

CHEMICAL HERITAGE FOUNDATION

PAUL B. WEISZ

Transcript of an Interview  
Conducted by

James J. Bohning

at

State College, Pennsylvania

on

27 March 1995

(With Subsequent Corrections and Additions)

## ACKNOWLEDGEMENT

This oral history is one in a series initiated by the Chemical Heritage Foundation on behalf of the Society of Chemical Industry (American Section). The series documents the personal perspectives of Perkin and the Chemical Industry Award recipients and records the human dimensions of the growth of the chemical sciences and chemical process industries during the twentieth century.

This project is made possible through the generosity of Society of Chemical Industry member companies.

CHEMICAL HERITAGE FOUNDATION  
Oral History Program  
RELEASE FORM

This document contains my understanding and agreement with Chemical Heritage Foundation with respect to my participation in a tape-recorded interview conducted by James J. Bohning on March 27, 1995.

I have read the transcript supplied by Chemical Heritage Foundation.

1. The tapes, corrected transcript, photographs, and memorabilia (collectively called the "Work") will be maintained by 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 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 tape(s) heard by scholars approved by 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 Chemical Heritage Foundation.
4. I wish to place the conditions that I have checked below upon the use of this interview. I understand that Chemical Heritage Foundation will enforce my wishes until the time of my death, when any restrictions will be removed.

a. No

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, PA.

b. YES

My permission required to quote, cite, or reproduce.

c. NO

My permission required for access to the entire document and all tapes.

This constitutes our entire and complete understanding.

(Signature)

*Paul R. Wiley*

(Date)

*May 28 1998*

*I sign this with the understanding that I will remain free to use any materials or excerpts in any publications, works, auto-biographical works which I am or will be undertaking.*

*Paul B. Wiley*

Upon Paul B. Weisz's death in 2012, this oral history was designated **Free Access**.

**Please note:** Users citing this interview for purposes of publication are obliged under the terms of the Chemical Heritage Foundation (CHF) Oral History Program to credit CHF using the format below:

Paul B. Weisz, interview by James J. Bohning at State College, Pennsylvania, 27 March 1995 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0141).



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.

## PAUL B. WEISZ

1919 Born in Pilsen, Czechoslovakia, on 2 July

### Education

1938-1939 Physics Study, Technical University, Berlin  
1940 B.S., physics, Auburn University  
1966 Ph.D., ETH [Eidgenössische Technische Hochschule], Zürich

### Professional Experience

1938-1939 Assistant, Humboldt University, Berlin  
1940-1946 Research Assistant, Bartol Research Foundation and Project Engineer,  
MIT Radiation Laboratory (wartime assignment)  
1942-1943 Instructor, Swarthmore College (evening courses to U.S. Signal Corps  
trainees

#### Mobil Research and Development Corporation

1946-1961 Research Associate  
1961-1967 Senior Scientist  
1967-1969 Manager, Exploratory Process Research  
1969-1982 Manager, Central Research Laboratory, Princeton, N.J.  
1982-1984 Scientific Advisor  
1984 Retired

1974-1976 Visiting Professor, Princeton University  
1984- Distinguished Professor of Chemical and Bio-Engineering, University  
of Pennsylvania, (now emeritus)

1993- Adjunct Professor, Chemical Engineering, Pennsylvania State  
University

1984- Consultant, Catalysis and R&D Strategy

## Honors

- 1972 E. V. Murphy Award in Industrial Engineering Chemistry, American Chemical Society
- 1974 Pioneer Award, American Institute of Chemists
- 1977 Leo Friend Award, American Chemical Society
- 1977 Elected member, National Academy of Engineering
- 1978 R. H. Wilhelm Award, American Institute of Chemical Engineering
- 1980 Honorary Doctorate (Sc.D., technological science), Swiss Federal Institute of Technology
- 1983 Lavoisier Medal, Société Chimique de France
- 1983 Langmuir Distinguished Lecturer Award, American Chemical Society
- 1985 Perkin Medal, Society of Chemical Industry
- 1986 Chemistry of Contemporary Technological Problems Award, American Chemical Society
- 1987 Carothers Award, American Chemical Society
- 1988 DGKM Kollegium Award (Germany)
- 1992 National Medal of Technology

## ABSTRACT

Paul Weisz begins this interview by discussing his family background. Because of the political uncertainty of Austria-Hungary in the post World War I period, his family moved to Berlin when he was a young boy. Weisz was educated in the Gymnasium, where he was exposed to basic science and developed an interest in physics and chemistry. His father further encouraged him to pursue the sciences, and Weisz remembers building small radios. Weisz attended the Technical University in Berlin, and spent his free time in the laboratory of Wolfgang Kohlhoerster at the Institute of Cosmic Radiation Research. There, he worked on Geiger counter instrumentation and cosmic ray measurements. Because of Hitler's rise to power, Weisz decided to come to the United States, and arranged an exchange program with Auburn University. He earned his B.S. in physics from Auburn in 1940, and accepted a research position at the Bartol Research Foundation in Pennsylvania. There, Weisz worked on radiation counting, and projects relating to the National Research Defense Council. After gaining clearance to do classified work, he moved to the MIT Radiation Laboratory where he helped to develop a long range navigation trainer (Loran). Weisz returned to Bartol, but soon decided to move away from cosmic ray research. He accepted a position with Mobil Corporation, where he worked on catalysis and cracking catalysts. In the 1950s, Weisz began to investigate zeolites and shape selective catalysis. In 1966, he completed his Sc.D. at the Eidgenossische Technische Hochschule in Zurich, where he had worked with Heinrich Zollinger on dye chemistry. Weisz concludes the interview by discussing innovation in industry, the importance of interdisciplinary thinking, and his later work on Alzheimer's Disease and angiogenesis.

## INTERVIEWER

James J. Bohning is Professor of Chemistry Emeritus at Wilkes University, where he was a faculty member from 1959 to 1990. He served there as chemistry department chair from 1970 to 1986 and environmental science department chair from 1987 to 1990. He was chair of the American Chemical Society's Division of the History of Chemistry in 1986, received the Division's outstanding paper award in 1989, and presented more than twenty-five papers before the Division at national meetings of the Society. He has been on the advisory committee of the Society's National Historic Chemical Landmarks committee since its inception in 1992. He developed the oral history program of the Chemical Heritage Foundation beginning in 1985, and was the Foundation's Director of Oral History from 1990 to 1995. He currently writes for the American Chemical Society News Service.

## TABLE OF CONTENTS

- 1 Childhood and Early Education  
Family background. Gymnasium and interest in science. Influence of father.
- 9 University Education  
Attendance at Technical University in Berlin. Work in laboratory at Institute of Cosmic Radiation Research. Decision to go to the United States.  
Exchange with Auburn University.
- 14 Bartol Research Foundation  
Radiation counting. Projects for National Research Defense Council. Work on navigation instrumentation. Clearance for classified work.
- 20 Career at Mobil Corporation  
Research freedom. Work on catalysis and cracking catalysts. Investigation of heterogeneous catalysis. Work on zeolites. Development of selectoforming. Researching shape selective catalysis.
- 35 Innovation in Industry  
Interdisciplinary thinking. Conflict between corporate thinking and research needs.
- 40 Retirement  
Teaching at the University of Pennsylvania. Interrelation between zeolite work and research on Alzheimer's Disease. Work on angiogenesis.  
Receiving the Perkin Medal and the National Medal of Technology.
- 51 Notes
- 55 Index



## NOTES

1. Ernst Zimmer, *Umsturz im Weltbild der Physik*, Verlag Knorr & Hirth, Munich 1969.
2. Paul Weisz, “Die 10-Meter-Welle: von Tag zu Tag Interessanter” (The 10 meter wave-length: More interesting every day), *Funkschau*, 7 (1936).
3. Paul Weisz, “Einfache Bandabstimmung und Bandwechsellvorrichtung” (A simple method for band switching), *Funk xxx* (1935).
4. Paul Weisz, “Ein Zählrohrverstärker mit Beliebigen Untersetzungsverhältnis” (A Geiger counter scaling circuit with variable scaling ratio), *Physikalische Zeitschrift*, 40 (1939): 34.

Paul Weisz, “Zur Untersuchung von Zählrohruntersetzern” (Notes on measurements on counter scaling circuits), *Physikalische Zeitschrift*, 40 (1939): 37.

Paul Weisz, “Der Vertikale Zählrohreffekt der Höhenstrahlung bei Proportionalzählern (Angular incidence of cosmic rays measured with proportional counters), *Zeitschrift für Physik*, 112 (1939): 364.

Paul Weisz, “Das Mesotron und die Richtungsverteilung der Höhenstrahlung” (The mesotron and angular incidence of cosmic radiation), *Naturwissenschaften*, 27 (1939): 132.

P. B. Weisz, “Zenith Angle Distribution of the Hard Component of Cosmic Rays and the Mass of the Mesotron,” Letters to the Editor, *Physical Review*, 55 (1939): 1266. See Chemical Heritage Foundation Oral History Research File #0141.

Paul Weisz, “Die Absorption der Höhenstrahlung in der Atmosphäre und die Mesotronen,” (Absorption of cosmic radiation in the atmosphere and the mesotrons), *Physikalische Zeitschrift*, 40 (1939): 617.

5. Paul Weisz, “The Geiger-Mueller Tube, and Electronic Instrument,” *Electronics* (1941).

Paul Weisz, “Radiation Instruments Using Geiger-Mueller Tubes,” *Electronics* (1942).

Paul Weisz, “Self-Quenching Geiger-Mueller Tubes,” *Physical Review*, 61 (1942): 392.

- Paul Weisz, "Note on the Nature of the Gas Mixture in Self-Quenching Geiger-Mueller Tubes," *Physical Review*, 62 (1942): 477.
- Paul Weisz and W. F. G. Swann, "Fluctuations of Cosmic Ray Ionization Data Obtained with Proportional Geiger Counters," *Physical Review*, 62 (1943): 299.
- P. B. Weisz and R. Pepinsky, "X-Ray Diffraction Measurements with the Geiger-Mueller Tube," *Physical Review*, 63 (1943): 457.
- 6 N. Y. Chen, J. Mazuik, A. B. Schwartz, P. B. Weisz, "Selectoforming—New Process to Improve Octane and Quality," *Oil & Gas J.*, 66, 154 (1968).
7. P. B. Weisz and V. J. Frilette, "Intracrystalline and Molecular Shape-Selective Catalysis by Zeolite Salts," *J. Phys. Chem.*, 64, 383, (1960).
- "Catalysis by Crystalline Aluminosilicates. II. Molecular Shape-Selective Catalysis," *J. Catalysis*, 1, 307 (1962).
- P. B. Weisz and J. N. Miale, "Superactive Crystalline Aluminosilicate Hydrocarbon Catalysts," *J. Catalysis*, 4, 527 (1965).
- P. B. Weisz, "Molekularsiebe als Selektiv-Katalysatoren" (Molecular Sieves as Selective Catalysts), *Erdoel und Kohle*, 18, 525 (1965).
- J. N. Miale, N. Y. Chen, P. B. Weisz, "Catalysis by Crystalline Aluminosilicates, IV. Attainable Catalytic Cracking Rate Constants and Superactivity;" *J. Catalysis*, 6, 278, (1966).
8. "Catalysis, Shape Selective," *Encyclopedia of Chemistry*, 2nd Ed., p. 190, Reinhold Publishing Corp., N.Y. (1966).
9. P. B. Weisz and H. Zollinger, "Die tiefere Bedeutung des Diffusionskoeffizienten bei Faerbevorgaengen," *Milliand Textilber.*, 1, 70 (1967)
- P. B. Weisz and H. Zollinger, "Sorption-Diffusion in Heterogeneous Systems. Part 3. Experimental Models of Dye Sorption," *Trans. Far. Soc.*, 64, 1693, (1968).
10. P. B. Weisz, "Sorption-Diffusion in Heterogeneous Systems. Part I. General Sorption Behavior and Criteria," *Trans. Far. Soc.*, 63, 1801 (1967).
- P. B. Weisz and J. S. Hicks, "Sorption-Diffusion in Heterogeneous Systems. Part II. Quantitative Solutions for Uptake Rates," *Trans. Far. Soc.*, 63, 1807 (1967).
11. Paul B. Weisz, "Molecular Diffusion in Microporous Materials: Formalisms and

- Mechanisms," *I&EC Research*, 34, 2692, 1995.
12. Paul B. Weisz, "Some Thoughts on Receiving the 1985 Perkin Medal," *The Chemist*, May 1985; "Molecular Shape-Selective Catalysis – The Personal Adventure," Perkin Medal Address, *Chemistry and Industry* (1985): 392.
  13. John E. Franz, interview by James J. Bohning in St. Louis, Missouri, 29 November 1994 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript #0119).
  14. P. B. Weisz, W. O. Haag, R. M. Lago, "The Active Site of Aluminosilicate Catalysis," *Nature*, 309, 589 (1984).
  15. J. Folkman, R. Langer, J. Linhardt, C. Haudenschild, S. Taylor, "Angiogenesis Inhibition and Tumor Regression Caused by Heparin or a Heparin Fragment in the Presence of Cortisone," *Science*, 221, 719 (1983).
  16. M. A. Gimbrone, Jr., S. B. Leapman, R. S. Cotran, J. Folkman, "Tumor Angiogenesis: Iris Neovascularization at a Distance from Experimental Intraocular Tumors," *J. Nat. Cancer Inst.*, 50, 219 (1973). And *J. Exp. Med.*, 136, 261 (1972).
  17. Paul B. Weisz and John F. Marshall, "Tumors and Chemical Reaction Engineering," *ChemTech*, 11, 615 (1981).
  18. J. Folkman, P. B. Weisz, M. M. Joullié, W. W. Li and W. R. Ewing, "Control of Angiogenesis with Synthetic Heparin Substitutes," *Science*, 243, 1490, 1989.
  19. "Pair Finds Substance To Curb Blood Vessels," *The New York Times*, 18 April 1989.
  20. P. B. Weisz, M. M. Joullié, C. M. Hunter, K. M. Kumor, Z. Zhang, E. Levine, E. Macarak, D. Wiener, E. S. Barnathan, "A Basic Compositional Requirement of Agents Having Heparin-Like Cell-Modulating Activities," *Biochem. Pharmacol.*, 54, 149-157, 1997.
  21. H. C. Herrmann, S. Steve Okada, E. Hozakowska, R. LeVeen, M. Golden, J. E. Tomaszewski, P. B. Weisz, E. S. Barnathan, "Inhibition of Experimental Angioplasty Restenosis by Oral Administration of the Heparin Mimic Beta-Cyclodextrin Tetradecasulfate," *Arteriosclerosis and Thrombosis*, 13, 924-931, 1993.
- G. T. Toes, E. S. Barnathan, H. Liu, J. E. Tomaszewski, P. N. Raghunath, R. Carone, P. B. Weisz, W. van Oeveen, M. A. Golden, "Inhibition of Vein Graft Intimal and Media Thickening by Periadventitial Application of Sulfated

- Carbohydrate Polymer," *J. Vasc. Surgery*, 23, 650-656, 1996.
22. James J. Bohning, Chemical Heritage Foundation Oral History Project, Society for Chemical Industry Project: Interview Agenda for Perkin Medalists. See Chemical Heritage Foundation Oral History Research File #0141.
  23. Vladimir Haensel, interview by James J. Bohning at the University of Massachusetts at Amherst, 2 November 1994 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript #0115).
  24. Edith Marie Flanigen, interview by James J. Bohning at UOP Laboratories, 7 December 1994 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript #0121).

## INDEX

### A

Alabama Polytechnic Institute. *See* Auburn University  
Allison, Fred, 14  
Aluminum, 22, 24, 27, 41-42  
Alzheimer's disease, 41-42  
Angiogenesis, 42-43  
Atlantic Ocean, 29  
Auburn University, 9, 13-15, 23  
Austria-Hungary, 1

### B

Bartol Research Foundation, 14-18, 20  
Beckman Research Institute of the City of Hope, 41  
Bell Labs, 28, 36  
Berlin, Germany, 1-2, 4, 9-11, 22, 50  
Biotechnology, 39  
Birmingham, Alabama, 9  
Bordogna, Joseph, 41  
Boy Scouts, 7  
Brazil, 17  
British Petroleum Company (BP), 29  
Budapest, Hungary, 1  
Bush, President George H.W., 48

### C

Cambridge University, 42  
Carboxyls, 43  
Catalysis, 22-23, 26, 31-32, 38, 41-42, 46-47  
Chicago, University of, 15  
Circuit, 5, 12  
Columbia University, 14  
Compton, Arthur H., 15  
Cosmic ray, 10, 12-13, 15-16, 18, 20-21  
Cracking catalyst, 22, 32, 46  
Cullman, Alabama, 9, 19  
Cumene, 38  
Cyclodextrin, 43-44

## **D**

Dahlem, Germany, 10  
Dallas, Texas, 28, 36  
Decanol, 22-23  
Delaware, University of, 16  
Deoxyribonucleic acid, 4, 42  
*Der Stuermer*, 6  
Duarte, California, 41  
Dutch East Indies, 11

## **E**

Eidgenossische Technische Hochschule (ETH). *See* Swiss Federal Institute of Technology  
Einstein, Albert, 14  
*Encyclopedia of Chemistry*, 30  
ENI, 29  
Exxon Corporation, 39

## **F**

Federal Bureau of Investigation, 19  
Felton, Walter F., 18  
Fiedler, Arthur, 8  
Flanigen, Edith M., 50  
Folkman, Judah, 42-44  
Fordham University, 10, 14  
France, 12  
Franklin Institute, 15-16  
Frilette, Vincent J., 27

## **G**

Geiger counter, 10, 14, 16-20  
Geiger, Hans, 12  
Germany, 1-2, 7-10, 13, 15, 37  
Gross-Zieten, Germany, 11

## **H**

Haensel, Vladimir, 31, 49  
Hahn, Otto, 9  
Hardy, Oliver, 19  
Hartung, Inez, 13  
Hartung, Philip G., 19  
Harvard University, 9, 42  
Heparin, 43-44  
Hess, Victor F., 10, 14-15  
Hitler Youth, 7  
Hitler, Adolf, 6-8, 11-12

Hoover, J. Edgar, 19  
Houdry Development Corporation, 33  
Houdry, Eugene J., 32  
Humboldt University, 9  
Hungary, 1, 15  
Hydrocortisone, 43

## **I**

Institute for Cosmic Radiation Research, 10, 12, 14  
International Catalysis Conference, 33  
Iowa State University, 9

## **J**

Japan, 6

## **K**

Kaiser Wilhelm Institut für Physikalische Chemie, 9  
Kaiser, Paul V., 20-22, 27  
Kerr, George T., 32  
Kohlhoerster, Wolfgang, 10, 12-14

## **L**

Laurel, Stanley, 19  
London, England, 29  
Loran, 19

## **M**

Manhattan project, 14  
Marcus Hook, Pennsylvania, 33  
Marshall, John F., 43  
Massachusetts Institute of Technology (MIT), 19-20, 33-34  
Mediterranean Ocean, 29  
Meisel, S. L., 31, 33  
Meitner, Lise, 9  
Michigan, University of, 9  
Milan, Italy, 29  
Mobil Corporation, 18, 20, 23-24, 28, 30, 32-34, 36-43, 46, 50  
    Central Research Laboratory, 28, 34  
    Technology Exploration Group, 26  
Molecular sieves, 30  
Munich Conference, 15  
Munich, Germany, 9, 12  
Munich, University of, 9

## **N**

National Bureau of Standards, 48  
National Institutes of Health, 41, 48  
National Medal of Technology, 48  
National Research Defense Council, 17  
National Science Foundation, 13, 41, 48-49  
National Technology Medals Foundation, 48-49  
*Nature*, 38, 41  
Nazi, 6-7, 19  
Nelson, Ted T.W., 29  
New York, New York, 13-14  
*New York Times*, 38, 42  
Nobel Prize, 10  
Nuclear magnetic resonance, 42

## **O**

Oscillograph, 16  
Osram, 11

## **P**

Paraxylene, 38  
Paulsboro, New Jersey, 20, 32  
Pegram, George B., 14  
Pennsylvania State University, 34  
Pennsylvania, University of, 24, 40-41, 43  
    Chemical Engineering Department, 41  
    Johnson Foundation for Medical Physics, 24  
    Medical School, 41  
Perkin Medal, 35, 37-38, 47  
Peru, 29  
Petrochemical, 38  
Petroleum, 7, 25, 27-31, 38  
Pharmaceutical industry, 30, 38-39, 46  
Philadelphia, Pennsylvania, 14-15, 33  
Phillips Metallics, 17  
Phosphates, 43  
Pilsen, Czechoslovakia, 1, 12  
Platforming, 31  
Ploesty, Romania, 7  
Prater, Charles Dwight, 23  
Princeton, New Jersey, 28, 34, 39

## **Q**

Quonset Naval Base, 20



## **R**

RCA, 10, 12  
Reinhold Publishing, 30  
Restenosis, 44  
Ribonucleic acid, 42  
Roberts, Eugene, 41  
Romania, 7

## **S**

Schiessler, Robert W., 31, 34  
*Science*, 38, 43-44  
Selectoforming, 26, 31, 36  
Shape selective catalysis, 26, 30, 32, 35, 38, 43, 47  
Silica, 22, 41-42  
Silicon, 24, 27, 42  
Socony Vacuum Oil Company. *See* Mobil Corporation  
Styrene, 38  
Sulfates, 43-44  
Swann, William F. G., 15, 18-19  
Swarthmore College, 16, 18  
Swarthmore, Pennsylvania, 15-16  
Swiss Federal Institute of Technology, 34  
Switzerland, 12

## **T**

Technical University of Berlin, 2  
Telefunken, 10-12, 14  
Thalidomide, 39  
Transistor, 36

## **U**

*Umsturz im Weltbild der Physik*, 5  
Union Carbide Corporation, 24-25, 32, 45, 49

## **V**

Vacuum tubes, 5-6  
Versailles Treaty, 7

## **W**

Wayne, Pennsylvania, 32-33  
Weisz, Paul  
    doctoral studies, 34-35  
    elementary school, 2  
    father, 1, 4-5  
    grandfather, 1

Gymnasium education, 2-4, 8, 10, 22  
mother, 1, 4  
wife, 18  
Wise, J. J., 33  
World War I, 1

## **X**

X-ray crystallography, 17

## **Z**

Zeolite, 23-24, 26-27, 30-33, 41, 46, 49-50  
4A, 24  
5A, 24  
A-zeolite, 24-26, 31-32, 46  
X-zeolite, 25, 32, 46  
Y-zeolite, 32  
ZSM-5, 32, 43, 50  
Zollinger, Heinrich, 34  
Zurich, Switzerland, 12, 34