

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.

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:

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

THE REGENTS OF THE UNIVERSITY
OF CALIFORNIA



(Signature)

(Signature)

Charles S. Zuker
(Typed Name)

Carli V. Rogers
(Typed Name)

Department of Biology

Copyright Officer

University of California,
San Diego

9500 Gilman Drive
(Address)

(Title)

San Diego, CA 92093-0649

Date 4/16/92

Date December 29, 1992

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:

Charles S. Zuker, interview by Neil D. Hathaway at the University of California, San Diego, San Diego, California, 20 December 1992, 30 January and 22 April 1993, and 29-30 January 1994 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0569).



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.

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

1983-1986 University of California, Berkeley
Postdoctoral Fellow, Department of Biochemistry

1986-1989 University of California, San Diego
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 *Dictyostelium 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 differentiation 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 Bolivia although 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 (curriculum vitae, 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 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 Zuker's childhood in Chile his education at Universidad Católica de Valparaíso, 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.

TABLE OF CONTENTS

Early Years	1
<p>Grandparents immigrate to South America to escape anti-Semitism. Childhood in AricaChileSiblings. Jewish community in Arica. Social turmoil during the Salvador Allendepresidency. Father's business career. Attends a Jesuit school. Decides to become a scientist. Childhood games. Meets with wife, Patricia Gioconda Ramolfo Zuker. Lack of guidance counseling in Chilean schools.</p>	
College	26
<p>Chilean system of higher education. Academic performance. Enters the Universidad Catolica de Valparaiso. Teaching undergraduates at University of California, San Diego (UCSD). High school course work. Teaching approach. Valparaisocurriculum. Influential professors. Undergraduate lab research. Learns to do research without expensive equipment. Plans to attend graduate school in the United States. ChileError! Reference source not found.'s development as a center for electrophysiology. Jerard Hurwitz's promotion of Chilean scientists.</p>	
Thoughts on Graduate Education and Teaching	46
<p>Preference for doing tasks at the last minute. Decides not to return to Chile after his graduate training. Difficulty of justifying basic research in underdeveloped countries. Teaching. Reforming graduate education. Criteria for admitting graduate students into the UCSD Department of Biology. Joint graduate program of the Salk Institute for Biological Studies and the University of California, San Diego. Attends Massachusetts Institute of Technology. Value of competition in science. Preference for hard-driving students and postdocs.</p>	
Postdoctoral Years	99
<p>Postdoc in the Gerald M. Rubin lab at the University of California, Berkeley. New transgenic technology. Decision in Rubin's lab to switch to neurobiological questions. Selecting a gene to study in <i>Drosophila</i>. RNA probe and the <i>white</i> gene. Using an RNA probe to isolate the rhodopsin gene. Decides to pursue research on photoreceptor cell function. Atmosphere in the Rubin lab. Rubin's management style. Importance of working on significant areas of research. Unpublished findings on the <i>white</i> gene. Searching the neurobiology literature. Goal of identifying every molecule involved in <i>Drosophila</i> eye function. Dividing the territory with Rubin. Publishing findings on the rhodopsin gene simultaneously with competitors Joseph E. O'Tousa and William L. Pak. Advantages of <i>Drosophila</i> as a system. Homologies in molecular biology Research. What homologies mean from an evolutionary standpoint.</p>	

Faculty Years	136
<p>Accepts a faculty position at University of California, San Diego. Setting up research on <i>Drosophila</i> signaling pathways. Emphasis on publishing a few major papers rather than a number of less significant ones. First students. Lab's reputation for being hard-driving. First postdocs. How principal investigators lack time to do bench research themselves. Evolving managerial style. Undergraduates in the lab. Significance of the <i>ninaA</i> gene in explaining why cyclosporin A suppresses immune reactions. Current postdocs' research. Developing electrophysiology techniques. Awarded tenure. Funding for lab.</p>	
Research and Thoughts about Science	172
<p>Fostering self-sufficiency in the lab. Inability to do targeted mutagenesis on <i>Drosophila</i>. Using presence or absence of a protein as an assay to determine whether a gene is active or not. Process of breeding genetic stock in the laboratory. Knocking out fly genes and attempting to rescue the function. Utility of mutants in exploring the signaling pathway. Question of what level of resolution a scientist wants on a problem. How the study of flies is relevant to the study of human genetics. How technology dominates modern biological research but cannot substitute for imagination and intuition. Evolutionary conservation. Value of basic science. Learning the cause of retinitis pigmentosa. Reasons for being a scientist. Allowing postdocs to take projects with them when they leave the lab. Quality of National Institutes of Health study sections. Serving on study sections. Scientific journals. Intense devotion to science and the changes in his attitude over the past year.</p>	
Index	216

INDEX

A

Abarzua, Patrigo, 41
actin, 41, 44
Albert Einstein College of Medicine, 44, 46, 47
Aldrich, Richard W., 99
Alfred P. Sloan Award in Neurosciences, 171
Allende, Salvador, 9, 12
Alzheimer's disease, 198
American Society for Cell Biology, 212
Applebury, Meredith L., 129, 134
Arica, Chile, 3, 4, 7, 12, 13, 14, 20
arrestin, 177, 182, 190

B

Baja California, 4
Baker, Bruce, 162
Baldwin, Robert L., 162
Baltimore, David, 81, 211
Baltimore, Maryland, 103, 112, 196
Basel, Switzerland, 104, 105
Benovic, Jeffrey L., 182
Benzer, Seymour, 123, 198
Blumberg, Daphne, 84
Bolivia, 1, 3
Borges, Jorge Luis, 34
Boston University, 44
Boston, Massachusetts, 39, 44, 142, 143
Bourne, Henry R., 41
Brandeis University, 38, 39, 123
Brenner, Sydney, 199, 200
Britt, Steven G., 182
Britten, Roy J., 89, 92
Brown, Michael S., 204
Buck, Linda, 161

C

C. elegans, 205

California Institute of Technology, 66
Caltech. *See* California Institute of Technology
capability and proficiency evaluation, 37, 38
CAPE. *See* capability and proficiency evaluation
Capecchi, Mario, 188
Carnegie Institute, 103
Caskey, C. Thomas, 199
Catholic (Roman), 14, 15
 Jesuit, 14, 15, 24, 25, 31, 32, 43
Chicago, Illinois, 196
Chile, 1, 3, 4, 5, 6, 7, 8, 9, 13, 15, 17, 20, 26, 27, 29, 31, 38, 40, 41, 42, 44, 45, 46, 47, 52, 53, 54, 55, 64, 88, 142, 211
Chuman, Lorraine, 51
Chung, Steve, 85, 89
collaboration, 124, 135, 173, 174
Columbia University, 59, 156
competition, 67, 94, 95, 98, 101, 103
Cowman, Alan F., 133
Crete, 54
Crick, Francis, 16
cyclophilin, 158, 159, 160, 162, 206
cyclosporin, 158

D

Damon Runyon Postdoctoral Fellowship, 99
Davidson, Eric H., 89, 92
Delbrick, Max, 198
Dictyostelium, 83, 88, 90, 92, 205
Dinsfertig, Chana (maternal grandmother), 1
Dinsfertig-Silberberg, Celia Zuker (mother), 49
DNA, 30, 37, 44, 46, 60, 63, 89, 92, 103, 108, 109, 110, 131, 132, 135, 151
Dolph, Patrick J., 177
Drosophila, 54, 83, 103, 104, 105, 111, 124, 129, 139, 140, 141, 144, 185, 186, 189,

192, 193, 194

E

electrophysiology/electrophysiologist, 45, 99, 163, 164, 178
Elledge, Stephen J., 196, 197
EMBL. *See* European Molecular Biology Laboratory
Europe, 1, 7, 11, 24, 53, 55, 129
European Molecular Biology Laboratory, 55

F

Feiler, Reinhard, 174, 182
Fiddler on the Roof, 7, 10
Firtel, Richard A., 83, 90
foldase, 158, 159
Fox, Maurice S., 79
Fred Hutchinson Cancer Research Center, 71

G

G protein, 143, 144, 146, 161, 177, 181, 182, 184, 189, 192, 194
Ganetzky, Barry, 162
Garcia Marquez, Gabriel, 34
Garcia, Pablo, 41
Gefter, Malcolm, 44, 46, 77, 79
Gehring, Walter J., 104
Geneva, Switzerland, 53
Genome of Drosophila Melanogaster, The, 106, 186
Germany, 1, 10, 11, 174, 175, 182
Goldstein, Joseph L., 204
Gonzalez, Roberto, 38, 40, 41, 42, 44, 45, 52
Gordon Conference, 53
Gorman, Monica, 161, 162
grants/funding, 40, 44, 51, 64, 65, 97, 101, 122, 146, 168, 169, 170, 172, 173, 207, 208, 209, 210, 211, 212
Greider, Carol W., 152

H

Hafen, Ernst, 104, 106, 116, 128
Hall, Jeffrey, 123
Hardy, Robert, 187
Harris, Gregory L., 164, 165, 173
Harris, William A., 175
Harvard University, 39, 54, 66, 78, 99, 156
Hawaii, 140
Heidelberg, Germany, 55
Hirsh, Jay, 131
Horvat, Alejandro, 43
Howard Hughes Medical Institute, 73, 74, 168, 171, 172, 173, 207
Human Genome Project, 95, 199
Hurwitz, Jerard, 44, 46, 47

I

Israel, 7

J

Jaenisch, Rudolf, 53
Jew/Jewish/Judaism, 4, 7, 8, 10, 12, 14, 15, 38
 bar mitzvah, 8, 16
 Conservative, 7
 Orthodox, 7
 Reform, 7
John D. and Catherine T. MacArthur fellowships, 122
John E. Fogarty International Center for Advanced Study in the Health Sciences, 39
Johns Hopkins University, 66, 107, 196
Jones, Kevin, 107
Julius, David J., 178

K

Kadonaga, James T., 58
Kafatos, Fotis, 54
Kernan, Maurice, 160, 162, 180
Khorana, Har Gobind, 192
King, Mary Clare, 205
Kirschfeld, Kuno, 174, 175, 176, 182, 183
Kirschner, Mark W., 115

Kunkel, Doug, 124

L

Lee Strasberg Theatre Institute, 20
Levine, Michael S., 104, 116, 128, 197
Levis, Robert W., 118
Lindsley, Dan L., 106, 186
Lodish, Harvey F., 76, 77, 78, 81, 82, 84,
85, 86, 89, 90, 142, 205
Lucille P. Markey Charitable Trust
Programs in Biomedical Sciences, 99
Luria, Salvador Edward, 198

M

MacKinnon, Roderick, 99
Maddox, John, 214
Maniatis, Tom, 197
Manning, P.A., 107
March of Dimes Basil O'Connor Award,
171
Marshall, Sergio, 38, 39, 52
Massachusetts Institute of Technology, 40,
44, 45, 46, 47, 66, 72, 73, 74, 81, 84, 87,
93, 94, 99, 103, 142, 152, 154, 177, 192
Max-Planck- Institut für biologische
Kybernetik, 174
McGinnis, William, 104
McKnight Foundation for Neuroscience
Award, 171
mechanoreceptors, 160, 161, 162, 163, 167,
180, 206
membrane biology, 75, 79, 82, 89
Mendel, Gregor, 96, 211
microspectrophotometry, 175, 182
MIT. *See* Massachusetts Institute of
Technology
Moby Dick, 49
Molecular Cloning, 197
Montell, Craig, 107, 125, 126, 128
Mount, Stephen M., 117

N

Nathans, Jeremy, 134, 135
National Eye Institute, 171

National Institutes of Health, 147, 170, 171,
172, 173, 207, 210, 212
Nazis, 1
Neruda, Pablo, 34
neurobiology, 45, 62, 63, 64, 99, 104, 105,
108, 122, 124, 143, 212
New York City, New York, 6, 20
New York University, 95
NIH. *See* National Institutes of Health
nina, 157
ninaA, 157, 158, 159, 163, 173, 180, 184
ninaE, 129, 130, 133
Nobel Prize, 39, 188
Nüsslein-Volhard, Christiane, 192

O

O'Tousa, Joseph E., 129, 132, 134
Oberlin College, 69, 73
Oppenheimer, J. Robert, 204
opsin, 129, 130, 134, 135, 141
bovine opsin, 110, 134, 135, 136, 141

P

p53, 196, 197, 203
Pak, William L., 107, 122, 129, 130, 131,
134, 135
Palade, George E., 182
Parada, Camilo, 41
Pardue, Mary Lou, 75
peer review, 96, 207, 210
Peru, 3
Pew Scholars Program in the Biomedical
Sciences, 51, 56, 74, 95, 170, 196, 199,
211
photoreceptor cells, 158, 159, 160, 161,
163, 164
R7, 106, 110
R8, 110
phototransduction, 144, 145
Pinochet (Ugarte), Augusto, 11
Poland, 10
Princeton University, 67, 106
Purdue University, 107

R

Ranganathan, Rama, 99, 147, 163, 165, 166,
167, 173, 175, 176, 180
Ras, 197
Red Book, 106, 186
Reinberg, Danny, 40, 47
retinitis pigmentosa, 203
rhodopsin, 7, 110, 111, 129, 130, 131, 141,
144, 158, 159, 160, 177, 192, 194, 203
Rio, Donald C., 108, 109, 113, 116
RNA, 60, 89, 90, 108, 109, 110, 135, 151
Roche Institute for Molecular Biology, 71
Roche Laboratories, 41
Rockefeller University, 41, 44
Roeder, Robert G., 41
Rothman, James E., 99
Rubin, Gerald M., 103, 104, 105, 106, 108,
109, 110, 111, 113, 115, 116, 118, 120,
121, 122, 125, 126, 127, 128, 131, 145,
176, 188, 189, 200
Russia, 1, 10
Rutgers University, 61

S

Sabbatini, David, 54
Salk Institute for Biological Studies, 70, 71,
72, 73, 103, 152, 165, 167, 180
Salk, Jonas, 72
San Diego, California, 1
Santiago, Chile, 3, 4, 26, 29, 41, 43, 46, 142
Schekman, Randy, 201
Schultz, David, 160, 162
Scott, Kristin, 149
Scripps Research Institute, 67, 71, 73
sevenless gene, 106, 118
Shieh, Bih-Hwa, 157, 168, 191
Signer, Ethan R., 80
Silberberg, Samuel (maternal grandfather),
1
Silberberg-Dinsfertig, Celia Zuker (mother),
1
simian virus40, 55
Simon, Michael A., 188
slime molds, 81, 82, 83, 86, 88, 89, 90, 122

Sloan-Kettering Institute for Cancer
Research, 46, 99

Smith, Dean P., 99, 147
South America, 1, 2, 7, 21, 27
Spitzer, Nicholas C., 165
Spradling, Allan C., 103
Stamnes, Mark A., 99, 147
Stanford University, 66, 99, 162, 200
Steller, Hermann, 116
Stevens, Charles F., 165, 166, 175, 176, 180

T

tenure, 97, 101, 168, 169, 171
Thierry-Mieg, Danielle, 121
Tjian, Robert T., 40
Tomlinson, Andrew, 106
Trenner, Dora (paternal grandmother), 1

U

U.S. Congress, 84
UCSD. *See* University of California, San
Diego
UCSF. *See* University of California, San
Francisco
United States of America, 11, 29, 38, 43, 52
Universidad Católica de Valparaiso, 4
University of California, 46, 59
University of California, Berkeley, 44, 66,
72, 74, 81, 103, 104, 108, 112, 122, 142,
143, 145, 152
University of California, Los Angeles, 23,
185
University of California, San Diego, 23, 29,
60, 66, 70, 71, 72, 73, 103, 104, 117, 142,
148, 152, 182, 197
University of California, San Francisco, 40,
41, 59, 66, 72, 73, 115, 143, 156
University of Iowa, 73, 95
University of Maryland, 61
University of Oregon, 59
University of Wisconsin, 162
University of Wyoming, 72
Uruguay, 1, 13

V

Valparaiso, Chile, 3, 4, 5, 6, 29, 33, 45, 52
Varmus, Harold E., 210
Villa del Mar, Chile, 142
virology, 75, 79, 80, 81
Vogelstein, Bert, 196, 197, 204

W

Watson, James D., 16
Weischaus, Eric F., 192
white gene, 16, 103, 104, 106, 107, 108,
109, 119, 120, 121, 166
Wichita, Kansas, 154
Williams, Lewis T., 40
Woods Hole, Massachusetts, 45
World War I, 11

X

Xenopus, 42

Y

Yale University, 124

Yiddish, 21

Yudelevich, Alejandro, 45, 46

Yugoslavia, 43

Z

zeste gene, 120, 121

Zimm, G.G., 186

Zipursky, Larry S., 185, 186

Zuker, Felipe (paternal grandfather), 1

Zuker, Murielle (daughter), 51

Zuker, Patricia Gioconda Ramolfo (wife), 6,
56, 101, 142, 200

Zuker-Silberberg, Dorita (Dora) Dalia
(sister), 6

Zuker-Silberberg, Estrella Marta (sister), 6

Zuker-Silberberg, Saul Marcos (brother), 4,
5

Zuker-Trener, Mauricio (father), 1, 20, 49

Zurich, Switzerland, 129

B

β -amyloid, 198