CHEMICAL HERITAGE FOUNDATION

WILLIAM C. GOGGIN

Transcript of an Interview
Conducted by

James J. Bohning

at

Midland, Michigan

on

20 August 1986

(With Subsequent Corrections and Additions)

William C. Coggin

JH 3/5/96

THE BECKMAN CENTER FOR THE HISTORY OF CHEMISTRY

Oral History Program

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(Revised 20 February 1989)

Chemical Heritage Foundation
Oral History Program
315 Chestnut Street
Philadelphia, Pennsylvania 19106

WILLIAM C. GOGGIN

1911 Born in Alma, Michigan on 2 August

Education

1933 B.S., chemistry, physics and mathematics, Alma College
1935 B.S.E.E., electrical engineering, University of Michigan
1936 M.S., electrical engineering, University of Michigan

Professional Experience

Dow Chemical Company
1936-1937 Student Training Program
1937-1939 Engineer, Physics Research Laboratory
1939-1941 Salesman, Special Products Division
1941-1942 Assistant Manager, Plastics Sales Division
1942-1943 Manager, Plastics Sales Division
1943-1947 Manager, Plastics Development Division
1947-1959 Manager, Plastics Technical Service
1959-1967 General Manager, Plastics Department

Dow Corning Corporation
1967-1971 President and Director
1971-1976 Chairman of Board

Honors

1954 Honorary D.Sc., Alma College
1976 Plastics Hall of Fame

ABSTRACT

William Goggin begins the interview with a description of his family and his childhood years in Michigan. After attending grade school and high school in Alma, Michigan, he attended Alma College. There, he received his B.S. in chemistry, physics and mathematics. Goggin went on to the University of Michigan to further his education in electrical engineering. After two years, he received a B.S.E.E. in electrical engineering. Remaining at the University of Michigan, he obtained his M.S. in electrical engineering in 1936. While a graduate student, Goggin interviewed with Dow Chemical Company, and joined their staff in the Student Engineer Training Program in 1936. There, he learned first-hand the specialties of chemical engineering. After completing his training, Goggin first worked on setting up testing procedures for new polymer electrical insulators. While an employee with Dow, Goggin received a patent for a cording stretching apparatus. Goggin's work in Dow's Plastics Division coincided with the rise of plastics in the world market, especially during World War II. He rose steadily through the company, remaining an employee with Dow for his entire career. He retired as Chairman of the Board of Dow Corning Corporation in 1976. Goggin concludes the interview with a discussion of the development and profitability of products.

INTERVIEWER

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

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INTERVIEWER: James J. Bohning

LOCATION: Midland, Michigan

DATE: 20 August 1986

BOHNING: Dr. Goggin, you were born in 1911 in Alma, Michigan on 26 August. Can you tell me something about your parents, their names and occupations?

GOGGIN: My father's name was Charles H. Goggin. At the time I was born he was an attorney in central Michigan. He graduated in law from the University of Michigan in 1906 or 1907. My mother, Sarah B. Goggin, was a teacher in county schools. They met in high school and were married right after dad graduated from the University of Michigan and became a prosecuting attorney. Then he decided to go into private practice, where he was very successful.

BOHNING: Do you have any siblings?

GOGGIN: I have a sister who is a year and one-half younger and a brother, now deceased, who was three years younger than me. My sister lives in Florida. My brother and his family lived in Alma, Michigan. He was an attorney serving in my dad's office. As a matter of fact, he took over the business when my dad died. In turn, his son has taken over his business after he died. The business is still operating very effectively.

BOHNING: Is Alma far from here?

GOGGIN: About forty-five miles.

BOHNING: And you grew up in this area?

GOGGIN: I grew up in this environment. I know it very well. It was a fine town for a youngster to grow up in. It was just the right size, about ten thousand people. We had all the advantages of a small town—rivers to swim, ballgames and activities of all kinds, with lots of kids. It was a real fun time. Much scouting activity as well.

BOHNING: I know that you were very active in the Boy Scouts.

GOGGIN: Yes. I was quite active in the Scouts. It was a lot of fun. I was active both in the Scouts and in summer camps here in the lower part of Michigan, as well as in Sault St. Marie.

BOHNING: I was going to ask if you spent much time in the Upper Peninsula.

GOGGIN: Not much, but my favorite camp director ran a camp up there. He had originally been from Saginaw. So I took advantage of that opportunity to go up there and help him teach swimming and other things in Saint Mary's river.

BOHNING: You went to grade school and high school in Alma?

GOGGIN: Yes, that's correct.

BOHNING: During the time you were growing up there, were there any particular individuals who had any influence on you?

GOGGIN: Well, we all had our gangs of friends. It worked out quite well. We were active in boating, scouting, ballgames. We had our own organized football and baseball teams. Probably the one individual who stands out in my mind for having an effect on me is a chap by the name of Art Murphy, who was a very good friend of my dad. Dad used him as special investigator in his law practice. He was a great huntsman. Dad was not that enthusiastic about hunting but he knew that I was, so he arranged for me to go hunting with this chap and we spent quite a lot of time hunting together. I really enjoyed being with him and learned a lot about the woods and how to take care of yourself in the woods.

BOHNING: What about school? When did you get your first exposure to science?

GOGGIN: In high school I was interested in taking as much science as I could. At that time, the only courses that were offered were in chemistry and physics. I became interested in them so much that I asked, and got permission by the teacher, to work after school on things like qualitative analysis, which at that time were not taught at high school. I guess you could say my first experience was that. Also amateur radio, which came a little before taking physics in high school.

BOHNING: Do you remember the chemistry teacher?

GOGGIN: His last name was Shaw but I can't remember his first name. I had a lot of fun with him. He was a great teacher. I really enjoyed it. Later, I had the opportunity to teach in his class while still a student. I taught physics when I took education in college. It worked out very well. He let me take over the whole class and I ran the show for the whole semester. It worked out beautifully as far as I was concerned. I made many friends.

BOHNING: You said that you wanted to take all of the physics and chemistry that you could. Why that interest? Where did that come from?

GOGGIN: That's difficult to pin down. My dad, who would have much preferred that I take law, did not object to that but was anxious that we would just get a plain, good education, regardless of our interests. My brother was interested in law. My sister's interests were in science and teaching. But to determine exactly the reason is not easy. Among other things, I always got gifts for Christmas such as chemistry sets and mechanical things to work with. I enjoyed them and I suppose they provided me some of the earliest enthusiasms for scientific matters.

BOHNING: Did you do any reading at the time?

GOGGIN: Yes. But most of it was not sophisticated. I was always getting books from the library, but mainly on things that I liked to build. I had my own shop and did a lot of building.

BOHNING: What kind of things did you build?

GOGGIN: By the end of high school I had built three boats in our basement, and I raced hydroplanes. Another chap had also built a somewhat similar boat so we raced together for several summers, had quite a bit of fun doing that in the late high school years.

BOHNING: When did your interest in radio develop? Was that also an outgrowth of this?

GOGGIN: That probably started before the boat building. It started with crystal sets and spark transmitters. I hooked up spark transmitters to my mother's clothesline and talked with my

friend across town. Then I went into one-tube sets and finally I built more sophisticated receivers. Ultimately I got an amateur license and operated amateur radio with this chap. There were several others too, but the two of us were the closest together.

BOHNING: Did you have that license before you graduated from high school?

GOGGIN: I'm not exactly sure of the date. It had to be very close to that. I graduated in 1929 and I think I had the license by that time. If it wasn't by that time, it was very shortly thereafter.

BOHNING: Did you have any career plans at this point? Had you thought about what you wanted to do?

GOGGIN: What little I knew about engineering led me to believe that I would be interested. In spite of the fact that I did a lot of traveling with my dad and spent a lot of time in court with him as a youngster and enjoyed it, I didn't think that that was what I wanted to do. I felt that I would be more interested in scientific things and my interests grew in that direction. My parents encouraged it.

BOHNING: I wanted to ask you if your mother had any influence on that.

GOGGIN: Yes, she was very helpful. She was a wonderful person and was always supportive of whatever we wanted to do with games, building, or any scientific things.

BOHNING: It sounds like she certainly tolerated a number of the projects you had going on.

GOGGIN: Oh, she did, and they were obnoxious to her at times, I know. For example, I built a wooden tower on the top of the house for an antenna and put up a three hundred-foot antenna over several other yards. It was a pretty conspicuous thing. My dad wasn't very enthusiastic about it but he didn't say anything.

BOHNING: I guess the selection of Alma College was a natural one.

GOGGIN: Oh, yes. This, of course, was in the middle of the Depression. My dad was not only the most prominent lawyer in town but also the chairman of the board at the bank. It was only a couple more years before the bank holidayed. They had two banks in town: his bank and

another bank. His bank was reasonably secure. They weren't worried about a run on the bank but they were greatly concerned about a run on the other bank. So he spent as much of his time helping run the other bank during the bank holiday, those stressful times, as he did running his own. They both came through without any problem.

BOHNING: That must have been quite an accomplishment for that time.

GOGGIN: Yes, it was. He got many gray hairs out of that.

BOHNING: I can imagine. When you started at Alma, what course of study had you selected?

GOGGIN: I started out taking the prerequisite courses: English and Math. I did take a freshman physics course and continued taking physics throughout the four years I was there. I don't recall what other courses I took as a freshman.

BOHNING: Chemistry? Or would that have been later?

GOGGIN: I took freshman chemistry but I don't think I took it at the same time that I took freshman physics. I don't recall the exact years.

BOHNING: Did you take chemistry beyond the freshmen chemistry?

GOGGIN: No. I concentrated on physics, math and education.

BOHNING: You were still thinking of teaching as a career?

GOGGIN: That was a stopgap kind of thing, in case I couldn't get a job. At that time the job situation was very tight.

BOHNING: Do you recall any faculty who impressed you or influenced you?

GOGGIN: The physics teacher was Professor Biddle, who was a grand physics teacher. He was very straight-laced, very severe but very good. He was a memorable character. One of his

interesting and strange idiosyncrasies was that he couldn't remember when he told a joke. I recorded the number of times that he told this particular joke in one semester and it was around thirteen times. But he was a good teacher and I learned a lot from him.

The chemistry teacher, Dr. [Wilford E.] Kaufmann, was outstanding. I think he became head of the department at Carleton after leaving Alma. He was extremely good. I enjoyed taking his course. As a matter of fact, I had a lot of contact with chemistry students after that. While I only had that limited amount of chemistry, I did most of the qualitative analysis stuff in high school and enjoyed chemistry very much. I just couldn't get everything in. I wanted to take astronomy and all possible courses.

BOHNING: What were the facilities like there?

GOGGIN: They were rather meager. When I entered this private school, I think the tuition was one hundred ten dollars. Total enrollment was two hundred seventy-five or three hundred, so it was pretty small. We got a lot of personal attention. It was a real fun experience. As a matter of fact, my life has just been filled with fun. All the way along the line I've enjoyed it. Almost nothing that I've done did I find distasteful.

BOHNING: Well, that's a marvelous accomplishment. As I recall, Alma started around the 1870s.

GOGGIN: In 1886. This is the centennial year. There will be a big celebration this year.

BOHNING: You said there was a small number of students. I'm curious about the laboratory facilities.

GOGGIN: Laboratory facilities were exceptionally good for the number of students that we had, both in physics and in chemistry. They were especially good in chemistry. The chemistry division of the college had a super reputation. A very high percentage of the chemistry students went on to graduate schools and got Ph.D.s or took good business jobs. Probably more than fifty percent went on to get Ph.D.s.

BOHNING: That's a very high percentage.

GOGGIN: Yes, the figure is very high. They were usually accepted at Harvard, Illinois. You name it: they were accepted, wherever they applied.

BOHNING: Do you recall any of your student colleagues who you were close to as a student?

GOGGIN: Most of the people that I was close to in high school went on to Alma College so we just continued our association there. The people that I came to know later were usually Alma residents. As a matter of fact, when I went on to school at the University of Michigan, along with me were four other Alma residents, and we roomed together. We had good experiences. Of course, there was a lot of extracurricular activity because we had both the advantages of the town that we came from and those of the city we lived in.

I didn't find Alma College too difficult. The courses were good and there was not any question about its grades being accepted elsewhere. I got good marks without studying too hard. The biggest problem was English, but I survived that.

BOHNING: Did you take any foreign language?

GOGGIN: I took two years of German which I enjoyed and had a chance to use later in Germany. We had a good German teacher. Professor Weise was an excellent person.

BOHNING: You were quite active in extracurricular activities at this time too, weren't you?

GOGGIN: Not as much as I might have been. I was not big enough to participate in sports. In addition to that, I had an adverse experience in high school with rheumatic fever. It slowed me down and stopped abruptly my activity in high school football. I had to lay pretty low as far as physical endurance and activities were concerned for a number of years after that. So I didn't participate in sports in college but I was very active in things like the chorus and later on in my junior and senior years, in the student council. I became president of the class, so in that respect I was active extra curricularly. I did belong to a fraternity and we had quite an active fraternity. At that time, this fraternity had the reputation of being one of the better fraternities in the school for academic affairs and not necessarily for athletics. I enjoyed that.

BOHNING: I believe you taught an astronomy class?

GOGGIN: Yes. My math professor, who also taught astronomy, used to referee football games as a hobby. He was in an accident coming back from a high school football game that he had refereed. He broke his leg and was not able to get around. His classes had to be taken over by other professors and by students. I was a junior and had previously taken astronomy as a

sophomore, so he asked me if I would teach his class in astronomy. He was partly through it; this was well into the football season. I took his class over and had quite a few seniors in the classroom. It was an interesting experience. I got along without any problems. The kids seemed to learn something. It worked out pretty well all the way around.

BOHNING: Did Alma have an observatory?

GOGGIN: No. It had a portable telescope. We would go up to the fields at night and work out there. It was pretty limited.

BOHNING: What was that teacher's name?

GOGGIN: Professor Clack. He was a student of Chinese, was a Chinese missionary at one point, and used to keep his records in Chinese characters. He would leave his record book open on the desk. People would come in and could wander around and go through it but they couldn't understand his recording system. At a school like that, you would run into a bunch of characters. They were a lot of fun to get to know them. We became very good friends.

BOHNING: Did you continue your activities with radio as a student?

GOGGIN: I continued my activities with radio until I went to the University of Michigan. Then I started taking electrical engineering. As a matter of fact, with a bachelor's degree from Alma, the courses that I had taken qualified me to enter school as a junior for electrical engineering. I think I could have gotten more credits than that, but I was anxious to take all the courses I could, anyway.

I found myself busy enough so that I was unable to operate the amateur radio equipment as I would normally, so I stupidly let my license lapse. I knew that I would at some time go back to it again, probably when I had a little more freedom than I had at school. I did, however, design, as a master's thesis, an amateur transmitter for the college that improved their radio facilities extensively. I have some literature on that someplace. It worked out to be an ideal subject for my master's thesis.

BOHNING: You also indicated that you had built the first automobile transmitter. When did that occur?

GOGGIN: That occurred back in high school, or perhaps when I was a freshman or sophomore

at college. This chap Paul Woodland and I built a small transmitter and a small receiver and put it in my car, a Model A Ford. At that time, transmitters in automobiles were unheard of. As we found out later, they were illegal, as far as amateurs were concerned, so we didn't attempt to use it for very long. It worked out pretty well. We checked it out for distance and it was pretty good.

[END OF TAPE, SIDE 1]

BOHNING: Did you have any summer jobs while you were in college at Alma?

GOGGIN: Yes. We had a cottage at a lake fifteen miles away from Alma, where I did boating and got to know a neighbor of ours quite well, Russ Hext. He ran an electric shop in Alma doing both home electricity wiring, as well as radio and sound in theatres. Sound was just coming in at that time. I got a job working for him a couple of summers. That would be from my sophomore year in high school to my freshman year in college. It was a part-time job, but I learned a lot in dealing with people and with electrical things. He was a good teacher and very helpful.

BOHNING: As you were finishing up at Alma, what effect was the Depression having?

GOGGIN: Because my father was as successful as he was, we felt the effects of the Depression probably less than almost anybody in town. His business was not affected by the Depression. People still got into trouble and needed to get out of trouble. We knew there was a Depression but we survived very well under the circumstances. Of course, small towns were not so affected as other places. So those were two factors which protected us. Our experiences during the Depression were not as sordid as they would have been elsewhere, I'm sure.

BOHNING: Did the Depression have any affect on the college?

GOGGIN: Yes, it had a considerable affect. It was a real grind to get students, and to get them to pay their bills. As a matter of fact, I learned later that my father helped support a number of our friends by putting them through college. He paid the tuition of several of my sister's and my own friends so that they could go to college. One of them became a professor at Alma College later.

BOHNING: With regard to your move to the University of Michigan, were you contemplating looking for a job or were you looking at additional education at that point?

GOGGIN: I was looking at additional education. I wasn't satisfied that I had the education I wanted when I got out of Alma. I would have been willing to go into teaching if we couldn't have afforded it, or for some other reason. I enjoyed teaching. I got a big kick out of it. But I really wanted to go on and by that time I was pretty well convinced that I wanted to study electrical engineering. Obviously, the place to go was the University of Michigan, which had the top electrical engineering school in the state. So, I applied and was accepted without any question.

BOHNING: Did those summer jobs that you spoke of have any influence on you choosing electrical engineering?

GOGGIN: I forgot to mention that there was another summer job that I had, which also had some effect. We had a district headquarters for a local utility in Alma. Through them, I got a job as a junior engineer doing distribution line drafting and field testing of distribution lines and power transformers. Yes, my summer job experiences did help me in taking electrical engineering.

BOHNING: You mentioned that a number of your friends also went on to the University of Michigan. Were any of them in electrical engineering as well?

GOGGIN: One chap, who was probably my closest friend, was in electrical engineering. He struggled quite a lot harder than I did at Alma, and his struggle became much more severe at the University of Michigan, to the point where he finally had to drop it. As a matter of fact, he was dropped. With the load that I had, I wasn't able to spend the time helping him that I probably should have. Maybe it would have been a mistake to do it anyway. He later graduated from Michigan State in electrical engineering, which shows the differences between the two schools, at that time. Electrical engineering at Michigan was tough.

BOHNING: You got your B.S.E.E. in two years since you were able to come in as a junior because of your background.

GOGGIN: Right.

BOHNING: What courses did you take and what faculty did you have?

GOGGIN: I took all the electricity courses I could. I also took a beginner's course in chemical engineering, really the chemistry of materials. Then, in my second year, I took courses in accounting and technical writing. I was busy enough so that I had very few options, but the options that I did take were business school courses to get a greater breadth of understanding in these matters.

BOHNING: Does that mean you were already anticipating moving into a business orientation and no longer emphasizing teaching?

GOGGIN: My policy in education was first breadth and perhaps depth as well, in certain things. That's the reason why I took accounting and business courses, not because I knew I wanted to go into business. As a matter of fact, I thought that I probably would want to do research, but I wasn't sure. I enjoyed things like engineering and drafting. One of my problems was that I enjoyed everything.

BOHNING: I understand that feeling. Were there any faculty that had an effect on you that you remember specifically?

GOGGIN: Yes. The design professor, Arthur D. Moore, was a real character and a very good professor. I took more graduate courses from him than I did from others. He had a significant effect on me. Also [Hempstead S.] Bull, who was in charge of electronics. He was interested in me because of my interest in amateur radio. There were just a lot of very good professors—Stoll, [Joseph H.] Cannon. All of them I found to be good and tough. You worked hard. There was not much time for a lot of extracurricular activities, even with the educational background that I had. I can imagine some people landing in those courses and finding it pretty tough. I found it tough enough myself although I never got lower grades than As in any of the electrical engineering courses.

BOHNING: Did you take any additional math at Michigan or was what you had at Alma sufficient?

GOGGIN: No. What I had at Alma was sufficient. The only courses that I took in math were courses that were really not math but were courses such as hydraulics. Of course, most engineering courses contained a considerable amount of math. The courses in descriptive geometry were fairly complicated.

BOHNING: How did you select this master's thesis of building a radio station?

GOGGIN: I didn't select that. They selected me, knowing that I had an interest in amateur radio and electronics. That was just a natural choice. I don't think there were any other amateur radio operators in the group at the time.

BOHNING: So you stayed on an additional year and were at Michigan for three years.

GOGGIN: That's correct.

BOHNING: What were you looking at when you went? You had your time spent for your master's degree. Was that part of your original plan?

GOGGIN: My plans were a little bit vague but I frankly wanted to get as much education as I could, although I didn't think that I wanted to go on and specialize to the doctorate level in electrical engineering. At that time, doctorates were valuable, but not so much more than a master's degree or even a bachelor's degree, particularly in engineering. I felt that I was young and interested in more education so I just went on and did my master's degree. I didn't even apply for jobs at the end of my bachelor's session.

BOHNING: Does this mean that you were not interested in research for a Ph.D.?

GOGGIN: Yes.

BOHNING: You had indicated earlier that research was one of the possibilities you were considering.

GOGGIN: I guess I was interested in engineering or in a research job in electrical engineering, but I wasn't really clear about what I specifically wanted to do. I wanted to see what was available and take advantage of the opportunities.

BOHNING: What did you do at the end of your master's? Were you applying to different companies? Were you getting help from the faculty at Michigan? That was in 1936.

GOGGIN: I was getting help from the faculty at Michigan. I wasn't really active in applying. I was more or less taking what came along. I had been accepted by General Electric [GE] when

Steve Starks, the recruiter for Dow, came to the electrical engineering group of the University of Michigan and asked about the possibility of finding an electrical engineer who could do research on polymeric materials such as insulators. The professors immediately thought of me because they knew I came from that area and because of my work. Dow invited me for an interview, which I enjoyed very much. Subsequently I got an offer from Dow that was much more substantial than what GE had offered. Also GE had a reputation for keeping students for about two years and then letting them go, keeping a few but getting rid of others. So I was skeptical about the offer from GE. I didn't go out of my way to interview with many other companies, particularly when the Dow job came along. I thought it was a good opportunity because I liked this part of Michigan—the hunting and boating and all the other activities that went along with it.

If I could go back just a little bit, probably the most significant extracurricular activity that I had at Ann Arbor was with Tau Beta Pi. They were a very active organization there. I participated in that to quite an extent. I was the treasurer. It worked out very well. I enjoyed it and met many very capable people.

BOHNING: Did any of them go on to Dow with you?

GOGGIN: No. At the time Dow was just looking for one person in electrical engineering and that was it.

BOHNING: I think you had commented that when you got to Dow there were a number of new recruits and almost all of them were from Tau Beta Pi. Was that right?

GOGGIN: One of the attractive things about Dow was a year long student course, in which you spent your time moving throughout the whole facility, meeting people, doing different jobs, and getting into dirty hands kind of situations. That appealed to me and Starks was the man who ran that too, so he was very able to describe it to me when I was interviewed. When we arrived together at Dow, it turned out that there were nineteen from Tau Beta Pi, plus one guy by the name of Bill Dixon, who was from an old Midland family and felt pretty much that that was the reason why they took him at Dow. The student course was really something else.

BOHNING: I want to talk to you about that. When did you arrive at Dow?

GOGGIN: Well, let's go back a little bit. One of the extracurricular things that I did at Ann Arbor was to play handball. I have very sensitive skin, and I became infected with athlete's foot in a very serious way. At that time there were no good drugs for treating it. It was so severe that I was in the hospital for part of my master's year and I couldn't even wear shoes

during the final exam. I had to go to the final exam in galoshes.

In the meantime, several of the engineers that I knew were active sailors in Detroit—one chap's father had a fifty-two foot boat that they sailed quite a bit and I sailed with them. We had the opportunity to sail the Mackinac Race. I'm not sure if you're familiar with it, but it's a race from Port Huron down here all the way up to Mackinac Island, a distance of two hundred forty miles. They do it another way now and go about two hundred seventy-five miles. Around the time I was hired we had the opportunity to take that same boat and sail in Lake Superior. The courses were set up on the basis of eight, six-week courses, so it took forty-eight weeks altogether. I opted to skip the first six weeks and come back starting with the second six weeks. That was a bit of a problem. I don't think Starks was very happy about that but I was in such bad shape that it might have been impossible for me to go to work anyway. By spending six weeks in the open air, in shorts with nothing on my feet, the sun could really help cure the athlete's foot. It was so bad that I lost skin pretty much up my legs. Fortunately, none of the other fellows got it. We spent most of our time in Lake Superior, sailing from Mishabagotten Island, which is an island in the northeastern part of the great lake, to Isle Royale, which is a forty-five mile wide island in the northwestern part. I had a lot of fun spending time around there, sailing back and forth. It was great fun.

Let me just add another anecdote about that boat trip. We landed in Isle Royale at night. We had done sextant shots and we were going all the way across the lake, from Mishabagotten Island for about a hundred fifty miles to land on a specific spot on Isle Royale. We got there at night and there wasn't any moon. But, you could see the outline of the island. It's a steep, two-cliff arrangement on the island. You could practically put your bowsprit on land and be in thirty feet of water.

You could see just the shadows of the cliffs and we had to decide whether we would go south or north to try to get to the little opening that we wanted to go to. It was a little place called Chippa Harbor. We decided to go north. We had only gone a quarter of a mile when we found the place that we were looking for. We went in and there was a cabin with a light. We hailed at the people and they said to take the course on the left of the island going up this stream into an inland lake. So we got through in fine shape, anchored in the lake and went to bed that night.

In the morning when we got up we noticed a little tent over on one side of the lake in the bushes. We soon met the fellows and it turned out that they were a couple of bug collectors. They were collecting wasps on Isle Royale. We invited them out to have a beer with us. Well, they didn't drink beer but they came out anyway. One of the fellows was a real queer guy. We couldn't make him out. He was the authority on bugs and the real number one collector. It turned out that his name was Bobby Dreisbach.

BOHNING: Oh.

GOGGIN: Then we found out that he also was from Dow Chemical and this was my first introduction to anybody who was from Dow Chemical Company.

[END OF TAPE, SIDE 2]

GOGGIN: In the broad daylight we ran aground going through that same stream we went through at night. Well, so much for that. Let's get back to the student course.

BOHNING: It's interesting because I've heard a lot about Bobby Dreisbach.

GOGGIN: You're dealing to a large extent with the physics lab fellows and Dreisbach was one of the mainstage figures there.

BOHNING: The Dow research pioneers book has a picture of him holding a box containing a collection of insects (1).

GOGGIN: He was a real authority.

BOHNING: He went to University of Michigan, didn't he?

GOGGIN: Yes, he did. A real valuable collection. He was really interesting to talk to when it came to the idiosyncrasies of wasps.

BOHNING: When you met him there, did you say anything about your upcoming work at Dow?

GOGGIN: No. Unfortunately, the fellows didn't either. My illness slowed the start in the student course. I came back in August and started in about the second week. It was a very hot summer and while working in that course I began to wonder if I had made the right choice. We were working up on the top of a building, pulling in heavy cables. This was an electrical field crew. One of the few bosses that I knew was diligent about hard work. He worked hard and saw that his helpers worked hard. We learned a lot and it was really tough work.

BOHNING: I'm interested in your experiences as you rotated through the six-week periods.

Did you have a different rotation because you were an electrical engineer or were all of the people put in the same rotation?

GOGGIN: No. They weren't all put in the same rotational sequence. Steve wanted to rotate them through departments they would not otherwise see in their subsequent experience. The fact that I was going to be in the Physics Lab meant that I did not go through it in this training course. But I covered most of the other departments. I got acquainted with the Physics Lab later. That was the way it worked out. Have you ever seen books on the student course?

BOHNING: No.

GOGGIN: Let me see if I have one. You would be able to get some idea of what they were all about.

BOHNING: The student course was certainly a quick way to learn about the company.

GOGGIN: And to learn about the people and labor. I tell you, that was a real experience for us. I wasn't sure if I was enthused about it. Much of the stuff was fun but a lot of it was also hard work and some of it was boring. But I wouldn't change it for anything in the world now. It was an education in itself.

BOHNING: Would it possible to get copies of some of these? [Bohning refers to documents shown to him by Goggin.]

GOGGIN: Yes. What I'd like to do is find the instrument department report because there were so many drawings and diagrams and photographs that we spent quite a lot of time on. I just didn't see it in the batch that I have here. It was a thorough job. We were all graded all the way through it. Some of the books have the grades in them but this one apparently doesn't.

BOHNING: How many of these did you have?

GOGGIN: One for each six weeks. Then there are supporting ones about various pieces of equipment that would be used in each department.

BOHNING: Do you recall which departments you rotated through?

GOGGIN: Obviously, the pipe shop was one. The boiler shop was one of the most interesting. At that time, a company like the Dow Chemical Company made most of its own reactors, big reactors. One of the most interesting experiences I had was with a guy by the name of Joe Le Fleur, who was the layout man making complex reactors out of steel plate with pipes that enter in at certain angles and need unusual holes. He laid this all out with chalk on big steel plates and then he cut out the welds here and there, bend the whole thing into shape and put it together so that it accepted entrances and exits for pipes and tubes and things like that. It was perfect. It just worked out beautifully.

In the boiler shop they had also a blacksmith whom worked with a forge. He was in the process of making a set of hand irons to take home. He had them all designed so that he could knock it down and get it into a lunch pail. You also learned other things such as where to go in the company to smoke and not be detected. There were many places where you could get away from the security people.

BOHNING: Smoking was not permitted on the premises?

GOGGIN: Yes, except in certain offices, labs and other places where it could be controlled. [Goggin refers to Dow student course material.] I'll be glad to put together an example for you. Or do you want them all?

BOHNING: Well, let me think about that because I've heard so much about this student course. Ray [Raymond] Boyer went through it, and others have mentioned it, but this is the first time I've met someone who has kept this kind of documentation. That becomes quite important. I would like them all and would be willing to pay for any reproduction costs.

GOGGIN: That would be quite a job.

BOHNING: There's something else I wanted to talk to you about later; your personal papers and records.

GOGGIN: I haven't been very diligent about keeping a lot of odds and ends in the way an honest to goodness researcher would make sure that he kept all of his papers, his publications and patents. I haven't really been that diligent about it. I have quite a bit of stuff but not like what I expect a real dedicated researcher would have.

BOHNING: Well, from that standpoint, Herman Mark doesn't have anything either.

GOGGIN: Oh, he doesn't?

BOHNING: No. The only things he has are his reprints but no other material.

GOGGIN: What are you going to do with all of this stuff?

BOHNING: The Center is acting as a clearing-house for scholarly work. One of our aims is to collect as much information as possible and assist in the dissemination of that information to people who are interested.

GOGGIN: Is the idea to make it available to students?

BOHNING: Students, scholars, and people who are working in industry. In terms of personal papers, we don't specifically collect them, but we want to assist someone in getting them to a repository where they would be preserved, either a local historical society, company archives, university archives, and things like that.

GOGGIN: This brings us to a question of the German Plastics Practice slides. I have quite a lot of stuff there from 1945. I'll be glad to show it to you. Walt Gloor mentioned it to one of your chaps and he's written me about it. I frankly haven't answered his letter because I didn't quite know how to answer it. Something should be done with it. It shouldn't just be dumped out because a lot of effort went into it and it's good historical stuff.

BOHNING: Back to the student rotations, you said you went through the boiler shop, the pipe shop.

GOGGIN: The instrument department, the lead shop, engineering department.

BOHNING: What was the lead shop?

GOGGIN: Lead burning. In a company like Dow, you have many processes where you're dealing with something that needs the corrosion resistance of lead. Maybe sulfuric acid or

something like that. You need a reactor that can withstand extremely severe corrosive conditions, so you make it out of lead. These chaps were literally building reactors out of lead sheet and in some cases, without too much regard for lead poisoning. There was a tin shop and a warehouse, which was an education in itself, dispensing all kinds of plumbing supplies. You really got to know those products. I really enjoyed that experience.

BOHNING: Do you remember any of the others who went through that with you?

GOGGIN: There was Bill Dixon, who was primarily a chemist. My roommate was Buzz Nelson from the University of Minnesota. Bill Melching from Michigan State, Guy Keiper, Bob Hights. Those were some of the fellows that I remember.

BOHNING: Were there any other experiences in any of the other shops that you recall?

GOGGIN: One that I didn't mention was the electrical shop. Let me give you a typical experience from the electrical shop. This experience was not my own but Keiper's. The electrical crew was a line crew and there's no more foul-mouthed crew. These guys were pulling power lines over cross irons on poles. It didn't make too much difference to them the fact that they were stripping the insulation right off. It was brand new wire. Buster was the head of the crew and he was the roughest character of them all. Keiper suggested to him that there was a better way to do that. Not to draw it right over the cross iron but to draw it through a pulley and save the insulation. Buster said to him, "So you want to tell me how to run my job, eh?" The next day, Keiper was out digging post holes for power poles in a sandy part of the plant where the hole would cave in as soon as it was dug. He spent the rest of that week there.

Some of these six-week periods were broken up to a week with this crew and a week with a different crew. So you met practically all the service people of the whole plant except for the purely operating personnel. It was fascinating. You really got to learn the way of thinking of an hourly paid man. I recall one experience of working in a caustic evaporator. This was in the winter. The temperature outside was about ten below. The evaporator had a twenty-five to thirty foot diameter. We were standing on tube plates and drawing and replacing corroded tubes in the evaporator. You had caustic dripping down on you. Then as you changed tubes, steam would leak out because the valves weren't tight and the temperature inside the evaporator was about a hundred twenty degrees. The minute you stepped outside, your overalls froze solid. It was a trying experience but we lived to tell about it.

BOHNING: I think Ray Boyer went through the year before you did.

GOGGIN: He was a year ahead of me. I didn't realize he went through the regular student

course. They carried that on for a few years and then for some reason, they dropped it. I think one of the reasons was because they were hiring too many people. It was not practical anymore to spend that kind of money for the organization and logistics of sending them around different places. It had become a very big job.

BOHNING: Did you ever meet Herbert [H.] Dow during this period?

GOGGIN: Yes. It was easy to meet him. I met him more frequently afterwards when I was working in the Physics Lab. He was an enthusiast about the course.

BOHNING: Did he come out in the field?

GOGGIN: He was in the plant quite a bit, not necessarily checking up on the students but he would be there for other reasons and a student would run into him one way or another.

BOHNING: When you completed the student training program, it had already been decided that you were going to the Physics Lab.

GOGGIN: Yes. I was hired to do research work on the testing of the new plastics, which came out rapidly at that time, as electrical materials, insulators, plastics.

BOHNING: And you spent two years there from 1937 to 1939. What was your first assignment and whom did you work for?

GOGGIN: I worked for Dr. Loren Matheson, who reported to Ray [Raymond] Boundy who, in turn, reported to Dr. [John] Grebe. My first assignment was to set up the proper testing procedures for these new polymers as electrical insulators. To design the equipment, build the necessary cells for the testing, and do the testing work, although we already had fellows who did the actual running of the specific tests. That was the job. I became a little bit disillusioned with it, as it wasn't the challenge that I had hoped it would be. My interests were broad enough so that I soon became attracted by many of other things that were going on around me while grinding away at the testing of insulating fluids and solids, polymers, and things like that.

BOHNING: During that period you had a number of patents with Alden Hanson (2-6).

GOGGIN: All the new polymer materials made at Dow came through the testing lab, so I got to know different people who were supplying them and among them was Alden Hanson. He also graduated from Alma College so I knew him over there. I haven't mentioned it yet but I've always been interested in photography, as was Hanson. We got well acquainted through that. Then he began to do some work in copolymerization and I was quite attracted to what he was doing. Since we had worked together before, it was quite natural. Incidentally, when Matheson was going out of town, which used to be for quite a long period of time, I got a little free time to do some other things. By the time he had returned, I was pretty well immersed in copolymerization work with Alden Hanson and he didn't object to that. He was very easygoing and freewheeling because we were working on the cutting edge of polymer science and technology. I enjoyed that part of it. I understood enough of the chemistry to get along very well, in spite of the fact that I didn't have a Ph.D. in chemistry like some of the fellows. So that's how we got started in copolymerization and dealing with plastic materials.

BOHNING: So you really didn't do that much electrical testing?

GOGGIN: No, we didn't. I was glad for the breadth of experience I had had in physics, chemistry and math, which allowed me to help in fields other than just plain electrical testing.

BOHNING: There was one patent that intrigued me (5). It was an apparatus for stretching cordage.

GOGGIN: Among the polymers we worked on was Saran, which is a crystalline polymer. If you extrude it in a certain fashion, and quench it to make it super-cool, you could then stretch it and it would crystallize and form strong molecules just like nylon does. We were considering it for things like fishing lines and that sort of thing. One of the problems we had was stretching it at a constant torque but at very widely varying speeds. There was no equipment that you could use to increase the speed way up and still maintain roughly the same pull. So I designed an electrical motor apparatus that would do exactly that and patented it. There really wasn't much that came from the patent. There wasn't anything much that Dow was particularly interested in because we weren't going to make fishing lines for other than experimental reasons. So it died on the vine as far as being a useful patent. It's quite possible that an electric motor manufacturer might have been interested to make an unusual motor that would pull at the same torque for a widely varying range of speeds.

BOHNING: In 1939, you left the research lab. How did that come about since it's a rather drastic change from what you had been doing?

GOGGIN: Well, not really. Dow at that time, under Sherman Putnam, operated a Special

Products Department in Sales. It sold everything that didn't fit into Dow's major chemical categories. This meant a whole host of organic materials that were made in small volumes in the organic lab or physics lab. It was the job of this outfit to try to promote those materials in the development stage and carry them through to see whether they could be commercialized. One of our neighbors, Bill Melching, was working for Sherman Putnam and he got to know quite a bit about what was going on because of the discussions we had at the house. He knew that Sherman was looking for someone that would be interested in taking over the polymer work that was coming out of the Physics Lab that they were trying to promote—Styron and Saran and variations of those themes. Not ethyl cellulose because that was handled by the so-called Plastics Department that was promoting Ethocel. Sherman offered me the opportunity to come and join them in Special Products in the Sales department.

[END OF TAPE, SIDE 3]

BOHNING: What did you do when you arrived there?

GOGGIN: My responsibility was handling the plastic products that came along, which were quite a few, even including monofilaments. For example, we were selling monomers like styrene, vinyl toluene, vinyl chloride, vinylidene chloride, and polymers in the raw material form and even some finished forms. Also electrical materials, such as fluids that would be good insulators for transformers. It turned out to be a full time job. How they were handling it before was a bit of a problem.

It was quite a range of products. There were a dozen or so major products that I would try to promote. That meant traveling, keeping a lot of correspondence, and answering the phones. In general, attempting to sell materials, which were at the stage of development.

BOHNING: How did you make your contacts?

GOGGIN: Through advertising and several other ways. We had a catalog of organic and inorganic materials and polymers that we offered through trade magazines. It was just a listing of the chemical formula and the physical properties of the material and it was up to the customer to figure out what he wanted to do with it. We usually provided some suggestions. That was one way. Advertising was another way. We advertised in the chemical journals of specialty products. We had no trouble getting many responses. We were busy. It was a lot of fun.

BOHNING: How many people did you have at this time?

GOGGIN: In that department there were Sherman, Jim Harris, Bill Melching, myself, and for a period of time, Buzz Nelson. These were colleagues from the student course.

BOHNING: Had they come in there directly from the student course?

GOGGIN: In the case of Melching, yes. In the case of Nelson, he was in the Physics Lab for awhile and then got into sales of chemical products.

BOHNING: Two years later in 1941, there was another change. Was that the creation of Plastic Sales?

GOGGIN: It was the establishment of Plastic Sales by Clate Shoemaker, who became sales manager. Very shortly after that I became assistant sales manager. By that time the business had grown enough so that it was pretty much beyond Sherman's hands, although Clate Shoemaker did report to Sherman as part of a new expanded operation.

BOHNING: So Plastic Sales was still essentially under Specialty Products?

GOGGIN: Yes, for a period of time. These lines are not as fixed and clear as I make them sound. They're more vague than you might think.

BOHNING: Of course, the war started now. Did Plastic Sales come after the war started or before?

GOGGIN: I guess I'm not clear on that.

BOHNING: The war effort was really gearing up at this point.

GOGGIN: Yes, but slowly. It really hadn't gotten going as far as we were concerned. Later, it really began to boom, we spent practically all of our time on war material of one form or another.

BOHNING: You became manager of Plastic Sales in 1942.

GOGGIN: Clate moved on to become manager of international sales operations. I took his position as head of sales. We got things going, doing quite a volume of business mainly in Styron. We were dealing through Union Carbide and Fiberloid, which later was bought by Monsanto, and we had an agreement to sell them the raw material, which they then made into granules for molding into plastic materials. That worked out until 1940. At the end of 1940 our agreement with them was to expire. So, in October, before that occurred, I took a trip to Mexico to find out whether we could sell direct ourselves and not have to go through Monsanto and Union Carbide. I had a batch of granules and colored materials. I think I had one hundred pounds each of fifteen different materials. Mexico was having trouble at the time because they were no longer able to get the plastic materials they wanted from Germany on which they depended for plastic materials. I made a lot of contacts with molders in and around Mexico City trying out these experimental materials to see whether they wanted to sell them. I was discouraged by what appeared to be the lack of enthusiasm on the part of the Mexicans. I found out later it was a lack of enthusiasm for our Mexican representatives, not so much for what we were trying to do.

At any rate, by the time I left, I had gotten orders for something like three thousand eight hundred pounds of granules, which was a big deal at the time. Our Mexican representatives predicted that we would get something of that order. They understood the Mexicans a lot better than I did. That was our start of selling colored granules and plastic products directly and not through Monsanto and Union Carbide.

BOHNING: At this point, you were moving away from the technical areas to the extent that you weren't working at a lab as you had started out. How did you feel about that?

GOGGIN: In reality, that's not as true as you might think. Our materials were at a very early stage of development and they were pretty crude. We were learning a lot technically about how to improve them, and what to do about developing new applications. So there was a lot of high technology involved even then, but not in the sense of the research for the development of a new copolymer. I enjoyed the technology side of my work very much and the customers were greatly dependent on us for technology. What we were supplying was in effect technology rather than just materials. It was technical selling of the purest form.

BOHNING: Did you have your own laboratory facilities?

GOGGIN: Not then. We depended on the Physics Lab. The Physics Lab was very supportive of our activity because our products were the polymers that they were producing. Boyer and Boundy and, of course, Dr. Grebe provided all kinds of support.

BOHNING: Was your staff increasing?

GOGGIN: Slowly. We were becoming overburdened with the job because quite a lot of traveling was involved in following up the samples that we were sending out. We were sending out samples galore; and following up on those samples meant a big job. So the staff was beginning to increase. About that time, Ray Boundy, who had been responsible for the construction and operation of synthetic rubber and raw materials supply plants, particularly styrene plants, had finished up that job ahead of schedule and with greater capacity than anticipated. Dow was great at underestimating the capacity of the output of the plants and that was very true of the styrene plant program. Also the quality of the product was extremely good.

So Ray was asked by Dr. Dow to take over the plastics operations as a sort of general manager yet without two distinct lines of authority as far as manufacturing and R&D was concerned. He asked me if I would organize the development and technical service department, which I was glad to do. I was anxious to stay on the technical side of dealing with plastic materials and while I liked sales, I preferred the technical aspects of it. So, Art Young, who had come from the Cellulose Labs, took over coatings and I took over plastics to form what we called at the time, Plastics Development and Technical Service. He formed coatings development and technical service that was later shortened to Plastics Technical Service and Coatings Technical Service.

BOHNING: What year did this occur?

GOGGIN: Either in late 1942 or early 1943.

BOHNING: Who were your big customers in plastics that you were now dealing direct?

GOGGIN: We didn't have big customers. We were still supplying Monsanto and Union Carbide with raw materials as well as selling directly to the molders that we could supply and solve their problems at the same time. It turned out that in doing the coloring that Monsanto and Union Carbide did, they improved the properties of the product from a moldability standpoint, making it easier to flow, and until we learned how to do that, we were having problems with selling our product directly. Some of the larger customers were Bouton Molding, Shaw Insulator, and ThermoPlastics. All of them were relatively small. Businesses hadn't grown to a large size at that time, not like GATX that came some time later.

BOHNING: Now at this time between 1942 and 1943, the war effort was really strong.

GOGGIN: It was really starting to build up as far as the United States was concerned. It was pretty obvious that there was a need for polymeric materials for the war effort and that we ought to be heading in that direction. New products came along, Styrofoam for example, which had many possibilities. Another one that we were dealing with was polyfiber—polystyrene oriented fiber for radomes. That became a very important product for a short period of time. We moved into military applications gradually, but really fast from about 1942 to 1943.

BOHNING: Who were you primarily dealing with in the military?

GOGGIN: A lot of our dealings were with the Quartermaster Corps because their responsibility was supplying a wide variety of materials to the military and many applications could be served by polymers. We were also dealing with the Naval Research Laboratory on such things as body armor. We were dealing with MIT on the use of polyfiber for radomes. This was really an attempt to control the German submarine menace, which was knocking out our supply ships early in the war. We stretched polystyrene fibers, made up batts and, by heating them in a bag molding, made them in the shape of a radome that fitted into the head of DC4s and other airplanes that would fly up to about two hundred miles per hour—that was about the limit. The wind velocities would tear the radome off if the speed got much higher than that.

It was so important, that we were shipping out bags of polyfiber by freight car and airplane from Tri-Cities Airport to Marion, Virginia where they were molded. A full bag of polyfiber, maybe as long as this table, would weigh maybe fifteen pounds. This was developed by Alden Hanson. His theory was that if you could make a fiber by taking polystyrene dissolved in toluene or any other solvent, put it between your fingers and draw your fingers apart then there should be a way to do that commercially. The way it was done was to use two thousand-pound, nine or ten feet long, chlorine cylinders whose outer surfaces were machined to make a true cylinder. They were mounted on shafts, and then set side by side, a long series of them, each rotating in an opposite direction from its neighbors. A very viscous solution of polystyrene was doctored between the nips of the rolls and stretched out to form fibers. The fibers were collected with a harvester that went between the rolls and collected them into long batts. Then those batts were used for bag molding into a structure, the density of which could be varied from about 0.25 to maybe 0.6 or 0.7, compared to polystyrene which has a density of 1.05. Thus a reasonable dome transparent to radar waves was produced. That development was so important that solved the submarine menace that was obstructing traffic across the Atlantic.

BOHNING: Were there any other military applications?

GOGGIN: Yes, there were many. One of them was the packaging of fifty mm. caliber machine guns, which were previously shipped in cosmolene which is a very viscous, Vaseline-like grease, almost a solid. When they arrived in the field, they had to spend time cleaning them with carbon tetrachloride before being able to use the gun. The idea was to find a packaging

method for shipping that gun so that it could be taken out of the package and used immediately. They developed this so-called two packaging method in which the gun is mounted in a framework, and carried in a wooden box, but the idea was to put a membrane all around the gun and package it in there so that it was hermetically sealed. But they didn't have such a membrane. That's where Saran film came into the picture. We produced tubes of oriented Saran film that were so impervious they were practically like aluminum. The moisture vapor transmission was very low compared to any other organic material, so that the guns were shipped sealed in that way. It became a big thing. Frigidaire was making the guns and packaging them and shipping them. We sold a lot of that material through them.

BOHNING: When did you get your own facilities, laboratory, etc.? Did that come later?

GOGGIN: Yes. That didn't occur until after the war, about 1948. It was when we moved from the main office building. By that time, Coatings and Plastics Technical Services had probably a staff of ten people. Boundy designed a new office and warehouse building, with central warehouse facilities on the first and second floors, laboratory facilities on the third floor and offices on the front half of the second floor, with production wings feeding in at four points of the building. So it was a complete plastics center. That was the time that we got our laboratory. It became the third floor operation of the warehouse. It gave us a lot of room. We built excellent facilities there and continued to grow at a pretty rapid rate after that as the development of plastic materials improved so rapidly.

There were a number of other military applications, one of which was body armor. That was a striking thing. We found out working with the Naval Research Laboratory that you could take a few layers of woven glass, bond them together with ethyl cellulose, and use them as protection against fifty caliber machine gun or pistol.

[END OF TAPE, SIDE 4]

GOGGIN: I remember some of the striking things that occurred during those tests: a Navy lieutenant held an eight inch rigid panel of body armor in his hand and caught a 45 mm. caliber bullet. It bruised his hand a little bit but it was an effective demonstration of its quality. I think they used sheep and goats, to check the effects.

BOHNING: Was it used in helmets?

GOGGIN: No. As a matter of fact, this development came later in the war and it was used for body armor, like vests or flat sheets in airplanes. It would protect personnel and material in airplanes. It was the forerunner of the bulletproof vest that police wear these days.

BOHNING: How long past the war did this production continue? Or was much of that curtailed when the war ended?

GOGGIN: In general, things came pretty much to a screeching halt because everybody was working on war materials. A good example was the number of people that were working on the proximity fuse. There was no use for that fuse once the war was over so they had to find other things to do. There were a number of molders around the country that were deeply involved in the proximity fuse development. It was very successful after the ethylcellulose development and was the most devastating of any of the weapons that the Germans encountered. Are you familiar with proximity fuses?

BOHNING: Only vaguely.

GOGGIN: This is a small radar set that sends out a signal, reflects the signal back and tells you how far you are away from an object. So when you shoot a shell, you could lop it over, have it come down and explode above the ground, instead of hitting the ground and then exploding. It made foxholes worthless. You were no longer protected in a foxhole like you would be if it hit the ground and then exploded. It exploded over the foxhole and was devastating. It was a major factor in the termination of the Battle of the Bulge.

BOHNING: You said you were right in the middle of that. In what way?

GOGGIN: A number of us had secrecy clearances and yet for quite a period of time we were asked to supply materials with certain kinds of properties without knowing what the ultimate use was. So we really didn't know what we were trying to accomplish. That went on for quite a while until once when I was in Washington and called the chap that was in charge of the development of proximity fuses. I told him, "Look, if you're expecting us to be of any help, we must know more about what we're doing." I didn't mention the proximity fuse. He said, "We're very restricted in this." I said, "I know you are, but I have seen this operation several times in different molding shops and it's very clear what this is all about." He was quite shocked that the secrecy was that loose. So we got our secrecy clearances and were then able to work directly with the army people in trying to improve the electrical characteristics of the polymers so that it would be a good radar transmitter and receiver.

BOHNING: I think this brings us to your European trip in 1945.

GOGGIN: Yes. Early in 1945—perhaps even late in 1944, I'm not quite sure which—I received a letter from General Doriot stating that it seemed that the war was coming to an end and that it would be a good opportunity to observe what the Germans were doing with plastics applications as well as in polymer manufacturing. Would I be interested in joining a group to undertake an investigation of the industry? I was thrilled at the idea. Then I found out that John DeBell and Walter Gloor, whom I knew from contacts in the plastics industry and the Quartermaster Corps, had received similar letters. I replied that I would definitely be interested and that I could arrange things to get away.

BOHNING: Do you know how he picked your name?

GOGGIN: Probably because of the contacts that we had with the Quartermaster Corps and the success of our products. We had a number of good programs with the Quartermaster Corps, screening, plastic canteens, helmet liners, and other things that worked out really well. He was guided into this to some extent by Major Ed Hobson, who was given the responsibility of the liaison man with the team for the United States Quartermaster Corps.

BOHNING: When did you leave for Europe?

GOGGIN: We left around early May 1945. The war was just finishing. I think we left before the armistice was signed and flew to Washington from Stevensville and from there directly to Paris, avoiding several hotspots in Belgium and parts of France where the shooting war was still going on. We landed in Paris and moved to a billet in Montmartre, which was quite interesting. We knew that the allied occupational areas were pretty well defined and that the Russians were not yet up to their line. Patton had overrun some of the area allocated as the Russian sector. This area included a number of very important chemical and plastic plants. So we knew that the Russians would be moving in there sooner or later, and we also knew that when they did, it would be very difficult for us to get at these plants and to talk with the scientists.

So we proceeded immediately to East Germany. The pictures that we have are of the plants of Wolfen, Leuna, Schopau, and Bitterfeld. [Goggin shows photographs to Bohning.] All four were major chemical plants, each dependent on the other with Leuna as the basic plant. There were over eighty thousand employees in those plants during the height of the Reich. For chemical plants, that's quite sizable.

BOHNING: How badly damaged were these plants?

GOGGIN: The plants of Schopau, Bitterfeld, and Wolfen were not badly damaged. But the Leuna plant, which was the basic supply plant, was completely destroyed so that it couldn't feed

the other plants and they all had to close down. It was a programmed bombing of the Allies that did this. They were very effective in the way they went about it. They really blasted Leuna.

BOHNING: Were you the photographer?

GOGGIN: Yes, I was. I took about nine hundred pictures. The day we arrived I lost my exposure meter. So all of this was done without an exposure meter.

BOHNING: Well, you had enough experience in photography.

GOGGIN: Yes, I did. There are a lot of pictures. It was a fascinating trip. You couldn't help but respect the Germans for what they had done. Although, if Hitler had allowed them to carry on with the development of their ideas and to follow up on their research, they would have been much more advanced. But they had to spend much time on fuel for jet fighters, they put everything into production rather than new developments.

BOHNING: How were their scientists? When you went into these areas, the American troops had been there just a short time before. How cooperative were the Germans when you talked to them?

GOGGIN: In general, they were very cooperative. They were very proud of what they had done, and rightly so. In addition, they knew that we had the power of authority and could put them in jail without any trouble if we felt they weren't cooperative. So we found a relatively small percentage of the German scientists who were not cooperative and who would not lead us to the inventors of their innovations. We depended on such leads. We didn't know many of their scientists or about a lot of the things that they were doing. Nor did the Allies know about them. As we mentioned in the book (7), there were quite a few new materials that we knew nothing about, especially the isocyanates.

BOHNING: Were there any big surprises?

GOGGIN: I'd say the isocyanates were the big surprise. Also some tremendous dryers were quite some developments too. Here we list some of the outstanding developments [Goggin refers to book, see note (7).]: caprolactam polymer for synthetic fibers, magnetic iron oxide film for plastic tape recording. Magnetic tapes were not known in this country at all and yet they were using them on the battlefield.

BOHNING: How long were you there?

GOGGIN: From early May until well into September and we were traveling all the time. We had our own weapons carrier and men assigned to us. We figured that we traveled about ten thousand miles throughout Germany, just going back and forth. Well-received, practically everywhere we went.

BOHNING: You talked about the scientists. What about the German people that you interacted with?

GOGGIN: They were very frightened of us, generally speaking, just as they were of the soldiers. We had our own A-rations, which were pretty good. We would be traveling fairly late some nights, not getting back to where we wanted to go and we would pick out a German country house, stop in and ask if we could come in and warm up our food. They would be pretty frightened at first and then they would warm up as we offered them food from our rations and become quite friendly. It was a fun experience.

BOHNING: Were you in Berlin?

GOGGIN: I did not go to Berlin and John [DeBell] didn't either on this trip. There was nothing much for us in Berlin, except just to say that we had been there.

BOHNING: You said you got information on other areas from people that you had talked to. What types of plants were you looking for? Were you looking for all kinds of chemical plants?

GOGGIN: We were looking for those chemical plants that had anything to do with polymers: rubber, foams, any of the polymeric materials, including the monomer plants that supplied them. So this book covers the technologies for monomers and polymers, up to plastics applications. That was our responsibility although with limited emphasis on rubbers, because there was another team doing that investigation. We were interested in synthetic rubbers only as far as they were used for plastics type application. So we didn't spend much time on synthetic rubber plants. We were interested very much in production processes for styrene, butadiene, vinyl chloride, ethylene, and other monomers.

BOHNING: On Monday I talked to Dr. [Ernest H.] Volwiler, of Abbott Labs. He had been in Germany as part of a team investigating pharmaceutical supplies.

GOGGIN: He had quite some experiences too, hadn't he?

BOHNING: Yes. But he was in later.

GOGGIN: He probably didn't get a chance to get in some of the Russian plant areas.

BOHNING: No.

GOGGIN: They were pretty rigid.

BOHNING: Did you manage to cover those areas before the Russians came back in?

GOGGIN: Oh yes. That's what we did. The plants that I speak of—Wolfen, Schopau, Bitterfeld, and Leuna are all in the Russian territory, surrounding the city of Leipzig. That was the biggest single concentration of plants other than Ludwigshafen and a few places like that. But we managed to cover them thoroughly before the Russians were allowed in there. The military people from the Chemical Warfare Service would arrange to get the scientists out and to get the key equipment out, so far as was possible, before the Russians moved in and did quite a job of it. The Russians who inspected these plants afterwards said they just didn't understand how they operated.

BOHNING: Did you see any of the Russians or were you gone before they arrived?

GOGGIN: Oh, no. We ran into the Russians and got into the Russian territory and into a few plants, but a great struggle was needed. We did it more or less to find out whether we could get across the Elbe and into some Russian sector plants.

BOHNING: Did the Russians have scientists in these plants?

GOGGIN: No. As far as we could tell we didn't have any Soviet counterparts. The people in the Russian sector had not been previously interviewed by anybody other than the military.

BOHNING: Did any of those scientists come to the United States as a result of this?

GOGGIN: Many of them visited the United States later. We've had many of them here in Midland. I don't know of any, other than the rocket people (Werner von Braun and his team) who were moved to the United States and developed things here. I don't know of any Germans who became employees in the United States, with the exception maybe of Rohm and Haas, which had close contacts with its German counterpart.

BOHNING: Did any of this information help you when you got back to Dow?

GOGGIN: Naturally I was very interested in some of these materials that were new to us and would have liked to have seen them developed by Dow. For example, I would have liked to have seen Dow interested in isocyanate chemistry in spite of the fact that we were in aniline, nitrogen chemistry. Dr. Veazey would have no part of it. He didn't want to have anything to do with it. I don't think he knew anything about it but he wouldn't even consider any possibilities. There were some possibilities in the cellulose area, particularly with methylcellulose. They had advanced much farther on the production of carboxymethylcellulose than we did. Some other materials like vinyl chloride and styrene were also interesting.

BOHNING: What happened to the equipment that was removed from the plants in the Russian sector before the Russians came in?

GOGGIN: It was moved back to West German plants and some smaller pieces of equipment were shipped to the United States.

BOHNING: Do you know what happened to them in this country?

GOGGIN: No. As a matter of fact, I'm not sure that the full advantage was taken of much of the stuff that came back. I think we published the most comprehensive book of any of the teams that were there.

BOHNING: It's extremely thorough. There's no doubt about that.

GOGGIN: Yes. It has everything in it that we picked up.

[END OF TAPE, SIDE 5]

BOHNING: Let's look at the postwar activities. As we said earlier, when the war many things changed. Demand stopped for a number of items. What happened in PTS [Plastics Techincal Service] during the postwar period?

GOGGIN: That was before we had really begun to grow very much. We had the problem of transition from war products to civilian products like everybody else. Companies had done a certain amount of postwar planning, but not many of them had reached the point where they could begin production. Our growth was slow during that period. It gave us time to write books and things like that. Demand really began to pick up in about 1947 or 1948.

BOHNING: You had polio in 1950 and I indicated to you on the phone that we shared something in common. I was wondering if you wanted to talk about your experience.

GOGGIN: One of the interesting things about this town is that a high percentage of the people travel a lot. It's a pretty worldly town in spite of its remote location. People do travel a lot and so there's a lot of exposure. It happened that a number of the people that were traveling came down with something that resembled polio. At the peak, I think there were one hundred thirty-three cases in town, which is substantial for a town of this size. A number of deaths, and some others requiring artificial respiration. I went deer hunting at Thanksgiving time, when the weather was cold and wet. I don't think we had any luck in deer hunting and I came back with what amounted to a cold, chills, and all that goes with it. We had a very close friend who was our family doctor. He came over to see me. At that time doctors were still making house calls. He couldn't figure out what the problem was. It didn't seem to be a typical case of flu or just a cold. It was a little more complicated than that and he didn't know what to do about it. He just kept me under surveillance here for awhile. But after a period of several days and no improvement, he decided I should go to a hospital and take some tests. By this time, the polio epidemic was in full bloom. He decided to do a spinal tap at the hospital. I could tell from the way that he did it that he had very little experience. His preparation was extensive. This spinal tap showed the presence of polio and so they immediately wanted to get me out of the hospital. I was *persona non grata* there. In Pontiac, Michigan there was at that time a polio clinic. I was taken there by ambulance and was immediately put into their program of hot packs and exercise. I had some muscular disability, not a lot, but generally just a plain malaise and felt run down. There was a doctor who ran the clinic and she was just expert at taking big husky fellows and giving them exercises that strengthened and lengthened muscles.

After about three days of hot packs, I began to develop very painful skin problems. They called a dermatologist who tried all the regular treatments. This was long before the steroids that are so effective with skin treatments these days. They tried everything they could but more and more skin kept coming off. There was almost complete defoliation during the

night. When I woke up the next morning, the problem was how to peel off the sheets. They were just one big pool of serum. It was a pretty messy situation.

That went on for quite awhile and finally was put under reasonable control. I came back home one day and I stayed in our bedroom where apparently there was some fungus which activated the skin problem again and I was right back in the same jam. Then I went back to the dermatology department at Ford Hospital. Dr. Menole was the real old-timer there that knew his business. They had all the old-fashioned systems there for treating dermatological cases—none of the new ones that are now available. They were just becoming available then and they didn't want to try them on a radical case such as mine.

I spent practically the whole year out. I finally got back to work around Thanksgiving of the following year. I spent most of the time either in Henry Ford Hospital or in their recovery home on the hills near Pontiac. It was a real terrible ordeal. At first when I came back I lived with my mother in Alma and, when I could, drove back and forth to here. But the fine thing about the whole situation as far as I was concerned was that Dow supported me all the way through. Never was there any question about cutting my salary or releasing me. They just carried right on. Of course, I had very good staff to help in Plastics Technical Service, although one of my closest assistants suffered from this polio epidemic too. It seemed to hit certain organs. In my case, it was the skin, in other cases, the liver, or stomach, or something else. Along with that, muscular dystrophy. It was a very unusual type of illness. I've had to be very careful with skin problems ever since. It's been a continuous nightmare to keep out of trouble.

BOHNING: Did you receive the article that I sent you on Sister Kenny?

GOGGIN: Yes, I have it right here. I enjoyed that and remembered having read it. We also receive the *Smithsonian* and I recognized it after you sent it. I appreciated receiving it. That was a pretty effective treatment. It sure helped a lot of people. When I arrived in the sister polio clinic, there were twenty-seven patients from Midland, from husky football players to babies. It was really pretty much of an epidemic in this town and we blamed it on the fact that people traveled so much. They were run down from quite a lot of traveling and they brought in all sorts of problems from the outside world.

BOHNING: I had an aunt who had polio at about the same time. She was in Palm Springs, Georgia where Roosevelt had been. In my own case, I just stayed at home for a year and once a week I was taken to Children's Hospital for Sister Kenny treatments.

GOGGIN: Hot blankets and exercise?

BOHNING: Mostly exercise at the time.

GOGGIN: How old were you?

BOHNING: Seven. And then one day the doctor came in and said, "You're going to walk." He got me up. My mother was on one side and he was on the other and that's how I started.

GOGGIN: Did you have any permanent impairments?

BOHNING: I have bad legs and have to be very careful. I do a lot of walking but I still have weak ankles and bad knees. I can still get around all right so that's all I care about.

Getting back to your career, in 1954 you received an honorary degree from Alma College.

GOGGIN: Yes. Professor Clark kept an eye on some of his students and that included me. He knew of my work on the German plastics team as well as some of the work that I had done earlier and the fact that I was getting along pretty well with Dow. So, I believe he instigated the honorary doctorate degree for those and probably other reasons too, which I'm not aware of. I was very pleased to have been a recipient.

BOHNING: In 1959, you became general manager of the Plastics Department. PTS existed from 1947.

GOGGIN: PTS started as a plastics development technical service in 1943 and carried right on through 1959 and beyond. PTS reported to the Plastics Department, which was a very small organization. It consisted of Ray Boundy and a number of people that he felt were key people in coalescing and pulling together the total corporate interests in plastics, but it was placed not on a direct line relation with other departments. This became pretty much the model for the MDO—multidimensional organization or matrix organization.

Reporting to Ray Boundy's operation on a line basis was the Plastics Technical Service, the Coatings Technical Service, and certain research facilities. Boundy's philosophy was pretty much that if you control the development and technical service of a product line, you've got a pretty good control of the whole business. He made it his task to see that the business aspect of plastics was taken care by the staff in his department who were essentially business-oriented. He developed this philosophy of a matrix type of organization with dotted line, rather than line, responsibilities. It was clear that this experiment would work because he was given the

authority by Dr. Dow. He reported directly to the president of the company and was for all practical matters, the equivalent of a vice president.

BOHNING: When you took this over in 1959, did you succeed Ray?

GOGGIN: No. I succeeded Ben [C. Benson] Branch, who had followed Ray. Ray moved to become Director of Research. Ben had been on the job about four or five years so he must have replaced Ray somewhere between 1953 and 1955.

BOHNING: You've hinted about the origins of MDO. Is Ray responsible for those early embryonic stages?

GOGGIN: Yes. Ray is responsible for attempting to run the plastics business at Dow without having full line responsibility for manufacturing, as was historically the case in the past. In the past the manufacturing operations at Dow were the key operations. Sales were sort of subservient to it.

BOHNING: I understand that somewhere after 1959, when you became manager of the plastics department you undertook a reorganization which eventually attracted the interest of the Harvard Business School. I'm not sure of the dates, but could you tell me about that.

GOGGIN: I attempted to expand on what Ray Boundy had already started which was essentially the start of a department that controlled the business through logistics and financial information. It was the intelligence center for plastic materials at Dow. Not too long after I became head of plastics, we were asked by a couple of researchers from Harvard, Jay Lorsh and Paul Lawrence, if they could come out and talk to us about the way we ran the operation. They were doing a study of a number of companies and the way they ran their plastics operations. I don't know who the other companies were. We were glad to talk to them and to get their ideas. They had good ideas too. They studied this organization and the way it operated from an academic standpoint, later published a book or two on the types of operations they had reviewed (8), where they examined the advantages and drawbacks of integration versus differentiation in the organization. Was an organization pulled together by integrated departments or by differentiated departments or by something in between?

MDO was sort of a combination of both. They found it quite intriguing and very effective. It worked out very well. We had a thriving business in plastics, expanding at a good rate per year, showing good profitability. It was a thriving operation, no question about that.

BOHNING: What were your major products during this time?

GOGGIN: Styron, Saran, Saran film, ethylcellulose, Styrofoam, plastic lined pipe, epoxy resins, latexes, monomers, etc. Dow was big in monomers.

BOHNING: How big was the staff of Plastics Technical Service when you left there?

GOGGIN: We started with a handful of people. I don't have exact figures, but I'm sure that by the time that I left, plastics and coatings technical services was at least two hundred strong. It had grown rapidly throughout those years. Another one of Boundy's premises was that we kept our operational costs within a certain percentage of sales. I don't recall what it was but something close to one and one-half percent of sales was our limit.

BOHNING: What about the physical facilities? Were you brought together in one place then?

GOGGIN: They were all brought together in a very large laboratory for fabrication of plastic products and the making of films. Not long after that, we started the fiber business because Dow was interested in the possibility of going into the textile fiber manufacturing business. At any rate, they were the biggest in the industry. It was quite an attraction for our competitors to see what they could of what we had. We were quite pleased to show them, because we felt that if we could interest them in investing in this sort of thing to promote the total plastics industry, then their investments would be more like ours and obviously, it would do the whole industry good without damaging ourselves too much.

BOHNING: Did others pick up on this?

GOGGIN: Yes. Du Pont was very active at picking it up. Union Carbide to some extent. General Electric was quite interested. They asked to come and we welcomed them, showed them the whole setup, the money we were spending and encouraged them to get into the industry in the same way.

BOHNING: I think you had an article in *Chemical and Engineering News* (9). Did you get much response from that article?

GOGGIN: Yes, it generated much interest, both in the United States and abroad.

BOHNING: Where abroad?

GOGGIN: BASF. At that time we were doing quite a lot of traveling, so that we were becoming known abroad. In Germany at first, then France, England with ICI and then later with Asahi and others in Japan.

BOHNING: Moving back to when you were in the plastics department, you were asked by Ted Doan to organize Dow's general chemical business.

GOGGIN: That's not quite right. I was asked by Ted Doan to show him how we were organized, so that he could organize the chemical business. He was my counterpart in chemicals. He had watched what we were doing in plastics and wanted to do the same thing for chemicals. He came over and we went through the whole organization. He then proceeded to reorganize chemicals on that same kind of basis.

BOHNING: You said you were the first person [from Dow] to go to Harvard's Advanced Management Program [AMP]. How was that decision made?

GOGGIN: There were two schools of thought at Dow at the time. One was that this advanced management program business was a lot of malarkey and it was largely supported by Ben Branch and a few other people. Ted Doan's philosophy was quite the opposite. He felt that there was a fair amount of good to be obtained by attending those programs and was worth a trial. I was not the first to go to Harvard. There was a chap that went for PMD—Program Management Development—ahead of me. But no one had gone to the AMP at that time. Ted asked me if I would be interested in going and I jumped at the chance to get some more education and was very enthused about it. Frankly I did enjoy it. He was so interested in the Program that he came while I was there to monitor the program and got a big kick out of that.

[END OF TAPE, SIDE 6]

BOHNING: I think that was about three and one-half months?

GOGGIN: Yes.

BOHNING: Could you tell us something about your experiences there. What procedures or courses did they put you through?

GOGGIN: They put you through a very rigorous course. The in reading was far and beyond of what any person—at least the average reader—could accomplish. It was mainly case studies, including some Dow cases, which I had a chance to elaborate on during the course. It was a very intensive program with a lot of interaction between the professors and the students.

BOHNING: How many students were there?

GOGGIN: My recollection is a hundred forty to a hundred fifty.

BOHNING: Oh, that large. I was thinking in terms of a very small number.

GOGGIN: Oh, no. It's a good-sized number. These fellows are all pretty much your peers.

BOHNING: Were there many from the chemical industry?

GOGGIN: Not many. Almost none. I was about the only one, except for Al Giacco of Hercules, who's another fellow that you might want to interview. He's now president of the company. It was an interesting experience of living together. There was a great deal of politicking to decide who should be president of the class. I was campaign manager for my roommate, who became president of the class. My candidate for secretary lost by one vote. So I didn't make out too well there.

BOHNING: Who was your candidate for president?

GOGGIN: A chap by the name of Dick Duncan who was at that time an executive vice president of Dunn and Bradstreet.

BOHNING: Well, considering your earlier experiences, you were president of the student government back in college. I'm trying to think of you in terms of being a campaign manager for someone.

GOGGIN: Well, I've had a little experience in it.

BOHNING: I take it then that you had quite a bit of interaction with the other people in the program.

GOGGIN: Yes, a great deal.

BOHNING: Did you all live in the dorms together?

GOGGIN: Yes, day and night, and weekends. We worked hard, except for a few very few playboys. There were three or four at the most who really didn't take it very seriously. We were a hard working group. There was a lot of appreciation of what was going on. The professors were very good. We really had a lot of respect for them. They were excellent. I became friends with many of them and with the Dean, Larry Foracre. He was a great personality. As a matter of fact, he became so interested in our matrix or MDO type of organization, that he reorganized the Harvard Business School on the basis of a matrix organization, with good cross-relationships.

BOHNING: At the time that you were there in 1965, was the development of MDO in your mind? Its origins date before this.

GOGGIN: I had prepared a talk with slides and the appropriate visual aids to demonstrate what we were trying to do in Dow and used it there. And again, when Foracre and the school became more interested it. However, it wasn't until after I was with Dow Corning that I began to lecture extensively on it by invitation at Harvard, MIT, Michigan, Alma, and places like that.

BOHNING: At the time you were in the AMP program.

GOGGIN: It was still in the formative stages. It was developing.

BOHNING: Had MDO reached any form of crystallization in your mind yet?

GOGGIN: Oh, yes. It was moving right along. We were satisfied with it in Plastics at Dow. We developed annual reports and one and five year plans. I still have thick volumes on annual

plans and reports that we developed there. My colleagues complained a little bit about having to do all of the work. But after having gone through it once or twice, it became much easier.

BOHNING: In the AMP program, were you in classes all day?

GOGGIN: No. The structure was usually three classes a day. Two were in the morning and the third in the afternoon. Then you had free time from about 2:30 or 3:00 on, to try to catch up on your homework—that wasn't enough. The workload was purposely heavy. There were probably fellows who could read it all the way through and get something out of it. As a matter of fact, in some of the subsequent courses, there were speed-readers who were quite good at that. They could read through it fast enough to allow themselves enough free time to bother other people.

BOHNING: How many different Harvard faculty participated? Did you get a good broad spectrum of their faculty?

GOGGIN: We got a broad spectrum for the standpoint of their talents, but in terms of numbers of participants, probably seven or eight handled the whole course. It wasn't a very large number.

BOHNING: What time of the year was this?

GOGGIN: It started in the winter—not long after the first of the year and carried on through until May.

BOHNING: A spring semester.

GOGGIN: Right. Normally, they have one in the fall and one in the spring. Once in awhile they would run a summer program, but not too frequently.

BOHNING: It was shortly after this that you made the move to Dow Corning. Could you describe how that sequence of events took place, leading up to the move?

GOGGIN: One day at the Country Club, Ted Doan suggested that I describe the plastics organization to the Corning Glass people. I took a rather dim view of this since Corning Glass

was a prime example of a well-established line staff organization. The change to an MDO didn't seem very promising. I didn't respond very quickly, and I soon learned that that was not a request but a command. So I promptly went to New York and made a presentation in the boardroom of the headquarters of Corning Glassworks. The presentation didn't go very well. People kept wandering in and out of the meeting. Most of the Corning board members were there however, although I was really discouraged by the time I had finished.

Later, my boss Ben Branch asked me to meet with Carl Gerstacker and Ted Doan in his office. They said the meeting in New York had gone quite well, so well that they asked me to join Dow Corning as president. Again, this was not a request but a command. This meeting took place early in August and I was asked to make the change as quickly as possible. They hoped it could be accomplished by early September, so there was not much time. I knew very little about Dow Corning and met some of the individuals only socially. I was concerned about the personnel situation and wanted to take some of my people with me. I had trained a number of very good people. I was very pleased with them and would be happy to take them along. I was told that I could have anyone I wanted so long as they came from Dow Corning.

This proved to be a blessing in disguise since there was a lot of latent talent within Dow Corning. So that's the way the whole thing came about. I moved over there in September. Dr. Bass was very anxious to get things going as quickly as possible to make the changes necessary there.

At the time of the board meeting there were several reasons for considering additional personnel at Dow Corning. I later learned from board members that Dow Corning had inadequate financial controls, cumbersome communications, and not all the divisions were communicating with one another, while there was not adequate vertical communication. The long range planning was uncoordinated and totally insufficient. Competition was rough and in 1967 profits were deteriorating quickly so that the members of the board felt that something should be done. Hence, the reason for the board's concern for getting a new President and reorganizing Dow Corning. I have a feeling that this write-up will take care of quite a lot of your questions (10).

BOHNING: If I could get a copy of that, I could just add it to the transcript. After you arrived at DCC [Dow Corning Corporation], how soon did you start implementing these changes and how long did it take before MDO was in effect?

GOGGIN: In one respect, right away I started talking to various groups about the credo and the principal things that were involved, like pushing management decisions well down into the organization, communication in all directions, etc. Then slowly we went about the process of selecting business managers. We started economic evaluations, which I thought were very important. There was no way of really communicating on an economic basis. So it was important to get that established. Along with that, we established methods for doing economic evaluation. I don't know if you're interested in those things or not.

BOHNING: I think we should include them.

GOGGIN: In order to establish a uniform, economic language, we put together analyses like this. Here's the first page. [Goggin gives Bohning an example of an economic evaluation (11).] When I first arrived at Dow Corning, Board meetings took two days. By the time I got established, Board meetings were done in two hours. That resulted from streamlining the organization so that everybody is talking a common language and they know what they're talking about. You don't have to go back and explain everything. You don't have to write a two-volume book to get a six million-dollar authorization through. It's covered right here in black and white so if you have some knowledge about it you can ask questions about it. That's the way the whole thing was designed to work.

Now to get back to your question about how long it took to implement the whole pattern, I arrived in 1967 and by 1970 or 1971, we were in pretty smooth running order.

BOHNING: You indicated that you had a lot of latent talent at Dow Corning. How did you identify that?

GOGGIN: I was very fortunate in having as head of the personnel department, Jack Lettington. Jack is an economics graduate from Albion but his main interest was personnel. So it was easy to go to Jack and ask for the engineers in the organization who had an MBA degree. That's a perfect background for doing economic evaluations. He was able to sort out about twenty fellows for the first group to start an economic evaluation program. I brought over from Dow a key man in our Plastics Department, Ed Zacharias, who taught this class in economic evaluation. From there on, Ed Steinhoff was able to carry on so that we didn't have to use a Dow man with subsequent groups for economic evaluations.

BOHNING: I'm intrigued by how one accomplishes making such major changes in an organization in such a short period of time. Did you meet much resistance?

GOGGIN: One of the reasons that we could do this was that we knew it was going to be done. There wasn't any question about whether we were going to reorganize. We were going to do it and do it in a fashion that was as pleasant and undisturbing as possible and yet get the job done. Sure, there was resistance, but there wasn't a violent kind of resistance that you'd expect if they didn't know that we were definitely going to accomplish the task. There was probably a little bit of dictatorship involved, as well as the planning and implementation.

BOHNING: How did you reach the lower levels of the organization?

GOGGIN: First, you have to convince the upper levels that they're in tune with what you want to do and to provide their support. Then they will go about convincing the lower levels. It worked that way very well. I didn't attempt to try to reach all levels and convince them because just going through things like a credo of principles; you're just not going to sell people. They have to live in it and be with it to get some impression of how the thing works. Here's an article that appeared in 1978, from *Business Week*.

BOHNING: Lawrence and Loursh eventually did publish a book.

GOGGIN: Yes, and I thought I had that book. I have one of their books but I don't think it's the right one. They have published quite a few books. They did publish a book, not in this particular organization, but on their philosophy of management as this organization was related. They didn't identify the organization but what they're talking about is the way that this is run. Here's another thing that pretty well describes the way I worked at the time. [Goggin gives Bohning a paper (12).]

BOHNING: We'll have to get you writing more history.

GOGGIN: Well, I've written quite a bit. Are you interested in those personal things?

BOHNING: Oh, yes. [Bohning refers to paper given by Goggin.] You had as many as four thousand products?

GOGGIN: A tremendous number. Almost impossible to deal with, so a big new development program was to get rid of products. That was one of the more painful things because people have their own babies that they think should be protected, regardless.

[END OF TAPE, SIDE 7]

BOHNING: What basis did you use in selecting the ones that you were going to eliminate?

GOGGIN: Profitability. If they were new enough, then we didn't worry too much about

profitability. But if they were old products with small demand and low profitability and nobody could convince us that they were going to improve, then we would eliminate them.

BOHNING: How many did you eliminate?

GOGGIN: We finally narrowed it down to fifteen hundred and eliminated more than half of them. Then we allowed it increase again with new products, as they were developed.

BOHNING: I'm intrigued by this because of my discussion with Dr. Volwiler; he became president of Abbott Labs around 1950. One of his first moves was to eliminate about one hundred old products. So he did exactly the same thing, very quickly. You said you were making changes slowly, but some were radical. What were the more radical changes?

GOGGIN: I don't recall what I was referring to at the time. Quite a few of these changes were radical because they meant major moves for an individual. For example, we moved personnel right out of a function and into a business. We had no qualms about moving people. That practice has been followed to a high degree since. Dow Corning is a very mobile organization. I kept records and found that we had moved twenty-five percent of our salaried people in one year from one job to another without losing them. This was not eliminating people. It was changing an employee's job entirely and you'd be amazed at how well they'd adapt to the new job, if they're flexible and talented. We had many of those kinds of people.

BOHNING: Were there scientists in this group?

GOGGIN: Oh, yes. Everything from chemists, physicists, engineers, business people. We judged our personnel in terms of their talents without regard to their academic background, which after a while with the company tends to become less significant.

BOHNING: As you look back on the whole reorganization and development of MDO, are there any particular experiences of your own that helped you to develop.

GOGGIN: Most of my experiences are build into the *Harvard Business Review* article (10). If you want to get my experiences, you'll find them in that article. There's one thing worth mentioning that I don't say in any of my writings. Even with my move to Dow Corning, all of the executives in Dow Corning have come either from Dow or from Corning originally and were, generally speaking, high technology people, frequently mostly chemists. I was convinced that running that organization is a business proposition, almost without regard to a fellow's

background if he has the proper ability and talent. Early on it occurred to me, particularly after he had attended the advanced management course, that Jack Ludington had the ability to lead Dow Corning. He's an economics graduate from a liberal arts college, a college competitive to mine. I was convinced that he was the best talent that we had to run the company and that he would rely heavily on technical abilities of other people to support any shortcomings that he might have himself.

This was a difficult thing to sell—somewhat difficult to Corning. He just felt that he didn't have the ability to do it and it was like an awful pull to get him convinced to even give it a try. But he finally agreed; largely the running of this company is handled between the chief executive officer and the two chief executive officers of Dow and Corning. Those three people are the triumvirate that really runs this company, with the chief executive officer of Dow Corning being the principal one. He calls the shots but the other two have to agree. Otherwise, the shots don't stay put. I felt that if we could bring a man from within Dow Corning, it would give the troops some really good signals and secondly, there was a good chance he would do a fine job in running Dow Corning. And I must say, he's done a fine job since I've left. Our compounded growth rates, while not achieving our total fifteen percent that we had hoped for annually, which is an outstanding rate, have achieved twelve, thirteen, and fourteen percentage increase per year, which in itself is outstanding. That's doubling every five or less years. This coming year, Dow Corning will be a billion dollar organization with over one hundred million dollars of profit after taxes. That's better than ten- percent return on sales after taxes which is quite outstanding, better than either one of our parent companies. As a matter of fact, Dow Corning has paid back its principals more than one hundred times their total investment in Dow Corning. So you can see why they are not interested in selling any Dow Corning stock. They own it fifty-fifty.

BOHNING: That original combination came about on a handshake, didn't it?

GOGGIN: Yes, it did. You'll get a real good story from Earl Warrick on that and from the book he's writing. I'm sure he was close enough to that—much closer than I was. It's too bad; the fellow you really should get is Shailer Bass, but as you know, he's had a stroke and is in bad shape. He would have been a valuable addition to your program.

BOHNING: Well, I've reached the end of my questions. Do you have anything else that you think we should add?

GOGGIN: Do you want to know anything about my participation in boards of directors?

BOHNING: I did not talk about your activities in professional organizations. You were involved in SPI [Society of the Plastics Industry].

GOGGIN: SPE [Society of Plastics Engineers] and PMMA [Plastics Materials Manufacturing Association] and MCA [Manufacturing Chemists' Association]. I've been very active in those organizations, either as a director or a committee chairman or both, and in the case of PMMA as their president in the early 1960s.

BOHNING: Thank you very much for a fascinating morning and afternoon. I appreciate your taking the time to develop all of this with me and especially for sharing all of this information with me. Thank you very much.

GOGGIN: If you have questions when you go through it, just let me know.

BOHNING: All right. Thank you again.

[END OF TAPE, SIDE 8]

[END OF INTERVIEW]

NOTES

1. R. S. Karpiuk, *Dow Research Pioneers: Recollections* (Midland, Michigan: Dow Chemical Company, 1985).

2. Alden W. Hanson and William C. Goggin, "Vinylidene Chloride Copolymer," U.S. Patent 2,238,020, issued 8 April 1941 (application filed 2 June 1939).

3. Alden W. Hanson and William C. Goggin, "Stabilized Vinylidene Chloride Compositions," U.S. Patent 2,273,262, issued 17 January 1942 (application filed 19 September 1940).

4. Alden W. Hanson and William C. Goggin, "Preservation of Textile Materials," U.S. Patent 2,371,618, issued 20 March 1945 (application filed 21 Febraury 1941).

5. William C. Goggin, Lorne A. Matheson and Alden W. Hanson, "Apparatus for Stretching Cordage," U. S. Patent 2,372,627, issued 27 March 1945 (application filed 20 August 1942).

6. Alden W. Hanson and William C. Goggin, "Vinylidene Chloride Compositions," U.S. Patent 2,384,910, issued 18 September 1945 (application filed 18 July 1941).

7. J. M. DeBell, W. C. Goggin and W. E. Gloor, *German Plastics Practice* (Springfield, Massachusetts: DeBell and Richardson, 1946).

8. J. W. Lorsh and P. R. Lawrence, *Developing Organizations: Diagnosis and Action*. (Reading, Massachusetts: Addison-Wesley, 1969) *Ibid.*, *Managing Group and Intergroup Relations* (Homewood, Illinois: Irwin, 1972).

9. Anon. "Dow: A Chemical Empire," *Chemical and Engineering News*, 37(17) (1959): 32-37.

10. W. C. Goggin, "How the Multidimensional Structure Works at Dow Corning," *Harvard Business Review*, 52 (1974): 54-65.

11. See CHF Oral History file #0047, William C. Goggin. Dow Corning Corporation proforma for Capital Authorization Request.

12. W. C. Goggin, "A Decade of Progress: Multidimensional Organization Structure," *University of Michigan Business Review* 31.

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