CHEMICAL HERITAGE FOUNDATION

CAROL W. GREIDER

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview
Conducted by

Neil D. Hathaway

at

The Cold Spring Harbor Laboratory
Cold Spring Harbor, NY

on

22, 24, 30 September and 5 October 1993

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 the Pew Scholars Program in the Biomedical Sciences Advisory Committee members.

This oral history was completed under the auspices of the Oral History Project, University of California, Los Angeles (Copyright © 1996, 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:

Marnie Berkowitz, Consultant to the Chemical Heritage Foundation. B.A., Classical Languages and Literatures, University of Minnesota; Ford Foundation Fellowship, Classical Languages and Literatures, University of Chicago.

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. R931020

This Interview Agreement is made and entered into this 25th day of October, 1993 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 CAROL W. GREIDER having an address at Cold Spring Harbor Laboratory, P.O. Box 100, Cold Spring Harbor, New York, 11724, hereinafter called "Interviewee."

Interviewee agrees to participate in a series of University-conducted tape-recorded interviews, commencing on or about September 7, 1993, and tentatively entitled "Interview with Carol W. Greider". 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 her 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 that University may deem appropriate.

3. Interviewee acknowledges that she will receive no remuneration or compensation for her 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 and make any substantive comments that Interviewee deems appropriate. 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. University will then incorporate Interviewee's comments into the Work. 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: Office of Intellectual Property Administration
University of California, Los Angeles
405 Hilgard Avenue
Los Angeles, California 90024-1406

Attention: Ms. Carli V. Rogers
Copyright Officer

If to Interviewee: Carol W. Greider
Cold Spring Harbor Laboratory
P.O. Box 100
Cold Spring Harbor, New York 11724

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

INTERVIEWEE

Carol Greider
(Signature)

Carol W. Greider
(Typed Name)

Cold Spring Harbor Laboratory

P.O. Box 100
(Address)

Cold Spring Harbor, NY 11724

Date Sept 22 1993

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

Carli V Rogers
(Signature)

Carli V. Rogers
(Typed Name)

Copyright Officer
(Title)

Date October 25, 1993

Pew Scholars in the Biomedical Sciences

Chemical Heritage Foundation Internet Posting Release Form

I, Carol W. Greider, Ph.D., hereby grant permission to post portions of the digital copy of the audio-taped interview of me, and the related written transcript, on the internet for non-commercial, educational use only as per the checked selection below.

Please check one:

a. _____ **No restrictions for Internet Posting.**
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, Pennsylvania.

b. X **Semi-restricted Internet Postings** (My review of the material intended to post is required.)

c. _____ **Restricted access.** (Do not post.)

This constitutes my entire and complete understanding.

Carol W. Greider

Carol W. Greider, Ph.D.

1/18/08

Date

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:

Carol W. Greider, interview by Neil D. Hathaway at Cold Spring Harbor Laboratory, Cold Spring Harbor, New York, 22, 24, 30 September and 5 October 1993 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0483).

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.

CAROL W. GREIDER

1961	Born in San Diego, California on 15 April

Education

1981-1982	Georg-August-Universität
1983	B.A., Biology, University of California, Santa Barbara
1987	Ph.D., University of California, Berkeley

Research Appointments

1988-1990	Cold Spring Harbor Fellow, Cold Spring Harbor Laboratory
1990-1992	Staff Investigator, Cold Spring Harbor Laboratory

Professional Experience

1992-1994	Senior Staff Investigator, Cold Spring Harbor Laboratory
1994-present	Senior Staff Scientist

Honors

1981	Auslandsamt Scholarship, Georg-August-Universität
1981	Regents Scholarship, University of California
1983	Phi Beta Kappa
1984	Graduate Opportunity Fellowship, University of California, Berkeley
1990-1994	Pew Scholar in the Biomedical Sciences
1992	Allied-Signal Corporation Outstanding Project Award

Selected Publications

Greider, C.W. and E.H. Blackburn, 1985. Identification of a specific telomere terminal transferase activity in Tetrahymena extracts. *Cell*, 43:405-13.

Greider, C.W. and E.H. Blackburn, 1987. The telomere terminal transferase of Tetrahymena is a ribonucleoprotein enzyme with two kinds of primer specificity. *Cell*, 51:887-98.

Greider, C.W. and E.H. Blackburn, 1989. A telomeric sequence in the RNA of Tetrahymena telomerase required for telomere repeat synthesis. *Nature*, 337:331-37.

Greider, C.W., 1990. Telomeres, telomerase and senescence. *Bioessays*, 12:363-69.

Harrington, L.A. and C.W. Greider, 1991. Telomerase primer specificity and chromosome healing. *Nature*, 353:451-54.
Greider, C.W., 1991. Telomeres. *Current Opinion in Cell Biology*, 3:444-51.
Greider, C.W., 1991. Telomerase is processive. *Molecular and Cellular Biology*, 11:4572-80.
Greider, C.W., 1991. Chromosome first aid. *Current Biology*, 2:62-64.
Collins, K. and C.W. Greider, 1993. Nucleolytic cleavage and nonprocessive elongation catalyzed by Tetrahymena telomerase. *Genes and Development*, 7:1364-76.
Auxtier C. and C.W. Greider, 1994. Functional reconstitution of wild-type and mutant Tetrahymena telomerase. *Genes and Development*, 8:563-75.
Mantell, L.L. and C.W. Greider, 1994. Telomerase activity in germline and embryonic cells of *Xenopus*. *EMBO Journal*, 13:3211-17.
Greider, C.W., 1994. Mammalian telomere dynamics: Healing, fragmentation shortening and stabilization. *Current Opinion in Genetics and Development*, 4:203-11.

ABSTRACT

Carol W. Greider was born in San Diego, California. Her father was a physicist; her mother was a biologist who died when Carol was young. Her father had a position at Yale University when Carol was a child, and they lived in New Haven for a couple of years. Then they returned to California, to the University of California at Davis, where they continued to live while Carol grew up, except for a year in Germany when Carol was about ten. She learned to speak German there and continued to study the language when she was in high school. Beatrice Sweeney, a friend of her father, inspired Greider to attend the University of California at Santa Barbara. She studied circadian rhythms there, working with a graduate student who was studying microtubules in chicken brains. She spent her junior year in Göttingen, Germany. In part because of Elizabeth Blackburn, Greider decided to attend graduate school at University of California at Berkeley. In Blackburn's lab she cloned telomeres by functional complementation and became interested in how sequences are added into telomeres. She began searching for the telomerase enzyme; when she discovered it she determined its nucleic acid component, finding that telomerase is sensitive to RNase and has an RNA component. After completing her Ph.D. she accepted a postdoc at Cold Spring Harbor Laboratory, where she remains. Greider continued work on telomerase, relating it to human aging and cellular senescence and attempting to clone the RNA component of telomerase. She found herself in competition with Blackburn's lab to some extent. But her collaboration with Calvin Hurley, who was recruited into Geron Corporation, led to a position as an advisor there; she has, therefore, what many scientists consider a great deal of funding. Competitors have risen in what used to be Greider's own area, but still telomerase remains uncloned. Greider has organized and held a conference on telomerase; she is editing a textbook; and she meets with others–most recently in Sweden–who are interested also in telomeres and telomerase.

UCLA INTERVIEW HISTORY

INTERVIEWER:

Neil D. Hathaway, Interviewer, UCLA Oral History Program. B.A., English and History, Georgetown University; M.A. and C.Phil., History, UCLA.

TIME AND SETTING OF INTERVIEW:

Place: Greider's office, Cold Spring Harbor Laboratory, Long Island, New York.

Dates, length of sessions: September 22, 1993 (106 minutes); September 24, 1993 (98) ; September 30, 1993 (108) ; October 5, 1993 (103).

Total number of recorded hours: 6.9

Persons present during interview: Greider and Hathaway.

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.

In preparing for this interview, Hathaway, in consultation with the director of the UCLA Oral History Program and three UCLA faculty project consultants, developed a topic outline to provide an overall interview framework. Hathaway then held a telephone preinterview conversation with Greider to obtain extensive written background information (curriculum vitae, copies of published articles, etc.) and agree on a research and interviewing timetable. Hathaway further reviewed the documentation in Greider's file at the Pew Scholars Program office in San Francisco, including her proposal application, letters of recommendation, and reviews by Pew Scholars Program national advisory committee members. For general background on the recent history of the biological sciences, Hathaway consulted such works as: J.D. Watson et al., *The Molecular Biology of the Gene*. 4th ed. 2 vols. Menlo Park, CA: Benjamin/Cummings, 1987; Lubert Stryer, *Biochemistry*. 3d ed. New York: W.H. Freeman, 1988; *The Journal of the History of Biology*; H.F. Judson, *The Eighth Day of Creation: Makers of the Revolution in Biology*. New York: Simon and Schuster, 1979; and recent issues of *Science*, *Nature*, and *Cell*.

The interview is organized chronologically, beginning with Greider's youth in Davis, California, and continuing with her education at University of California, Santa Barbara, her graduate work at University of California, Berkeley, her post-Ph.D. work at Cold Spring Harbor Laboratory, and the creation of her own lab at Cold Spring Harbor. Major topics discussed include the discovery of telomerase and its role, cloning telomerase's RNA component, processivity and telomeres, the biotechnology industry, the funding and administration of research, and the place of women in science.

ORIGINAL EDITING:

Vimala Jayanti, editor, 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.

Greider reviewed the transcript. She verified proper names and made minor corrections.

Steven J. Novak, senior editor, prepared the table of contents. Jayanti assembled the biographical summary. Kristian T. London, editorial assistant, compiled the interview history and the index.

TABLE OF CONTENTS

INDEX

D

E

F

G

H

R

S

T