

CHEMICAL HERITAGE FOUNDATION

JOHN E. FRANZ

Transcript of an Interview  
Conducted by

James J. Bohning

at

St. Louis, Missouri

on

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(With Subsequent Additions and Corrections)

## ACKNOWLEDGMENT

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## JOHN E. FRANZ

1929 Born in Springfield, Illinois, on 21 December

### Education

1951 B.S., University of Illinois

1955 Ph.D., organic chemistry, University of Minnesota

### Professional Experience

#### Monsanto Company

1955-1959 Research Chemist, Organic Chemicals Division

1959-1962 Group Leader, Organic Chemicals Division

1962-1967 Science Fellow, Organic Chemicals Division

1967-1975 Science Fellow, Agricultural Products Division

1975-1980 Senior Science Fellow, Agricultural Products Division

1980-1994 Distinguished Science Fellow, Agricultural Products Division

### Honors

1977 IR-100 Award, *Industrial Research* magazine

1981 J. F. Queeny Award, Monsanto Company

1985 Achievement Award, Industrial Research Institute

1986 Inventor of the Year Award, St. Louis Metropolitan Bar Association

1987 National Medal of Technology Presidential Award

1988 Outstanding Achievement Award, University of Minnesota

1988 Missouri Award, Department of Economic Development

1989 Carothers Award, American Chemical Society, Delaware Section

1990 Perkin Medal, Society of Chemical Industry, American Section

## ABSTRACT

John E. Franz begins this interview by discussing his early life in Springfield, Illinois, during the Depression. He then describes his undergraduate work at the University of Illinois and his contacts there with Roger Adams, Elliott Alexander, Virginia Bartow, Reynold Fuson, and Carl Marvel. Moving on to his graduate work at the University of Minnesota, Franz contrasts his studies there in physical organic chemistry with his training in practical synthetic organic chemistry at Illinois. Next, Franz discusses choosing to work at the Monsanto Company, rather than DuPont. After describing his first projects, Franz recalls his transfer from the organic chemicals division to the agricultural division, where he worked on synthetic herbicides. This work led to Franz's discovery of glyphosate, a natural plant growth inhibitor that forms the active ingredient in Roundup, an environmentally friendly herbicide that has become one of the most widely used herbicides in the world. He describes the aftereffects of his discovery—the reactions of Monsanto and other companies, and the steps involved in commercial production of Roundup. Franz then examines his later work to understand amine and phosphine compounds as well as plant growth inhibitors. Discussing herbicides in light of current environmental and governmental regulations, he compares Roundup with the more potent herbicides favored by the industry today. Finally, Franz discusses his forthcoming book on the history of glyphosate, his final years at Monsanto, and his retirement.

## 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.

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1. Elliot R. Alexander, *Principles of Ionic Organic Reactions* (New York: John Wiley & Sons, 1950).
2. Alfred Bader, "How to Find a Great Herbicide," *Aldrichemica Acta*, 21 (1988): 15.
3. John E. Franz, "Reflections on Research and Discovery," *Chemistry & Industry*, 21 (1990): 326-328.
4. William Beveridge, *The Art of Scientific Investigation* (New York: Random House, 1957).
5. Vladimir Haensel, interview by James J. Bohning in Amherst, Massachusetts, 2 November 1994 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript #0115).
6. John E. Franz, "The Art of Research," [IRI Achievement Award Address], *Research Management*, 26, #2 (March-April, 1986): 11-13.
7. Willard Dow, "Progress of Styrene Production," *Industrial and Engineering Chemistry*, 34 (1942): 1267-1268.
8. John E. Franz, *Glyphosate: An Extraordinary Global Herbicide* (Washington: American Chemical Society, 1996).
9. Gibbon, Edward, *The Decline and Fall of the Roman Empire* (New York: Modern Library, approx. 1932)



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