KARL AUGUST FOLKERS

An Interview Conducted by

Leon Gortler

at

Folkers's Summer Home

Sunapee, New Hampshire

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ABSTRACT: In this interview, Karl Folkers first talks about his family and his early exposure to science. He then describes some of his experiences as an undergraduate at the University of Illinois, as a graduate student at the University of Wisconsin, and as a postdoctoral fellow at Yale University. This is followed by a long discussion of his years at Merck, and includes his research on vitamins, particularly vitamin B_{12}, his work on penicillin, the structure of research at Merck, and comments on various co-workers and administrators. Special attention is paid to coenzyme Q_{10}, a project begun at Merck and continued for the last thirty-seven years. After Merck, Folkers talks about his five-year tenure as president of the Stanford Research Institute, and then about his current research at the University of Texas, including his work on vitamin B_6 and the carpal tunnel syndrome, and his work on peptide hormones.

INTERVIEWER: Leon Gortler is Professor of Chemistry at Brooklyn College of the City University of New York. He holds A.B. and M.S. degrees from the University of Chicago and a Ph.D. from Harvard University. He has long been interested in the history of chemistry and has conducted over forty oral and videotaped interviews with major American chemists.

KARL AUGUST FOLKERS

1906	Born in Decatur, Illinois on September 1. (Parents: August William and Laura Susan [Black])
1928	B.S., University of Illinois
1931	Ph.D., University of Wisconsin (Mentor: Homer Adkins)
1931-1934	Postdoctoral Fellow, Yale University (Squibb & Lilly Research Fellow) (Mentor: Treat B. Johnson)
1932	Married: Selma Johnson Children: Cynthia Carol, Richard Karl

Merck

1934-1938	Research Chemist, Laboratory of Pure Research
1938-1945	Assistant Director of Research
1945-1951	Director, Organic and Biochemical Research Department
1951-1953	Associate Director, Research and Development Division
1953-1956	Director, Organic and Biological Chemical Research
1956-1962	Executive Director, Fundamental Research
1962-1963	Vice President for Exploratory Research
1963	Resigned March 1
1962	President, American Chemical Society
1963-1968	President and CEO, Stanford Research Institute
1968-	Ashbel Smith Professor of Chemistry and Director of The Institute for Biomedical Research, University of Texas at Austin
1990-	President, Karl Folkers Foundation for Biomedical and Clinical Research

Honors and Awards

1940	Mead Johnson & Company Award (Co-recipient)
1941	Award in Pure Chemistry, American Chemical Society
1948	National Academy of Sciences
1948	Presidential Certificate of Merit (Harry S. Truman)
1949	Mead Johnson & Company Award (Co-recipient)
1951	Board of Directors' Scientific Award, Merck & Co., Inc.
1959	Spencer Award, Kansas City Section, American Chemical Society
1960	Perkin Medal, Society of Chemical Industry

1962	D.Sc., Philadelphia College of Pharmacy and Science
1967	Nichols Medal, New York Section, American Chemical Society
1969	D.Sc., University of Uppsala
	D.Sc., University of Wisconsin
	Van Meter Prize, American Thyroid Association (Co-recipient)
1972	Robert A. Welch International Award and Medal
1973	D.Sc., University of Illinois
1974	APhA Research Achievement Award, Academy of Pharmaceutical Science
1977	Alexander von Humboldt-Stiftung Award
1980	Award by Austin Capital of the Age of Enlightenment
1986	Priestley Medal, American Chemical Society
	Illinois Alumni Achievement Award, University of Illinois
1989	Doctorate in Medicine, University of Bologna
1990	President's National Medal of Science (George Bush)
1994	Achievement Award in Preventive Medicine, American College for Advancement in Medicine

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NOTES

A complete list of publications by Karl Folkers can be found in the file which accompanies this interview.

1. Eric T. Stiller, John C. Keresztesy and Joseph R. Stevens, The Structure of Vitamin B_6. I," Journal of the American Chemical Society, 1939, 61, 1237-1242.

2. (a) Stanton A. Harris and Karl Folkers, "Synthetic Vitamin B_6," Science, 1939, 89, 347-348; (b) Stanton A. Harris, Eric T. Stiller and Karl Folkers, "Structure of Vitamin B_6. II," Journal of the American Chemical Society, 1939, 61, 1242-1244; (c) Stanton A. Harris and Karl Folkers, "Synthesis of Vitamin B_6," ibid., 1939, 61, 1245-1247.

3. Eric T. Stiller, Stanton A. Harris, Jacob Finkelstein, John C. Keresztesy and Karl Folkers, "Pantothenic Acid. VIII. The Total Synthesis of Pure Pantothenic Acid," ibid., 1940, 62, 1785-1790. See also Roger J. Williams and Randolph T. Major, "The Structure of Panthotenic Acid," Science, 1940, 91, 246.

4. Stanton A. Harris, Donald E. Wolf, Ralph Mozingo, R. Christian Anderson, Glen E. Arth, Nelson Easton, Dorothea Heyl, Andrew N. Wilson and Karl Folkers, "Biotin. II. Synthesis of Biotin," Journal of the American Chemical Society, 1944, 66, 1756-1757.

5. Ralph Mozingo, Donald E. Wolf, Stanton A. Harris and Karl Folkers, "Hydrogenolysis of Sulfur Compounds by Raney Nickel Catalyst," ibid, 1943, 65, 1013-1016.

6. Vincent du Vigneaud, Donald B. Melville, Karl Folkers, Donald E. Wolf, Ralph Mozingo, John Keresztesy and Stanton A. Harris, "The Structure of Biotin: A Study of Desthiobiotin," Journal of Biological Chemistry, 1942, 146, 475-485.

7. The Chemistry of Penicillin, eds. Hans T. Clarke, John R. Johnson, and Robert Robinson. Princeton University Press, Princeton, NJ (1949). Chapters IV, VII, IX, XVIII.

8. Frederick A. Kuehl, Jr., Robert L. Peck, Alphonse Walti and Karl Folkers, "Streptomyces Antibiotics. I. Crystalline Salts of Streptomycin and Streptothricin," Science, 1945, 102, 34-35.

9. Frederick A. Kuehl, Jr., Robert L. Peck, Charles E. Hoffhine, Jr., and Karl Folkers, "Streptomyces Antibiotics. XVIII.

Structure of Streptomycin," Journal of the American Chemical Society, 1948, 70, 2325-2330.

10. (a) Edward L. Rickes, Norman G. Brink, Frank R. Koniuszy, Thomas R. Wood and Karl Folkers, "Crystalline Vitamin B_{12}," Science, 1948, 107, 396-397; (b) Edward L. Rickes, Norman G. Brink, Frank R. Koniuszy, Thomas R. Wood and Karl Folkers, "Vitamin B_{12}, A Cobalt Complex," ibid., 1948, 108, 134. (c) Edward L. Rickes, Norman G. Brink, Frank R. Koniuszy, Thomas R. Wood and Karl Folkers, "Comparative Data on Vitamin B_{12} from Liver and from a New Source, Streptomyces griseus," ibid., 1948, 108, 634-635.

11. Karl Folkers, "Perspectives on the Discovery of Vitamin B_{12}." Talk given (?), 1990.

12. E. Lester Smith, "Purification of Anti-pernicious Anaemia Factors from Liver," Nature, London, 1948, 161, 638-639.

13. (a) Edward A. Kaczka, Frank J. Wolf, Fern P. Rathe, Karl Folkers, "Cathomycin. I. Isolation and Characterization," Journal of the American Chemical Society, 1955, 77, 6404-6405; (b) Clifford H. Shunk, Charles H. Stammer, Edward A. Kaczka, Edward Walton, Claude F. Spencer, Andrew N. Wilson, John W. Richter, Frederick W. Holly, Karl Folkers, "Novobiocin. II. Structure of Novobiocin," ibid., 1956, 78, 1770-1771.

14. (a) Edward Walton, Arthur F. Wagner, Louis H. Peterson, Frederick W. Holly and Karl Folkers, "The Synthesis of (+)-α-Lipoic Acid and its Optical Antipode," ibid., 1954, 76, 4748; (b) Edward Walton, Arthur F. Wagner, Frank W. Bachelor, Louis H. Peterson, Frederick W. Holly and Karl Folkers, "Synthesis of (+)-α-Lipoic Acid and its Optical Antipode," ibid., 1955, 77, 5144-5149.

15. (a) Donald E. Wolk, Carl H. Hoffman, Paul E. Aldrich, Helen R. Skeggs, Lemuel D. Wright and Karl Folkers, "β-Hydroxy-β-methyl-δ-valerolactone (Divalonic Acid), A New Biological Factor," Journal of the American Chemical Society, 1956, 78, 4499; (b) Helen R. Skeggs, Lemuel D. Wright, Emlen L. Cresson, Gloria D. E. MacRae, Carl H. Hoffman, Donald E. Wolf and Karl Folkers, "Discovery of a new Acetate Replacing Factor," Journal of Bacteriology, 1956, 72, 519-524; (c) Arthur F. Wagner and Karl Folkers, "The Organic and Biological Chemistry of Mevalonic Acid," Endeavour, 1961, 20, 177-187; (d) Arthur F. Wagner and Karl Folkers, "Discovery and Chemistry of Mevalonic Acid," Advances in Enzymology, Interscience Publishers, Inc., N.Y., 1961, 23, 471-483 and references cited therein.

16. Donald E. Wolf, Carl H. Hoffman, Nelson R. Trenner, Byron H. Arison, Clifford H. Shunk, Bruce D. Linn, James F. McPherson, and Karl Folkers, "Coenzyme Q. I. Structure Studies on the Coenzyme Q Group," Journal of the American Chemical Society, 1958, 80, 4752, and succeeding papers. Karl Folkers and his co-workers, through 1990, had published over 400 papers related to Coenzyme Q. See file accompanying this interview for list of publications.

17. Arthur F. Wagner and Karl Folkers, Vitamins and Coenzymes. Wiley-Interscience Publishers, New York, 1964.

18. Karl Folkers, "Vitamins - Perspectives and Prospectives," Perkin Medal Award address before the American Section of The Society of Chemical Industry, Waldorf-Astoria Hotel, New York, NY, February 5, 1960.

19. Karl Folkers, Franz Enzmann, Jan Bøler, Cyrily Bowers and Andrew V. Schally, "Hypothalmic Hormones 1. Discovery of Modification of the Synthetic Tripeptide Sequence of the Thyrotropic Releasing Hormone Having Activity," Biochemical and Biophysical Research Communications, 1969, 37, 705, and succeeding papers. Folkers and his coworkers have published over 250 papers in the field of peptide hormones.

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