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NEAL R. AMUNDSON

Transcript of an Interview  
Conducted by

James J. Bohning

at

University of Houston

on

24 October 1990

(With Subsequent Corrections and Additions)

CHEMICAL HERITAGE FOUNDATION  
Oral History Program  
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NEAL R. AMUNDSON

1916 Born in St. Paul, Minnesota on 10 January

Education

1937 B.A., chemical engineering, University of Minnesota  
1941 M.S., chemical engineering, University of Minnesota  
1945 Ph.D., mathematics, University of Minnesota

Professional Experience

Standard Oil Company of New Jersey  
1937-1939 Process Engineer

University of Minnesota  
1939-1947 T.A., Instructor, Assistant Professor, Department of Mathematics  
1947-1951 Associate Professor, Department of Chemical Engineering  
1949-1977 Head, Department of Chemical Engineering  
1951-1967 Professor, Department of Chemical Engineering  
1967-1977 Regents' Professor, Department of Chemical Engineering

University of Houston  
1977-1982 Cullen Professor of Chemical Engineering  
1982- Cullen Professor of Chemical Engineering and Professor of Mathematics  
1987-1989 Vice President

Honors

1954-1955 Fulbright Scholar, Cambridge University, England  
1955 Guggenheim Fellow, Cambridge University, England  
1960 Industrial and Engineering Chemistry Award, ACS  
1961 William H. Walker Award, AIChE  
1969 National Academy of Engineering  
1970 Vincent Bendix Award, American Society of Engineering Education  
1970 Fellow, AIChE  
1971 Warren K. Lewis Award, AIChE  
1973 Richard H. Wilhelm Award, AIChE  
1975 Guggenheim Fellow, NATO Senior Fellow  
1985 Sc.D. (Honoris Causa), University of Minnesota

- 1985 Founders Award, AIChE
- 1986 Eng. D. (Honoris Causa), University of Notre Dame
- 1989 Albert Einstein Award, Computing and Modelling Association

## ABSTRACT

Neal Amundson begins the interview with a discussion of his family and early years in St. Paul, Minnesota. Amundson graduated from high school at the very depth of the Depression. For the Amundson family, times were very grim, yet Amundson's parents insisted on sending their son to college. Amundson attended the University of Minnesota, where he received his B.A. in chemical engineering in 1937. Immediately after graduation, Amundson accepted a position with Exxon, then Standard Oil Company of New Jersey, as a process control engineer. There he worked on controlling phenol loss in Exxon's process for lubricating oil. After nearly two years with Standard Oil, Amundson returned to the University of Minnesota. While working toward his M.S. in chemical engineering, Amundson served as a teaching assistant in the mathematics department. After receiving his M.S. in 1941, Amundson decided to switch his educational focus and received his Ph.D. in mathematics in 1945. Amundson stayed at the University of Minnesota as an assistant professor of mathematics. In 1947, he transferred to the University's chemical engineering department and became an associate professor. In 1949, Dean Athelstan F. Spilhaus offered Amundson the position of acting chair of the chemical engineering department. That same year, Amundson became a full professor with the University. In 1951, at just age thirty-five, Amundson held the positions of department chair and professor at the University. Amundson's research work focused on heat transfer, chromatography, and adsorption. Although he was chair of chemical engineering, Amundson was first a mathematician. As a result, he structured the chemical engineering department on a more theoretical level, hiring faculty that held mathematical interests and initiating mathematical applications into a practical engineering curriculum. The strength of the faculty that Amundson assembled helped build a solid reputation for the University of Minnesota. By the late 1940s and early 1950s, Amundson introduced computers into his curriculum. In 1977, Amundson left the University of Minnesota and became the Cullen Professor of Chemical Engineering at the University of Houston, a position he holds today. Amundson concludes the interview with a discussion of his consulting work, the success of students, and thoughts on his career decisions.

## INTERVIEWER

James J. Bohning is currently Visiting Research Scientist at Lehigh University. He has served as 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 written for the American Chemical Society News Service, and 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.

## TABLE OF CONTENTS

- 1      **Early Years**  
Parents. Growing up in St. Paul, Minnesota. Influence of high-school teachers. The Depression. Attending the University of Minnesota. Textbooks. Chemical Engineering Department. Role models and mentors.
- 9      **Education and Career Beginnings**  
Desire to get a job. Working for Standard Oil [Exxon]. Process control. Decision to return to school. Graduate focus on mathematics. Working as a teaching assistant. Hugh Turrittin. Desire to join U.S. Navy. Overcoming speech impediment. Five months at Brown University. Ph.D. dissertation.
- 17     **Career in Education**  
Staying at University of Minnesota as an Assistant Professor of mathematics. Athelstan F. Spilhaus. Becoming Acting Chair of Chemical Engineering Department. Connection with Chemistry Department. Heat transfer research. Irving Klotz. Mathematics in engineering. Shaping Chemical Engineering Department.
- 25     **University Environment**  
Faculty at University of Minnesota. High-standards in selection process. Relationship with Chemistry Department. Introducing computers. Leaving the University. Going to University of Houston.
- 34     **Final Thoughts**  
Consulting work. Finding financial support in academia. Success of students. Changes in teaching profession. Reflections on career. Future of University development.
- 41     **Notes**
- 42     **Index**

## NOTES

1. James B. Conant, *The Chemistry of Organic Compounds; A Year's Course in Organic Chemistry* (New York: The Macmillan Company, 1933).
2. Frank H. MacDougall, *Physical Chemistry* (New York: John Wiley & Sons, 1936).
3. Neal Amundson, "Application of Matrices and Finite Difference Equations to Binary Distillation," *Transactions of the American Institute of Chemical Engineers*, 42 (1946): 939-946.
4. Neal R. Amundson, "Solution of a Nonlinear Partial Differential Equation of the Parabolic Type" (Ph.D. dissertation, University of Minnesota, 1946).
5. Nicholas Minorsky, *Introduction to Non-Linear Mechanics: Topological Methods, Analytical Methods, Non-Linear Resonance, Relaxation Oscillations* (Ann Arbor, MI: J. W. Edwards, 1947).
6. Oleg Bilous and Neal R. Amundson, "Chemical Reactor Stability and Sensitivity," *American Institute of Chemical Engineers Journal*, 1 (1955): 513-521.
7. Neal R. Amundson, "A Note on the Mathematics of Adsorption in Beds," *Journal of Physical and Colloid Chemistry* (1948): 1153-1157, and subsequent papers. For a complete list of Neal R. Amundson publications see CHF Oral History file #0084.
8. I. M. Klotz, "The Adsorption Wave," *Chemical Reviews*, 39 (1946): 241-268.
9. William D. Munro and Neal R. Amundson, "Solid-Fluid Heat Exchange in Moving Beds," *Industrial and Engineering Chemistry*, 42 (1950): 1481-1488.



## INDEX

3M Company, 36

### A

Acrivos, Andy, 36

Adams, Roger, 25

Adsorption, 22

Allied Chemical Company, 10, 37

American Institute of Chemical Engineers [AIChE], 23-24

AIChE Journal, 24

American Mathematical Society, 16

Amundson, Neal R.

father, 1-4

grandmother (Kohler), 1, 4

mother, 1, 15

wife, 1, 17, 33-34, 38

Anhydrous phenol, 11

Aris, Rutherford, 22, 25, 27, 36-37

Arnold, Dick, 28

### B

Baer, Lyle, 4

Barnett, Marguerite Ross, 40

Bates, Frank, 30

Baton Rouge, Louisiana, 10

Beckman, Orville, 4

Bilous, Oleg, 21

Bird, Robert Byron, 25

Boron hydrides, 31

Brown University, 15-16, 21

Bush, --, 2, 4

### C

California Institute of Technology [Cal Tech], 36

California, University of, Berkeley, 17, 36, 38

Cambridge University, 21, 25

Carbon, 6, 22

Carlin, Robert, 4

Carnegie Mellon University, 4

Carr, Bob, 25

Case Western Reserve University, 10

*Chemical Engineering Science*, 24

Chemical reactor, 21, 23  
Cheston, Warren, 28  
Chevron Corporation, 38  
Chicago, Illinois, 3-4  
Chicago, University of, 25  
Chromatography, 22  
City College of New York, 36  
Conant, James B., 5  
Control Data Corporation, 30  
    1604 computer, 30-31  
    6000 computer, 30  
Crawford, Bryce, 28, 31

## **D**

Dahler, John, 22, 25, 27, 29  
Davis, Ted, 25, 27, 29, 36  
Denn, Morton, 36  
Depression, The, 3-4, 8, 10-12  
Distillation, 6, 11, 14, 22-23  
Doyle, Mary, 8  
DuPont, E. I. de Nemours and Co., Inc., 10, 23, 37  
    Chambers Works, 23

## **E**

Exxon Corporation, 10-12, 23, 35-36, 38

## **F**

Fenton, Stuart, 28  
Florida, University of, 39-40  
Franklin, Joe, 18  
Fredrickson, Arnie, 25, 27, 37

## **G**

Gavalas, George, 36  
Geiger, I. W., 5  
Georgia Institute for Technology, 9  
Great Northern Railroad, 4  
Gulf Oil. *See* Chevron Corporation

## **H**

Hafinate, 11  
Hancock School, 2  
Harvard University, 25  
Heat transfer, 13, 21-22, 24  
Hildebrand, Joel, 17

Hirschfelder, Joseph O., 25  
Hosmer, Mary, 8  
Houston, Texas, 1, 34  
Houston, University of [UH], 36, 39  
    University Senate, 39  
Humphrey, Hubert H., 14  
Hyde, Molly, 8

## **I**

Illinois, University of, 10, 13, 22, 25  
*Industrial and Engineering Chemistry [I&EC]*, 24  
International Business Machines [IBM], 30  
    602A calculating punch, 30  
    605 computer, 30  
Isakoff, Sheldon, 23

## **J**

Jackson, Dunham, 13

## **K**

Keillor, Garrison, 1  
Kellogg distillation unit, 11  
Klotz, Irving M., 22  
Kolthoff, Izaak, 6, 28

## **L**

La Crosse, Wisconsin, 1  
La Jolla, California, 30  
Lake Wobegon, Minnesota, 1  
Lapidus, Leon, 36  
Latimer, Wendell, 17  
Lipscomb, William, 30-31  
Livingston, Robert, 7  
Louisiana State University [LSU], 12  
Luss, Dan, 36

## **M**

MacDougall, Frank H., 5, 8, 28  
Macosko, Christopher W., 30  
Mann, Charles A., 17, 28  
Massachusetts Institute of Technology [MIT], 9-10, 15, 18, 36  
Massachusetts, University of, 37  
McCabe-Thiele method, 14  
Minneapolis, Minnesota, 22, 31-33, 34  
Minnesota, University of, 4-7, 11, 13, 15-16, 20, 22-24, 26, 28-31, 36-37, 39

Biological Process Technology Institute, 36  
Chemistry department, 6, 28-29, 35  
College of Education, 19  
College of Engineering, 5, 19, 28  
    Chemical Engineering department, 12, 15, 17, 21-22, 24-26, 28-29  
    Department of Chemical Engineering and Materials Sciences, 29  
Mathematics department, 5, 11, 12, 13, 17, 19, 31  
School of Mines and Metallurgy, 29  
Minorsky, Nicholas, 21  
Monsanto Comapny, 23, 37  
Munro, William D., 24

## **N**

National Defense Education Act [NDEA], 35  
National Science Foundation [NSF], 35  
Northwestern University, 22, 37  
Notre Dame, University of, 36

## **O**

Oak Ridge National Laboratory, 18  
Office of Naval Research [ONR], 21-22  
Oklahoma, University of, 10

## **P**

Paraffins, 11  
Pennsylvania State University, 25  
Phillips Consumer Electronics, 35, 38  
Polymers, 29-30, 38  
Princeton University, 15, 25, 36-37  
Providence, Rhode Island, 16  
Purdue University, 9-10, 13, 37  
Puzak, Anne, 32

## **R**

Raderson, Lloyd, 28  
Ranz, William E., 25-26  
Raymond, Lee, 36  
Reeves Automatic Electronic Computer [REAC], 21, 30  
Remington Rand Univac, 30, 35  
    ERA 1103 computer, 30-31  
Richardson, Roland G. D., 16  
Rosen, Mary, 8  
Rutt, Norman, 12

## S

Schechter, Robert S., 36  
Schmeal, W. Richard, 36  
Schmidt, Lanny, 25  
Schmitz, Roger, 36  
Scriven, L. Edward, 22, 24-25, 27, 34, 36-37  
Shell Chemical Ltd., 35-36, 38  
Shoberg, Mary, 8  
Smith, Lee Irvin, 5-6, 8, 28  
Sneed, M. Cannon, 5  
Spilhaus, Athelstan F., 18-19, 21, 26, 28-29, 31-32  
St. Paul, Minnesota, 1-2, 10, 35  
    Central High School, 2, 8  
Standard Oil. *See* Exxon Corporation  
Stoppel, Arthur E., 17  
Swanson, Carl, 8  
Syracuse University, 30  
    Chemical Engineering and Materials Science Department, 30

## T

Texas A&M University, 37, 40  
Tirrell, Matthew V., 30  
Tsuchiya, Henry, 25  
Turrittin, Hugh, 8, 12-13

## U

U.S. Army, 16, 22  
U.S. Navy, 14, 16  
    ASTP program, 16  
    V-12 program, 16  
U.S. Steel Corporation, 10

## V

Valentas, Kenneth J., 36  
Victor Meyer apparatus, 9

## W

Warschawski, Stefan, 8, 31  
Western Union, 3  
Wilhelm, Richard, 25  
Wilson Junior High School, 2  
Wisconsin, University of, 1, 22, 25, 27, 38  
World War II, 28