

CHEMICAL HERITAGE FOUNDATION

PAUL M. MACDONALD

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview
Conducted by

Steven J. Novak

at

Stanford University
Palo Alto, California

on

21, 22, and 23 February 1995

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

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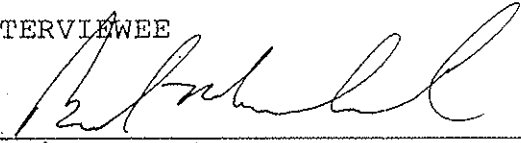
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(Signature)

Paul M. Macdonald

(Typed Name)

Department of Biological
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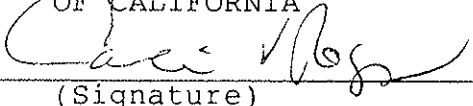
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PAUL M. MACDONALD

1955 Born in Denver, Colorado on 12 November

Education

1978 B.S., Colorado State University
1980 M.S., Georgia Institute of Technology
1983 Ph.D., Vanderbilt University

Research Appointments

1984-1986 Postdoctoral Fellow, Harvard University
1987-1989 Postdoctoral Fellow, Columbia University

Professional Experience

1989-present Assistant Professor, Department of Biological Sciences,
Stanford University

Honors

1981-1983 Predoctoral Fellow, National Institutes of Health Cellular-Molecular
Biology Graduate Training Program
1984-1986 Damon Runyon-Walter Winchell Postdoctoral Fellowship
1990-1993 Pew Scholar in the Biomedical Sciences
1990-1994 David and Lucile Packard Fellowship

Selected Publications

Macdonald, P.M. and G. Struhl, 1986. A molecular gradient in early *Drosophila* embryos and its role in specifying the body pattern. *Nature*, 324:537-45.
Macdonald, P.M. and G. Struhl, 1988. *Cis*-acting sequences responsible for anterior localization of *bicoid* mRNA in *Drosophila* embryos. *Nature*, 336:595-98.
Goto, T. et al., 1989. Early and late periodic patterns of *even skipped* expression are controlled by distinct regulatory elements that respond to different spatial cues. *Cell*, 57:413-22.
Struhl, G. et al., 1989. The gradient morphogen *bicoid* is a concentration-dependent

- transcriptional activator. *Cell*, 57:1259-73.
- Macdonald, P.M., 1990. *Bicoid* mRNA localization signal: Phylogenetic conservation of function and RNA secondary structure. *Development*, 110:161-71.
- Kim-Ha, J. et al., 1991. *Oskar* mRNA is localized to the posterior pole of the *Drosophila* oocyte. *Cell*, 66:23-35.
- Macdonald, P.M. et al., 1991. Protein encoded by the *exuperantia* gene is concentrated at sites of *bicoid* mRNA accumulation in *Drosophila* nurse cells, but not in oocytes or embryos. *Genes and Development*, 5:2455-66.
- Smith, J.L. et al., 1992. Overexpression of *oskar* directs ectopic activation of *nanos* and presumptive pole cell formation in *Drosophila* embryos. *Cell*, 70:849-59.
- Macdonald, P.M. et al., 1993. RNA regulatory element BLE1 directs the early steps of *bicoid* mRNA localization. *Development*, 118:1233-43.
- Kim-Ha, J. et al., 1993. Multiple RNA regulatory elements mediate distinct steps in localization of *oskar* mRNA. *Development*, 119:169-78.
- Webster, P.J. et al., 1994. *Drosophila virilis oskar* transgenes direct body patterning but not pole cell formation or maintenance of mRNA localization in *D. melanogaster*. *Development*, 120:2027-37.
- Kim-Ha, J. et al., 1995. Translational regulation of *oskar* mRNA by bruno, an ovarian RNA binding protein, is essential. *Cell*, 81:403-12.
- Macdonald, P.M. et al., 1995. Ex1 protein specifically binds BLE1, a *bicoid* mRNA localization element, and is required for one phase of its activity. *Proceedings of the National Academy of Sciences*, 92:10787-91.
- Wilson, J.E. et al., 1996. *Aubergine* enhances *oskar* translation in the *Drosophila* ovary. *Development*, 122:1631-39.

ABSTRACT

Paul M. Macdonald was born in Denver, Colorado, to a forensic psychologist from New Zealand and an American nurse. He has an older sister, who is a dean at William and Mary College, and a younger brother. He grew up as much outdoors as he could manage; uninterested in school and preferring skiing, bicycling, backpacking, and rock climbing to studying, he decided to attend Colorado State University's forestry school. During summers he worked for the Youth Conservation Corps in Colorado and then in California. Continuing his uninspired high-school pattern, he remained a poor and undirected student until his last year, when he had a class with Larry Hopwood in radiation biology. He loved the class and asked to work in a lab. Because of his excellent GRE scores and his lab work he was a candidate for graduate school. He went to Georgia Tech partly because it had faculty who interested him and because he wanted to distance himself from his usual outdoor distractions. He worked on bacteriophage mutant in Dwight H. Hall's lab to finish his Master's degree. Then he applied to Vanderbilt for a Ph.D. in molecular bio techniques under Gisela Mosig; Lee Rowen taught him recombinant DNA techniques, and he finished his Ph.D. He accepted a postdoc at Harvard, working in Tom Maniatis's lab. He worked with Gary Struhl there, identifying proteins involved in *adh* gene expression and with molecular gradient in *Drosophila* embryos. He went to Columbia as a postdoc with Struhl. From there he accepted a faculty position at Stanford University. His work included studying how molecules that control patterning are localized; comparing RNA sequences from different *Drosophila* species; redundancy of information in *Drosophila* RNA, and the role of chance in his *mRNA oskar* research. Macdonald has published many articles, continues at Stanford to run and work in his lab, teaches, and attempts to balance all this with his life at home with his wife and infant son.

UCLA INTERVIEW HISTORY

INTERVIEWER:

Steven J. Novak, Senior Editor, UCLA Oral History Program. B.A., History, University of Colorado; Ph.D., History, University of California, Berkeley; M.B.A., UCLA Graduate School of Management.

TIME AND SETTING OF INTERVIEW:

Place: Macdonald's office, Stanford University, Palo Alto, California.

Dates, length of sessions: February 21, 1995 (125 minutes); February 22, 1995 (127); February 23, 1995 (70).

Total number of recorded hours: 5.35

Persons present during interview: Macdonald and Novak.

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 consultants developed a topic outline. In preparing for this interview, Novak held a preinterview telephone conversation with Macdonald to obtain written background information (curriculum vitae, copies of published articles, etc.) and to agree on an interviewing schedule. He also reviewed prior Pew scholars' interviews and the documentation in Macdonald'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, Novak consulted J.D. Watson et al., *Molecular Biology of the Gene*. 4th ed. Menlo Park, CA: Benjamin/Cummings, 1987 and Bruce Alberts et al., *Molecular Biology of the Cell*. 3d ed. New York: Garland, 1994. The interview is organized chronologically, beginning with Macdonald's childhood in Denver and continuing through his undergraduate and graduate education, his postdocs at Harvard University and Columbia University, and the establishment of his own lab at Stanford University. Major topics discussed include the demonstration of a molecular gradient in *Drosophila* embryos, localization and translational regulation in *Drosophila*, lab management, and scientific funding and publishing.

ORIGINAL EDITING:

Kristian London, assistant 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.

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

London prepared the table of contents, biographical summary, and interview history. Rebecca Stone, oral history assistant, compiled the index.

TABLE OF CONTENTS

Early Years	1
<p>Born and raised in Denver, Colorado, with a sister and a brother. Always interested in the outdoors; loves skiing, biking, backpacking, rock climbing; dislikes school and studying. Summer employment with the Youth Conservation Corps. His shyness as an adolescent.</p>	
Undergraduate Years	12
<p>Enters Colorado State University in the forestry department; switches to pre-med; then just drifts, unable to engage with school, though he has one interesting course in biochemistry, where a guest speaker discusses recombinant DNA, new at the time. In his last year he discovers radiation biology and becomes excited at last; works in radiation biology lab; decides to go to graduate school</p>	
Graduate Years	18
<p>Enters master's program at Georgia Institute of Technology. Characterizing a bacteriophage mutant in the Dwight H. Hall laboratory. Transfers to Vanderbilt University to pursue Ph.D. under Gisela Mosig. Develops expertise in molecular biological techniques in Mosig's lab. Learns recombinant DNA techniques from Lee Rowen courses.</p>	
Postdoc Years at Harvard University	31
<p>Accepts a postdoc in Tom Maniatis' lab at Harvard University. Meets Gary Struhl. Unsuccessfully attempts to identify proteins involved in <i>Adh</i> gene expression. Characterizes homeobox-containing genes with Struhl. Problems with the argument that <i>caudal</i> gene products are present in a gradient in the early embryo. Collaborating on research with Struhl. Demonstrating molecular gradient in <i>Drosophila</i> embryos.</p>	
Postdoc at Columbia	36
<p>Accepts a postdoc in Struhl's lab at Columbia University. Fellow postdocs in the Struhl lab. Relationship with Struhl.</p>	
Faculty Position at Stanford University	55
<p>Accepts a position at the Department of Biological Sciences at Stanford University. Macdonald's start-up package. The difficulty of attracting good graduate students to his lab. Interactions with colleagues at Stanford and with other scientists in the San Francisco Bay Area. Stanford's tenure review process--Administration and bureaucratic regulations at Stanford. Macdonald's transition from postdoc to principal investigator. His <i>Drosophila</i> stocks. <i>Drosophila</i> RNA. More on translational regulation. Benefits of working with <i>Drosophila</i>. Competition among <i>Drosophila</i> researchers.</p>	
Index	115

INDEX

A

Adh. See alcohol dehydrogenase
Alberts, Bruce M., 27, 106
Albuquerque, New Mexico, 94
alcohol dehydrogenase, 35
American Cancer Society, 105
antigenicity, 92
Aruba, 96
Atlanta, Georgia, 19, 20, 23, 25, 45, 52

B

bacteriophage, 20, 21, 24, 25, 28, 86
Baker, Baker, 60, 65, 85
Basel, Switzerland, 37
Bateson, William, 109
Berlin Wall, 24
Bethesda, Maryland, 94
bicoid, 83
Biogen Idec, Inc., 46
bithorax, 113
Boston, Massachusetts, 41, 52, 54, 96
Boulder, Colorado, 3
Bronx High School of Science, 49
Brown Jr., Representative George E., 106

C

California Institute of Technology, 26, 33
Caltech. See California Institute of
Technology
Cambridge, England, 39
Cambridge, Massachusetts, 41, 50
Campbell, Allan M., 55
Carleton College, 12
Carter Lake, 7
Casanova, Jordi, 53
caudal, 36, 48
Cherry Creek, Colorado, 3, 4
Cherry Creek, High School, 12
Chicago, Illinois, 1, 2, 10
Christian Reform Church, 3, 10

chromatography, 91
Civilian Conservation Corps, 7
Clinton, President William J., 106
Cold Spring Harbor Laboratory, 24, 33
Cologne, Germany, 24
Colorado, 19
Colorado State University, 6, 12, 13, 15, 16,
17, 18
Columbia University, 38, 39, 41, 49, 55, 65,
102, 113
Columbia-Presbyterian Medical Center, 52,
53
CSU. See Colorado State University

D

David and Lucile Packard Fellowship, 102
Denver, Colorado, 1, 2, 3, 4, 5, 7, 8, 9, 52
Dewey, William C., 15
Djerassi, Carl, 56
DNA, 16, 17, 21, 25, 26, 27, 31, 33, 35, 36,
70, 77, 94, 113
Drosophila, 32, 33, 35, 36, 60, 66, 70, 79,
82, 84, 86, 87, 89, 91, 109, 113
Dusenbery, David B., 19
Dutch Antilles, 96

E

E. coli, 21, 47
East Germany, 24
*Eighth Day of Creation, The: Makers of the
Revolution in Biology*, 11
electromicroscopy, 92
Englewood, Colorado, 3, 4
exu, 92

F

folate analogs, 21
Fort Collins, Colorado, 7, 12, 13, 44
Fred Hutchinson Cancer Research Center,
55
Fritsch, E. F., 31

G

Garner, Jack, 7, 44
Gehring, Walter J., 37
Georgia Institute of Technology, 18, 19, 22, 23
Georgia Tech. *See* Georgia Institute of Technology
Gold, Lawrence, 113
Goldberg, David A., 33, 35
gradient, 16, 37, 46, 47
Graduate Record Examination, 18
Grand Ole Opry, 23
gurken, 79

H

Hall, Dwight H., 20, 21
Hanawalt, Philip C., 57
Harvard University, 33, 34, 41, 45, 46, 49, 53, 54, 99, 106
Hershey, Alfred D., 24
high-pressure liquid chromatography, 91
Hoekstra, Ming (maternal aunt), 12
Hogness, David S., 63
Holland, 2
homeobox, 36, 112
homeodomain, 76
Hood, Leroy E., 26
Hopkins Marine Station, 56
Hopwood, Larry E., 14
Horse Tooth Reservoir, 7
Howard Hughes Medical Institute, 49, 50, 51, 57, 109
Howard, Ken, 53
human immunodeficiency virus, 106

I

Indian languages, 81

J

Johanson, Donald C., 111
Jones, Patricia P., 61
Judaism, 11
Judson, Horace F., 11

K

Kerr, Karen, 80
Kim-Ha, Jeongsil, 78, 80, 90, 97
Kirschner, Marc W., 106
Kornberg, Arthur, 26, 113

L

Laboratory of Molecular Biology, 39
Laski, Frank A., 81, 87, 110, 113
Lawrence, Peter A., 39
Leask, Andrew, 99
Lederberg, Joshua, 1, 107
Lehmann, Ruth, 87, 88, 89
Lewin, Benjamin, 100, 102
Lewis, Edward B., 113
LMB. *See* Laboratory of Medical Biology
Los Alamos, New Mexico, 94
Loveland, Colorado, 7
Lucy, 111
Luder, Andreas, 24
Luk, Sandy, 99

M

Macdonald, Ellen Sutin (wife), 2, 11, 93, 96, 97, 109
Macdonald, Ian Sutin (son), 10, 94, 96, 97, 111
Macdonald, John M. (father), 1, 102
Macdonald, Lucile Hoekstra (mother), 1
Macdonald, Ruth Heather (sister), 3
Macdonald, William James (brother), 3
Maddox, John, 43
Maniatis, Tom, 31, 32, 33, 34, 35, 41, 42, 45, 50, 53, 102
Martin, Robert, 17
Massachusetts Institute of Technology, 39, 49, 87, 99, 102
Massachusetts Institute of Technology Press, 102
Mathews, Christopher K., 21
Max-Planck-Institut, 84
McConnell, Susan K., 58
Medawar, Peter B., 72
Medical Research Council, 39, 62

Milligan, Ronald A., 62
MIT. *See* Massachusetts Institute of
Technology
morphogen, 37, 46, 47, 66, 88
Mosig, Gisela, 22, 23, 24, 25, 26, 31, 42, 73
MRC. *See* Medical Research Council
mRNA, 35, 37, 72, 77, 78, 80, 92

N

nanos, 88
Nashville, Tennessee, 23, 26
National Academy of Sciences, 27, 106
National Institutes of Health, 49, 94, 103,
104, 106
National Science Foundation, 105
New York City, New York, 50, 52, 53, 54,
65, 83, 84, 103
New Zealand, 1, 2
Nexogen, 113
NIH. *See* National Institutes of Health
Nobel Prize, 42, 72, 104, 113
Noll, Markus, 83
Nüsslein-Volhard, Christiane, 82, 83, 85,
87, 89

O

Oregon State University, 21
oskar, 72, 77, 78, 79

P

page charges, 102
Paule, Marvin R., 17
People for the Ethical Treatment of
Animals, 109
Petunia, 24
Pew Charitable Trusts Foundation, 63
Pew Scholars in the Biomedical Sciences, 1,
18, 32, 47, 49, 62, 69, 70, 75, 80, 89, 91,
98, 102, 103, 106, 107, 108
phylogenetic, 69, 70
Posakony, James W., 32, 33, 35, 42
Ptashne, Mark, 53, 98
Puerto Rico, 107
putative replication complex, 27

R

ribonucleic acid, 36, 37, 60, 69, 70, 71, 77,
78, 80, 81, 83, 88, 92, 106
RNA. *See* ribonucleic acid
Rockefeller University, 105
Rocky Mountain National Park, 7
Rowen, Lee, 26, 31, 34, 41

S

Sacramento, California, 7
Sambrook, J., 31
San Francisco, California, 2
Santa Barbara, California, 7, 44
Santa Fe, New Mexico, 11
Scheller, Richard H., 55
Schüpbach, Gertrud, 79
Scotland, 1, 2
Seattle, Washington, 54, 55
Sharp, Phillip A., 46
Simon, Michael A., 60
Simoni, Robert D., 61
Snow, C. P., 107
Society of Fellows, 33
Somerville, Massachusetts, 50
Stanford Memorial Church, 58
Stanford University, 16, 19, 21, 26, 31, 46,
51, 55, 57, 58, 60, 61, 62, 63, 93, 98, 99,
100, 102, 103
Struhl, Gary, 33, 34, 38, 39, 42, 46, 49, 50,
51, 52, 53, 64, 75, 82, 83, 84, 88, 100,
109, 112, 113
Struhl, Kevin, 34
Sutin, Esther (mother-in-law), 95
Sutin, Michael (father-in-law), 10, 93, 94,
95
systematic mutagenesis, 70, 80

T

T4, 20, 26, 27
Thomas, Ewart, 57
Tübingen, Germany, 83

U

UCSD. *See* University of California at San

Diego
UCSF. *See* University of California at San Francisco
United States Bureau of Reclamation, 7, 44
University of California at Berkeley, 60, 99, 111
University of California at San Diego, 94, 95
University of California at San Francisco, 15, 60, 106
University of California at Santa Cruz, 60
University of Colorado, 1, 6, 12, 13, 113
University of Colorado Medical Center, 1
University of Idaho, 18
University of Washington, 26, 54
Unwin, Nigel P.N.T., 62

V

Vanderbilt University, 22, 24, 26, 31, 96
Varmus, Harold E., 106

W

Wartell, Roger M., 19
Watson, James D., 42
Webster, Philippa J., 72, 99
Wharton, Robin P., 51, 53, 88
Whitehead Institute for Biomedical Research, 87
William and Mary College, 3
Williamsburg, Virginia, 3
Wilson, Joan E., 79, 97
windsurfing, 96
Wong, Rosemary S., 16
Woodstock West, 9
Wyoming, 14, 96

Y

Youth Conservation Corps, 7, 44

Z

zebra fish, 82
Zinn, Kai, 32, 35, 42