CHEMICAL HERITAGE FOUNDATION

GEORGE A. O'TOOLE

The Pew Scholars Program in the Biomedical Sciences

Transcript of an Interview Conducted by

David J. Caruso

at

Dartmouth Medical School Hanover, New Hampshire

on

16 and 17 January 2008 (With Subsequent Corrections and Additions)



George A. O'Toole

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 Scholars Program in the Biomedical Sciences Advisory Committee members.

This oral history is made possible through the generosity of



CHEMICAL HERITAGE FOUNDATION Oral History Program FINAL RELEASE FORM

This document contains my understanding and agreement with the Chemical Heritage Foundation with respect to my participation in the audio-recorded interview conducted by <u>David Caruso</u> on <u>16 and 17 January 2008</u>. I have read the transcript supplied by Chemical Heritage Foundation.

- 1. The audio recording, corrected transcript, photographs, and memorabilia (collectively called the "Work") will be maintained by the Chemical Heritage Foundation and made available in accordance with general policies for research and other scholarly purposes.
- 2. I hereby grant, assign, and transfer to the Chemical Heritage Foundation all right, title, and interest in the Work, including the literary rights and the copyright, except that I shall retain the right to copy, use, and publish the Work in part or in full until my death.
- 3. The manuscript may be read and the audio recording(s) heard by scholars approved by the Chemical Heritage Foundation subject to the restrictions listed below. The scholar pledges not to quote from, cite, or reproduce by any means this material except with the written permission of the Chemical Heritage Foundation.
 - I wish to place the conditions that I have checked below upon the use of this interview. I understand that the Chemical Heritage Foundation will enforce my wishes until the time of my death, when any restrictions will be removed.

Please check one:

4.

No restrictions for access.

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.

Semi-restricted access. (May view the Work. My permission required to quote, cite, or reproduce.)

c. _____

Restricted access. (My permission required to view the Work, quote, cite, or reproduce.)

This constitutes my entire and complete understanding

(Signature) George A. Ø'Toole (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:

George A. O'Toole, interview by David J. Caruso at Dartmouth University, Hanover, New Hampshire, 16-17 January 2008 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0400).

C	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.

GEORGE A. O'TOOLE

1966	Born in Port Jefferson, New York on 16 May		
	Education		
1988	B.S., Cornell University		
1994	Ph.D., Microbiology, University of Wisconsin		
	Professional Experience		
	University of Wisconsin		
1994-1995	Post-doctoral Research, Bacteriology		
	Harvard Medical School		
1995-1999	Post-doctoral Research, Microbiology & Molecular Genetics		
	Dartmouth College		
1999-2005	Adjunct Assistant Professor, Department of Biology		
2005-present	Adjunct Associate Professor, Department of Biology		
	Dartmouth Medical School		
1999-2005	Assistant Professor, Department of Microbiology & Immunology		
2005-present	Associate Professor, Department of Microbiology & Immunology		
	Honors		
1989-1990	Cell & Molecular Biology Training Grant Fellow		
1990-1991	Biotechnology Training Grant Fellow		
1993	Sigrid Liermo Memorial Award, recognizing scientific mentorship		

- 1995-1998Runyon-Winchell Cancer Research Post-doctoral Fellowship
- 1998-1999 Medical Foundation Senior Post-doctoral Fellowship
- 2000 DuPont Young Professor Award
- 2000-2004 Pew Biomedical Scholar Award
- 2000-2005 NSF Early Career Development Award (CAREER)
- 2003 Dean's Award in Basic Science, Dartmouth Medical School
- 2007 Full Member, Dartmouth Chapter of Sigma Xi

ABSTRACT

George A. O'Toole grew up in rural eastern Long Island, New York heavily influenced by his parents and their Irish and Italian immigrant families. Throughout his youth, his parents, both in education, stressed the importance of school and attending college. In high school he was especially encouraged by a science teacher who praised O'Toole's interests in science oriented shows like *Nova* and *Nature*. O'Toole participated in a research program for high school students at Catholic University of America in Washington D.C., where he was first exposed to cell biology. Deciding he wanted to pursue biology, O'Toole matriculated at Cornell University where he earned a position in the Cornell Tradition scholarship program. Throughout his time at Cornell he balanced his studies with his work in the Noyes dining hall. Early on O'Toole engaged in extra laboratory research and had a paper accepted to the *Cornell Undergraduate Journal of Science*. He worked as a dishwasher in the microbiology research laboratory of Steven H. Zinder, though ultimately conducting research on methanogenic archaea.

After graduating from Cornell, O'Toole began his graduate research as Jorge C. Escalante-Semerena's first graduate student at the University of Wisconsin, focusing his research on the genetics and biosynthesis of Vitamin B_{12} ; during what little free time he had, O'Toole became active in political campaigns. In the small Vitamin B_{12} field, he published nine papers, learning the process of writing a scientific paper directly from Escalante-Semerena. Upon finishing his Ph.D., O'Toole undertook his post-doctoral research with Roberto Kolter at Harvard Medical School, where he began his work in biofilms. While in the Kolter laboratory, O'Toole took advantage of the inquisitive scientific atmosphere and intellectual freedom fostered in the group to make his mark in this field.

Although he considered working in biotechnology companies, O'Toole accepted a position at Dartmouth Medical School and opted to work as a consultant for his friend's company, Microbia. As soon as he started his lab, O'Toole immediately began efforts to create an environment that fostered success and creativity in his students. Shortly after arriving at Dartmouth, O'Toole received a Pew Scholar in the Biomedical Sciences award from which have come numerous collaborations and a networking system. Throughout the interview O'Toole discusses the current climate of funding, mentoring, scientific ethics, and the importance of translational research with regard to scientific responsibility.

INTERVIEWER

David J. Caruso earned a B.A. in the History of Science, Medicine, and Technology from the Johns Hopkins University in 2001 and a Ph.D. in Science and Technology Studies from Cornell University in 2008. His graduate work focused on the interaction of American military and medical personnel from the Spanish-American War through World War I and the institutional transformations that resulted in the development of American military medicine as a unique form of knowledge and practice. David is currently the Program Manager for Oral History at the CHF. His current research interest focuses on the discipline formation of biomedical science in 20th-century America and the organizational structures that have contributed to such formation.

TABLE OF CONTENTS

Early Childhood Growing up in rural eastern Long Island. Influences of Irish and Italian immigrant family. Father's interest in the outdoors. Influence of the	1
Catholic Church. Watching <i>Nova</i> and <i>Nature</i> . Summer cell biology research at Catholic University of America in Washington, D.C.	
Undergraduate Education Cornell University. Cornell Tradition scholarship program. Balancing laboratory work and studies. Developing interest in microbiology. Managerial experience in the dining hall. First publication. Anaerobic microbiology research with Steven H. Zinder.	13
 Graduate Education University of Wisconsin. Microbiology research with Jorge C. Escalante-Semerena. Brian M. Cali from Cornell at the University of Wisconsin. Genetics and biosynthesis of Vitamin B₁₂. Transition from genetics to molecular biology. Writing papers. Basic science versus translational science. Political awareness. Collaborations. Madison activist culture. 	25
Post-Doctoral Research Roberto Kolter. Harvard Medical School. Finishing at the University of Wisconsin. Funding. Biofilms. Scientific Risk. Intellectual freedom.	43
The Job Market and becoming a Principal Investigator Dartmouth Medical School. Interviews. Considering working for biotech firm Microbia. Consulting at Microbia. Teaching, advising, and laboratory management.	55
Funding and The Pew Other Scholars at Dartmouth Medical School. Pew funding. Risk compared to NIH funding. Collaborations.	61
The Field of Biomedical Science Scientific responsibility. Interest in translational research. Collaboration with Michael E. Zegans, M.D. Translational research and funding.	65
The Pew Scholars Program in the Biomedical Sciences Collaborations. Annual Meetings. Importance of flexibility. Networking.	70
The State of Science in the United States	73

NIH funding. Scientists and families. Time commitments. Current funding situation. Attrition of science students. Dartmouth's Summer Undergraduate Research Fellowship. Science and minorities. Early science education. Public understanding of science.

The Obligations and Perks of a Scientific Life Consultant for *Nova* episode on Bio-Terror. Mentoring. Scientific ethics and fraud. Reviewing articles for publication. Patents.

Index

97

82

INDEX

A

AAAS [American Association for the Advancement of Science], 85
Adobe Photoshop, 89
Affinergy Inc., 70
American Society for Microbiology, 31, 85
Anthrax, 83
Antibiotics, 44
Antifungal Drugs, 56
AP [advanced placement], 7
Ashland University, 13
Ausubel, Frederick M., 65

B

Bacteria, 33, 34, 37, 38, 44, 48, 50, 56, 64, 66, 67, 70, 71 Bacteriophages, 38 Basic Science, 36, 37, 66, 67, 68, 69, 92 Beckwith, Jonathan R., 55 Bench-Work, 10, 11, 23, 24, 31, 43, 46, 52, 53, 61, 69, 78, 80, 83 Biology, 5, 7, 9, 11, 12, 15, 16, 17, 20, 37, 38, 44, 51, 54, 58, 62, 65, 70, 74, 76, 80, 82,83 anaerobic physiology, 29 biochemistry, 25, 33, 34, 39 biomedicine, 11, 66, 68, 69, 75, 86, 93, 96 biosynthesis, 29, 34, 51 cellular biology, 11, 18, 48, 49, 58, 64, 70, 78, 85, 86, 89 ecology, 17, 20, 49 eukaryotic biology, 11, 37, 64 genetics, 25, 29, 33, 34, 44, 45, 46, 47, 48, 49, 50, 51, 52, 55, 57 microbial genetics, 25, 29, 33 microbiology, 16, 18, 19, 23, 25, 33, 34, 35, 37, 45, 55, 57, 64, 81, 83 molecular biology, 25, 33, 34, 38, 44, 47, 48, 49, 50, 51, 57, 58, 67, 78

Bio-terrorism, 81, 83 Blacksburg, Virginia, 25 Bloemberg, Guido V., 46 Boston, Massachusetts, 4, 45, 46, 53, 54, 56, 58, 59, 60, 65, 70 Fenway, 4, 54 Brooks, Terry, 10 Buchanan, Patrick J., 21

С

Cali, Brian M., 25, 27, 32, 37, 56 California, 26, 85 Cambridge, Massachusetts, 53 Camden Community College, 3 Camden, New Jersey, 3 Carbon Dioxide, 84 Catholic University of America, 11, 12, 79, 80 Catholicism, 1, 2, 3, 13 Cell, 91 Cells epithelial cells, 64, 70 Champaign, Illinois, 26 Chemistry, 7, 8, 9, 10, 15, 16, 17, 58, 70, 76, 79 chemical engineering, 58, 77 organic chemistry, 10, 42, 58 Chicago, Illinois, 26 Chromosomes, 11 Clinton, William J., 21, 41, 75 Cloning, 33, 34, 38, 85, 89 CoA, 23 Collaborations, 64, 65, 69, 70, 71 Cornell Undergraduate Journal of Science, 17 Cornell University, 7, 13, 14, 15, 19, 20, 21, 26, 56, 69, 81 Jordani Natural History Society, 20 Noves, 17 Tradition Program, 14 Crystallography, 39

Cystic Fibrosis, 64, 65, 93 Cystic Fibrosis Foundation, 63, 64

D

Dartmouth College, 5, 10, 12, 15, 58, 62, 75, 76, 79 Dartmouth Medical School, 56, 57, 59, 60, 62, 64, 67, 69, 70, 72, 82, 86 Women in Science Program, 76 Dear, Peter, 19 Dialysis, 67, 68 DNA, 34, 38 Donaldson, Stephen R., 10 Dray's Test, 11 Duke University, 70

E

E. coli, 25, 45, 46, 48, 50 Endnote, 38 Endotoxic Shock Response, 67 Enzymes, 34 Escalante-Semerena, Jorge C., 28, 29, 30, 33, 35, 37, 39, 40, 41, 42, 44, 45, 50, 51, 52, 53, 60, 76, 87 Ethics, 78, 85, 86, 87, 88

F

Farmingville, New York, 1 Feingold, Russell D., 21, 41 Ferry, James G., 26 Fink, Gerald R., 56 Finkel, Steven E., 54 Fordham University, 13 *Foreign Affairs*, 21, 41 F-plasmids, 33 Funding, 11, 14, 30, 34, 38, 42, 43, 48, 52, 58, 59, 61, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 78, 85, 86, 87, 88, 93, 94, 95, 96

G

GenBank, 38 Genes, 25, 33, 34, 38, 44, 48, 52, 91 GMP Group, 34 Goodrich-Blair, Heidi, 55 Goodwin, Elizabeth, 87 Gordon Research Conferences, 65 GRE [Graduate Record Examination], 78, 79 Greenberg, E. Peter, 49 Grinnell College, 74 Grinstaff, Mark W., 70

Η

Harvard Medical School, 4, 15, 43, 45, 46, 47, 53, 55, 62, 65, 66, 69, 75 Heme, 34 Heparin, 67, 68 Higgs, Henry N., 62 High School, 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 21, 31, 79, 80, 81, 83, 84 Hinsa-Leasure, Shannon, 74 History of Science, 19, 20 Hitchcock Foundation, 63 HIV [Human Immunodeficiency Virus], 21 Hogan, Deborah A., 58, 59, 62, 70, 72, 73 Horton, Jay D., 69 HPLC [High Performance Liquid Chromatography], 45

I

Immunology, 67 Indiana University, 56, 57, 68, 69 Industry, 27, 57, 58, 59, 61, 67, 74 Intelligent Design, 84 Iona College, 13 Ireland, 1, 2 Italy, 1, 2 Ivory Tower, 37 Ivy League, 13, 77

J

Johns Hopkins University, 24, 76 Journal of Bacteriology, 33, 44, 49, 88, 91 Junior Faculty, 63, 64, 65, 71, 72 Junior High School, 1, 5, 6, 7, 8, 9, 12

K

Kinases, 23 King, Stephen, 10 Kirkegaard & Perry Laboratories, 58 Kolenbrander, Paul E., 44 Kolter, Roberto, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 58, 60, 61, 63, 64 Maine Event, 46, 51, 54, 58

L

Laboratory Courses, 18 Laboratory Rotations, 28 Little League, 6 Long Island, New York, 1, 2, 3, 6, 15, 21

М

Madison, Wisconsin, 26, 32, 34, 41, 42, 45, 54,56 Massachusetts, 45, 53, 65, 85 Massachusetts General Hospital, 65 Mentoring, 40, 61, 83 Methanogenic Archaea, 22 Methanogens, 33 Mexico, 31 Microbia, 56, 57, 58, 59, 60, 66 Microbial Biofilms, 44, 45, 46, 47, 48, 49, 50, 51, 55, 56, 58, 64, 65, 67, 68, 70, 91 Microscopy, 44, 64 Midwest, 26, 27, 45 Minorities, 41, 53, 76 MIT [Massachusetts Institute of Technology], 45, 56 Molecular Microbiology, 49 Montana State University, 50 Center for Biofilm Engineering, 50 Mother of the Savior Seminary, 3 Mutants, 49, 66, 88, 91 Myers-Briggs Personality Profile, 61

Ν

National Academy of Sciences, 29, 49, 65 *Nature*, 5, 8, 20, 91 New England, 79 New Hampshire, 4, 46 New York, 1, 2, 8, 13, 14, 19, 41, 59, 69 New York State Regents Exams, 8 New York Times, 41 New York, New York, 1, 2, 69 Bensonhurst, 2 Bronx, 1, 3 Brooklyn, 1, 3 Bushwick, 2 Sheepshead Bay, 2 Newsday, 21, 41 NIH [National Institutes of Health], 34, 42, 48, 58, 63, 64, 65, 69, 72, 73, 74, 75, 86, 87, 88, 93, 94, 96 National Institute of Dental and Craniofacial Research, 44 Norris Cotton Cancer Center, 63 Northwestern University, 48 Nova, 5, 8, 20, 81, 82 NSF [National Science Foundation], 5, 42, 63, 78

0

Ohio, 13, 15 Ophthalmology, 67

P

Parkinson's Disease, 85 Patents, 56, 75, 92, 93, 94 Pathogens, 46 PBS [Public Broadcasting System], 5, 83 PCR [Polymerase Chain Reaction], 34, 38 Pennsylvania State University, 26 Peptides, 70 Pew Charitable Trusts, 43, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 86, 95, 96 annual meetings, 3, 7, 16, 19, 30, 31, 43, 45, 47, 48, 50, 51, 58, 63, 64, 68, 69, 70, 71, 72, 73, 78, 96 Biomedical Scholars, 43, 62, 63, 68, 70, 71, 92, 94, 96 Pharmaceutical Companies, 58 Pharmaceutical Industry, 27, 93 Phosphates, 23, 34 Physics, 10, 20, 76 Physiology, 64

Politics, 11, 21, 36, 41, 42, 85 Porphyrin, 34 Port Jefferson, New York, 1 Portsmouth, New Hampshire, 46, 54 Post-Doctorate, 15, 29, 33, 36, 38, 39, 42, 43, 44, 46, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 62, 65, 66, 67, 72, 74, 76, 83 Pseudomonas, 46, 47, 48, 49, 50, 64, 65 Pseudomonas aeruginosa, 46 Pseudomonas fluorescens, 46 Psychology, 32 Pub Med, 38, 82 Public Health, 36, 68, 75 Public Perceptions of Science, 42 Publishing, 35, 36, 38, 49, 52, 55, 59, 61, 86, 87, 89, 90, 91, 94

Q

Quorum Sensing, 49

R

Rahme, Laurence, 65 Ramer, Dan, 19, 23 Rayment, Ivan, 39 Reagan, Ronald W., 21, 42 RNA, 34 Roth, John R., 33

S

S³⁵ Sequencing, 34 sad [surface attachment defective] mutants, 17, 65, 66 Sagan, Carl, 83 Salk, Jonas E., 83 Salmonella, 33, 34, 38, 46 Science, 42, 76, 85, 91, 94 Scientific Creationism, 84 Searle Scholars Program, 62 Seattle, Washington, 49 September 11th, 2001, 82 Silver Platter, 38 Stanton, Bruce A., 64 Staphylococcus, 46 State University of New York, Stonybrook, 14, 15 Stewart, Valley, 25 Summer Undergraduate Research Fellowship, 77, 81 Swarthmore College, 15 Syracuse University, 15 Syracuse, New York, 19

Т

Thesis, 35, 38, 39, 43, 56 Tilghman, Shirley M., 74 Tolkien, J. R. R., 10 Toxicology, 11, 12, 13, 15 Translational Science, 65, 66, 67, 69

U

United States Congress, 43 United States Senate, 41 University of Iowa, 49 University of llinois, 25, 26 University of Michigan, 27, 45 University of Southern California, 54 University of Utah, 33 University of Washington., 49 University of Wisconsin, 25, 26, 27, 37, 39, 42, 43, 44, 45, 55, 56, 58, 66, 73 Biotechnology Training Program, 58 Enzyme Institute, 39 Sigrid Lermo Memorial Award in Biochemistry, 39 Sterling Hall/Army Math Research Center, 41

V

Vietnam War, 21, 41 Virginia Tech, 25 Vitamin B₁₂, 29, 33, 36, 39

W

Wal-Mart, 42 Washington D.C., 11, 12, 75, 85 Washington University in St. Louis, 56, 57, 59, 67 Westhampton Beach High School, 7 Westhampton, New York, 2 Williams, L. Pearce, 19 Winogradsky columns, 24 Wisconsin, 5, 21, 32, 37, 40, 41, 54, 56, 85, 87 Writing, 16, 35, 38, 42, 52, 58, 59, 63, 66, 70, 77

Z

Zegans, Michael E., 67 Zinder, Steven H., 18, 19, 22, 23, 25, 27