CHEMICAL HERITAGE FOUNDATION

R. BYRON BIRD

Transcript of an Interview
Conducted by

James G. Traynham

at

Madison, Wisconsin

on

1 October 1998

(With Subsequent Corrections and Additions)

CHEMICAL HERITAGE FOUNDATION
Oral History Program
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R. BYRON BIRD

1924 Born in Bryan, Texas on 5 February

Education

1947	B.S., chemical engineering, University of Illinois
1950	Ph.D., chemistry, University of Wisconsin
1950-1951	Post-doctoral Fellow, theoretical physics, University of Amsterdam

Professional Experience

University of Wisconsin

1950-1951	Project Associate in Chemistry

Cornell University

1951-1952	Assistant Professor of Chemistry

1952	E. I. DuPont de Nemours and Co., Inc. Research Chemist

University of Wisconsin

1953-1955	Project Associate, Department of Chemical Engineering
1955-1957	Associate Professor, Department of Chemical Engineering
1957-1992	Professor, Department of Chemical Engineering
1964-1968	Chairman, Department of Chemical Engineering
1968-1972	Burgess Professor, Department of Chemical Engineering
1972-1992	Vilas Research Professor
1982-1992	John D. MacArthur Professor
1995-present	Professor Emeritus

Technische Universiteit Delft, The Netherlands

1958	Fulbright Lecturer and Guggenheim Fellow
1994	J. M. Burgers Professor

Kyôto University and Nagoya University, Japan

1962-1963	Fulbright Professor

Université Catholique de Louvain, Belgium

1994	Visiting Professor

Honors

1959 Curtiss-McGraw Award, American Society for Engineering Education
1960 Westinghouse Award, American Society for Engineering Education
1962 William H. Walker Award, American Institute of Chemical Engineers
1965 Professional Progress Award, American Institute of Chemical Engineers
1970 American Physical Society, Fellow
1972 Honorary Doctorate, Lehigh University
1973 Honorary Doctorate, Washington University, St. Louis
1974 Bingham Medal, Society of Rheology
1974 Warren K. Lewis Award, American Institute of Chemical Engineers
1977 Honorary Doctorate, Technische Universiteit Delft, The Netherlands
1979 Honorary Doctorate, Clarkson University
1981 American Academy of Arts and Science, Fellow
1982 Wisconsin Academy of Sciences, Arts, and Letters, Fellow
1983 Eringen Medal, Society of Engineering Science
1983 American Academy of Mechanics, Fellow
1986 Benjamin Smith Reynolds Award, University of Wisconsin
1986 Honorary Doctorate, Colorado School of Mines
1987 Corcoran Award, American Society for Engineering Education
1987 National Medal of Science
1989 Founders Award, American Institute of Chemical Engineers
1989 Hilldale Award, University of Wisconsin
1989 LAS Achievement Award, University of Illinois
1991 Institute Lecturer Award, American Institute of Chemical Engineers
1993 Centennial Medallion, American Society for Engineering Education
1993 Honorary Doctorate, Technion, Israel Institute of Technology
1994 Centennial Medallion, College of Engineering, University of Maryland
1994 Corcoran Award, American Society for Engineering Education
1994 Honorary Doctorate, Eidgenössische Technische Hochschule, Zürich
1996 Honorary Doctorate, Kyôto University, Japan
1997 Distinguished Alumni Award, Chemical Engineering Department, University of Maryland
1998 Engineering Innovation Hall of Fame Award, College of Engineering, University of Maryland

ABSTRACT

R. Byron Bird opens the interview with a brief discussion of his childhood. Born in Texas, Bird's family moved frequently, following Bird's father, a professor of civil engineering. During high school in Washington, DC, Bird developed his interest in foreign languages, and wanted to pursue either language or music in college. However, his father pushed him towards a degree in chemical engineering. Bird completed two years of study at the University of Maryland before entering the Army to fight in World War II. When he left the Army, he resumed his studies after a brief hiatus in a biochemistry lab of the U.S. Department of Agriculture. Bird completed his degree at the University of Illinois, at Urbana. It was there that he decided he wanted to enter a Ph.D. program in chemistry, and he chose to study at the University of Wisconsin. While in graduate school, Bird conducted rigorous research under Joseph Hirschfelder, and went on to a post-doctoral, Fulbright grant for research in the Netherlands. Bird returned to the United States to take a teaching position in the chemistry department at Cornell University, and after a year there, accepted a position in the chemical engineering department at the University of Wisconsin. Before returning to Wisconsin, Bird spent a summer working for DuPont, where he was introduced to the subject of rheology. Bird was extremely active at Wisconsin; he introduced a curriculum in transport phenomena, and as there existed no satisfactory textbook for this subject, he wrote one with colleagues Warren Stewart and Ed Lightfoot. After publishing a few influential books in his field, Bird returned to his original interest in foreign languages and collaborated with William Shetter on two books of Dutch literature. As a result of another Fulbright, Bird spent a year in Japan as a visiting professor. Frustrated by his inability to understand technical Japanese, he produced a book outlining a program for learning technical Japanese. Bird retired in 1992, but has continued to teach at least one semester each year. He closes his interview by discussing his awards, and talking about his hobbies: music and outdoor activities.

INTERVIEWER

James G. Traynham is a Professor of Chemistry at Louisiana State University, Baton Rouge. He holds a Ph.D. in organic chemistry from Northwestern University. He joined Louisiana State University in 1963 and served as chemistry department chairperson from 1968 to 1973. He was chairman of the American Chemical Society's Division of the History of Chemistry in 1988 and is currently councilor of the Baton Rouge section of the American Chemical Society. He was a member of the American Chemical Society's Joint-Board Council on Chemistry and Public Affairs, as well as a member of the Society's Committees on Science, Chemical Education, and Organic Chemistry Nomenclature. He has written over ninety publications, including a book on organic nomenclature and a book on the history of organic chemistry.

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INTERVIEWEE: R. Byron Bird

LOCATION: University of Wisconsin
Madison, Wisconsin

DATE: 1 October 1998

TRAYNHAM: Professor Bird, I know from things I've read that you were born in Texas in 1924. For the record, can you give me your exact birth date and tell me something about your early childhood?

BIRD: Well, I was born on February 5, 1924 in Bryan, Texas, where my father was a professor of civil engineering at Texas A&M University. About a year later the family moved back to Iowa where my father had grown up and where he had been born on a farm near Fort Dodge.

TRAYNHAM: How long were you in Iowa?

BIRD: Well, let's see, we were there for about four years and then we went to Memphis, Tennessee for a year, then we went back to Fort Dodge. Then we went to Washington, DC, for a year, and we returned to Fort Dodge again until 1936. At that point we moved to Washington, DC and I went to high school there.

TRAYNHAM: What took your father to Washington, DC, at that time?

BIRD: Well, he was a civil engineer and he was working in the field of flood control and water treatment. He got a very good job with the Corps of Engineers in Washington. He had a very successful and productive career there as a civil engineer.

TRAYNHAM: What do you remember of your high school years in Washington, DC?

BIRD: Oh, they're very wonderful memories. I went to Central High School (a fine high school in downtown Washington) and I think the level of instruction was extremely good there.

TRAYNHAM: Did your interest in engineering start there?

BIRD: Not really. When I got ready to go to college I wanted to major either in foreign languages or music, but my father didn't think that that was a very wise idea. He was afraid I wouldn't be able to earn a living that way, so he said, "You're going to take engineering." [laughter]

TRAYNHAM: What foreign languages were you particularly interested in at that time?

BIRD: Well, I had had five years of Latin and two years of French, and I studied German on my own on the bus ride back and forth to school. I also studied some Anglo-Saxon on my own.

TRAYNHAM: Do you have any recollection of what prompted your intense interest in foreign language at that time?

BIRD: I think it was because the teachers I had in foreign languages were exceptionally good.

TRAYNHAM: That was in Washington, DC?

BIRD: Yes.

TRAYNHAM: Your music interest—when did that develop?

BIRD: Oh, I started piano lessons in Iowa when I was about seven years old, and here again I had a very fine music teacher in Fort Dodge, Iowa, and an excellent music teacher in Washington, DC.

TRAYNHAM: What particular expression of music do you find you have most talent for?

BIRD: Well, my interests are mainly in classical music, and I do some composing now because my finger dexterity isn't what it used to be.

TRAYNHAM: Were you primarily a pianist then?

BIRD: Yes. Later I took pipe organ as well.

TRAYNHAM: You graduated from high school in Washington, DC, and what did you do then?

BIRD: I went to the University of Maryland as a major in chemical engineering.

TRAYNHAM: Your father's influence was dominant on your choice at the time you went to college.

BIRD: It was his choice. [laughter]

TRAYNHAM: Well, how did you find it once you were enrolled there?

BIRD: Oh, I did just fine. I enjoyed it. I think I always enjoyed going to school, so I did okay.

TRAYNHAM: What do you particularly remember about your college days with your new major in chemical engineering?

BIRD: Well, I started college in 1941, and on December 7 of that year the Japanese bombed Pearl Harbor, and the United States entered World War II. So there was a cloud hanging over all of us at that time—it wasn't a question of whether you were going into the Armed Services, it was a question of when. This made studying rather difficult because if you think you're going to be yanked out of school in the middle of the term, why, somehow you don't put the intense effort into your studying that you should.

TRAYNHAM: Well, surely you didn't falter in your academic success at that time.

BIRD: Well, as a matter of fact, I did, because I was in the advanced ROTC program and I knew that we were going to be called up. So when the word would come out that we were going to be called out in the middle of the semester, why, we all quit studying and just enjoyed ourselves. The result was that my grades went down appreciably in the last two semesters that I was there.

TRAYNHAM: How long were you at the University of Maryland?

BIRD: I was there for a little less than two years, before I went into the Army.

TRAYNHAM: How long were you in the Army?

BIRD: I was in the Army for three years. I went in around June of 1943 and got out about June of 1946.

TRAYNHAM: What were your assignments or responsibilities while you were in the Army? Were they connected with your engineering interests?

BIRD: Not at all, nor any interest in language or music either for that matter! [laughter] No, I went in and took basic training in the Chemical Warfare Service, and then went on to Officer Candidate School since I'd been in the advanced ROTC program. Then I joined a 4.2 inch Mortar Battalion as a Second Lieutenant. Almost right away we shipped over to Europe (in the fall of 1944).

TRAYNHAM: Were you actually a gun-carrying soldier during the time in Europe?

BIRD: Well, yes, I had a carbine. I was in charge of the Fire Direction Center for the whole company of 4.2 inch mortars.

TRAYNHAM: The war was over before you were discharged from the Army. What were you doing during that interim period?

BIRD: Well, they had a rule at that time that, when the war ended in August of 1945, you had to have a certain number of "points" in order to be discharged. They let the people out right away who had above a certain number of points, and then they went down to the people who had fewer numbers of points. I didn't have enough points to get out right away and I had to stay in until May of the following year (1946).

TRAYNHAM: You were in the Occupation Forces overseas then?

BIRD: Well, I was in the Occupation Forces in Germany from VE-Day until about some time in perhaps July 1945, and then we came back to the States. We were at Fort Jackson, South Carolina.

TRAYNHAM: Did you find that your self-taught German from earlier years was handy while you were in Germany?

BIRD: Absolutely. I was the only officer in the company who knew both French and German. I got pressed into service on numerous occasions in France, Belgium and Germany to act as an interpreter, even though my language knowledge at that time was not really adequate to function in that capacity.

TRAYNHAM: I'm sure that it was enhanced by the necessity of responding to those assignments.

BIRD: Yes. Somehow I had the foresight to take along pocket dictionaries for both French and German, and I just about wore those pocket dictionaries out.

TRAYNHAM: When you were discharged in 1946, what were your plans then?

BIRD: Well, I knew I wanted to go back to college, but I felt that I needed a little bit of time to review what I had learned before I went into the Army, so I spent about four months in a biochemistry lab in the U.S. Department of Agriculture in Washington. That gave me a chance to do some laboratory work and get familiar with some kinds of chemistry that I didn't know before. I ran Kjedahls and a number of other routine measurements for the chemists who were in charge of this laboratory. Then on the bus going back and forth, I studied some more German and reviewed differential equations, as well as some of the chemical engineering and chemistry topics.

TRAYNHAM: Did you ever have thoughts of changing from chemical engineering at that point, since it had been more or less directed on you by your father earlier?

BIRD: No, at that point, I was still quite definitely dedicated to chemical engineering.

TRAYNHAM: Well, after doing this period of working in the laboratory and reviewing on the bus and otherwise, when did you resume your formal studies?

BIRD: In September of 1946.

TRAYNHAM: Where was that?

BIRD: University of Illinois in Urbana.

TRAYNHAM: How did you happen to make the choice to switch from your former school at Maryland to go to Illinois?

BIRD: Well, this is an extremely complicated story, but when I left Maryland I had finished five semesters. While I was in the Army, I went back to Maryland for one semester on the ASTP Program, and I took the seventh semester at that time. After the war was over I went to see the chairman of the chemical engineering department at Maryland and he said, "Well, you're lacking the sixth semester and the eighth semester, so you'll have to come two years in a row in the spring." I said, "Well, can't we make some sort of a deal where I can finish up in one year?" He said, "No." So I started shopping around and found that there were plenty of schools that would be willing to have me come and finish up in one year, and Illinois was one of them. Also, I sort of wanted to come back to the Midwest.

TRAYNHAM: Well, you did return to college at Illinois and you graduated, and what then?

BIRD: Well, I knew I wanted to go on to grad school because I had lived at the *Alpha Chi Sigma* house at Urbana, and at that time there were forty grad students living there and four undergraduates. So I saw how much fun these grad students were having and I decided that was for me. I had also decided, pretty much, that I didn't want to continue in chemical engineering because in talking to the chemical engineering grad students, it seemed to me that there wasn't enough novel in the graduate program at that time. It just seemed as if it were more of the same sort of stuff we'd had as undergraduates. So I started shopping around, and I had to make a decision between organic chemistry and physical chemistry, because I liked both of these subjects very much. One of the fellows living in the *Alpha Chi Sigma* house was Ed [Edward H.] DeButts, and Ed had known Joe [Joseph O.] Hirschfelder during the war, and Ed himself was a physical chemistry major, and I liked him very much. He said, "You know, you ought to go to Wisconsin and study with Joe Hirschfelder." In addition, my organic chemistry teacher there had been Bob [Robert L.] Frank, and he had gotten his Ph.D. degree up here at UW with Homer [E.] Adkins in organic chemistry, and he also was pushing me toward Wisconsin. So I

came up here and took a look around and fell in love with the place. I didn't even apply anywhere else. I just applied to the one school.

TRAYNHAM: When you entered the University of Wisconsin did you have financial support such as an assistantship or scholarship?

BIRD: Oh, yes. I had a WARF Fellowship. (That's Wisconsin Alumni Research Foundation.)

TRAYNHAM: Did that require any particular duties of you other than scholarly achievement?

BIRD: It was for doing research with any professor that I chose to work with, so I interviewed around here. I talked to Farrington Daniels, and Bob [Robert A.] Alberty and Jack [John W.] Williams, Joe Hirschfelder, and several of the other physical chemistry professors. I decided that Joe was the most exciting one.

TRAYNHAM: When did you actually begin your research with him?

BIRD: The first week. He put me to work immediately. He was a very hard taskmaster. We had to be in his institute every day of the week, including all day Saturday. Joe was one of these people who went around and talked to each of his graduate students every day to see what we were doing, whether we were experiencing any problems, and so forth. He was an extremely diligent mentor.

TRAYNHAM: What research did you undertake that first year?

BIRD: Well, he put me to work along with another one of his students, Ellen [L.] Spotz. He put the two of us together on a problem of the calculation of the transport properties of dilute gases. In other words, the viscosity, thermal conductivity, diffusion, and thermal diffusion, and we were to make calculations of these properties using a reasonable inner-molecular force law. Several years later we found out that a professor in Japan [Taro Kihara], during WWII, had made the same calculations, using an abacus!

TRAYNHAM: In those days, the calculations were a time-consuming, tedious operation compared to what they would be today with computers, right?

BIRD: Absolutely. What took us a year or so to do could probably be done today in a week or less. But at that time, all we had was the Marchant and Monroe calculators. These were electro-mechanical devices. They cost about a thousand dollars apiece, but all they could do was add, subtract, multiply and divide.

TRAYNHAM: Did you make any change in the research problem during your graduate study with Hirschfelder?

BIRD: Oh, yes. I went on and worked on some other problems after that, though we continued some of this work into the second year. The third year I started to work on equation of state, the so-called virial equation of state, and it was my job to calculate the third virial coefficient using the Leonard-Jones (6-12) potential.

TRAYNHAM: You were successful at doing that, I presume?

BIRD: Yes, I was successful at doing this, and the results were published in the *Journal of Chemical Physics*.

TRAYNHAM: Was that the principal focus of your dissertation then?

BIRD: Yes, the third virial coefficient. I found out at about the time I was ready to finish that the third virial coefficient had been duplicated in Holland by Jan van Kranendonk and Jan de Boer, his professor. Also there was another group that had calculated the third virial coefficient, but my work was much more extensive and much more accurate than theirs had been.

TRAYNHAM: That completed your dissertation work, and you received your Ph.D. from Wisconsin. What did you do then?

BIRD: Well, during the time I had been a grad student with Hirschfelder, I had had a chance to meet many of the big wheels in the field of theoretical physical chemistry. Joe Hirschfelder himself was a very well-known person, and so he was always inviting people to come here as visitors, and one of the visitors that I had met was Jack [John G.] Kirkwood who, at that time, was at Cal Tech, and another I met was Jan de Boer of the University of Amsterdam in the Netherlands. I was quite impressed with both of these people, and Kirkwood offered me a fellowship, and in addition I was able to get a Fulbright Grant to go to Holland at the same time. So it was a difficult decision to make because both of these gentlemen were absolutely

outstanding in their field. However, the chance to go to Europe and study another foreign language was more than I could resist, and so I went to Holland to study with Jan de Boer.

TRAYNHAM: Had you developed any facility with Dutch language before that time?

BIRD: I started studying before I applied for the Fulbright grant. I got some books out of the library and studied by myself. Then later on I got a record course, and then after I was sure I had the grant, I hired a teacher, Hans Wijnberg, whom you may know. He's a professor of organic chemistry at the University of Groningen in the Netherlands. He just retired there recently. Hans was my teacher for the summer, during the summer term before I went over.

TRAYNHAM: He was here at Wisconsin?

BIRD: Yes, he was a graduate student also. He was a terrific teacher, and I got a lot out of those private lessons.

TRAYNHAM: So you had good facility with Dutch language when you went to Amsterdam?

BIRD: It was still rather halting, but I could certainly read things all right, and after I'd been there for several months my conversational ability improved at a rapid rate.

TRAYNHAM: You must have a real gift for language comprehension.

BIRD: I wouldn't say it's a gift. It's a sickness! [laugher]

TRAYNHAM: How long were you in Amsterdam?

BIRD: For one year.

TRAYNHAM: What was the nature of your work there?

BIRD: Well, I was working at the Institute for Theoretical Physics, and I worked on two projects there. One was infrared absorption in homonuclear diatomic molecules (with Jan van

Kranendonk), and then I did another project on quantum corrections to the transport properties of gases at low density with Jan de Boer.

TRAYNHAM: When you completed that year of post-doctoral work in Amsterdam, you returned to the United States?

BIRD: Yes, I came back to the University of Wisconsin, because during the summer before I went to Holland, Joe Hirschfelder had decided that he wanted to write a book (1) and that later became *Molecular Theory of Gases and Liquids*. He asked Chuck [Charles F.] Curtiss who had been one of his graduate students, Ellen Spotz and me to work on this book with him. We started to work on that in the summer before I went to Holland. While I was in Holland, I wrote two chapters over there with Jan de Boer, the director of the Institute for Theoretical Physics. During the same period, the other three were writing chapters of the book at UW. When I returned, we had one more year during which we completely reorganized the material, changed a lot of the notation, and then prepared the final manuscript.

TRAYNHAM: What was the source of financial support during that time you were writing the book?

BIRD: Well, Joe Hirschfelder had a grant from the Navy and I was supported on that.

TRAYNHAM: The Navy was supporting the writing of the textbook, or the grant was for other purposes of research?

BIRD: The details of that I don't know. How Joe managed this is beyond me—that was his responsibility.

TRAYNHAM: Yes. You spent the year after your European post-doc working on the book as a co-author.

BIRD: Yes.

TRAYNHAM: The book was completed by the end of that year?

BIRD: The major part of the manuscript was completed by the end of that year.

TRAYNHAM: What did you do following that writing?

BIRD: Well, I got in my car, with my few belongings, and drove off to Ithaca, New York to be on the faculty of the chemistry department at Cornell.

TRAYNHAM: You'd gotten an offer from them in the meanwhile?

BIRD: Yes. I had offers from Berkeley, Colorado, Texas, and Cornell. I decided to take the one at Cornell.

TRAYNHAM: Do you remember what particularly influenced your choice among the different prestigious institutions?

BIRD: Well, I think the quality of Cornell influenced me. I thought Berkeley was a bit too far away. Also at Berkeley, they wanted me to teach freshman chemistry. At Cornell I was told I would be teaching physical chemistry. But unfortunately, during the summer, one of the professors in the chemistry department had passed away, so I got assigned to analytical chemistry. I've forgotten the details of that, but in any case, I ended up teaching quantitative analysis, which was a subject I didn't like at all.

TRAYNHAM: But you probably were able to bring some unexpected physical chemistry perspectives into the teaching of quantitative analysis.

BIRD: Well, perhaps so, but I think the biggest thing that helped me there was Don [W. Donald] Cooke. Don Cooke had joined the faculty there a year or two before, and he was an analytical chemist. He very generously offered to help me get started in reading the right books and getting the right perspective on the subject. He was so enthusiastic about analytical chemistry and so kind to me that I ended up actually enjoying teaching analytical chemistry. And I learned a great deal, mainly because of Don Cooke.

TRAYNHAM: Did you ever have to teach analytical chemistry again?

BIRD: I taught it the second semester that I was there; I just taught for two terms at Cornell.

TRAYNHAM: Then you were teaching physical chemistry all the time after that while you were at Cornell?

BIRD: Well, I was only there for two semesters. The second semester I did have the chance to teach a course in quantum chemistry jointly with Bob [Robert M.] Hexter and Rich [Richard] Bersohn.

TRAYNHAM: Then what happened?

BIRD: Well, a very strange thing happened. On April Fool's Day of 1953 I got a telegram from Olaf [A.] Hougen, who was at that time the chairman of chemical engineering at Wisconsin, inviting me to come to Wisconsin to join the faculty here. Since it came on the first of April, and since someone had played a terrible April Fool's joke on me the year before, I thought this was another April Fool's joke. [laughter] So I didn't answer the telegram. [laughter]

TRAYNHAM: Did you think it was one of your colleagues at Cornell that was playing the joke on you?

BIRD: Oh, no. I suspected the person here at Wisconsin who had pulled a joke on me the previous year. So I didn't answer the telegram. I thought, "Well, I'm not going to fall for it this time!" [laughter] Then about ten days later, I suppose, Joe Hirschfelder called me up and said, "Well, aren't you going to answer Olaf's telegram?" I thought for a moment, I said, "Oh, was that for real?" He said, "Yes, of course it was for real. What did you think?" [laughter] I told him I thought this was an extension of the joke that had been played on me the year before.

TRAYNHAM: He knew about the previous joke?

BIRD: I think he did, yes.

TRAYNHAM: After he assured you that it was for real, then you responded to the telegram?

BIRD: I responded right away, yes, because I realized I'd been quite rude.

TRAYNHAM: Well, did you have any questions about whether to make the move from Cornell or were you immediately ready to come back to Wisconsin?

BIRD: I was in a terrible dither. I came out here for a few days, to look around, and Olaf Hougen gave me a sales talk, and led me to believe that probably I would succeed him as a teacher in thermodynamics and statistical mechanics. He realized that thermo was moving in a more molecular direction, more or less the direction in which John [Prausnitz] at Berkeley finally went. He wanted me to work in that area, and I found that very attractive.

[END OF TAPE, SIDE 1]

BIRD: You asked whether it was obvious what I should do at that point, and the answer is that I was in a terrible dither. I really was enjoying myself at Cornell immensely. I had practice privileges on the Sage Chapel pipe organ on the Cornell campus, which was a magnificent instrument. I had made a number of very wonderful friendships in the chemistry department there, and so I really had no compelling reason to leave. I was quite happy there. Also, I wasn't sure that I wanted to switch fields again. I was quite content in the field of theoretical chemistry and felt that I had a good future there. On the other hand, I had had a wonderful time here in Madison and there were forces that were pulling me back here as well.

TRAYNHAM: At Madison you had taken your degree in chemical engineering.

BIRD: No. In chemistry.

TRAYNHAM: In chemistry, yes.

BIRD: Here, yes, I had done my degree in chemistry with Hirschfelder.

TRAYNHAM: But they were inviting you back.

BIRD: In a different department, yes. Now, fortunately, here at Wisconsin the relations between chemistry and chemical engineering had always been extremely good. There were a lot of good friendships formed between the departments. Joe Hirschfelder and Farrington Daniels were very good friends, and Chuck [Charles C.] Watson in chemical engineering had done his Ph.D. with Jack Williams in chemistry, and so there were tremendous friendships between the two departments, and the two departments got along well together. At Cornell, on the other

hand, there was considerable enmity between the chemistry and the chemical engineering departments. At Cornell, I had wanted to establish some connection between the two departments when I was there, and Frank [Franklin A.] Long, who was the head of the chemistry department, simply said, "Well, if I see you consorting with any of those guys, why your job will be in jeopardy!" Or words to that effect. I didn't like that very much. But I managed to make friendships in physics and math as well as in chemistry. So, I was in a terrible bind. I didn't know what to do. Finally I made a list of all the points one should consider in deciding which job I should take. I had a column for Cornell and I had a column for Wisconsin. Then I gave weighting factors to each of these points, and I filled in the numbers, grading each university for each of the points. Then I added up the numbers and Cornell won. Somehow I felt uncomfortable with the way this had come out, so I went back and adjusted the numbers, and adjusted the weighting factors, and Cornell still came out ahead. I carried this card around in my pocket with me for several weeks, fiddling with the numbers, and Cornell always won. Then finally I realized that I really wanted to come back to Wisconsin, and it didn't make any difference what those numbers were; that's what I was going to do. So I did.

TRAYNHAM: I once read that the way you really decide a case is to flip a coin, and while the coin is in the air, you know how you want it to turn up. [laughter] You don't have to wait for the coin to come down.

BIRD: This was something like that. [laughter]

TRAYNHAM: You did return to Wisconsin in the department of chemical engineering.

BIRD: Yes. But that was after I spent the summer at DuPont. That was a very important part of my career.

TRAYNHAM: All right. So you left Cornell, knew you were going to leave, and you took a summer employment at DuPont.

BIRD: At DuPont, yes.

TRAYNHAM: What were you doing at DuPont?

BIRD: Well there I got introduced to the subject of rheology. I went into DuPont and found out that my boss was going to be [W.] Henry Linton [Jr.], and Henry and I had gone through Officer Candidate School together during World War II, so my boss was somebody I knew. I walked

into his office and he said, "Well, we're going to make a rheologist out of you." I said, "What's rheology?" [laughter] I didn't even know.

TRAYNHAM: That's understandable. Did you go to DuPont ostensibly as a chemist or a chemical engineer, or was there a distinction?

BIRD: I think my title was "Research Chemist," but there wasn't all that much of a distinction. In fact, well, Henry Linton had gotten his Ph.D. degree in chemical engineering at MIT [Massachusetts Institute of Technology], and Jim [James M.] McKelvey, who later became the Dean of Engineering at Washington University in St. Louis, was a chemical engineer. There were a number of others there, so it was sort of a mixture of chemists and chemical engineers.

TRAYNHAM: So you set out to learn a new language.

BIRD: I had to learn the language of rheology. Also during that summer, we were reading proofs on the *Molecular Theory of Gases and Liquids,* so it was an extremely busy summer for me to work at DuPont all day and then work every evening until midnight reading the proofs of the book.

TRAYNHAM: During the time you were reading the proofs, you were doing that on your own. You were not doing it as a group.

BIRD: Oh, no. I was down there in Wilmington and Joe and Chuck were here at UW. By that time, I think Ellen Spotz had dropped out of the project so there were just three of us at that time.

TRAYNHAM: Well, at the end of the summer you had learned the language of rheology and completed the reading of the proofs.

BIRD: Yes. Almost. [laughter]

TRAYNHAM: Almost. So you came to Wisconsin in chemical engineering.

BIRD: Yes.

TRAYNHAM: What did you set out to do at that time?

BIRD: Well, I had been given to understand that I would be teaching thermodynamics when I came here, and I was very happy with that idea. But during the summer before I got here, Bob [W. Robert M.] Marshall had been moved up from the department to become Associate Dean of the College of Engineering, and his specialty was fluid dynamics, mass transfer, and applied math. So suddenly the department had no strength in that area at all, because he would not be able to teach and be Associate Dean at the same time. Immediately, Olaf Hougen assigned me the job of organizing a course in fluid dynamics. Fortunately, during my stay at DuPont, I had been doing fluid dynamics of molten plastics. So I was actually reasonably well prepared to step into that assignment, although that's not what I had expected.

TRAYNHAM: Well, you had the perspective of practical applications of the study as well.

BIRD: Precisely.

TRAYNHAM: You could bring to the classroom that experience.

BIRD: Absolutely. I had some practical experience, and I had also had the experience of seeing that the chemical engineers, who were working at DuPont on the projects that I was involved in, were missing something in their training. Namely, they had not had sufficient training in the fundamentals of "transport phenomena".

TRAYNHAM: So you set about to add that to the curriculum?

BIRD: Precisely. Right away I knew that there was something there that I could do to help strengthen the chemical engineering curriculum.

TRAYNHAM: That was probably the perspective of the physical chemist looking at the area of rheology.

BIRD: Well, I had the advantage of a chemical engineering undergraduate training, I had the advantage of the theoretical chemistry graduate training, and I had the advantage of the short period at DuPont in trying to attack some of these problems. So I really just lucked out in having the right background at the right time.

TRAYNHAM: When you undertook the incorporation of these ideas and perspectives, did you feel that you were actually making significant changes in the direction of the department, or of the field itself?

BIRD: I don't think I really had that sort of feeling at that time. It was just that I felt quite strongly that this area called "transport phenomena"—which is a combination of fluid dynamics, heat transfer, and mass transfer, it's really a subject in classical physics—should be covered by our undergraduates, and also by our graduate students.

TRAYNHAM: That was an innovation for the time.

BIRD: This was a definite departure from what had been done before.

TRAYNHAM: Was there any resistance to making that kind of curriculum change?

BIRD: Oh, yes. The first time I proposed this to the department, it was voted down. I wasn't too surprised because it was quite a departure from what we had done before.

TRAYNHAM: Did the opponents just think that it was not really chemical engineering, or that it was getting too much on the applied side for the university? What was the source of the opposition?

BIRD: I don't know. I suspect if I had been one of the older faculty members and saw some young squirt come in wanting to change the way things were being done, I expect I would probably have not been too enthusiastic about it. So what happened next was that Bob Marshall decided to start up a department of nuclear engineering. I was put on the committee to formulate what this department would be, what its curriculum would be, what kind of faculty it would need. The committee, in assembling the curriculum, decided that we needed a course in transport phenomena for the nuclear engineering students. I made up the outline for the course, the aims of the course, and the subject material in some detail, and the committee adopted this. Then when the curriculum went to the Physical Sciences Division Executive Committee, where it had to be approved, the committee there said, "Why isn't this course already being taught in chemical engineering?" So the course proposal came back to the department for action a second time. By that time, my own ideas had become better organized, and I had much more detailed material prepared. So the course was ultimately accepted by a vote of five to four. Also at that

time, we were having extensive discussions about curriculum revision and the transport phenomena course seemed to fit in with the curriculum revision.

TRAYNHAM: Back up just a trifle. Sometimes when a person becomes a faculty member in the same department in which that person received a Ph.D. degree, there is at least a period of time when it is difficult for that person to be perceived as a faculty member instead of a continuing student. Perhaps you didn't face that problem because you took your degree in one department of Wisconsin and you returned to a different department, so I presume that that was not a part of the opposition to your new ideas.

BIRD: No, I don't think so. No.

TRAYNHAM: When the proposal was finally accepted by a five to four vote, how did you proceed to develop the course?

BIRD: Well, it was decided that the next fall we would put this course into the curriculum.

TRAYNHAM: In chemical engineering rather than nuclear engineering?

BIRD: Yes. Nuclear hadn't started up yet. So it was up to chemical engineering to do the trailblazing work at that point. Professor [Roland A.] Ragatz was the chairman of the department at that time, and his feeling was—and the feeling of the other older members of the department was—that there should be a condition put on the start-up of this course, namely that I would prepare an extensive set of notes so that the students would have something to work from, and so that the teachers would have something to work from. Professor Ragatz felt that every professor in the department should take a turn teaching this course if it was going to be part of our curriculum. I think that was a very wise decision on this part. At this point it was clear that this was going to be a <u>major</u> undertaking, to prepare essentially a textbook for a course with only a few months' notice.

TRAYNHAM: There was no textbook at the time?

BIRD: No.

TRAYNHAM: Was there a similar course elsewhere, or was this really a pioneering effort?

BIRD: This was a pioneering effort. Although later we found out that there were similar courses being developed at other schools. [Stuart W.] Churchill and [Robert R.] White at Michigan were in the process of developing a course. I think [H.] Fraser Johnstone at Illinois was toying with that idea. Joe [Mauk] Smith, who was at that time at Purdue, was thinking about such a course. Bob [Robert L.] Pigford at Delaware, and Joe [Joseph L.] McCarthy at the University of Washington. There were all these people around the country who were beginning to have this same feeling that this type of a subject material was needed.

TRAYNHAM: It sounds almost like some research that just comes to flower and is being worked on in several different places independently and unknowingly.

BIRD: That's right. Well, it was an idea whose time had come, as one says. Also, none of us knew anything about this, but there was even a committee of the ASEE, the American Society for Engineering Education, that had been the formed to develop the syllabus for this kind of course. We knew nothing about this, and we didn't know anything about these other developments going around the country. I say, "We," I mean myself, Warren [E.] Stewart and Ed [Edwin N.] Lightfoot, because those two colleagues had volunteered to collaborate on this project. That was also a tremendous stroke of luck.

TRAYNHAM: What particular specialties did those two bring to the project?

BIRD: Well, Warren Stewart had worked for the five previous years or so for an oil company in Chicago—Sinclair, I believe—and prior to that time he had taken his Ph.D. at MIT in the chemical engineering department. He's an extraordinarily gifted person, very bright, and has, I think, a photographic memory. He'd had the five years of industrial experience, and in addition, his thesis had been in pretty much this area of transport phenomena. Ed Lightfoot had gotten his Ph.D. in chemical engineering at Cornell and then he had worked for three years for the Pfizer Company in New York City, which is a pharmaceutical company, and Ed is a person with fantastic energy, and tremendous imagination. He knows how to challenge ideas and statements. He's sometimes a little bit on the wild side, always wanting to upset the apple cart, you might say. These two fellows were tremendous colleagues and they brought whole new perspectives to this subject, which I did not have.

TRAYNHAM: Were all of you new faculty members of the same rank?

BIRD: Well, Ed Lightfoot and I had come here almost during the same week, and Warren had come here two years after that.

TRAYNHAM: You quickly worked together and produced a textbook for the course to be offered in the fall.

BIRD: We were turning out notes at an astonishing rate—I can't believe that we did it. We turned out the notes, keeping ahead of where the class was, and we had a room in the basement where these notes were being assembled, and we would try to get them out in time for class. Also, I ran a coaching session for the faculty members for whom this was completely new material. Thus the material had to be produced very promptly, so that I could have my planning session with the other faculty members as well.

TRAYNHAM: So you didn't have the textbook ready when the course began, but you had it evolving just-in-time?

BIRD: This is very unusual, as you know. Most textbooks are written after a person has taught the course for ten years and feels that he knows something about it. Here we were—three rank beginners really. We'd never taught the course before. We weren't even quite sure what the course was going to consist of as far as the details were concerned. So we were doing something that I think is extremely unusual.

TRAYNHAM: Do you recommend it as a pattern?

BIRD: I wish it could happen more often, but at that time, you have to keep in mind, there were no pressures on young faculty members to get grant money and to heed the admonitions of "publish or perish," and "travel and triumph," and "cash or crash." That whole mentality did not exist at that time in the 1950s in chemical engineering.

TRAYNHAM: Do you mean that you did not feel that research output was part of your university responsibility?

BIRD: Exactly.

TRAYNHAM: Permissible but not required.

BIRD: Well, I think in this department at that time, it was more or less understood that teaching was the number-one priority, and that textbook-writing was a high form of teaching. Olaf

Hougen and Ken [Kenneth M.] Watson were textbook authors and Bob Marshall was a textbook author, and before Olaf Hougen, the previous chairman had been Otto [L.] Kowalke, who was also a textbook author.

TRAYNHAM: Of course in chemistry there was Farrington Daniels.

BIRD: Yes, Farrington Daniels. Wisconsin was fairly well known at that time, both in chemistry and chemical engineering because of undergraduate textbooks, which were very popular and very widely used.

TRAYNHAM: Well, how did the course go under those unusual circumstances?

BIRD: Well, let's just put it this way. We were exhausted by the end of the semester. We had produced a first draft of the main text material. Then in the spring, I taught in Delft in the Netherlands on a Fulbright Professorship and a Guggenheim Grant. During the spring term of 1958, I taught transport phenomena at the Technical University of Delft in Dutch.

TRAYNHAM: How did you happen to take off from the University of Wisconsin so early in your career here? Was it a special leave?

BIRD: Well, I had applied for a Fulbright Grant. I wanted to go back to Holland again because I had enjoyed my stay there so much the first time. I already had that leave planned. So during the spring, I was teaching transport phenomena at Delft, and Ed Lightfoot and Warren Stewart were teaching transport phenomena here in Madison. Then we were both making up problems and illustrative examples to flesh out the text.

TRAYNHAM: Did you find it instructive for yourself to have to translate this new material into Dutch?

BIRD: Oh, it was a tremendous challenge, and I really liked that. Also I was interacting with a different type of group of students there, and faculty. So I got some good ideas there about what to include in the book as well. As a result, by June of 1958, we had a pretty good manuscript, and that was sent into the Wiley Publishing Company; over the summer they prepared what was known as a "preliminary" edition of the book. It was called *Notes on Transport Phenomena*. It was just typeset—they typed it with an electric typewriter. That was our textbook for the following two years. During the following two years we revised this extensively and then the final book finally came out in 1960 (2).

TRAYNHAM: It became a best seller.

BIRD: Not right away. In fact, there was a certain amount of skepticism among a lot of people. We got rather mixed reviews on the book. Then gradually, I think, people began to realize that this idea had merit. So little by little, the book started to be used in graduate and also in undergraduate courses.

TRAYNHAM: You mentioned several other people and places where this type of course was being developed simultaneously with the one here at Wisconsin, but unknown to you. When your book did appear, either in the preliminary or final version, did you find that those institutions were early adopters, or do you know?

BIRD: I don't know the answer to that. It may have been that some of them used their own locally produced notes. I just really don't know.

TRAYNHAM: But no other notes had become a textbook before yours did.

BIRD: No. Well, the White and Churchill notes had gotten pretty far along, but that never materialized as a textbook.

TRAYNHAM: Has there been any textbook in the field, transport phenomena, since yours was published?

BIRD: Oh, quite a few. There are probably several dozen books now available.

TRAYNHAM: But yours is still selling.

BIRD: It's still selling. It's in the fifty-seventh printing.

TRAYNHAM: That's amazing!

BIRD: It's certainly lasted far longer than we ever dreamed it would.

TRAYNHAM: It either means that the field hasn't changed very much, which is doubtful, or the authors were unusually astute at seeing into the future.

BIRD: Well, here again, I think it was a matter of luck. It was luck that the three of us with our three different backgrounds got together at just the right time, at just the right place, with the encouragement of Olaf Hougen. Without all this luck, it wouldn't have happened. [laughter] Olaf Hougen really played an important role. As I mentioned earlier, he felt that our first obligation was to teaching, and when we started to work on the book writing project, he told us that we should give that project everything we had, even if it meant neglecting some other departmental duties. He was a tremendous mentor and a tremendous colleague.

TRAYNHAM: Well, I presume that that book (2), long-lasting as it is, has been a significant influence on engineering curricula throughout the country.

BIRD: I think that's a safe statement. I don't know whether the influence was good or bad, though.

TRAYNHAM: I presume there is a course related to that text material in all chemical engineering curricula now.

BIRD: I think something like that. I mean, this course has evolved in various departments in various ways. But certainly this kind of subject material is there now.

TRAYNHAM: You indicate that there was a strong emphasis on the textbook writing early on in your days at Wisconsin that led to the successful production of this major textbook. Your publication record reflects that you have engaged in research unrelated to textbook writing. When did you feel that a shift, if any, occurred to direct your efforts toward original research output?

BIRD: Well, here again that traces back very much to my time at DuPont, because it was there that I was introduced to the world of plastics, polymers and rheology. It became rather apparent that there were, at that time, very few people active in the polymer/rheology field in chemical engineering departments in the United States—not more than three or four. So I finally decided that it looked like a good area to do research in and challenge students with. So that's what I started doing.

TRAYNHAM: Did you feel that there was any strong push from the administrative office?

[END OF TAPE, SIDE 2]

TRAYNHAM: You were speaking about your initiation of research activities that was prompted by your work at DuPont. Would you continue with what you undertook and where it led?

BIRD: Well, you asked the question whether or not I had been pushed in this direction by any of the university authorities, and the answer is no. I've always felt that this university treats the professors very well in that they don't get involved in trying to shove anybody in any particular direction. I started to work in this field, and right up until 1968, I worked on what would be called the "continuum mechanics" aspect of the field. In other words, not the molecular theory but the fluid dynamics and thermodynamics. This led me also to become a consultant for the Union Carbide Company, and for about fifteen years I was a consultant with them. That contributed also very strongly to the direction of my research program and also the teaching in that area. I went out to Bound Brook, New Jersey, a couple of times a year and spent time seeing the kinds of problems that they were working on. Maybe I shouldn't say this, but I think I learned more from them than they learned from me. [laughter] It was, from my point of view, a very stimulating experience.

TRAYNHAM: What were the major papers about that grew out of this research endeavor?

BIRD: Well, there were papers dealing with the heat transfer in flowing polymeric liquids. There were papers dealing with the viscous heating effects on high-speed polymer flow. There were papers dealing with constitutive equations for polymers. There were papers dealing with the solutions of flow problems of various kinds, including solutions by variational methods. Those were the kinds of things I was doing, and as I say, this was stimulated very strongly by the work at Union Carbide.

TRAYNHAM: Was the research financed in any way by Union Carbide or other industrial sources?

BIRD: No. Carbide did not furnish research grants. By that time I was getting research funding from the National Science Foundation [NSF].

TRAYNHAM: So by that time you had become part of the grantsmanship game.

BIRD: I had joined the grantsmanship crowd, although even then at that time, the situation was a lot easier and you didn't have to write such huge grant proposals. I mean, the grant proposals were a matter of several pages, and then after the grant was finished, the NSF wanted you to turn in a few pages telling what you'd done. We didn't have to have special offices at the university to help you prepare your grants and take care of the finances and things of that sort. It was a much more scholarly sort of enterprise.

TRAYNHAM: How many graduate students did you have at one time in this research work?

BIRD: Well, I started out with just having a few, and then gradually I accumulated more. By 1964, I think I had a group of about ten, which was too many, particularly since in 1964 I became Chairman of the department and that meant that I didn't have, really, enough time to supervise that many students. I also wanted to keep a hand in teaching; the first two years of my chairmanship I was working way too hard. Then by 1966, we were beginning to have riots on the campus in connection with the Vietnam War, and I realized I was going to have to give up my teaching and spend more time on departmental and university affairs. I turned over part of my research program to post-docs, to let them co-direct some of the work, which I didn't like to do. But I had to, because I spent the next two years then replacing broken windows in the building, trying to maintain a safe building, and trying to keep the rioters out of the hallways. I spent a lot more time on these things at the campus level also, talking with the Chancellor about protection of laboratories and things of that sort. It was really pretty hazardous for a while.

TRAYNHAM: Were the rioters focusing on the engineering building, or was it more general on campus?

BIRD: Well, we have the engineering placement office in this building, and there were interviewers coming here from various companies like General Electric and Dow, and some of the other companies that were targeted by the demonstrators, as you may recall. Therefore, this building was the focal point. We would have thousands of students congregating around the building, or storming into the building. What I didn't want to have happen was for them to cause an accident in one of our laboratories or, if some poisonous gas were accidentally let loose in the building, I didn't want students to be killed or injured on that account. So we did have a considerable problem here involving safety and relations with the campus authorities, with the police, and so forth. My last two years as chairman, from 1966 to 1968, were pretty rough.

TRAYNHAM: Were the protesters confronting the building and the occupants of the building more or less on a general basis, or did it seem to be confined to the times that the interviewers were here?

BIRD: It usually involved specific companies, or when, for example, the CIA [Central Intelligence Agency] people were coming here.

TRAYNHAM: Was there any damage more serious than a few broken windows?

BIRD: Well, we had the Sterling Hall bombing, which took place in around 1970, I believe—either 1969 or 1970. That was when a van filled with fertilizer mixed with fuel oil and was parked over here between the chemistry building and the physics building. That thing went off at 3:00 a.m. one night and blew out nearly all the windows of the buildings in the middle part of the campus. It caused the middle wing of the chemistry building to collapse, and it blew a hole about three or four stories tall in the physics building. After that the whole mood on the campus changed. I mean, there was a sudden realization that that was not the way to proceed.

TRAYNHAM: Was anyone injured in that explosion?

BIRD: One person was killed, and one was injured. Several professors' laboratories and research results were destroyed. It was one of our saddest moments.

TRAYNHAM: Were the perpetrators of the bombing ever apprehended?

BIRD: I believe ultimately three of them were apprehended, and the fourth one has never been heard from since, as far as I can recall.

TRAYNHAM: Were the rioters' disruptions that were occurring part of the reason that you discontinued being chairman in 1968, or was it just that your term in the barrel had run out?

BIRD: I had agreed to do it for four years. The Dean at that time had sort of an unwritten rule that if you accepted the job, you had to be willing to do it for four years. If you wanted to do it for more, you could. After four years of that, though, I was quite willing to let somebody else do it for a while. I found I was getting jealous of my colleagues who were teaching and doing scholarly things.

TRAYNHAM: You returned to those things that you enjoyed more than being Chair?

BIRD: Yes.

TRAYNHAM: Did you return to more or less the same teaching assignments, or did you undertake new ones at that time?

BIRD: I started to undertake some new things. I started teaching several new courses in polymers: a course in polymer fluid dynamics, and a course in kinetic theory of polymers. In my research I decided to go in a totally new direction for me, namely the kinetic theory of polymers, i.e., the molecular theory of polymers. So here I was combining the sort of thing I learned at DuPont with the sort of thing I'd done here at UW in graduate school. This was a very lucky choice, just at the right time, somehow.

TRAYNHAM: This became a fruitful field of research?

BIRD: Oh yes, very definitely.

TRAYNHAM: Well, did it lead to any more textbooks?

BIRD: Yes. Right after I got out of the chairmanship I had to build my research group up all over again. I had two students, Robert C. Armstrong, who is now the head of the chemical engineering department at MIT, and Ole Hassager, who is now a professor at the Technical University of Denmark. These two students were my only two students for a couple of years. I could spend a lot of time with them, and we really worked very well together as a team. They are both extremely gifted and very hard-working, very cheerful people, and extremely good scholars. Before they had finished their Ph.D.s, they came into my office one day with sort of a funny grin on their faces, and I said, "What are you guys up to anyway?" One of them said to the other one, "Well, who's going to tell him? Which of us is going to tell him?" I thought, "What on earth is this about?" [laughter] Finally they said, well, they had something they wanted to talk over with me. They wanted to write a book with me. I said, "Are you sure?" [laughter] They said, "Yes, your class notes for this course that you teach, we like them very much and there's nothing like it in the literature. So we'd like to help you produce a book out of those notes that you have." So I spent several hours with them telling how much work this was going to involve, what sort of a time commitment would be involved, how much pain would be involved. [laughter] After that, they said they still thought they wanted to do it. So I said, "Well then, the next thing we have to do is write an outline and see if we can agree on an

outline, see if we can agree on the scope, the aims, and the level." For the next several weeks we worked on this. Mind you, they still didn't have their Ph.D.s yet. By the end of the semester, we had pretty well settled on what we would do: then they both stayed over during the summer as post-docs and we starting producing a manuscript. Within about three years, we had this book finished (3). By that time Bob Armstrong had gone on to MIT and Ole Hassager had gone back to Denmark. So we were doing a lot of this by mail.

TRAYNHAM: Did you have some grant money to support them during that summer?

BIRD: I guess I must have.

TRAYNHAM: Or they were counting on big royalties in the future!

BIRD: No, I think I must have made use of grant money on the ground that much of what we were doing was, in fact, research. I mean, the book was still in the distance, and we had to shape some of this material in the proper form for textbook. Then when we got along toward the end of this process, I realized we were really making a great deal of use of things I had done together with Chuck Curtiss over in the chemistry department. He and I had been teaching a course jointly on some of this material. So the other two co-authors agreed that we should ask Chuck to join us, so he became the fourth co-author.

TRAYNHAM: That book was then published.

BIRD: Yes.

TRAYNHAM: What is its title?

BIRD: *Dynamics of Polymeric Liquids*, *Volumes 1 and 2* (3, 4). Volume 1 is Fluid Mechanics; Volume 2 is Kinetic Theory.

TRAYNHAM: Who is the publisher of that?

BIRD: That's Wiley also. It came out in the first edition in 1977, and then we put out a second edition in 1987.

TRAYNHAM: Were all four co-authors involved in the revision?

BIRD: Oh, yes, very definitely. Ole Hassager came over from Denmark and spent a semester here working on it. Then I would make trips periodically to MIT to work with Bob.

TRAYNHAM: Is this book used primarily for graduate courses?

BIRD: Yes. Well, the second volume definitely for graduate courses. Volume 1 can be used for seniors and graduate students.

TRAYNHAM: Is it widely adopted?

BIRD: Not terribly widely because polymer fluid dynamics and polymer kinetic theory are rather specialized topics. That book never achieved the widespread use that *Transport Phenomena* did. But it has, I think, been influential in the research area.

TRAYNHAM: Well, that involved research you were doing in the 1970s. What did you do following that? Did you switch fields again?

BIRD: No, because in the 1980s we kept on working in kinetic theory of polymers, and all that work went into the second edition of the book.

TRAYNHAM: Well, this has been a career of considerable achievement and interplay of your industrial exposure, your teaching sense and obligations. It's interesting that your research exposure led you into the transport phenomena, a textbook (2), and continued research in that. When you switched fields to kinetic theory, you sensed a need for another textbook (3, 4). It's been the center-play. Do you sense that this has been a very fruitful way to do your professorial duties?

BIRD: Oh, yes, I do. I think that every profession needs to have responsibly written textbooks and monographs. I think that the people who write them should be people who are, in fact, actively engaged in the research so that they are up-to-date, go to meetings, and know the other people in the field. I think those are the kinds of books that we need. Also, the other thing is that what one gets a great deal of satisfaction from is producing textbooks in areas where there haven't been any before. You're collecting together an enormous amount of material that is

scattered all through the literature, which is hard to find, and it's always in different notations with different viewpoints. If you can bring this material together, with standard notation, uniform notation, uniform viewpoint, and summarize not just your own work, but the work of everybody else as well, then you can contribute enormously to the advancement of the profession.

TRAYNHAM: You indicated that early on in your career at Wisconsin, you sensed a very definite encouragement to produce such textbooks.

BIRD: Yes.

TRAYNHAM: You did so. Do you find that, now, young members of the faculty are oriented in that direction or not? Is the textbook tradition of Wisconsin continuing, or has it waned a bit?

BIRD: Well, I'm afraid it's gone somewhat downhill here like it has at other places around the country. Our young faculty members are expected to write grant proposals and account for the finances. They're expected to be very productive. They're expected to go to meetings. They're expected to network with similar faculty members at other schools. You know, this doesn't leave very much time over for textbook writing. So, we have not been as prolific, I think, as probably we should have been. Now, [W.] Harmon Ray, whom you met earlier this morning, has written two books (5) since he's joined the faculty here. Dale [F.] Rudd wrote several books (6) during his period of tenure here. We have one young faculty member downstairs who's currently working on two textbooks, and then we have another faculty member up on this floor who's thinking about working on a textbook.

TRAYNHAM: That sounds like quite a list of textbooks in the making.

BIRD: Well, I think we're maintaining the tradition, perhaps more so than other departments.

TRAYNHAM: Do you think that the list you just cited is an indication that there is a return to the emphasis on textbook production in the department, or has it more or less been this level all along?

BIRD: Well, I think that we've had this tradition in the department, starting with Kowalke, then Hougen and [Kenneth. M.] Watson, then Bob Marshall, and then Warren, Ed, and myself. This has sort of kept going. I think because there is that tradition here, that it may be easier to

maintain it here than it will be to build it up at other schools where the tradition does not exist anymore, or never did exist.

TRAYNHAM: How do you find the students changing over your career? Do you find much difference, or do you see them differently?

BIRD: Well, I suppose I see them differently because I've grown older. [laughter]

TRAYNHAM: I meant in terms of their preparation, their readiness for education.

BIRD: Well, I think, by and large, we have had just wonderful students here at Wisconsin, both undergraduate and graduate students. Our undergraduate students are made up primarily from students who come from small towns and farms around Wisconsin, and they've got both feet firmly planted on the ground, and they're willing to work hard. They've had good home training. They've had good encouragement from their families. They've been a real pleasure to work with. Our graduate students come from all over the world, and many of our graduate students were the top people in their classes in the schools that they came from. So they're a very lively group, and they challenge one another. They work well together with each other. So my own feeling is that I couldn't have asked for more as far as students to work with here, both at the undergraduate and graduate level. As far as their background is concerned, we have noticed a definite decline, I think, in the basic training in mathematics, physics and chemistry. There's been, I think, a decided deterioration over the past, say, two or three decades. On the other hand, the young people now know a lot more about computers. They're much more computer literate than previous students were. So I think overall they're still a very fine group of people, but I wish the high school training were better.

TRAYNHAM: Do you find that there has been a noticeable shift toward or away from chemical engineering in student choices during your career?

BIRD: Well, of course we went through a very low point in engineering enrollments in the 1970s, in the wake of the Vietnam disruptions. The students in that period tended to get away from the hard sciences and drift over to the social sciences, political science, economics, and social studies. So in the 1970s, the enrollment went way down. In the 1980s the enrollment went way up again to the point where we were just inundated with engineering students. In fact, our department, I think, raised the admissions standards up to something like a 3.0 grade point average, or maybe even 3.25 for a while, for admission to the junior year. Then after that, then the enrollment went back down again. I think now it's about where it should be.

TRAYNHAM: Do you have any other comments about your career at Wisconsin itself before we go on to other topics?

BIRD: Well, as you know, I've had sort of a dual career here in chemical engineering and foreign languages. As I told you earlier, I have a "sickness" for foreign languages. In 1963 I collaborated with a colleague in the German department, named Bill [William Z.] Shetter, on a Dutch reader based on selections from modern Dutch literature (7). This book was quite successful. Bill went on to teach at Bryn Mawr, and then to the University of Indiana; he's now the President of the American Association of Netherlandic Studies. He's become one of the "grand old men" in Netherlandic studies, and I consider it a real privilege and a pleasure to have been able to work with him and to learn more about linguistics and language and literature. Then later on, in I think it was around 1985, we put out a second Dutch literary reader (8). Once again, I'm just very grateful for having had this chance to work with Bill on that book, because I learned even more on the second time around; I was much more sensitized to some of the problems of language and literature.

TRAYNHAM: He was a native Netherlander, even though he was teaching in the German department here?

BIRD: No, he is an American. He got his Ph.D. at Berkeley, and his specialty was Dutch. He came here and he taught German because there was no Dutch program here, and then he went on, ultimately, to found the Dutch program at the University of Indiana. At the same time, I worked very hard here at Wisconsin to get our Dutch program established in the German department. We now have two full-time professors over there who handle the Dutch program and they're doing a splendid job. I just am very pleased to see how they've taken hold, and how well the department has treated them.

TRAYNHAM: Was your Dutch reader that you published just selections of Dutch language literature, or did it include instruction in the elements of language itself?

BIRD: No. These were readers, because Bill Shetter had already published a grammar book himself, and that's been probably the most successful Dutch grammar book (9). It's gone through many editions. So our readers were intended for second-year students.

[END OF TAPE, SIDE 3]

BIRD: The reason we put out the second book was we felt that we needed to have a new book with newer literature in it, with more modern authors represented, and also we wanted to expand

it to include Flemish literature, literature from Indonesia, and from the ABC Islands in the Caribbean. So the first book was then allowed to go out of print, and the second book then took its place. But by that time, we were beginning to develop a lot of competition. There were a lot of competing books out there, and so our second book has gone out of print. It lasted about ten years.

TRAYNHAM: Is another Dutch reader from you apt to appear?

BIRD: I don't think so because, as you know, the next thing I did was to get involved with Japanese.

TRAYNHAM: Tell me about that.

BIRD: Well, in 1961 I went to a meeting in Japan. It was the 25th anniversary meeting of the Japan Society of Chemical Engineers, and then the following year I was invited to spend a whole year—that was 1962-1963—in Japan as a visiting Fulbright Professor. So I spent a half-year at Kyôto University, and a half-year at Nagoya University. I took private Japanese lessons when I was there and worked very hard at the language. But by the end of the year I wasn't able to read technical things, and I wasn't able to have technical discussions with my colleagues; I felt terribly depressed, terribly upset, disconcerted, and disappointed.

TRAYNHAM: By that time could you handle non-technical conversation, grocery store shopping, that sort of thing?

BIRD: To a limited extent. I mean, I could get around because I had learned the grammar pretty well by then and I had a reasonable "daily life" vocabulary, so I was able to get along. But I felt bad that I couldn't function in connection with the technical language. So when I came back to Madison, I started making systematic studies of the *kanji*. Those are the Chinese characters that are used in Japanese. I started making an intensive study of these to find out what the distribution of these characters in the technical language is. I took a high-level high-school physics book, and I went through and counted the number of times each character appeared in this book, so that I could build up a frequency diagram and thereby know which characters were the most frequent and which ones were the least frequent. What I found to my amazement was that if you knew the right three hundred out of the total of about three thousand of these characters you could read ninety percent of a physics text. Later on I joined together with Ed [Edward E.] Daub and a Japanese professor [Nobuo Inoue] in Tokyo, and the three of us put out a book called *Comprehending Technical Japanese* (10). This was a technical reader that could be used to learn the three hundred important characters are and then get practice in the art of reading technical Japanese. This book was intended as a second- or third-year

textbook for students of Japanese who wanted to go into the direction of reading technical material. Ed Daub was the senior author of that book, because he had spent something like ten or eleven years in Japan. After that book came out, he became the director of the technical Japanese program here in Wisconsin. So we actually founded a new field here, and he became the director of the program. This was the only university to start up a program of that type. Then later on, in 1990, we put out a second book (11) called *Basic Technical Japanese*, which is a grammar book designed specifically for people who want to go into reading technical Japanese and who don't want to know anything about conversation at all. They just want to aim toward a very narrow goal. Both of those books have done quite well. I think the first one is in its fifth printing, and *Basic Technical Japanese*, I believe, is either in the second or third printing. Since our pioneering effort here, other schools have started up technical Japanese courses.

TRAYNHAM: Is your textbook used in those other institutions?

BIRD: I believe it is. I don't have any of the sales figures on this. I do know that since, Ed Daub has retired, his successor, Jim [James L.] Davis, now gives the course by television, and he has been training people at the Chemical Abstracts Service in Columbus by means of a TV hook-up, as well as people in a number of industries who also want to learn how to be competent in technical Japanese translation.

TRAYNHAM: So as a very new faculty member here, you had significant input into changing the curriculum in chemical engineering. As a result of your own travels to the Netherlands, you had an influence on getting a Dutch program established in the German department here. As a result of your stay in Japan, you had an influence in getting a Japanese program established at the university.

BIRD: Yes.

TRAYNHAM: What other departments have you started at the university?

BIRD: I think that's all! Isn't that enough? [laughter]

TRAYNHAM: That's enough. [laughter] That's more than usual, certainly. But it is interesting that your own keen interests as they developed, extending your own competencies outside of chemical engineering, are registered in what happens in the university. You have found it a very receptive place for your own interests outside of your specialty.

BIRD: Yes. I should add here, too, that in these language interests, I have the full support of the administration. When I started to work on the Dutch project, the first one, I went to the head of the chem. engineering department, who was Professor Ragatz at that time, and asked him if he had any objection to my spending part of my time on this. He said, "Absolutely not. As long as you do your work in chemical engineering, why, it's perfectly fine if you want to do that." Then when I started up the work on technical Japanese, Bob Marshall heard about this and he said, "Look, if you produce anything you'd like to have published, we'll turn it out as a report from the Engineering Experiment Station. I encourage you to work on this. I think that's an important thing to do." Then later on when I got the campus-wide professorship, I wanted to spend part of my time then doing either Dutch or Japanese, and I had to check that out with the Chancellor. I went up to see Chancellor Irving Shain (an analytical chemist, incidentally) and asked him if there was any problem if I diverted some of my funds to this hobby, and he was very enthusiastic about that. So, at every step, I've had enthusiastic support by administrative officials, and I know there are some universities where faculty members pursuing a second career would not be encouraged (or even tolerated).

TRAYNHAM: Well, I've been waiting but I haven't heard you say you've had a similar impact on the music program at the university. [laughter]

BIRD: No, I'm afraid I haven't. [laughter]

TRAYNHAM: But you did mention that you are doing some composing now.

BIRD: Well, that's just a hobby. These are little musical exercises. I just have to do something.

TRAYNHAM: But they haven't been publicly performed?

BIRD: Not really, no. I sometimes play them at our department Christmas parties where I have a captive audience. [laughter] I think maybe they would rather I <u>didn't</u> perform. [laughter]

TRAYNHAM: I doubt that, but it sounds as though your fingers are not so stiff that you won't undertake such performances yourself.

BIRD: [laughter] Well, I can assure you that this is pretty rudimentary music, and my performances are not what you'd call stellar. [laughter]

TRAYNHAM: You've had very strong encouragement at the university and have an illustrious career here, and I believe it's been recognized by awards and memberships in other kinds of organizations. Tell us about those.

BIRD: Must I? [laughter]

TRAYNHAM: Probably it would help the record be complete at this time. Don't be modest. This is recording for people to get the complete picture of what a university professor really is.

BIRD: Well, in the first place, I think you know as well as I do that receiving awards and recognition is a matter of luck to a very large extent.

TRAYNHAM: You have to have friends that will nominate you.

BIRD: Yes, you do. You have to have colleagues who are supportive in those efforts. Good luck plays a big role—I mean, I've served on a number of awards panels myself. Gosh, you know, you have one slot you're trying to fill for an award, a membership in an academy or something like that, and for every one of these awards that you can make, there are ten or twelve others that could just as well have been the recipient of these awards. So, I tend, myself, not to put too much emphasis on those things.

TRAYNHAM: But just for the record, which one do you take most pleasure, private pleasure in remembering?

BIRD: Well, I don't know that I take private pleasure in these things. I'm happy for the department and the university that we get recognition that way. I mean, when you get these awards, there's nothing you can do with them. They don't make you feel any better. You can't buy anything with them. [laughter]

TRAYNHAM: But it is nice to have peers acknowledge what you've achieved.

BIRD: It's nice to know that something that you've done, often with colleagues and co-authors, has been favorably received. I think two of the honors that I've received have meant a great deal to me for personal reasons. One was receiving an honorary doctorate from Delft in the

Netherlands, because I had a lot of friends there. I had some very good friendships, very solid friendships. I've felt a strong link with the Netherlands and with Delft it was sort of like a homecoming party and it just gave me a very comfortable feeling, a very warm feeling to have that kind of recognition. Then the other one was the honorary doctorate from Kyôto University several years ago, because here again, I had taught there and we've had people from Kyôto University spending time here, and I've maintained my connections with those people. I formed some very wonderful friendships with them. So going back to Kyôto for that sort of a ceremony was very heartwarming. Very nostalgic.

TRAYNHAM: Were the honorary degrees at both of those institutions awarded in such a way that all of the speaking associated with it was in the native language pertaining to each university, or did they spill over into English?

BIRD: No, the one in Holland was in Dutch, and I think the one in Japan was entirely in Japanese.

TRAYNHAM: But you could completely understand both of them.

BIRD: The one in Dutch, yes. The one in Japanese, the language was so flowery and so complex that I'm sure I missed a great deal of that. [laughter]

TRAYNHAM: Really?

BIRD: Well, yes. My knowledge of Japanese is rather limited to the technical part of the subject. I don't have a very big vocabulary for formal spoken Japanese.

TRAYNHAM: I believe you received an award from the Rheology Society, didn't you?

BIRD: Yes.

TRAYNHAM: That was for your research achievements, or was it primarily for your textbook (3, 4), or just general leadership in the field?

BIRD: I believe that was before the textbook came out, so it must have been for my early research work.

TRAYNHAM: You were elected to the National Academy of Engineering, I believe?

BIRD: Yes.

TRAYNHAM: Do you recall what year that was?

BIRD: Must have been 1969. It was the fifth year that they elected people to that academy.

TRAYNHAM: Subsequently, you were elected to the National Academy of Sciences.

BIRD: Yes.

TRAYNHAM: It's rather unusual, isn't it, for a person to be in both of those academies?

BIRD: Oh, Ed Lightfoot is a member of both of those academies, and it seems to me that there must be about eighty or a hundred people who belong to both of them.

TRAYNHAM: Both of these have at least as part of their mission, advising the United States Government.

BIRD: Yes.

TRAYNHAM: On scientific and engineering matters. Have you participated in that way in these academies?

BIRD: No, I don't think I have been asked to do that. I haven't particularly pushed to do it. I guess I'm more of a scholarly hermit than I am a committee person. [laughter]

TRAYNHAM: Any other honors, awards that you wish to mention?

BIRD: Well, let's see, I'm an honorary member of both the Dutch and Belgian Academies of Science. That means a great deal to me because of my extensive association with the Netherlands, and my links with Belgium. But here again, it was very wonderful to have these chances to see old friends again and to maintain the connections and the friendships.

TRAYNHAM: Is your father still alive?

BIRD: No. He passed away in 1971.

TRAYNHAM: So he was alive long enough to see the fruition of his firm direction of your career choice.

BIRD: I suppose so, yes. [laughter]

TRAYNHAM: I'm sure he was proud that you had done so well.

BIRD: Yes, I think he was. I think I turned out better than he expected. [laughter]

TRAYNHAM: Did you have any siblings?

BIRD: Yes, I have one brother.

TRAYNHAM: What area did he get directed into?

BIRD: Well, he worked for the Ling-Temco-Vought, Inc. Aircraft Corporation in Dallas, and he retired in 1987, I guess it was. He's younger than I am, but he retired before I did.

TRAYNHAM: During your career you have been a member, I believe, of AIChE [American Institute of Chemical Engineers], and have been elected a Fellow of that organization.

BIRD: Yes.

TRAYNHAM: Is there anything in particular you would like to record about your association with AIChE? Your participation in the organization or its meetings?

BIRD: Well, as I mentioned earlier, I'm not much of a committee person or a meeting person. But I go to AIChE meetings probably once every two or three years. I've served on a couple of committees. One of them was called The Dynamics Objectives of Chemical Engineering. That was a committee back in the 1960s, I believe, which was put together to try to determine what the future directions of the field might be. That was a fairly interesting committee to be on, mainly because of the people that I had a chance to meet there and interact with.

TRAYNHAM: I would imagine also it would be a subject in which you took a great deal of interest.

BIRD: Oh yes. Well, I guess I enjoyed going to those committee meetings, mainly because of the people. How much influence our final report had, I really don't know. I think more gets done when a few individuals sit down and do it, rather than having a committee sit and deliberate.

TRAYNHAM: Have you held any office in AIChE, local or national?

BIRD: No.

TRAYNHAM: You told me last night you have been asked to present a paper on history at an AIChE meeting this fall.

BIRD: That's correct.

TRAYNHAM: Do you have any particular feelings about the change in chemical engineering during your career, or as you look back over, even before you started in the field? What are the principal shifts you have observed in the field?

BIRD: Well, I think the field has undergone an enormous change. When I was an undergraduate, the emphasis was on the unit operations and particularly those of the petroleum industry. Hougen and Watson's books (12) were very strongly influenced by Watson's work in the petroleum industry. That was the industry in which the science was being most extensively exploited, and it was a big enough industry that they could afford the research and the

exploitation of science, of the basic science. Of course now, sixty years later, chemical engineers are going into a much broader range of industries. Petroleum has ceased to be the main field in which our graduates are being hired. We have people now going into surfactants and detergents. We have many going into microelectronics. We have others going into biotech areas, which, of course, are really blossoming, as you know, at the present time. We have others going into polymers and plastics. That's been another big area. So there's been this tremendous shift in the subject material and the companies into which our students are moving.

Now, the second thing that's had an enormous impact has been the development of the computer. The computer, of course, has made possible the implementation of a lot of theory, which before 1950, say, was <u>just</u> theory. You couldn't do anything with it. You couldn't calculate with it. It was too complicated. But nowadays, as you know, even our beginning graduate students can make fantastic calculations, simulations, and graphic displays that are mind-boggling to those of us who grew up in the 1940s and 1950s, back when we took mechanical drawing and descriptive geometry.

TRAYNHAM: Punched cards with knitting needles was considered a very significant advance in literature collecting.

BIRD: Yes, it was back in the late 1940s and early 1950s that we were doing punched cards. Well, my own thesis back in 1950 was done with punched cards and a whole bunch of IBM [International Business Machines] machines, you know, regular accounting machines. My whole Ph.D. thesis nowadays could be done in an afternoon. Terrible to think how I wasted my time, isn't it? [laughter]

TRAYNHAM: Are your students having any difficulty finding employment these days?

BIRD: Well, keep in mind that I retired over six years ago, so I haven't really been following the employment picture recently. I have not heard from my colleagues of any crisis in this area so I assume that they're fairly successful.

TRAYNHAM: You mentioned your retirement. We are holding this interview in your office in the chemical engineering building at the University of Wisconsin. What is your continuing relationship with the department after retirement?

BIRD: Well, I suppose officially it's up to them, but I come to the office every morning, usually between 6:30 and 7:00 a.m.

TRAYNHAM: You must be one of the earliest arrivals.

BIRD: The Chairman is often here by that time. As you know, chairmen have to get in early and stay late to get their jobs done. [laughter] But I am usually one of the first people here. The first two years after I retired, I swore I was not going to do any more teaching, and that I was going to really enjoy being retired. Then in 1994, two years after I retired, I accepted a visiting professorship in Delft again, and I went back over there and taught a course in kinetic theory of polymers. Then while I was there, I was invited to go to Belgium and lecture there in the fall on transport phenomena at the University in Louvain-la-Neuve, and so I did that. About that time I think people were beginning to wonder why I didn't just stay home and teach. [laughter] So while I was in Belgium, I had an urgent message from the Chairman saying that they were short-handed for the next semester, and when I got back to Madison, would I be willing to teach again? So I did that. Then they asked in the fall, would I be willing to do it again? So I've been teaching ever since, although not always both semesters.

TRAYNHAM: Do you teach what would be considered a full load, or teach one course?

BIRD: I just teach one course. Of course, I have no committee work. I don't go to department meetings. I don't have to fill out forms. I don't have to write grant proposals. So it's an idyllic life. [laughter]

TRAYNHAM: Well, I hope that it's arranged at Wisconsin so that you can lead this idyllic life, but not totally as a volunteer! [laughter] That in spite of retirement that they are able to pay you for your part time teaching. So you do teach every semester now?

BIRD: I've had a few semesters off since I resumed my teaching duties. [laughter] I really enjoy it. I mean, it's such a wonderful group of students, and the last couple years I've been teaching the graduate course in transport phenomena, so that's material that I'm very familiar with.

TRAYNHAM: Do you use your textbook (2)?

BIRD: Oh, yes! As a matter of fact, we're rewriting the book.

TRAYNHAM: Oh, you are revising it now?

BIRD: Yes, we're revising. The book is still in its first edition.

TRAYNHAM: Yes.

BIRD: We're now preparing to put out a second edition.

TRAYNHAM: All three authors are involved?

BIRD: Yes. We're hoping that we can finish this over a two-year period. So between the textbook writing and the teaching, plus the fact that I'm doing some research with Chuck Curtiss over in the chemistry department, that keeps me pretty busy.

TRAYNHAM: It sounds as though it's hardly what most people consider retirement. About the only thing you've retired from is making out exams. [laughter]

BIRD: Well, that's true. It's been really, as I say, an idyllic life. I'm doing all the things that I really enjoy with colleagues whom I really enjoy, and with students that I really enjoy.

TRAYNHAM: That's wonderful.

BIRD: What could be nicer?

TRAYNHAM: That's right. And in a lovely environment.

BIRD: In a beautiful environment.

[END OF TAPE, SIDE 4]

TRAYNHAM: Professor Bird, during your illustrious career, I'm sure you had opportunities to move from Wisconsin with enticing offers from other prestigious institutions. I believe I read somewhere that you had had such offers, but you decided to stay here. Do you remember what factors particularly made you to decide to stay?

BIRD: Well, I guess I haven't thought about that for a long time.

TRAYNHAM: Not all of your colleagues at Wisconsin did stay.

BIRD: That's true.

TRAYNHAM: Professor Bill [William S.] Johnson moved to Stanford.

BIRD: Yes.

TRAYNHAM: You had a similar offer, but you decided to stay.

BIRD: Well, I guess I have too many friends here, I've enjoyed being at Wisconsin. I like the countryside around here, and I like the opportunities for canoeing and hiking, and I just generally like the Midwestern way of life. I don't think I could be happy on the East or West Coast, and the South would be too warm. [laughter]

TRAYNHAM: So, in effect, non-chemical engineering factors played a major role.

BIRD: Sure. But the excellence of the chemical engineering department was also important.

TRAYNHAM: You found the chemical engineering situation a happy one here and the geography added to that happiness, so no need to move.

BIRD: That's it. Plus the general feeling of collegiality on the campus, and the good relations between the professorial staff and the administrators. We've had some very fine people here in the top positions and I appreciated that.

TRAYNHAM: Are there any of them particularly you would like to comment on or not?

BIRD: The administrators?

TRAYNHAM: Yes.

BIRD: I think probably we ought to leave that out of the discussion.

TRAYNHAM: All right.

BIRD: It has no real direct bearing on chemistry.

TRAYNHAM: All right. Well, perhaps that's a good comment in itself, that they have not been detrimental to your endeavors.

BIRD: Actually, some of our best administrative officials have been chemists. Conrad [A.] Elvehjem was President of the university shortly after I got here, and then probably our best Chancellor so far was Irving Shain, an analytical chemist, and one of our best Deans of the Graduate School was Bob [Robert H.] Bock, a biochemist. In addition, Bob [Robert A.] Alberty was Dean of the Graduate School for a while, then he became Dean of Science at MIT.

TRAYNHAM: There was another chemist, Norm [Norman] Cromwell, who was a Vice Chancellor at the University of Nebraska for several years. I once heard him remark that he thought chemists made very good university administrators because they were always glad to go back to chemistry. They had somewhere to go back to! [laughter] Some persons from other disciplines didn't seem to have anything to go back to, so it was important for them to preserve their administrative position.

BIRD: Well, actually, I've always figured that chemistry is a big field, it's very complicated, it's very messy, it sprawls all over the place. Chemists are brought up to deal with this tremendous diversity of problems, and a lot of problems that are, frankly, insoluble. I think that tends to make them good administrators. They're willing to tackle the insoluble problems.

TRAYNHAM: When I was graduate dean, I noted that over half of the graduate deans in the country were chemists. That's certainly a disproportionate representation.

BIRD: Yes. Well, there's another reason for that, too, I think, and that is that chemists understand the importance of having well-functioning laboratories in many departments, and if

you get somebody as graduate dean who's never done any lab work, they have a terrible time trying to appreciate the needs of the experimental sciences.

TRAYNHAM: You just mentioned a moment ago, in response to another question, canoeing and hiking. Are those your principal hobbies?

BIRD: Well, my principal hobbies are probably languages and music, but I very much like the out-of-doors and Wisconsin is always beckoning with its out-of-doors. We have beautiful rivers to canoe on here and a lot of lakes to go swimming in, and we're also not all that far from some of the finest canoe country in Canada. I go up to Canada every summer and spend anywhere from two to six weeks canoeing on the lakes and rivers up there.

TRAYNHAM: Are you packing your gear in the canoe with you to camp in wilderness areas?

BIRD: Yes, that's what we do. Our canoe trips are usually two or three weeks in length, and we take all our food, our tents, sleeping bags, and all the other equipment that we need.

TRAYNHAM: You say, "We." Is this your research group or a group of other canoeing enthusiasts?

BIRD: Well, it can be other faculty members, it can be graduate students, it can be friends in other departments. Just anybody who's willing to go out and put up with the mosquitoes, the rain, the portages, and that sort of thing.

TRAYNHAM: Are you the principal organizer of these outings?

BIRD: Well, I've organized my fair share, but I've also gone on trips where other people did the organizing. Dan [C. Daniels] Cornwell and Worth [E.] Vaughn and our own Chemistry Department have organized a lot of river trips here in Wisconsin.

TRAYNHAM: Can you think of anything that we've left out of the account that you would like to record at this time?

BIRD: Not at the moment, no.

TRAYNHAM: Well, I want to thank you for being very generous with your time and information about your illustrious career. It's been fascinating for me as an interviewer to hear you talk about it.

BIRD: Well, you've been a great interviewer, too.

TRAYNHAM: Thank you.

[END OF TAPE, SIDE 5]

[END OF INTERVIEW]

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