Budget, 19 Online Computer Library Center [OCLC], 17 Optical matching, 11

#### P

Pasadena Playhouse, 2
Perry, James W., 11
Postley, John A., 14-15
Powell, Lawrence Clark, 14-15
Princeton University, 1
Programming languages, 6
Public-sector/private-sector taskforce, 20
Punch-card equipment. See Standards Eastern Automatic Computer [SEAC]

#### R

Ramo-Woolridge Corporation, 15
Rand Corporation, 16-17
Rapid selector, 10-11
Research Libraries Network [RLN], 17
Rexall Sundown, Inc., 13
Dart, Justin [president], 13
Rhodes, Homer H., 13
Rin Tin Tin television series, 2
Ronald Reagan administration, 18-19

#### $\mathbf{S}$

Sample data systems, 8
Saturday Evening Post, 2
School of Library Service, 14-15
Shoffner, Ralph M., 16
Southern California, University of [USC], 1
Space travel, 4
Standards Eastern Automatic Computer [SEAC], 5
Standards Western Automatic Computer [SWAC], 5-6
System for Interlibrary Communication [SILC], 18
Systems analysis, 5

#### Т

Taube, Mortimer, 11-13 conference of, 13 Telecommunications Act of Equity and Access, 21 Terminal Island, 3 Thompson Products, Inc., 15 Thorensen, Ragnar, 10 TRAC macro-processing language, 11 TRW, Inc., 15

# W

Wardman Park Hotel, 13 Washington Library Network [WLN], 17 Washington State Library, 17 Washington, University of, 12 Western Reserve University, 11 Wiener, Norbert, 8 World War II, 3 Wright Paterson Air Force Base, 12

# $\mathbf{Z}$

Zatocoding, 11