CHEMICAL HERITAGE FOUNDATION

CHARLES S. ZUKER

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview
Conducted by

Neil D. Hathaway

at

University of California, San Diego
San Diego, California

on

20 December 1992, 30 January and 22 April 1993, and 29 and 30 January 1994

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.

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. R921228

This Interview Agreement is made and entered into this 29th day of December, 1992 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 CHARLES S. ZUKER having an address at Department of Biology, University of California, San Diego, 9500 Gilman Drive, La Jolla, California, 92093-0649, hereinafter called "Interviewee."

Interviewee agrees to participate in a series of University-conducted tape-recorded interviews, commencing on or about December 18, 1992, and tentatively entitled "Interview with Charles S. Zuker". 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 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 : 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: Charles S. Zuker
Department of Biology
University of California, San Diego
9500 Gilman Drive
San Diego, CA 92093-0649

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

INTERVIEWEE

(Signature)

Charles S. Zuker
(Typed Name)

Department of Biology

University of California,
San Diego

9500 Gilman Drive
(Address)

San Diego, CA 92093-0649

Date 6/18/92

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

(Signature)

Carli V. Rogers
(Typed Name)

Copyright Officer

(Title)

Date December 29, 1992

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

CHARLES S. ZUKER

1957	Born in Arica, Chile, on 27 June

Education

1977	B.Sc., Cell Biology, Universidad Católica de Valparaíso, Chile
1983	Ph.D., Molecular Biology, Massachusetts Institute of Technology

Professional Experience

University of California, Berkeley

1983-1986	Postdoctoral Fellow, Department of Biochemistry

University of California, San Diego

1986-1989	Assistant Professor, Department of Biology
1989-1992	Associate Professor, Department of Biology and Department of Neurosciences, School of Medicine
1989-present	Associate Investigator, Howard Hughes Medical Institute
1993-present	Professor, Department of Biology and Department of Neurosciences, School of Medicine
1993-present	Investigator, Howard Hughes Medical Institute

Honors

1979-1980	Whitaker Health Sciences Fund fellow, Massachusetts Institute of Technology
1981-1982	Whitaker Health Sciences Fund fellow, Massachusetts Institute of Technology
1983	European Molecular Biology Organization fellow
1984	Sigma Xi
1984-1986	Jane Coffin Childs Memorial Fund for Medical Research fellow
1988-1991	McKnight Foundation Fund for Neuroscience Award
1988-1992	Pew Scholar in the Biomedical Sciences
1988-1990	Alfred P. Sloan Award in Neurosciences
1989-1991	March of Dimes Basil O'Connor Award

Selected Publications

Zuker, C.S. and H.F. Lodish, 1981. Repetitive sequences transcribed with developmentally regulated *Dictyosteium discoideum* mRNAs. *Proceedings of the National Academy of Sciences USA,* 78:5386-90.

Zuker, C.S., et al., 1983. A repetitive *Dictyostelium* gene family that is induced during differentation and by heat shock. *Cell,* 34:998-1005.

Zuker, C.S., et al., 1983. The *Dictyostelium* transposable element DIRS-1 has 350 by inverted repeats that contain a heat-shock promoter. *Proceedings of the National Academy of Sciences USA,* 81:2660-64.

Zuker, C.S., et al . , 1985. Isolation and structure of a rhodopsin gene from *D. melanogaster. Cell,* 40:851-58.

Zuker, C.S., et al., 1987. A rhodopsin gene expressed in photoreceptor cell R7 of the *Drosophila* eye: Homologies with other signal transducing molecules. *Journal of Neuroscience,* 7:1550-57.

Zuker, C.S., et al., 1988. Ectopic expression of a minor *Drosophila* opsin in the major photoreceptor cell class. *Cell,* 55:475-82.

Stamnes, M.A. and C.S. Zuker, 1990. Peptidyl-prolyl *cis-trans* isomerases , Cyclophilin, FK506 binding protein, and *ninaA:* Four of a kind. *Current Opinion in Cell Biology,* 2:1104-7.

Zuker, C.S., 1992. Phototransduction in *Drosophila:* A paradigm for the genetic dissection of sensory transduction cascades. *Current Opinion in Neurobiology,* 2:622-27.

Zuker, C.S., 1994. On the evolution of eyes: Would you like it simple or compound? *Science,* 265:742-43.

Rutherford, S. and C.S. Zuker, 1994. Protein folding and the regulation of signaling pathways. *Cell,* 79:1129-32.

Kernan, M. and C.S. Zuker, 1995. Genetic approaches to mechanosensory transduction. *Current Opinion in Neurobiology* (in press).

ABSTRACT

Charles S. Zuker was born and raised in Arica, Chile, on the border of Peru and Boliviathough the family moved to Santiago when Zuker was in the third year of his high school. His father was a prominent businessman, his mother a homemaker; Zuker was the second oldest of four siblings. He had a normal childhood playing with friends, though, from an early age, he was interested in biology and medicine but not in becoming a doctor. Although Jewish, he attended Jesuit schools since, from his parents' perspective, they provided the best education in Chile. The reign of Salvador Allende Gossens caused some perturbation within Chile and for Zuker's family but did not have much of an impact on Zuker's education; the prominence of electrophysiological work on the giant squid, a native of Chile, provided some access to well-trained scientists.

He was tracked, from an early age, to study biology and so he entered the Universidad Católica de Valparaíso for his degree, knowing all the while that he wanted to pursue a doctoral degree in the United States. He worked as a teaching assistant as an undergraduate, learned about scientific research from a doctoral student at the university, and became handy at building his own equipment with little funds. He applied to and was accepted at the Massachusetts Institute of Technology (MIT) for his graduate studies, during which time he had to develop rapidly his knowledge of the English language. After rotating through several labs, Zuker settled in to work with Harvey F. Lodish using slime molds as a system for studying development and trying to characterize the genes turned on as the molds developed spores. He moved on to a postdoctoral position at the University of California, Berkeley with Gerald M. Rubin, focusing more on neurobiological questions and, ultimately, research on photoreceptor cell function. Zuker used an RNA probe to isolate the rhodopsin gene in *Drosophila*; findings from this work published in *Cell* were done so simultaneously with competitors Joseph E. O'Tousa and William L. Pak. He then accepted a faculty position at the University of California, San Diego, and set up his research on *Drosophila* signaling pathways.

Throughout the interview he talks about his role and reputation at San Diego, as well as the joint graduate program with the Salk Institute for Biological Studies, basic research in underdeveloped countries, and the standards of graduate education. The interview concludes with Zuker's thoughts on the value of competition in science; his graduate students; balancing time in the lab with time with his family; the significance of the *ninaA* gene in explaining why cyclosporinA suppresses immune reactions; the development of electrophysiology techniques; the inability to do targeted mutagenesis on *Drosophila*; using the presence or absence of a protein as an assay to determine whether a gene is active or not; the process of breeding genetic stock in the laboratory; knocking out fly genes and attempting to rescue the function; and the utility of mutants in exploring the signaling pathway. He ends the interview with a discussion of how technology dominates modern biological research but cannot substitute for imagination and intuition; evolutionary conservation; learning the cause of retinitis pigmentosa; the quality of National Institutes of Health study sections; and his intense devotion to science.

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: Zuker's office, University of California, San Diego

Dates, length of sessions: December 20, 1992 (85 minutes); January 30, 1993 (99); April 22, 1993 (75); January 29, 1994 (75); January 30, 1994 (79).

Total number of recorded hours: 6.9

Persons present during interview: Zuker 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, from 1988 through 1992.

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 personal preinterview conversation with Zuker to obtain extensive written background information (curriculumvitae, copies of published articles, etc.) and agree on a research and interviewing timetable.

Hathaway further reviewed the documentation in Zuker's file at the Pew Scholars Program office in San Francisco, including his proposal application, letters of recommendation, and reviews by Pew Scholars Programnational 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 Zuker's childhood in Chilehis education at Universidad Cat6lica de Valparaiso, graduate work at Massachusetts Institute of Technology, postdoc at University of California, Berkeley, and setup of his own lab at University of California, San Diego. Major topics discussed include slime mold and *Drosophila* as genetic systems, recombinant DNA technology, neurobiology, *Drosophila* eye development, genetic mutations, lab management, the funding and training of scientists, and

science in developing countries.

ORIGINAL EDITING:

Steven J. Novak, senior editor, edited the interview. He 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.

Zuker reviewed the transcript. He verified proper names and made minor corrections.

Novak prepared the table of contents. Vimala Jayanti, editor, compiled the biographical summary. Kristian London, assistant editor, assembled the interview history and index.

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