

CHEMICAL HERITAGE FOUNDATION

WILLIAM WEIS

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview
Conducted by

Helene L. Cohen

at

Stanford University
Stanford, California

on

7, 8, and 9 February 2000

From the Original Collection of the University of California, Los Angeles

ACKNOWLEDGEMENT

This oral history is part of a series supported by a grant from the Pew Charitable Trusts based on the Pew Scholars Program in the Biomedical Sciences. This collection is an important resource for the history of biomedicine, recording the life and careers of young, distinguished biomedical scientists and of Pew Biomedical Scholar Advisory Committee members.

This oral history was completed under the auspices of the Oral History Project, University of California, Los Angeles (Copyright © 2001, The Regents of the University of California) and is made possible through the generosity of



**From the original collection at the Center for
Oral History Research, UCLA Library, UCLA.**

The following oral history, originally processed at the UCLA Center for Oral History Research, has been reformatted by the Chemical Heritage Foundation. The process involved reformatting the front matter, adding a new abstract, replacing the table of contents, and replacing the index. The paragraph spacing and font of the body of the transcript were altered to conform to the standards of the Oral History Program at the Chemical Heritage Foundation. The text of the oral history remains unaltered; any inadvertent spelling or factual errors in the original manuscript have not been modified. The reformatted version and digital copies of the interview recordings are housed at the Othmer Library, Chemical Heritage Foundation. The original version and research materials remain at the Darling Library, University of California, Los Angeles and at the Bancroft Library, University of California, Berkeley.

REFORMATTING:

Kim Phan, Program Intern, Oral History, Chemical Heritage Foundation. B.A. expected 2011, Anthropology, Cornell University.

David J. Caruso, Program Manager, Oral History, Chemical Heritage Foundation. B.A., History of Science, Medicine, and Technology, Johns Hopkins University; PhD., Science and Technology Studies, Cornell University.

UNIVERSITY OF CALIFORNIA, LOS ANGELES

Oral History Interview Agreement No. TO21600A

This Interview Agreement is made and entered into this 15th day of February, 2000 by and between THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, a California corporation, on behalf of the Oral History Program at the UCLA campus, hereinafter called "University," and WILLIAM I. WEIS, having address at Department of Structural Biology, Stanford University School of Medicine, Fairchild Building, Room D 139, Stanford, California 94305, hereinafter called "Interviewee."

Interviewee agrees to participate in a series of University-conducted tape-recorded interviews, commencing on or about February 7, 2000, and tentatively entitled "Interview with William I. Weis". This Agreement relates to any and all materials originating from the interviews, namely the tape recordings of the interviews and a written manuscript prepared from the tapes, hereinafter collectively called "the Work."

In consideration of the mutual covenants, conditions, and terms set forth below, the parties hereto hereby agree as follows:

1. Interviewee irrevocably assigns to University all his copyright, title and interest in and to the Work. This assignment applies to University, its successors, and assigns, for and during the existence of the copyright and all renewals and extensions thereof.
2. By virtue of this assignment, University will have the right to use the Work for any research, educational, or other purpose, including electronic reproduction, that University may deem appropriate.
3. Interviewee acknowledges that he will receive no remuneration or compensation for his participation in the interviews or for the rights assigned hereunder.
4. Interviewee will receive from University, free of charge, one bound copy of the typewritten manuscript of the interviews.
5. To insure against substantive error or misquotation, Interviewee will have the right to review the manuscript before it is put into final form. University therefore will send Interviewee a copy of the edited transcript for review and comment. Interviewee will return transcript and comments to University within 30 days of receipt of the transcript. In the event that Interviewee does not respond within 30 days, University will assume that Interviewee has given full approval of the transcript.

6. All notices and other official correspondence concerning this Agreement will be sent to the following:

If to University: Oral History Program
University of California, Los Angeles
Box 951575
Los Angeles, California 90095-1575


Attention: Director

If to Interviewee: William I. Weis
Department of Structural Biology
Stanford University School of Medicine
Fairchild Building, Room D 139
Stanford, California 94305

University and Interviewee have executed this Agreement on the date first written above.

INTERVIEWEE

THE REGENTS OF THE UNIVERSITY
OF CALIFORNIA

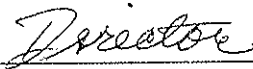

(Signature)


(Signature)

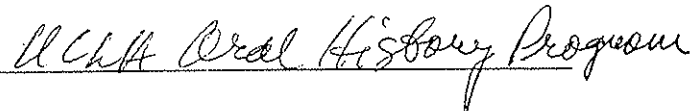
William I. Weis
(Typed Name)

Dale E. Treleven
(Typed Name)

Stanford University School
Of Medicine
(Address)


(Title)

Department of Structural
Biology



Stanford, CA 94305

Date 2/8/00

Date 2/15/00

This interview has been designated as **Free Access**.

One may view, quote from, cite, or reproduce the oral history with the permission of CHF.

Please note: Users citing this interview for purposes of publication are obliged under the terms of the Chemical Heritage Foundation Oral History Program to credit CHF using the format below:

William Weis, interview by Helene L. Cohen at Stanford University, Stanford, California, 7-9 February 2000 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0540).



Chemical Heritage Foundation
Oral History Program
315 Chestnut Street
Philadelphia, Pennsylvania 19106



The Chemical Heritage Foundation (CHF) serves the community of the chemical and molecular sciences, and the wider public, by treasuring the past, educating the present, and inspiring the future. CHF maintains a world-class collection of materials that document the history and heritage of the chemical and molecular sciences, technologies, and industries; encourages research in CHF collections; and carries out a program of outreach and interpretation in order to advance an understanding of the role of the chemical and molecular sciences, technologies, and industries in shaping society.

WILLIAM WEIS

1959 Born in Queens, New York, on 10 June

Education

1981 A.B., Princeton University
1988 Ph.D., Harvard University

Professional Experience

1989-1992 Columbia University
Postdoctoral Fellow, Department of Biochemistry and
Molecular Biophysics

1992-1999 Stanford University School of Medicine
Assistant Professor, Department of Structural Biology
1994-1999 Assistant Professor, Department of Molecular and
Cellular Physiology

1997-1999 Assistant Professor, Stanford Synchrotron Radiation Laboratory
1999-present Associate Professor, Department of Structural Biology
2000-present Associate Professor, Department of Molecular and
Cellular Physiology

Honors

1989-1992 Howard Hughes Medical Institute
1994-1998 Pew Scholar in the Biomedical Sciences
1996-1998 Stanford University/Howard Hughes Medical Institute Junior Faculty
Scholar Award

Selected Publications

Weis, W. et al., 1988. Structure of the influenza virus haemagglutinin complexed with its receptor, sialic acid. *Nature* 33:426-31.

Weis, W.I. et al., 1990. The structure of a membrane fusion mutant of the influenza virus haemagglutinin. *European Molecular Biology Organization* 9: 17-24.

Weis, W.I. et al., 1990. Refinement of the influenza virus haemagglutinin by simulated annealing. *Journal of Molecular Biology* 212:737-61.

- Weis, W.I. et al., 1991. Structure of the calcium-dependent lectin domain from a rat mannose-binding protein determined by MAD phasing. *Science* 254: 1608-15.
- Weis, W.I. et al., 1992. Structure of a C-type mannose-binding protein complexed with an oligosaccharide. *Nature* 360:127-34.
- Burling, F.T. et al., 1996. Direct observation of protein solvation and discrete disorder with experimental crystallographic phases. *Science* 271:72-77.
- Kolatkari, A.R. and W.I. Weis, 1996. Structural basis of galactose recognition by C-type animal lectins. *The Journal of Biological Chemistry* 271:6679-85.
- Huber, A.H. et al., 1997. Three-dimensional structure of the armadillo repeat region of β -catenin. *Cell* 90:871-82.
- Lenzen, C.U. et al., 1998. Crystal structure of the hexamerization domain of N-ethylmaleimide-sensitive fusion protein. *Cell* 94:525-36.
- Misura, K.M.S. et al., 2000. Three-dimensional structure of the neuronal-Sec 1 /syntaxin complex. *Nature* 404:355-62.

ABSTRACT

William Weis was born and grew up in Queens, New York, the youngest of three brothers. His grandparents immigrated from Ukraine, Belarus, and Latvia, ultimately settling in Brooklyn, New York. A “frustrated architect,” his father was in the United States Merchant Marines in World War II, where he learned electronics; he later earned a degree in electrical engineering at Brooklyn Polytechnic (now Polytechnic Institute of New York University) and worked in vacuum tubes until technology passed them by, at which time he began work for the New York City Office of Management and Budget. Weis’s mother was an administrator in a volunteer social work agency and the administrator of a close family.

Weis always liked learning and school. He especially liked mathematics and science, even reading his older brother’s entire anatomy textbook when he (William) was in sixth grade. In eighth grade he took a class of biology and chemistry together and fell in love with biochemistry. In high school he took two science classes every year and was on the math team.

Since a broad base of learning was important to him, Weis knew he wanted to attend a liberal arts college that also had strong science. He was accepted at Princeton University, and although it was financially difficult for his parents, he did go there and loved it. He majored in biochemistry and discovered spectroscopy, writing his graduation thesis on rhodopsin spectroscopy. Because DNA sequencing was new, many others went into molecular biology, but Weis liked physical chemistry best. He worked in Meredith Applebury’s lab, and she and Zoltan Soos were his major influences.

For graduate school Weis wanted a strongly quantitative school and one large enough to have a choice of labs. Matriculating into Harvard University, Weis liked all his rotations, but he found Don Wiley’s crystallography lab perfect for him. Wiley was doing fascinating work and was extremely enthusiastic about science. There he worked on influenza hemagglutinin.

When he finished his PhD he decided to spend a year at Yale University, working with Axel Brünger on simulated annealing, getting a better model of hemagglutinin. From there he went to Columbia University Medical Center, to Wayne Hendrickson’s lab, where he spent the “best four years of [his] life” studying the structure of C-type lectins using MAD phasing (multiwavelength anomalous scattering phasing or dispersion).

He accepted an assistant professorship at Stanford University, taking his research with him. In addition to managing his lab with its different personalities, he teaches some and has a few administrative duties. He likes writing papers and does not mind writing grants, of which he has received several. He has achieved tenure. He loves his work and spends most days in the lab, though he also takes time for his girlfriend. He feels he has met his goals so far, especially his professional goals. He thinks he would someday like to do community work, perhaps science education in earlier grades, particularly among minority students.

His current research comprises three areas: the C-type lectins; an interest in cell adhesion, specifically cadherins (calcium-dependent adhesion molecules); and intracellular vesicle trafficking.

UCLA INTERVIEW HISTORY

INTERVIEWER:

Helene L. Cohen, Interviewer, UCLA Oral History Program. B.S., Nursing, UCLA; P.N.P., University of California, San Diego/UCLA; M.A., Theater, San Diego State University.

TIME AND SETTING OF INTERVIEW:

Place: Weis' office, Stanford University.

Dates, length of sessions: February 7, 2000 (112 minutes); February 8, 2000 (104); February 9, 2000 (77).

Total number of recorded hours: 4.9

Persons present during interview: Weis and Cohen.

CONDUCT OF INTERVIEW:

This interview is one in a series with Pew Scholars in the Biomedical Sciences conducted by the UCLA Oral History Program in conjunction with the Pew Charitable Trusts's Pew Scholars in the Biomedical Sciences Oral History and Archives Project. The project has been designed to document the backgrounds, education, and research of biomedical scientists awarded four-year Pew scholarships since 1988.

To provide an overall framework for project interviews, the director of the UCLA Oral History Program and three UCLA faculty project consultants developed a topic outline. In preparing for this interview, Cohen held a telephone preinterview conversation with Weis to obtain written background information (curriculum vitae, copies of published articles, etc.) and agree on an interviewing schedule. She also reviewed prior Pew scholars' interviews and the documentation in Weis's file at the Pew Scholars Program office in San Francisco, including his proposal application, letters of recommendation, and reviews by Pew Scholars Program national advisory committee members. For technical background, Cohen consulted J.D. Watson et al., *Molecular Biology of the Gene*. 4th ed. Menlo Park, California: Benjamin/Cummings, 1987; Bruce Alberts et al., *Molecular Biology of the Cell*. 3rd ed. New York: Garland, 1994; Horace F. Judson, *The Eighth Day of Creation*. New York: Simon and Schuster, 1979; and recent issues of *Science* and *Nature*.

The interview is organized chronologically, beginning with Weis's childhood in Queens, New York, and continuing through his undergraduate work at Princeton University, his graduate work at Harvard University, his postdocs at Columbia and Yale University, and the establishment of his own lab at Stanford University. Major topics discussed include his research in the Don C. Wiley and Wayne A. Hendrickson laboratories, his application of simulated annealing to the study of hemagglutinin, and his current research.

ORIGINAL EDITING:

Ji Young Kwon, editorial assistant, edited the interview. She checked the verbatim transcript of the interview against the original tape recordings, edited for punctuation, paragraphing, and spelling, and verified proper names. Words and phrases inserted by the editor have been bracketed.

Weis did not review the transcript and therefore some names have not been verified.

William Van Benschoten, editor, prepared the table of contents. Kwon assembled the biographical summary and interview history. Deborah Truitt, editorial assistant, compiled the index.

TABLE OF CONTENTS

Early Years	1
Family background. Eurasian Jews who settled in Brooklyn. Father's electrical engineering work. Early love of learning, especially science and mathematics. Decline of Queens neighborhood. Discovery of biochemistry in junior high school. High school science classes and teachers.	
College Years	11
Enters Princeton University; majors in biochemistry. Meredith Applebury's lab. Also likes philosophy and comparative literature. Good liberal arts education. Prefers physical chemistry to molecular biology. Always wanted to be in academics, be his own boss.	
Graduate School Years	22
Chooses Harvard University as being quantitative and having large number of potential labs. Loved Don Wiley's lab. Worked on influenza hemagglutinin. High pressure, arrogance in lab. Discovers crystallography.	
Postdoctorate Years	31
First year at Yale University with Axel Brünger. Simulated annealing. Columbia University School of Medicine for four years. Wayne Hendrickson's lab. MAD phasing and C-type lectins.	
Faculty Years	39
Assistant professorship. Managing his lab. Teaching. Writing grants. Publishing. Currently writing fourth of eight papers. Pew Scholars in the Biomedical Sciences award. Girlfriend. Tenure. Composition of students and faculties in science. Quality control. Ethics. Patents. Competition and collaboration. Creativity in science and origin of ideas. Three current areas of research.	
Index	93

INDEX

A

Aldrich, Richard W., 45
American Cancer Society, 55
Applebury, Meredith L., 16, 21
armadillo, 61, 76
asialoglycoprotein, 33

B

Baldwin, Robert L., 23
Bjorkman, Pamela J., 53, 55
Block, Steven M., 50
Boulder, Colorado, 31
Boxer, Steven G., 58
Bragg, Sir William Henry, 84
Bragg, William Lawrence, 84
Brooklyn, New York, 1, 4
Brünger, Axel T., 31, 72

C

cadherins, 75, 78
California Institute of Technology, 53
Caltech. *See* California Institute of
Technology
Cambridge, Massachusetts, 23
Cantly, Lewis C., 23
Carl, Jerome, 34
catenin, 55, 57, 59, 61, 76, 77, 78, 82, 89
CD4, 80
Chu, Steven, 50
Cold Spring Harbor Laboratory, 17
Columbia University, 39
Columbia University Medical Center, 32,
36
Cornell University, 11
Cross, Patricia C., 43
crystallography, 21, 24, 28, 31, 36, 41, 42,
44, 45, 73, 79, 85
C-type lectins, 33, 74

D

DNA, 21, 46, 80, 85
Drickamer, Kurt, 33, 35, 36, 74
Drosophila, 76

E

Einstein, Albert, 82
endosome, 27
England, 67

F

Fourier [Jean Baptiste Joseph] transforms,
84
France, 34

G

Genentech Inc., 40, 47
golgi, 76
Great Neck, Long Island, New York, 5, 7, 9
Guidotti, Guido, 23

H

Halfon, Sharon M., 68, 69
Harrington, Gloria, 11
Harrington, William, 11
Harrison, Stephen C., 24
Harvard University, 11, 13, 21, 23, 24, 32,
33, 50, 54
Hell's Kitchen, 1
hemagglutinin, 27, 28, 32, 75, 79
Hendrickson, Wayne A., 26, 29, 30, 32, 33,
35, 38, 75
Herschlag, Daniel, 44
HHMI. *See* Howard Hughes Medical
Institute
HIV. *See* human immunodeficiency virus
Hodgson, Keith O., 34
Howard Hughes Medical Institute, 54, 55,
57, 77
human immunodeficiency virus, 77, 79, 80

I

IBM [International Business Machines], 31
influenza, 24, 26, 27, 28, 29, 77, 79

J

Jane Coffin Childs Memorial Fund for
Medical Research, 55
Johns Hopkins University, 11
Johns Hopkins University School of
Medicine, 39

K

Karplus, Martin, 24, 30, 31
Kiev, Ukraine, 1
Kobilka, Brian K., 77
Kuriyan, John, 30, 31, 38

L

lanthanide, 33, 34
Lewis, Henry, 7
Lewis, Richard S., 45
Lithuania, 1
Long Island, New York, 3

M

MAD. *See* multiwavelength anomalous
scattering phasing
major histocompatibility complex, 78
mannose-binding, 33
Massachusetts Eye and Ear Infirmary, 21
Massachusetts General Hospital, 21
Massachusetts Institute of Technology, 10,
30, 54
McKay, David B., 31, 40, 41, 44, 65
Memorial Sloan-Kettering Cancer Center,
39
Menlo Park, California, 67
Merchant Marines [United States Merchant
Marines], 2
MGH. *See* Massachusetts General Hospital
Michel, Harmut, 28
Minsk, Belarus, 1
MIT. *See* Massachusetts Institute of
Technology

Moerner, William Esco, 50
molecular dynamics simulations, 32
Moore, Mark, 40, 47
Mountain View, California, 67
multiwavelength anomalous scattering
phasing, 33

N

National Institutes of Health, 41, 53, 54, 55,
56, 57, 81
National Science Foundation, 55
National Young Investigator award, 55
Nelson, W. James, 74, 75
New York City, New York, 1, 2, 3, 32, 38,
39
NIH. *See* National Institutes of Health
NMR. *See* nuclear magnetic resonance
Nobel Prize, 50
NSF. *See* National Science Foundation
nuclear magnetic resonance, 39, 45, 53

P

Palo Alto, California, 49
Paris, France, 34, 38
Petsko, Gregory A., 30
Pew Scholars in the Biomedical Sciences,
43, 53, 54, 57, 77
phosphorylation, 76, 78
Polytechnic Institute of New York
University, 2
Princeton University, 11, 12, 13, 14, 15, 16,
20, 21, 50
Providence, Rhode Island, 2
Puglisi, Joseph, 44, 45

Q

Queens, New York, 1, 4, 6

R

Randy, Vera, 8
rhodopsin, 15, 44, 77
RNA, 28
Rockefeller University, 28, 30, 38
Rorty, Richard, 21

Russia, 1

S

Scheller, Richard H., 56, 77
Scripps Research Institute, 27, 39
selectins, 74, 79
sialic acid, 27, 28, 79
signal recognition particle, 28
simulated annealing, 31, 32
Skehel, John J., 29
Snow, Baron Charles Percy, 83
Soos, Zoltan G., 20
Stanford Linear Accelerator Center, 50
Stanford Synchrotron Radiation Laboratory,
52
Stanford University, 23, 34, 38, 39, 40, 49,
50, 51, 53, 54, 58
Stanford University/Howard Hughes
Medical Institute Junior Faculty Scholars,
54
State University of New York, 11
State University of New York at
Binghamton, 11
Steitz, Thomas A., 66
SUNY. *See* State University of New York
synchrotron, 28, 34, 38, 42, 66, 85
synchrotron radiation, 28, 34
Synchrotron Radiation Laboratory [Stanford
University], 34

T

Tuori, Tony, 11

U

UCSF. *See* University of California, San
Francisco
University of California, Berkeley, 23, 58

University of California, San Diego, 50
University of California, San Francisco, 23,
38, 39, 40, 49, 51
University of Colorado, 31
University of Paris, 38

V

Varmus, Harold E., 56
von Laue, Max Theodor Felix, 84

W

Wang, James C., 23
Weis, Anne Z. (mother), 1, 50
Weis, Celia (paternal grandmother), 1
Weis, Louis (paternal grandfather), 1
Weis, Martin (father), 1, 50
Weis, Philip C. (brother), 2
Weis, Richard J. (brother), 2, 19
Westinghouse Science Honors Institute, 17
Wiley, Don C., 23, 24, 25, 27, 29, 30, 33,
35, 75, 77, 78
Williams College, 13
Wilson, Ian A., 27, 39
World War II, 2
Wright, H. Tonie, 21

Y

Yale University, 11, 13, 23, 32, 51, 66

Z

Zinn, Kai G., 53
Ziolkowski, Theodore, 21
Zupnick, Alex (maternal uncle), 5
Zupnick, Flora P. (maternal grandmother), 1
Zupnick, Isadore W. (maternal grandfather),
1