

CHEMICAL HERITAGE FOUNDATION

RAPHAEL KATZEN

Transcript of Interviews  
Conducted by

David C. Brock and Arnold Thackray

at

Chemical Heritage Foundation, Philadelphia, Pennsylvania and Bonita Springs, Florida

on

20 October 2000 and 2 February 2001

(With Subsequent Corrections and Additions)

CHEMICAL HERITAGE FOUNDATION  
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## RAPHAEL KATZEN

1915 Born in Baltimore, Maryland on 28 July

### Education

1936 B.ChE., Polytechnic Institute of Brooklyn  
1938 M.ChE., Polytechnic Institute of Brooklyn  
1942 D.ChE., Polytechnic Institute of Brooklyn

### Professional Experience

1937-1940 Northwood Chemical Company  
Chemical Supervisor  
Director of Research, Chemical Products

1942-1944 Diamond Alkali Company  
Technical Supervisor for Research and Development,  
Northwood Project

1944-1953 Vulcan-Cincinnati, Inc.  
Project Manager, Design and Construction  
Manager, Engineering Division

1953-1997 Raphael Katzen Associates International, Inc.  
Chairman and President, Consulting and Process Design  
1953-1980 Managing Partner

1998-present Raphael Katzen, P.E.  
Consulting Engineer

### Honors

1986 Chemical Engineering Professional Practice Award, American  
Institute of Chemical Engineers

1988 Outstanding Personal Achievement in Chemical Engineering  
Award, McGraw-Hill Chemical Engineering

1990 Robert L. Jacks Memorial Award, Management Division,  
American Institute of Chemical Engineers

1996 Election to National Academy of Engineering [Bioengineering,  
Chemical Engineering]

- 1997 C. D. Scott Award, Symposium in Biotechnology for Fuels and  
Chemicals
- 1999 Lifetime Achievement Award, Renewable Fuel Association
- 2000 Special Lifetime Achievement Award, Significant Contributions  
in Engineering Biomass-to-Chemical Processing Plants,  
American Chemical Society
- 2000 First Award of Excellence, International Fuel Ethanol Workshop
- 2001 Founders Award, American Institute of Chemical Engineers

## ABSTRACT

Raphael Katzen begins the interview by discussing his family background and childhood. He attended an all-boys high school, DeWitt Clinton, in New York and graduated from Polytechnic Institute of Brooklyn [Poly] with a bachelor's degree in chemical engineering in 1936. While an undergraduate at Poly, Katzen became acquainted with his mentor, Donald F. Othmer. Othmer, the generous and helpful man that he was, aided Katzen whenever possible by finding Katzen summer employment, taking Katzen on off-campus consultations, and requesting permission for Katzen to obtain his master's degree in absentia while working at Northwood Chemical Company. After receiving his doctorate in 1942, Katzen became involved with the acid hydrolysis of wood in the production of ethanol at Vulcan-Cincinnati Incorporated. With nearly seventeen years experience behind him, nine years at Vulcan, and seven years in the operating industry, in 1953 Katzen decided to start his own company, Raphael Katzen Associates International, Inc., focusing on process design engineering and consultation. Katzen Associates, now known as KATZEN International, Inc., has consulted and reorganized numerous companies over the last fifty years, such as Vulcan-Cincinnati, Air Products and Chemicals Inc., and Union Carbide Corporation. Katzen concludes the interview with a discussion of his current work with Raphael Katzen, PE, his marriage to and life with Selma M. Katzen, and his friendship with Donald and Mildred Topp Othmer.

## INTERVIEWERS

David C. Brock is Program Manager for Educational and Historical Services at the Chemical Heritage Foundation in Philadelphia. He is currently a Ph.D. candidate in the History Department, Program in the History of Science at Princeton University. In 1995, Mr. Brock received his M.A. in the History of Science from Princeton University and in 1992, he earned a M.Sc. in the Sociology of Scientific Knowledge from the University of Edinburgh.

Arnold Thackray is President of the Chemical Heritage Foundation. He majored in the physical sciences before turning to the history of science, receiving a Ph.D. from Cambridge University in 1966. He has held appointments at Oxford, Cambridge, Harvard, the Institute for Advanced Study, the Center for Advanced Study in the Behavioral Sciences, and the Hebrew University of Jerusalem. In 1983 he received the Dexter Award from the American Chemical Society for outstanding contributions to the history of chemistry. He served on the faculty of the University of Pennsylvania for more than a quarter of a century. There, he was the founding chairman of the Department of History and Sociology of Science, where he is the Joseph Priestley Professor Emeritus.

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INTERVIEWEE: Raphael Katzen  
INTERVIEWER: David C. Brock  
LOCATION: Chemical Heritage Foundation  
Philadelphia, Pennsylvania  
DATE: 20 October 2000

KATZEN: My father [Isidor Katzen] was born in New York City; he was the second son of immigrants in a five-child family. In typical immigrant fashion, the eldest son was sent to college to study medicine. The other children had to work in order to support the eldest and the rest of the family. Thus, my father went to work in construction at the age of sixteen. My father was self-educated—very literate, very well read. Both he and our mother [Esther Katzen] emphasized the need for my brother, who is three years younger, and I to further our education. My father was an early nutritionist. He always said, “Have an apple a day, keep the doctor away!” [laughter] “Drink lots of tomato juice and eat lots of tomatoes. They’re wonderful for you!” He was ahead of his time on that score. In fact, my father lived to the age of ninety-six. My mother, with frailer health, lived to be seventy-five.

BROCK: Impressive.

KATZEN: Until he was seventy-seven, my father was active in construction as a piping foreman. My mother grew up in Philadelphia; she was the twelfth child of a widow and widower who remarried. One already had five children; one had six children. She was the only child of that union. Therefore, she had sisters and brothers much, much older than she was. Much of the family lived near Philadelphia and Atlantic City. Once a month, we took the train from New York City, where we lived at that time, to Philadelphia to visit the “family.” Frankly, I got tired of visiting cousins by the dozens! [laughter] My memories of Philadelphia as a youngster are not good.

Those were the days of the “Chinese Wall” and trolley cars—few people had cars. Once, I rode in a Model T; it was a unique innovation. That is how far back I go—the early 1920s. As far as my pre-college education, as I said, being brought up in construction, I was a pipe fitter’s helper before I was an engineer. I started making materials lists for my father when I was ten years old. I got a work permit at age fourteen to work in construction, plumbing, and piping. I was going to be an engineer, probably a civil engineer. I went through the New York City educational system for grammar school, and then an advanced middle school—three years in two. I then went to DeWitt Clinton High School, which was a very interesting school with ten thousand students—boys only. I took two courses. One was for trades training; the other



was college preparatory. It was an excellent school for all things: math, science, history—excellent teachers, except one.

I decided to take a course in chemistry my junior year. The woman who taught it hated men. [laughter] Why she taught in that boys' school, I will never know! [laughter] That teacher was in such a rush to get through the textbook that she skipped quickly from inorganic to organic chemistry. The first chapter was on paraffins. She retorted, "We won't find anything useful in this section. Let's skip it." Paraffins, subsequently, became the base for petrochemicals! [laughter]

New York State, at that time, instead of SATs [Scholastic Achievement Test], had Regents Exams for each course. I scored very high on my Regents. I skimmed through the courses. In fact, when I went to Poly [Polytechnic Institute of Brooklyn, now Polytechnic University, Brooklyn Campus], they looked at my grades and said, "This can't be the same person! Your Regents are above average, but your grades are average!" Well, I did not have to study hard to score high on the Regents—in the high nineties—except for chemistry; there I only scored a seventy-five.

In my senior year at DeWitt, I took an advanced course in chemistry, qualitative and quantitative analysis, taught by a teacher whose name I will never forget—Philip Broadhurst. It was a small class with only ten students. Broadhurst would visit with each of us individually to ask us what we intended to do with our lives. When he asked me, I answered, "I intend to be a civil engineer." Broadhurst replied, "That's a dull profession. You ought to be a chemical engineer." Now, keep in mind, this was 1931 or 1932, so I asked, "What's a chemical engineer?" Chemical engineering was a rather new profession at that time, so he explained it to me. He had gone to Brooklyn Polytechnic and studied chemical engineering, which was the marrying of chemistry and engineering. Since there were very few jobs in chemical engineering, Broadhurst began teaching. Broadhurst recommended that I go to Poly to study chemical engineering.

I had always hoped to go to Cornell [University], but those were poor days, Great Depression days. My family and I could not afford Cornell, so I decided to live at home and attend Poly. Broadhurst's was a wonderful recommendation, both the school and the course. Poly had four hundred day students and four hundred evening students, a top-notch faculty, and students received personal attention. I entered as what was called a "February freshman," in February 1932. With intensive instruction right through the summer, I finished my freshman and sophomore years in a year and a half. I studied days, I worked nights; if I studied nights, I worked days.

BROCK: What type of work did you do?

KATZEN: I did any and everything I could do—errand boy, janitor. In fact, I did some work with the NRA, National Recovery Administration, for forty cents an hour. I worked in the chemical engineering laboratory; I swept the attic and lab.

I was broke every day of the week. I lived on twenty-five cents a day. That was carfare—five cents each way—and fifteen cents for lunch. Fortunately, there was a Greek restaurant close to Poly. The owners were very kind to students. One could get a big roast beef sandwich and a chocolate milkshake for twenty-five cents! [laughter] That was a lot of money in those days. I had to drop out of Poly after my sophomore year to find work. My father was unemployed because there was no construction work to be done. He was too proud to go on relief or sell apples on street corners. So, I toured New York City on the subways. I do not know how many miles I covered—hundreds of miles. There were no jobs, but I finally found work in a small food shop. I worked six and a half days per week, seventy-two hours, for seventeen dollars a week. But the fortunate thing was I could buy food at a reduced rate. I was the breadwinner of the family.

BROCK: Who was living at home with you?

KATZEN: It was my mother, father, brother, and me.

At the end of that year, I was ready to give up, but, fortunately, my Dad found work. He said, “You should go back to school,” so I decided to do just that. I went back to Poly. I had become acquainted, during my first year and a half, with Dr. Raymond [Eller] Kirk, head of the chemistry department and one of the authors of the *Kirk-Othmer Encyclopedia [of Chemical Technology]* (1). He was a very open and friendly person. It was unusual for the head of the department of chemistry to insist on teaching freshman chemistry, but he did just that and was an excellent teacher. The only problem his students had was when he called us “comical” engineers. We could not tell if he was pulling our legs or mispronouncing the word due to his Scottish brogue accent. [laughter]

I went to see Kirk about finding a job, “Well, there are odds-and-ends jobs you can do. There’s the NRA, but you’re a “comical” engineer. You ought to see the new professor, [Donald F.] Othmer, and get acquainted with him.” The head of the department was John C. Olson, whom I had met briefly, but didn’t know well. I went to see Othmer and explained my situation. He replied, “All right, here’s a broom. Sweep the attic over the chemical engineering lab.” “That’s fine with me, so long as I can earn some money.” Othmer also found out that I knew something about piping, so he put me to work with the laboratory mechanic—Max was his name—fixing piping, equipment, and so on. I was useful with my hands; I was a hard worker.

At that time, many students had financial difficulties and Othmer was always helpful. I applied for scholarships, but there weren’t many. There were some loans from Tau Beta Phi, the engineering fraternity. I borrowed money. Times were hard, as Dr. Othmer knew, so he

decided he had to help, I guess. Othmer would pull out his wallet and hand a ten- or twenty-dollar bill to a student and say, “Pay me when you can. Go ahead.” That’s the way he was. When I finished my junior year, Othmer helped me find summer work with Gray Chemical Company in Roulette, Pennsylvania—in the northern part of the state—that used older wood pyrolysis technology. While working for that company, I saw a problem with their machinery and worked out a solution, which later became the subject of my bachelor’s thesis. My thesis was unique by the time it was written—the technology was being successfully practiced commercially.

Othmer was a consultant for Gray Chemical—he got me the job. During the Depression, there was a boarding house in the small town of Roulette. In a boarding house, one got a nice bed and meals for a few dollars a week. There were two schoolteachers staying there also. After about a week, Dr. Othmer came up to Roulette to do some work and stayed at the boarding house. One night when Othmer sat down at the dinner table with me, the lady who ran the boarding house introduced him to the schoolteachers, “This is Dr. Othmer, a guest of ours.” One woman rejoiced, “A doctor!” and Othmer replied, “Please, ma’am, I’m not that kind of doctor.” [laughter] You have to visualize it—Don was a tall, handsome, dark-haired fellow—very attractive to women! [laughter] That was a fun time.

During my senior year, Othmer took me out on consulting trips with him. On one trip to New York State, Othmer acted as an “expert witness.” I sat and listened to the discussion and testimony of the deposition. I heard testimony that someone had broken a line valve and a fire had resulted. Someone had been hurt. Listening to the testimony, with my knowledge of piping, I wrote a note to Othmer. He asked the question that I had written him—I thought the problem was a defective valve that someone had tried to open and broke. I was able to help Othmer in that way. One learned by doing with Othmer, which I thought was wonderful.

**BROCK:** Was your mentorship experience with Othmer unique?

**KATZEN:** No, he did that with other students, from year to year. He was known for that. Now, some students didn’t like the fact that he frequently left Poly to do so much consulting. Poly was a unique college in that it permitted professors to do consulting. Too many colleges limited their professors on outside contacts—professors had to stay at the college and do research. Othmer missed lectures forcing substitutes to give his lectures. The students didn’t care for that, but those of us who worked with him and learned from him felt that we learned an awful lot from a practical standpoint.

Therefore, when I graduated in June 1936 with a bachelor’s degree, I had written my thesis on an accomplished technology. There were very few jobs available. Again, Othmer came to the rescue. He was consulting with a small company in the Bronx that was developing a method for making cellulose acetate plastics with a new dip-molding technique. Othmer had worked for Eastman Kodak [Company] on this product. Cellulose acetate is either a film or a

fiber. This was a film product. Othmer got me a job. It was a very nice and interesting job, but, after two months, the company went broke. I never collected a paycheck. [laughter]

Those were the Depression days. There was no work, so, again, I went to see Othmer. He said, “Well, there’s a graduate fellowship available.” The stipend was a grand two hundred fifty dollars a year. Of course, I lived at home. Two hundred fifty dollars a year didn’t go very far, but I started on my master’s work.

BROCK: What thesis projects were you pursuing then or were you just doing course work?

KATZEN: At that time, one had to write a thesis for each degree. My master’s thesis was on wood hydrolysis—well, first off, I didn’t finish my master’s. I was short on two things: a plant design course and my thesis. I went to work for a company in northern Wisconsin that Othmer had consulted with called Northwood Chemical [Company].

Upon my arrival at Northwood, I was immediately given the title of chemical supervisor. Northwood was a small wood-chemical plant—I had worked at a similar plant in Pennsylvania. The plant was being restarted, so I trained the operators, started it up, and got the thing running. I started experimenting with new products from wood. At times, I worked with the Forest Products Laboratory of the U.S. Department of Agriculture in Madison, Wisconsin. Forest Products had developed a laboratory technique to acid treat wood to make a plastic product. This was intriguing, so I went to Madison and studied the technology.

I talked to Othmer about designing my own continuous pilot plant. He thought it was a good idea. That became my plant design course. The research became my thesis. Othmer had to go to the board at Poly to get permission for this because I was the first student to do anything by correspondence. That’s how I finished my master’s in 1938, by correspondence while I was working at Northwood.

BROCK: Was that government laboratory actively trying to get their findings published for commercial reasons?

KATZEN: That was the idea. Now, there are many more labs of that type, but the Forest Products Lab was an early government research lab. Forest Products was full of good scientists and engineers developing new ideas for using wood and wood waste. However, they could only go so far in scaling up to pilot work before somebody in industry had to take over. My employer at Northwood thought this was a good idea, and sent me down there to study it. He spent the money to build that pilot plant, but when I wanted him to spend money to build a commercial plant he didn’t have the funds! The story is that the company was owned by the Reynolds family out of Marquette, Michigan. Grandpa Reynolds had built a blasting-powder plant in upper Michigan. During the 1890s, he sold it to DuPont [E. I. DuPont de Nemours and

Co., Inc.] for stock rather than cash. The family's tradition was to always keep that stock, never sell it, and live off the income. [laughter] That's why my research and the funding for commercial application were limited. However, since I was inventing so much, I had a number of patents that I assigned to the company. Through this, I owned 15 percent of the company before I was through.

Along the line, they said, "Look, we know you'd like to have a doctorate someday. We'll fund your doctorate. Go back Poly. Othmer, our consultant, is there, and we'd like you to work with him." I liked that idea, but then again I would have liked to try another school. You just have to take it the way it goes. I talked to Othmer over the phone and he said, "You know, that's a good idea. Let's see if we can get some money, not just for you, but for some master and bachelor students." I talked them into six scholarships, in addition to my fellowship.

BROCK: Who offered the scholarships?

KATZEN: Northwood.

BROCK: Thus, Northwood funded you and a team from Poly as well.

KATZEN: It was Othmer's suggestion that I work it out with the company. Mine was a fellowship to do graduate work toward a doctorate.

BROCK: Was Northwood's hope to hire those students?

KATZEN: That's right—and get the technology.

BROCK: I see.

KATZEN: The main thing was to get the technology developed.

An interesting part of that story is that Othmer was all for it, but he had to get the approval of the president of the university, Dr. Rogers, who was a civil engineer. I don't know if Dr. Rogers fully understood chemical engineering. I'd met Dr. Rogers once before, briefly. He happened to be at a college president's meeting in southern Wisconsin. Othmer arranged to come out and I came down with my boss to meet Dr. Rogers and talk to him about our plan. For some reason, when I mentioned the funding and my salary, he didn't seem too receptive. Dr. Rogers seemed a little dubious about whether he wanted to go ahead with this. Ha! I was

always an independent character, but after I returned to school for my junior year, I took a very independent attitude. I walked out of the meeting and Othmer and Rogers practically came running after me. Rogers told me, "It's all right! It's all right, Ray. We'll work it out!" It took me some time to find out what the problem was—I was requiring a salary as great as that of an assistant professor! [laughter] That threw off his entire pay scale, but he had to accept it. So, I went back to Poly for two years, 1940 to 1942. Numerous excellent graduate students went straight through at that time: Joseph J. Jacobs, Fred Sawyer, and Robert White of Villanova [University].

I taught Jacobs' chemical engineering lab while I was doing my master's work. We got our doctorates together. He's one of my students of whom I'm very proud. In any event, I was looking for a research thesis, and I had an idea. Since I had worked with acetic acid as a product from wood processing, I thought that it could be made synthetically from natural gas. I had some idea of the chemistry. When I talked to Othmer about the equipment we needed—very sophisticated petrochemical-type equipment—he answered, "Ray, we can't afford it. We don't have that kind of money. So go out and find another idea!" [laughter] Well, it so happened that that fall I went to a meeting of the pulp industry called TAPPI, Technical Association of Pulp and Paper Industry, at the Commodore Hotel, in New York City. Dr. Joseph McCarthy—not the infamous Joseph McCarthy, the senator—[laughter] a professor at University of Washington, talked on why, when pulp is bleached, there is a color formation in the liquid material. As he spoke, I had a bright idea. I returned to Poly, went to my office—I had a desk in Othmer's office—and started dictating a patent application. I learned about writing patents from Othmer. As I dictated, Othmer came in and inquired, "What are you doing, Ray?" I answered, "Dictating a patent application. I have an idea for my thesis." It was a good idea, pulping without water by using a solvent like methanol or chlorine. I could do that with conventional devices and it wasn't very expensive. Lo and behold, it worked! I had two students working on the interesting by-products that came out of this.

As I was getting my doctorate, Northwood was acquired by Diamond Alkali Company of Painesville, Ohio. Diamond, of course, was in the chlor-alkali business. Diamond had gotten into plastics and were intrigued by the technology that I had developed for Northwood, so they purchased Northwood. As soon as I received my doctorate, I began working for Diamond Alkali as technical director of the Northwood Project, in the R&D section. I was able to build a pilot plant from glass piping to duplicate the process. Nevertheless, the war [World War II] raged on, and nobody had an interest in improving the pulp industry right then. Another problem came up, making a product for the [United States] Navy—chlorinated paraffins. They asked if I could do this with my pilot plant. I replied, "Sure." So I did, and within months, I had gone from a pilot plant to a full commercial plant, which I designed to make chlorinated paraffins for the Navy. These were the same paraffins that my high school teacher said were not important.

BROCK: Right! And what were the paraffins used for?

KATZEN: It wouldn't be accepted today, but they were incorporated into paints for Navy ships. If a fire started on one side of a bulkhead, the heat would cause this paint to foam and form an insulating blanket.

BROCK: Quite interesting.

KATZEN: However, if the flame went further, it would burn and produce toxic fumes. We wouldn't use it today, but this was wartime.

BROCK: Right. A good idea nonetheless.

KATZEN: Another technology that I developed was for making plastics from wood. I used a mild treatment of plywood veneer with acid to make a much tougher veneer. I did that in the pilot facility that I set up at Diamond. There were about six people working in my group. I was able to make a very tough veneer, which meant tough plywood. The military wanted to use this plywood veneer for trainer planes. They couldn't afford to spend a great amount on trainer planes and were short of aluminum, so they decided to make them out of plywood. That was another one of my wartime projects. I was deep in wartime projects by that time. After I went through my second year at Diamond Alkali, the president of the company, Raymond Evans, gave a talk at the Diamond Technical Association on the future of Diamond. He made it very clear that the future of Diamond was in the chlor-alkaline business, the conventional chemicals that they produced. I could see that there was not going to be any real interest in going into the type of chemistry that we had worked with in the Northwood group.

I had previously applied for a commission in the [United States] Army, with the Chemical Warfare Service, when I was still in Wisconsin. An officer was sent to interview me, and after he saw what I was doing he said, "We need you for the war effort, you stay where you are." So I didn't join the Army. At the same time, I became aware of research that was very secret—the development of the atomic bomb.

BROCK: How did you become aware of that?

KATZEN: Besides being interested in everything else at Poly, I loved physics. Poly had a terrific physics department and I took every course in physics through my junior year and my senior year—the only course remaining was atomic physics. I put it down on my course list and went to the head of the department, John C. Olson, for approval. This was before Othmer became head of the department. Olsen said, "Katzen, you're trying to do too much. Atomic physics? What would a chemical engineer have to do with atomic physics?" [laughter] I retorted, "Well, Prof, I agree. I can't tell you just what I would do with it, but I want to take it.

I've had every other course in physics. I want to take it. It's my risk, let me take it!" He replied, "All right." I became one of the first two chemical engineers at Poly to study atomic physics, which is normally reserved for physicists and some chemists.

Getting into atomic physics, I began to read the literature, and then I realized that the literature stopped. Nothing was being published, but I began to hear things. My neighbor in Painesville, a government inspector, said, "You know, I've got an odd assignment. I'm supposed to be tracking down a shipment of heavy water. What's heavy water?" I answered, "I know what it is, but I'm not going to talk to you about it." I had heard Professor [Harold C.] Urey, who identified heavy water, give a lecture at Poly about it.

In addition, my father was in wartime construction and things had picked up. He was on a project down in Tennessee, when he called and stated, "It's an odd set-up. I'm in a compound where you can't get out more than once every few weeks and then only by special permit. I work in a building with very odd walls and can't figure out what they are made of." I replied, "I think I know what it is, but I won't say anything because the less you know the better." He was working on the gas diffusion system for uranium fluoride, which was being separating for the atomic bomb.

Well, this all gave me an idea. I decided to leave Diamond Alkali. I went to visit Union Carbide [Corporation] in New York City. I knew Carbide was involved in the operation my father worked on, so I went to see them in the Q room. I had the oddest interview because they couldn't tell me what they were doing and I couldn't tell them what I knew! [laughter] But I sat down and I mentioned my background in atomic physics. Nothing came of that, so I decided it would be better to apply for a commission in the Navy.

I was in Painesville, 30 miles from Cleveland, where the Navy had an Office of Naval Officer Procurement. I went and visited them. They gave me a quick exam. One question asked was, "What specialties do you have?" When I saw that atomic physics was listed, I underlined that. I continued with the exam. The yeoman graded it quickly and took it in to the commander. The commander came running out, "We've got to get you aboard in a hurry! We've got to get you in!" Of course, I figured, "This was the atomic bomb team."

BROCK: Right.

KATZEN: He said, "However, you can't be an officer in the Navy and wear glasses. There's a book, *Perfect Sight Without Glasses* (2), get it, try it, and see if you can fix your eyes. Come back and pass the exam without glasses. You've also got to get your weight down to 158 pounds." Therefore, I resigned from Diamond, and prepared my wife [Selma M. Katzen] and daughter [Nancy Riedel], who was one year old, to stay with family in New York City. I put the house up for sale, and used the exercises from *Perfect Sight Without Glasses*—it worked. Within a month, I passed the eye exam without glasses. As I was being prepared, I was told that, in the coming months, I would be going to Columbia University and Princeton



[University]. When I heard, “going to Princeton,” which was where the action was, I said, “Fine.” Just then, I had a call from a company in Cincinnati called Vulcan-Cincinnati [Incorporated]. Vulcan was another company that Othmer had consulted for. Vulcan had heard of me through Othmer. They said, “Ray, we have a contract to build a plant for the Defense Plant Corporation. It involves acid hydrolysis of wood to make ethanol. We know you’ve been involved with the acid hydrolysis of wood. Will you help us?” I answered, “I can consult with you for one month, and then you have to agree to release me to the Navy.”

[END OF TAPE, SIDE 1]

KATZEN: I started to design this plan based on information from the Forest Products Laboratory of the USDA [United States Department of Agriculture].

BROCK: Whose idea was the ethanol?

KATZEN: The technology came from Germany. It was known as the Scholler Process. That process was modified to form the Madison Wood Sugar Process.

BROCK: Was this for aviation fuel?

KATZEN: No. At that time, ethanol was the primary source for synthetic rubber. We needed a lot of ethanol—some of it was being shipped from Cuba, but German subs were sinking tankers as fast as they came into view. Ethanol was being produced from molasses, but the government wanted to find a new way to make ethanol without depending upon molasses.

None of us was aware of how severe the German submarine attacks along the East Coast had gotten. It was kept very secret. Many ships were being sunk right off the coast. Anyway, that was the contract with Vulcan. At the end of the month, I received a letter from the Navy stating, “Your qualifications for the special post are excellent, but the post has been filled. We don’t need you.”

So with that, Vulcan asked, “Will you stay with us and guide this project through?” I replied, “Of course!” I went on to I design the plant; I built it as the assistant project manager in Oregon. Since the Forest Products Laboratory picked the people who were running the plant, they retained Vulcan to operate and manage the plant. Not only did we designed and build the plant, but we also operated the plant! Only a few people among us had ever designed, built, and operated a plant before. Anyway, it wasn’t quite finished when the war was over, but I came back to Vulcan. The government decided to finish the plant, so I went back again for a second tour in Oregon to complete the construction of the plant and operate it. We operated it with

great difficulty. I would say I earned my gray hairs at a young age, running that plant! [laughter] We proved you could make alcohol at the yield it was designed for, but it was not easy to operate.

BROCK: What happened?

KATZEN: Well, besides making sugars into conventional alcohol, we made a lot of tars, gums, and resins. We used sulfuric acid in the process, which was then neutralized with lime to make calcium sulfate. It's tough. The mixture of calcium sulfate with tars form a mortar that will not break loose. It clogged the pipes, pumps, and everything else.

It was a wonderful experience in what not to do! [laughter] I am one of the few people who know how to operate one of those plants. There were plants in Germany that were shut down after the war. Russia had fifty-two of them. They shut them down after the Communist Party was out of power. Some of them, under Communism, were very inefficient. In any event, that was quite an experience. Having done that, I began to like the design and construction industry. I'd done construction, and this gave me the full range of engineering—design, construction, and operation.

I worked my way up from project manager to assistant manager, to manager of a sixty-person engineering division. In the early 1950s, we were very successful in petrochemicals. I went to Europe and licensed technology from a Swiss company. So, I not only had operating experience, but, from Northwood and Diamond, I acquired seven years of research and development experience. Vulcan operated very well, technically. It was a wonderful place to work, very adventuresome—they let you do what you wanted. It was a family-owned company, with family problems and family battles.

BROCK: Really?

KATZEN: On a few occasions, I, as manager of the division, was called into board meetings to help explain processes, but I'd be drawn into a family battle—I was mediator! [laughter] I finally said to the president of the company, Ted Wentworth, "Either move me up into top management or I can't accomplish any more for you." He replied, "No! The family has to run the company. We can't have outsiders running it." Therefore, in about July or August, I made up my mind I was going to have to leave the company. There was a ceiling at Vulcan—like the glass ceiling women talk about. Wonderful company, I gained a lot of experience, but it was very poorly run. For the few years that I ran the engineering division, I made a lot of money for Vulcan, but it was wasted as fast as I could make it. [laughter] I wrote the contracts; I worked out the deals; I worked with their attorney, with whom I got along very well, and the accountant. Management was the problem. The company went bankrupt a few years after I left.

BROCK: Is that so?

KATZEN: I hadn't made up my mind. While driving down to Florida for vacation, I told my wife to take out a notebook and take dictation. List one. What do I know? The next list read, Whom do I know? Vulcan was very good for contacts. Moreover, I'd worked at Diamond and Northwood, so I knew many people—chief engineers on up to presidents of companies. I gave Vulcan my notice six weeks in advance—to give them plenty of time. I trained four people to take over my job! It was a very good department. The day after I resigned, the president of the company, who was a good friend—he was a good engineer but a poor manager—invited me to lunch. He was concerned that I might be going to work for a competitor, so he asked me what I intended to do. I responded, “I have thought about this for a long time and I've decided I'm going to go into consulting.” He affirmed, “I'm your first client!” [laughter]

Well, that lasted about three years. He began to treat me like an employee, so I can't consult properly. To this day we're still good friends! He would always say, “Ray, I really regret the day I let you go!” I would always counter, “Ted, you didn't let me go, I resigned!” [laughter] Anyway, I later decided what I was going to do, not just consulting, but the whole routine of going from research to design to construction. The key was process engineering. That is where we do the major thinking, the rationalization, the process, the economics, the optimization, the energy, and the material balances—the real thing—the part of the process that makes or breaks the project. At Vulcan, I had a group of six top-notch engineers doing that. Therefore, I decided I was going to develop a process engineering company, Raphael Katzen Associates. In the first year, Selma and I were it. I had sole proprietorship, but then we set up a partnership and started bringing others in. Then, in 1956, we became an international corporation. I knew it would work out. I knew that there was a global market.

BROCK: So your initial strategy was to focus on consulting for process engineering.

KATZEN: That's right—then do the actual process design work that goes beyond consulting.

BROCK: I'm wondering—this may show a bit of my ignorance—what other models were there for a chemical engineering consulting firm? Was there a soup-to-nuts model?

KATZEN: Well, no. There weren't any very good models. Most consultants just consulted. They advised, but they didn't design.

The best model was in Chicago at UOP, Universal Oil Products. I came to know them because one of my Poly students, Albert [W.] Bicknell, worked there. He was in the same 1937 class as Joe Jacobs, so I taught him chemical engineering. He worked at UOP and invited me to

their labs in Des Plaines, just outside of Chicago. UOP did most of the innovation in the petroleum and petrochemical industry. They developed technology, built pilot plants, and then licensed the technology to industry—the contractors or owners.

I saw that model and I wanted to be on that scale. So I decided that we'd just do the development—although we can't afford all these laboratories—but I could use commercial laboratories or pilot plant facilities to develop the technology, and then license the technology, providing the “process design package.” They called it the “Schedule A package.” It was a package of complete process design, because they turned it over to the contractors to detail. Contractors would design the concrete, steel, and piping, and then build. I decided my model was going to be better. My model, as I developed it at that time—this was 1956—was identified as the Raphael Katzen Associates International, Inc. Process Design Package [PDP].

BROCK: Who was the design for?

KATZEN: It was for an Ohio professional corporation. We did the process design package, after doing the research through commercial laboratories or taking a client's research and developing a design. I would take something from the government laboratories, and come up with a design package, which was then licensed. They liked our package; it was complete and comprehensive. In the practice of the company, we not only delivered our package, we checked the detail work, the engineering, piping, electrical layouts, and so on. We helped write the operating manual, train operators, and start up the facility—we carried it all the way through.

BROCK: It was the carry through that set you apart.

KATZEN: Yes, the carry through. In some cases, the owner bought the technology from us and then picked the contractor. Other times, contractors came to us for the technology and then built the technology. It was a very flexible arrangement. We've been able to work all over the world that way. It's a small company—ten professionals, an office staff of five, plus fifteen associate consultants—operating on every continent except Antarctica. [laughter] Ours is a company that's relatively small, but is known worldwide.

BROCK: This model sounds very much like the initial model that you came up with during that car ride to Florida. It seems like you had your model figured out from the start.

KATZEN: That's right. We started the business ourselves. I started adding people—chemical engineers and mechanical engineers, and then, in later years, microbiologists.

SELMA M. KATZEN: Don't forget, you had [W. R.] Ackley, an electrical engineer, working for you.

KATZEN: No, Ackley was chemical. He was an instrument engineer. We also had the designers on drafting board—later, AutoCAD designers.

I resisted the computer. I thought, “No computer is going to rule me or make a stenographer out of me!” But the Katzen office today is completely computerized. Even the secretarial staff is tied to the same computer system as the engineers. I saw engineers being typists! I finally had to give up the computer fight when I moved to Florida. Selma has worked with computers for some time. She was the treasurer of the company. Essentially, she ran the office, the staff people, and was a director of the company.

BROCK: That sounds like a real partnership.

KATZEN: That's right—we started together. When I first outlined the idea, after writing up what I knew and whom I knew, I talked to Selma about renting an office. Selma said, “Why would you want to do that? We have this big house.” [laughter] We started with just one big room of the house furnished with two desks, face to face. As we grew, the basement, which I was going to remodel as an entertainment room for my daughter, became an office.

S. M. KATZEN: That room could hold four engineers and a secretary. When we had five engineers, the secretaries were moved out to the furnace! The receptionist was in the breakfast room! [laughter]

KATZEN: We had our business throughout the house. Finally, we outgrew the house and bought a building. When we outgrew that, we started renting space. The company started in 1953 as a partnership, and in 1956, it was a corporation.

S. M. KATZEN: Well, in 1980 you gave up the partnership. Everything went to the corporation in 1980. In 1998, the name was changed.

KATZEN: I said that I liked their choice—KATZEN International, Incorporated.

S. M. KATZEN: The “Katzen” is capitalized—KATZEN International, Inc.

KATZEN: The company name also includes a subtitle, “Technology and Engineering.”

I’m very proud of all three of the people that I trained. I trained them to be the management team—president and two senior vice-presidents. Two of them are twenty-year veterans. The third we’ve known for twenty years. He joined us six years ago. Our top process engineer, George [D.] Moon, died about a year ago. Our top mechanical engineer is hospitalized right now. We’re the active survivors. In addition, KATZEN has four forty-year plus veterans.

BROCK: That’s quite impressive.

KATZEN: One key of the company—if I could expand a minute on the company philosophy, besides its approach.

I’ve always been bothered by engineers fussing that they were not being treated like professionals. I have gotten up in public meetings and at the American Institute of Chemical Engineers [AIChE], when this complaint has been made, and said, “Look, if you want to be treated like professionals, start acting like professionals!” I’ve always supervised engineers, from day one. Even at Northwood I had chemical engineers under my direction. I always said, “If you treat them like professionals, they’re going to act like professionals.” So, in the Katzen organization, there are no professional employees—they’re associates. Over the years, they have had a chance to buy stock in the company. There are no outside shareholders. It’s owned by the key people—engineers and designers. They buy stock and they get good returns on it, if it makes profits. If there are losses, that’s too bad. When you leave the company, you have to sell the stock back to the company. The stock is not transferable.

I also believe in giving people responsibility. I learned that from Othmer. When people wanted to join us, I always said, “All right, if you think you’re qualified, we’ll give you a one-year trial, but be warned, it is sink or swim! You’ll be thrown into ice-cold water. You’ll have big responsibilities and fast! If you make a mistake, we’ll help you fix it. But that’s it. If you survive that year, you’re in.” It was a very interesting test because many people didn’t go beyond that first year. They just couldn’t take it. They were so used to working in a structured setup. However, those who did make it, stayed a long time—we have twenty-year veterans who took over for the forty-year veterans.

BROCK: Since the principle players in the company owned it, do you think that gave the company, technologically speaking, an edge—you weren’t restricted and you could take a gamble because it was your enterprise.

KATZEN: That’s exactly right. In addition, it meant that we realized that everything that was developed went to the common benefit—as shareholders. The only trouble I ever had was that

we never designed a plant the same way twice! Take ethanol plants, one of the main areas of the company, but not the only one. Each one was better than the one before! In fact, I was just talking to Phil [Philip W.] Madson, who became president when I retired. I chose him two or three years before I retired, so he's been president for the last five or six years. I just talked to him recently. There was a project in Canada that I'd been working on for seven years, because the client hadn't been able to finance it. The basic design was drawn seven years ago, but now it has been finally financed. I said, "Well, that's wonderful!" He replied, "Yes, but now we have to redesign it. We've made so many changes and advances in the last seven years that we cannot use that old design." That's the philosophy that I built into my company. I'm very proud of that. Never stand still. I always said that we were always ten years ahead of the parade in any field of technology.

BROCK: Can we talk about the technological story, once you went independent? All of your previous patents were associated with Northwood. With this venture, you started with just your expertise.

KATZEN: That's right. I started with new ideas.

BROCK: Did you continue with ethanol or did you continue with wood?

KATZEN: I went into many fields. We have patents in the pulp field and in the petrochemical field. We did not just focus on ethanol. We were in every field. We were inventive.

BROCK: I'm interested in knowing how you started. What route did you take? You had a home office with desks facing one another in the house. How did you progress?

KATZEN: First, we took on clients. We focused on our knowledge of their technology. One client was Vulcan. We already knew what they were doing.

BROCK: Right.

KATZEN: I helped them license technology in Europe for synthetic urea and for synthetic methanol. I was able to help them with designing those plants and with reviews. Our second client was Air Products and Chemicals [Inc.]. That was interesting. They were a small company; they only had four hundred employees and were losing money. I was brought in to help them straighten out their engineering design, which was based on an antiquated European style. I started with my knowledge of engineering. I designed for the cryogenic field. It's a

long story, but with my help, over seven years as a consultant and with my group designing for them and showing them advanced design, we took Air Products from a four hundred-person company that was losing money, with maybe ten or twenty million dollars a year in sales, to a three billion-dollar corporation with 15 percent returns.

BROCK: Is that what it is today?

KATZEN: Yes.

BROCK: When were you asked to consult?

KATZEN: That was the 1950s. They were my second client. That went on continuously for seven years until I had taken them far enough along that they felt they could do it themselves. Then they would call my company occasionally for special problems. We were mostly problem solvers.

Leonard [P.] Pool, who ran Air Products, was a genius at finance and marketing. Much like my father, he was self-educated—never got beyond grammar school. Pool had worked in air separation for some other company on a small scale, decided to go on his own during World War II, and developed some interesting air separation plants. After the war, he went commercial. After I had been consulting for Air Products for several years, Pool inquired, “Ray, what’s wrong with this company?” I responded, “Leonard, it would take two hours of uninterrupted time to sit down and explain that to you. I’ve been in your office—you don’t have more than two minutes uninterrupted!” He answered, “See me the next time you’re in.”

Therefore, I stopped in to see Pool the next month. He stated, “I’m driving to New York, it takes two hours. Do you want to go with me?” I replied, “Sure, I’m heading to New York anyway.” We got in his car and started driving from Allentown, Pennsylvania, to New York. Again, Pool asked, “Ray, what’s wrong with my company?” I answered, “Leonard, you are.”

That is what a consultant does. I’m never afraid to say “no” to a client. That’s the reputation the company and I have. We say it like it is. If we don’t like something, we say so. If we do a study and the results are negative, we say, “It’s no good—stop it.”

Anyway, I went on to explain to him that he had a simple organization chart. He was on top of a horizontal line of four hundred people. [laughter] He ran five different businesses. I never went to business school, but I’d learned enough about business. He had five different businesses, and no profit centers—he had no control. Pool retorted, “Write me a memo.” So I wrote a memo entitled, “Air Products: Past, Present, and Future,” and outlined the different businesses, the profit centers, and what needed to be done. I wrote, “Organize a central-



planning committee, I'll be glad to help you with that—do six months planning and go from there.”

Well, I sent Pool that memo, but somehow or other I cannot find my own copy now. It would be an historic document! I was at Air Products the next month when I was stopped by the vice president of finance, who was also an engineer, Frank Pavlis. He took me into his office, closed the door and asked, “Ray, did you write a memo to Leonard Pool?” I replied, “Yes.” “Was it about, you know, changing the company?” “Yes.” He continued, “All hell's broken loose! He's doing it right now!” [laughter] Well, it took two years to overcome that! I helped him set up a research committee. I'm very proud of that—it's the best bit of consulting that I ever did. At the same time, my company was helping him reengineer things. How to design things properly, how to work between the engineers and the sales department. They had wonderful marketing people; they had good ideas, but they didn't know how to coordinate. Therefore, I reorganized the engineering and sales interaction.

I worked on a time and expense basis, but I kept getting complaints from Air Products about our high rates. On one particular occasion, Air Products had taken a contract with the military to design a truck system that would take liquid oxygen at 3,000 pound pressure and 300° below zero, convert it to a gas under pressure, and deliver it from a truck using heat from the truck's engine. They couldn't figure out how to accomplish the contract. They were very good salesman, but didn't know how to do the work. So, they asked if my group and I would tackle the job. I answered, “Yes, with one condition. I've heard enough about our high rates. You will see, when we finish this job, how many hours we spent and how many dollars it cost. Then you show me what you have on your books—the man hours and dollars.” They agreed. Well, we went back to the Cincinnati to brainstorm. We always brainstorm together. We made sure we could develop an idea to make this work—how to do it going from 3,000 pound pressure at -300° to atmospheric pressure, as a warm gas, using only engine exhaust heat.

We worked it out and designed a prototype. Air Products built it and it worked immediately! We had the contract accomplished very simply and very quickly. Well, as simple as we could make it—a three tube-in-tube exchanger with intermediate fluid that would not freeze at the temperature of the oxygen, but at the same time would take the heat from the engine and transfer it to gasify the liquid oxygen. It was very simple when you get down to it. Therefore, once we finished, we compared the numbers. Air Products had only spent one-half of the money that was budgeted, using only one-fourth the man-hours! This meant that our people were twice as efficient as theirs, cost wise. I never heard any more about our high rates after that! [laughter] That's just one of the things I'm very proud of.

We also helped Air Products develop liquid hydrogen for rocket fuel, which they had also gotten a contract for without knowing how to do it. We had to have extremely high purity, which is found at -423°F for liquid hydrogen. I have always been very strong in separation technology. In my company, we did and still do distillation, adsorption with activated carbon, and a number of other processes. I finally figured out a two-stage system—two different adsorbents to take impurities out. When the first commercial plant was up and running, it worked with impurities in the parts per hundred billion. That's how pure we made it.

Once there was trouble with a helium plant that separated and stored helium for the government. The helium was being taken out of the ground, purified, and stored. However, the purity was too low. This was long after our basic contract expired, so I was called in again. I looked at what they were doing. They were running at critical conditions—gas and liquid were almost at the same density. I went to a physics textbook and found Stokes' Law. I tried to figure out what was happening, and then I sat down and talked to them. Under Stokes' Law, gas bubbles are not lighter than liquid—they have the same density. As a result, there is a drag factor, interfering with the separation of gas from liquid. Thus, you have to figure out how to baffle and modify the flows, so the gas has a chance to separate. A mechanical design change fixed the plants. That's the sort of things that we did—innovative thinking by going back to fundamentals.

**BROCK:** How did the firm build its expertise? Was it from the personal experiences of the engineers who were working on a particular project? Or was it developed over time?

**KATZEN:** It's hard to describe the innovative process in terms of how we completed projects. The term process engineering is a broad one. The chemical industry, process engineering, and cryogenics are one thing, the pulp industry is another, sugar is another, and petrochemicals is another, but the principles used are all still the same. What we found, going back and forth across these industries, was a synergistic effect from one industry to another. We were taking technology and processes from one industry and applying them to another industry, which had never heard of that technology or process.

**BROCK:** Very interesting.

**KATZEN:** It's amazing to see the new equipment that we brought into the pulp industry for chemical recovery. It was technology that the pulp industry had never seen before, but it was standard equipment used in the chemical industry. In other fields, we brought in technology used in the pulp or sugar industry. We found that this cross-fertilization of industries was useful, but it took imagination. One needs people who are adventuresome—I call them "mavericks." Most mavericks have come from big companies where they have become frustrated, like the current president of KATZEN who came from Proctor & Gamble [Company]. At twenty-nine, he was a group leader of thirty people, but had to wait ten years before he could move up the ladder again. He was chomping at the bit. He answered one of our ads, so we brought him in. He joined us twenty years ago. He had never done anything with ethanol except drink it. Today, he's an expert. He learned fast, applied himself, and he continually improved. It's hard to explain how we did it or why we did it; we simply hired people with open minds.

[END OF TAPE, SIDE 2]

[END OF INTERVIEW]

INTERVIEWEE: Raphael Katzen  
INTERVIEWER: Arnold Thackray  
LOCATION: Bonita Springs, Florida  
DATE: 2 February 2001

THACKRAY: I would like to continue with the story of Katzen from the 1970s onward.

KATZEN: I started my own company and my consulting activity in October 1953. Vulcan, my former employer, was my first client, and shortly after that, a friend of mine who worked for Air Products contacted me. He told me he'd been looking for a top engineer for his company. I replied, "That's interesting but I'd rather be a consultant. I'd like to meet with your people." A meeting was arranged. It was late 1953, when I visited Air Products. At that time, their office was in an airplane hangar at a small airport in Emmaus, Pennsylvania. That was where I met Leonard Pool and his brother, Walter. Frank Pavlis was the financial officer, and Ed Donnelly was next in line. After talking for a while, they said they would like to put me on a retainer. Thus, Air Products became my second client in 1953. That retainer continued for seven years; this included monthly visits and helping with troubleshooting. As I built up their organization, I also helped with design problems. We had a very good relationship. I was to work with any and everyone in the company who needed help, but I mainly worked for the engineering group.

Air Products was very interesting because it didn't seem to be well structured or organized. I'd been to their shops—their techniques were antiquated. This led to the point where, after two years of consulting, Leonard Pool called me into his office and asked, "Ray, what's wrong with this company?" In response, I wrote my infamous memo entitled, "Air Products: Past, Present and Future." I knew that Air Products' background during World War II was in developing shipboard oxygen plants. I knew where they were at, and I could see the potential for them if they learned, one, how to design, and two, how to fabricate in a modern manner. At the end of the memo, I wrote, "You need to reorganize into business divisions, profit centers, and you ought to put together a committee for six months of planning." I sent Pool the memo. The next month I returned for my monthly visit. I had just entered when Frank Pavlis came out of his office and demanded, "Ray, come in to my office." Pavlis closed the door and inquired, "Ray, did you write a memo to Leonard Pool?" I replied, "Yes." "About reorganizing the company?" I answered, "Yes." He continued, "Well, all hell's broken loose. He's doing it right now!" [laughter] I interjected, "That wasn't the way I proposed to do it." It took two years to overcome that, but that was Leonard. Once you got his attention, he moved. I'm very proud of the fact that Air Products today is the type of organization that I outlined for Leonard—and, of course, it has gone beyond that. After seven years, Air Products was pretty well organized and expanding, so they discontinued my annual contract and went on an as-needed basis, which allowed me to work on several major assignments.

THACKRAY: You mentioned that Air Products had a dominant sales department. Does that often happen with engineering companies?

KATZEN: Sales does not dominate in an engineering company. In an engineering company, engineering dominates. However, in companies that sell products, sales is the driving force. Marketing was very competitive. They were in a small industry. There was tough competition. The sales people dominated. Leonard Pool was a genius in financing. You probably know the story. In the early days, he didn't have much money, so he'd go to Ford Motor Company and ask, "Do you need a small oxygen plant right across the fence? We'll put it up. Just give us a ten-year take-or-pay contract." He'd go to the bank and get 100 percent financing. For he knew that before those ten years were up, they would need a bigger one. He was remarkable in financing and sales. However, the sales people were the key.

THACKRAY: Thinking, in contrast to Leonard Pool, about your own unique set of strengths, how would you characterize what you were offering?

KATZEN: I was offering a very analytical approach. I had a very broad scientific and engineering base. I was very fortunate when I studied engineering at Poly, the chemical engineering curricula wasn't fully developed, so we studied mechanical, electrical, and civil engineering. In fact, I took mechanical engineering thermodynamics before I ever took chemical engineering thermodynamics in graduate school. I was also interested in physics. I took all the physics courses Poly had except for atomic physics.

Poly gave us a wonderful background in those days. Today, the engineers don't get as good a scientific and chemical background. I graduated taking advanced organic chemistry in my undergraduate studies. When I received my doctorate, my minors were in physical and organic chemistry. That's helped me, because I can deal with research people, as I'm doing now with my clients. I understand the chemistry, I can do the physics, I can point out things, and I appreciate and understand the chemical reaction that's going on.

THACKRAY: It seems that a major part of your education, which has helped you greatly in life, is communication.

KATZEN: Absolutely. There's one thing I learned—again from Olson—to listen. You learn more by listening than by speaking. The same old story. I used to preach that to my fellows in Cincinnati. Spend the maximum time listening and speak only when it is essential to clarify something. I am fortunate to have also learned how to write properly. I was at Diamond Alkali in research and development when Dr. [Julian] Avery, the vice president in charge, called me into his office after I was there a few months. This was after Northwood was acquired by

Diamond. Avery told me he appreciated the work I was doing and said, “By the way, you write very fine reports, the best I’ve seen in this group.”

THACKRAY: Were you considered the “rainmaker” at Katzen?

KATZEN: Yes, you might say so. Let’s put it this way: I mentioned in my prior interview why and how I started the company after working seventeen years for other companies. I felt that engineers did not operate well in large organizations. I wasn’t a driver-type, but a challenger-type. I claim that with my method of operation—when I threw responsibility at people quickly, and gave them a chance to develop—two things happened: one, within a year, we would know whether he or she really fit the business; and if they fit, they stayed. Those that couldn’t take it, left. In addition, I never ask people to do anything that I couldn’t do. That includes climbing in and out of equipment, climbing ladders, and climbing on top of things. That’s my practice. People like that kind of leadership because they’re not driven; they’re challenged.

THACKRAY: How would you connect what you’ve learned from experience to chemical engineering education? What would you add to the standard course?

KATZEN: So much has to be done by practice. I think two things are needed. Most engineers are looking for a job. We have to start teaching them something about entrepreneurship and how, with the training they have, they can start an operation, an organization—whether it be research, engineering, or production. However, it’s hard to say how that would fit into a course.

I knew of Union Carbide through Vulcan, we had built a lot of equipment for them, but they were very secretive about their own engineering. So, I went after them. My contract with Union Carbide ran for twenty-five years. That was the first time an outside group had worked for their central engineering and research group on sensitive projects. Carbide challenged us to see what we could do. The first assignment was to evaluate four different ways to make a catalyst for their plastic resin business. We had four weeks to do it. I said, “That is a tight time schedule, but we’ll try it.” Well, we came out with a report in five weeks and sent it to them but heard nothing for two months. Then they asked us to come to Charlestown for a meeting. “The reason it’s taken this long is that we couldn’t believe that anything done that fast would be worthwhile. So we had our people check your work.” [laughter] “It checks out. How did you do it?” I replied, “Carbide has people just as good as the people in our organization. They’re top-notch but they have to go through a line of command, they have to organize a team, they have to get approvals up and down the line. All we’re doing is turning on the dime and doing the work.” I continued, “I can teach your people how to do this if your management will let them.” But you know, in a big company it’s hard to change management. We were very successful. We did about sixty projects for Union Carbide in twenty-five years. It was wonderful working for them. They treated us like equals. The scientists and engineers from

their central R&D organization admired our work and developed projects for us. The engineer in charge of our contract would come to me and say, “Ray, I’ve got a problem. Help me write the specification on what this project is” and we’d write it together. He’d say, “All right, go ahead and do it.” We found we could work with a big company the same way we worked with a small one.

THACKRAY: Why did your group not dwindle away to nothing or grow to include one thousand people?

KATZEN: We focused on what we wanted to do. In a way, that was my doing. I spent nine years in turnkey design construction where I was very unhappy about the cyclic nature of the business. In the industry of big engineering contractors, there was a roving population of engineers and designers going from one company to another to get a decent workload. That was ridiculous. After two or three cycles at Vulcan I said, “I don’t like this kind of business.” What I do like—I think this is where the greatest contribution is made in the engineering construction picture—is process design. That is where you do the basic thinking—you do the optimization not only technically but also economically. The make or break of the project is in process design.

[END OF TAPE, SIDE 1]

KATZEN: We started as a sole proprietorship. My wife acted as my secretary because she wanted to work with me—she had taken a correspondence course and learned bookkeeping. I set up the books. I brought in an accountant after a while and he was amazed at how my system worked. He set my wife up with a real accounting system, which she became very good at using. She was a top-notch financial officer. She does the same thing today for me and with me. Eventually we started bringing people in. First, it was Walter Kline, who had been a mechanical engineer at Vulcan. And then Vincent [Diebold], a top process engineer from Vulcan. Vulcan was sort of falling apart at that time. I could see it happening. We started a partnership, Raphael Katzen Associates. In 1956, we organized as a Western Hemisphere Corporation because we were doing work in Latin America and could receive a tax benefit.

Raphael Katzen Associates International, Incorporated was a private corporation. That name lasted for numerous years until I finally retired from the company a few years ago. The name changed to KATZEN International, Inc.

THACKRAY: Are you still a partner in the corporation?

KATZEN: No. I learned that one has to make a clean break. We actually had a three-year transition period where my responsibilities were phased down as others were trained to take over. I retained the nominal title of chairman of the board for a three-year period until the final financial obligation was completed.

THACKRAY: Your legacy is your good name.

KATZEN: That's right. Moreover, that's well known internationally.

THACKRAY: You must be very proud.

KATZEN: I am very proud and amazed. Many young engineers say, "You're the Katzen of so many publications! Gosh, you published in 1940-something!" In the field I'm in, my work and name are recognized.

THACKRAY: It seems that you have undertaken another venture.

KATZEN: I thank God, literally, for my health and sanity. I'm very fortunate. I'm eighty-five and still in good shape without heart problems or cancer. I have no problems other than the conventional ones. Old age doesn't seem to bother me. I have interest in new technology, like the conversion of biomass to fuels and chemicals with new enzyme technology.

I also became involved in a new pulping process that I developed in my doctoral thesis. It was so radical that nobody would touch it. It was a dead issue until twenty years ago, when I found a Canadian consultant who said the pulp industry was going to go bankrupt from producing and selling paper at cost. They had to change their ways. He had come up with some chemistry that sounded good, but he didn't understand the engineering, so we joined forces. We originally called it the alcohol pulping and recovery process [APR], but it was acquired by a Canadian company, who called it ALCELL. ALCELL is a radical but simpler method of pulping than I proposed in my doctoral thesis. We've completed the demonstration phase, so we'll soon see how commercial it is.

THACKRAY: Again, are you back to a sole proprietorship?

KATZEN: Yes, sole proprietorship.



THACKRAY: But not with KATZEN International. What are you called now?

KATZEN: Simply Raphael Katzen, PE. I use the PE because that's important in these parts. I offered to make Selma a partner. She replied, "No, I don't want to be partner." I asked, "How about a corporation?" "No. I don't want the paperwork." Therefore, she is an unemployed, unpaid, non-employee, executive secretary.

THACKRAY: Are other consultants involved?

KATZEN: No. Just myself.

In selling the company, I turned over all my technology for a payment payout, which is now complete. I cannot offer the technology or engineering design. However, I can offer my knowledge of how to organize projects, how to evaluate technologies, how to do deal with financial people, look at feedstock and product markets, and that sort of thing. Once again, I've never been trained in business school, but as I taught Leonard Pool, I know how to reorganize a company. I learned the practical way. I never studied contracts, but I've done a lot of contract work with lawyers. I'm adept at it. What I do now is broad-based, which I like. It's something I can help with. My current client, BC International [Corporation] out of Dedham, Massachusetts, is run by an entrepreneur who's already developed a couple of other businesses, got interested in this business about eight years ago, but got off to a poor start with another company that had the so-called enzyme technology. He acquired that technology himself from the University of Florida and called me in three years ago as a consultant, just about as I phased out of KATZEN International. I started with him.

THACKRAY: Tell me more about Selma, if you would. When and where did you meet?

KATZEN: That's an interesting story. Poly had an open house once a year in the armory building to which one of my classmates, Ed Garretson, invited his girlfriend to come, and she brought a friend of hers along, Selma. That's how we met. She was a chemistry student at Hunter College then. We were introduced while I was working my way through school. At that time, I also sold the *Chemical Rubber Company Handbook of Chemistry and Physics* (3). When Selma told me she was a chemistry student, I told her, "I'm going to sell you a *Chemical Rubber Handbook*." She replied, "My uncle already gave me one." Her uncle, Dr. Henry [H.] Storch, was a very famous chemist with United States Bureau of Mines laboratory in Pittsburgh. That was a disaster. Sometime later Ed Garretson asked, "How about a double date?" That's when our relationship picked up again. We met at Poly, but that meeting was a disaster as well. I couldn't sell her a handbook, but something still developed. She's a bright woman. It's always a good challenge to have a bright woman for a wife. She's been a tremendous support to me. She's had to live through my long absences in the early days of business.

THACKRAY: What year did you marry?

KATZEN: When I got my master's degree, 1938.

THACKRAY: Was Selma working?

KATZEN: She'd just graduated. She graduated a couple years ahead of time. She was all of nineteen years old when we got married, but she had a college degree. We were engaged in 1937. After marriage, my young bride and I had to move to the cold country, Wisconsin, for Northwood Chemical.

THACKRAY: Where did Selma grow up?

KATZEN: In New York City.

THACKRAY: Wisconsin must have been quite a change for her.

KATZEN: I'll tell you, we met some of the friendliest people there. I was already accustomed to it. Northwood was situated in a small town of six hundred people—everyone knew who you were and what you were. It was a typical small town. Nothing vicious about it. Very friendly. We lived 2 miles outside of town, so I wanted to walk to work, but people wouldn't let me walk to work. If I was walking, they'd stop me, "Come on, Ray. I'll give you a ride." "No thanks. I don't want a ride. I want to walk." "No, come on." It was just that way. For Selma, there was a bit of a culture shock. I had a year to get used to it. I was one of the few people, other than the doctor and dentist, in town with a college degree. They asked me to be on a committee to judge a high school contest. I became very involved with the high school. Once you participated in the community, it was a very nice atmosphere. But for Selma, she had led a sheltered life in New York. In any event, as I say, she's a bright lady.

In the first seventeen years of our marriage, we lived in about twenty different places because I kept moving. When I went back to school for my graduate work, Selma stayed in a small apartment near Poly, close to Don Othmer's place. Then Northwood was acquired by Diamond Alkali, which meant we moved to Painesville, Ohio, for two years, and then to Cincinnati, where I went to work for Vulcan. We lived in Oregon twice. We lived in Canada for a year and a half for a project. Selma accepted all of this and never quit. We finally settled down in Cincinnati, which has been our home most of our lives.

THACKRAY: Why Cincinnati?

KATZEN: Because of Vulcan Copper and Supply Company, as the company was known—it was later changed to Vulcan-Cincinnati.

As I said, Don was a consultant at Vulcan. Don always kept track of what I was doing. He became far more than just a mentor and a professor. We were close friends. When I decided to leave Diamond to apply for a commission in the Navy in 1944, Othmer called me to say that his client, Ted Wentworth—I had met Ted when he visited Don Othmer at Poly—at Vulcan, had a contract from the Defense Plant Corporation to build a plant to make ethanol from sawdust. Moreover, since I was one of the few people in the country who had any experience with that type of technology, I should help them out. So I called Wentworth and said I was to be commissioned in the Navy. The Navy might call me up in thirty days, but I'd come to work at Vulcan if he gave me a written agreement that he would release me to the Navy, which he did. I told my wife and daughter, "We may as well put our house up for sale." They were going to move back to New York and stay with Selma's parents while I was in the Navy. At the end of the month the Navy advised me that the qualifications for special post had been filled, "We don't need you." That one month at Vulcan became nine years. I went from helping with a project to manager of a sixty-person engineering division.

THACKRAY: So that is what took you to Cincinnati where you settled down.

KATZEN: We liked Cincinnati. It had a very pleasant atmosphere for a midsized city. It had a southern atmosphere, but northern activity. The northern-most southern city and the southern-most northern city. The smallest big town and the biggest small town. I didn't mind leaving, but Selma loved Cincinnati. She hated to leave Cincinnati. She still brings that up periodically.

THACKRAY: What year was your daughter, Nancy, born?

KATZEN: Nancy was born in—I have to do the subtraction—1943.

THACKRAY: So in 1953, you had a wife and a ten year old daughter. How did Selma feel about you going out on your own?

KATZEN: She always knew I was going to do it eventually. In fact, I had prepared for it. Vulcan was a wonderful company to work for in terms of accomplishment. Ted Wentworth,

president of Vulcan, never got his engineering degree, because when he married, his father, an old-time German—his family name was originally Wente—took him out of school and said, “You’re married. Get to work.”

THACKRAY: You had to go out on your own.

KATZEN: Yes. I could see that Vulcan was a family-owned business. I had worked up to management of the engineering division, and I made more money for them in the last two years I was there than they’d ever seen before—I wrote the contracts and I executed the projects. I got contracts that Wentworth himself couldn’t get at prices that he couldn’t get. I have story after story like that. In any event, Vulcan was a family-owned company. There was a lot of interfamily battling. They were bleeding the company dry. I worked with the lawyer and accountant to try to get them straightened out but I couldn’t. I finally said, “You’ve got to make me an officer of the company, if I’m going to do any good.” The president responded, “No, sorry. It’s family only. Can’t do it.”

Finally, I saw that the company was going bankrupt. I had my reservations about leaving Ted Wentworth. Again, we were good friends. He’s a photographic bug, as was I. We traveled together a lot. He let me do what I wanted. However, he didn’t want me to run the company. Wentworth invited me to lunch after I’d given my resignation, in order to see what I was planning. I think he was afraid I was going to work for a competitor. I said, “I’ve been thinking about this for some time. I have nearly seventeen years experience behind me, nine years at Vulcan, and seven years in the operating industry. I’m going to start my own company to do process design and consulting.” He replied, “I’m your first client!”

THACKRAY: Selma, right from day one, has been your chief financial officer, no matter what her title has been.

KATZEN: It’s funny, her father was a lawyer and an accountant. He was a very good accountant before he studied law. He worked in New York and in Israel for a New York company. He’s passed away now. Selma always said, which is typical, because her father spent so much time with the books, she didn’t want to be an accountant. When we started the business, I said, “Let’s rent an office.” She replied, “No, let’s start it at home and save some money.” Therefore, we started the office at home. Selma volunteered to keep the books. Therefore, I set up a simple bookkeeping system. After a year or two, I realized we needed some professional advice, and an accountant was recommended. He was tall, thin, and very dramatic. As he came into our home office, he thought he was walking into a den of iniquity. He didn’t know what kind of trouble we were in. He spent a few hours going through the books and said, “This is the first time I’ve seen a homemade bookkeeping system that actually worked.” But then he showed Selma double accounting, which she took a commercial correspondence course for. She picked it up right away and was very good at it. She was the

treasurer of the company and, essentially, the financial officer. She knew how to handle a staff of five ladies. We came down here and started consulting. She's not interested in club work or cards, doesn't golf or anything. She likes business. She really is a businesswoman. At the office in Cincinnati, we always use to say to clients, "If you call and you can't find any of us, ask for Selma. She'll know where we are and what we're doing." She's very good at it. Very efficient.

THACKRAY: It's been a great partnership.

KATZEN: It's been a wonderful partnership. She speaks her mind. I'm very proud of her because she is her own woman.

THACKRAY: Does Selma have brothers or sisters?

KATZEN: Just a younger sister who is a retired lawyer.

THACKRAY: Where is your daughter?

KATZEN: Nancy is in Cincinnati. She was born in Painesville, Ohio, and brought up in Cincinnati. She went to Denison University, in Ohio, and married a medical doctor. He was on the Kentucky side of the river, but they've lived in Cincinnati ever since he got through his internship and residency. I have three grandchildren. Two of them were born in Chicago where Nancy's husband was interning. The youngest, a girl, was born in Cincinnati. They all grew up in Cincinnati. Selma and I are very close to our grandkids. The boys are men now with families. Our granddaughter just married.

THACKRAY: What do your grandchildren do?

KATZEN: The eldest grandson [Andrew Riedel] is my pride and joy. He's the only other engineer in the family. He's a top, straight A student. He's also an athlete—co-captain of the swim team in high school. He's an "All American Boy." By the time he was twelve years old, he was playing with a friend's Apple computer and he decided that was for him. So he talked his father into buying an Apple computer for the family. The computer was 95 percent Andy's, 5 percent the family's. By the time he was in high school in Anderson Township, a suburb of Cincinnati, Andy was working for a local man putting computer systems together. He applied to six top colleges for computer systems engineering. Andy didn't just want a computer programming education. He wanted the whole nine yards. He was admitted to five out of the

six schools. The only one he didn't get into was Princeton. He picked Stanford [University]. It was tough but he survived it. He works in Silicon Valley. While he was at the university, he took a job servicing the university computers. He received his degree ten years ago. He's thirty-two now.

Andy and a couple of his friends tried to start up their own company, but they didn't really know how to go about that, so he had to leave that venture and work for another start-up company. That's typical—everyone has an idea about developing his or her own start-up company to get rich. Andy went to work with a third company, which was developing programs to transfer voice communications as well as electronic signals to computers. He became chief architect—that is the same title Bill [William H.] Gates has at Microsoft [Corporation]. The last time I talked to Andrew, he said, "I'm thinking of going into consulting." This was almost a year ago. I replied, "In nine years, you'll have the equivalent of thirty years of experience in any other industry, it moves so fast. You have the personality for it. You know what you want to do, so do it, and, I'll bet you, the day you resign, your employer will be your first client." So guess what happened—he resigned, and his employer wanted to be his client.

[END OF TAPE, SIDE 2]

THACKRAY: How long ago did your grandson start consulting?

KATZEN: He's only been consulting for six months or so. Meanwhile, his former employer, Hello, Inc., besides using him as a consultant, asked him to take over their maintenance contracts—a big part of their license agreement is maintenance contracts—so he's taken that on for very good remuneration. Andrew has one partner in his business and one associate. I told him to move slowly bringing in partners. Make them associates first. Everybody wants a piece of the action right away. I never gave people a chance to buy stocks until they were with the company for three years. You don't want to lose control either. At Raphael Katzen Associates International, Inc., Selma and I had majority control. We gave part of our stock to our daughter; she was a shareholder through a legacy set up. I've been advising our grandson that way. I'm very proud of Andrew.

Andrew's brother, who is a year-and-a-half younger, is a salesman for Abbott Laboratories. He's more the outgoing type. He's a very good salesman, but not technically oriented. My granddaughter, like Selma, Selma's mother, and our daughter Nancy, has an artistic trend. My granddaughter has a bachelor of fine arts degree in jewelry making and metalworking. Of the three kids, none wanted to be doctors like their father.

THACKRAY: But at least one became a consultant. That's neat.

KATZEN: Yes, an engineering consultant.

THACKRAY: Would you say a few more words about Don Othmer?

KATZEN: Well, I told you about my relationship with Othmer at Poly—well, at least, the start of it. I dropped out of Poly in 1933. I completed my freshman and sophomore years in a year-and-a-half. I was broke. I had to find work. After a year of searching, I became hopeless, and had to borrow money in order to go back into school. I went to visit Raymond Kirk whom I had been well acquainted with while I was at Poly. Kirk taught freshman chemistry. I stated to Kirk, “I’m looking for some part-time work at the school.” Kirk replied, “Well, you’re a “comical” engineer, and there’s a new man in the department. You ought to meet him, Dr. Othmer. See if he can use a helper.” So, I went up to the chemical engineering department, on the top floor, and introduced myself. Othmer said, “You can help me out with the National Recovery work at forty cents an hour. I need the attic cleaned up.” The chemical engineering lab attic was famous. It was a real rat’s nest of old stuff. I took the broom and cleaned. When Othmer learned that I’d been a pipe fitter’s helper for my father, he put me to work with the lab mechanic organizing equipment in the engineering lab. Our relationship started that way. At the start of my senior year, Don took me out on a couple of his consulting jobs, so I could see him in action.

THACKRAY: This was something he only did with the students he really trusted.

KATZEN: That’s right.

To me, working with him was a great experience because the work was all very practical. There weren’t many jobs available, but Othmer helped me find a job with a small company, which had developed a new process for dipping molds into cellulose acetate to form bottles or jars. Interesting work. The company was in the Bronx, not far from where I lived. This was the summer after I received my bachelor’s degree. I worked for two months before the company went bankrupt. Depression days. I was never paid. Again, I went to see Don Othmer at Poly and stated, “Well, there aren’t many jobs around. Anything open here?” He replied, “There’s a graduate fellowship in the chem. engineering lab. Do you want to take it?” I responded, “Yes.” It paid two hundred fifty dollars a year, plus free tuition. I spent a year at that, but two hundred fifty dollars a year doesn’t go very far. I lived at home, and my budget included carfare—a nickel a day—and twenty-five cents for lunch. At the end of the year, I knew that I had to find work. I just could not live that way. Even though I hadn’t finished my master’s, Othmer said, “Well, there’s a company up in Wisconsin that is restarting a chemical plant like the one you worked for in Pennsylvania. You can get a job there.” I replied, “Fine. I’ll take it.” I went to Wisconsin with the title of chemical supervisor. My task was to restart the plant. Meanwhile, I worked out a plan with Don Othmer on how to complete my master’s.

Of course, I had to write a thesis. He had to get permission from the faculty or board to let me do my plant design course and thesis in absentia.

My idea was to develop a continuous wood hydrolysis process to make plastics. I was studying work I saw at the Forest Products Lab, which used a batch process. I designed and built the pilot plant, did the experimental work, and, like my bachelor's thesis, which was operating commercially, I had this pilot plant running and had the results in to complete a plant design. With the plant design course passed and my thesis written, I received my master's in 1938, which was the year Selma and I married. We were engaged in 1937.

Don was also a consultant for the company I was with, so I went back for doctoral work with the company's support. After that, we kept in touch. There was one time that I was on the outs with Othmer over a student, Robert S. Aries. Do you know the name?

THACKRAY: Indeed.

KATZEN: Aries was at Poly while I was doing my graduate work, so Don assigned him to work with me. I gave him a thesis to do, and then I watched the way he worked—cutting up articles and pasting them together was his idea of writing a paper. One morning, I walked into Don's office—my desk was in Don's office—and there was Aries going through Don's desk. I told Don, "Check this guy out. He's a liar and a thief. Get rid of him." "No. He's a nice guy." So Aries stayed on and got a master's degree and eventually a doctorate. Then he started his own company [R. S. Aries & Associates] where he listed Don Othmer as one of his associates. He asked me to be an associate. "No way. I don't want to even be near it." Anyway, I was in New York when Don said he was going to visit Aries and asked if I would go with him. It was the same old story. Aries was sort of fooling Don into some plan of his that I wanted no part of. Don and I left and began arguing in the street. Don was very upset. I said, "Don, you've got to get away from this guy. He's going to destroy you and Poly. He's a thief and a crook." Well, I had found out that he was stealing. He'd stolen a drug to cure a chicken disease from Merck [& Company]. He also stole another invention and tried to sell to Vulcan. I was in the meeting when he presented it. Immediately I could tell it wasn't his. I told Vulcan, "Stay clear of him." They paid him two thousand dollars for that meeting. I started a movement within the American Institute of Chemical Engineers, of which Aries was a junior member, to decline Aries' full membership. I received a call from the ethics committee, and I informed them, "Here's the evidence we have." They kicked Aries out of the AIChE. Don finally chose to disassociate himself from that guy. I don't know how much harm it did, but it was bad that Don's name was associated with Aries' and his name was associated with Poly.

THACKRAY: I never thought of Don as a credulous person.



KATZEN: I don't know what kind of magic Aries used. He was a great talker and was very personable. I don't know how he got Don flimflammed. I could see through him immediately. Of course, I caught him in the act of opening Don's desk. The other incidents were actual thefts, but Don didn't want to believe it.

THACKRAY: In the 1930s, Don married his first wife. Theirs was a marriage of many problems.

KATZEN: Marcia Imray was her name. I got to know her because they lived in Brooklyn Heights while I was in graduate school. We were both married, and lived just a short distance from each other. We met occasionally. I knew she was a problem. Don always asked me to drop in on her, keep an eye on her, and help her out. We didn't realize what the problem was at first—she was an alcoholic. Once, Don asked me to check up on Marcia while he was out of town. I asked Selma to go with me. Marcia, obviously, had been drinking. She said, "I wouldn't mind if he had a woman for a mistress, but when his profession is his mistress, I can't stand it." This was a real problem. She was the spoiled daughter of an Eastman executive, who probably saw Don as a bright, young, handsome man of the future. But when Don's future changed from Kodak to being a professor, publishing, and consulting, it took him away from her so much that she resented it. Don built a beautiful home in Coudersport for her. She practically destroyed it in a tantrum. It was a shame. Their marriage finally ended.

THACKRAY: Did they divorce?

KATZEN: They divorced. She has remarried since to some lawyer or doctor in Rochester. We've lost track of her. I think the alcoholism was a big problem, but so was her jealousy of his work and profession. I will always remember her remark—she wouldn't mind his having a woman for a mistress, but having his profession for his mistress, she couldn't cope with that.

THACKRAY: Indeed.

KATZEN: I remember that so vividly mainly because Don asked us to help. He knew that we were aware of the situation and would not talk about it. It was difficult because he was trying to get his career started and she was making a rough go of it.

THACKRAY: Yes, it is a classic scenario, isn't it?

KATZEN: It was all too bad, but of course, his marriage to Mid [Mildred Topp Othmer] was just the other way around. That was a wonderful marriage.

THACKRAY: Yes. That was the other end of the pendulum.

KATZEN: Mid was smart in that she participated—went traveling with Don around the world.

THACKRAY: By the time I met Mid and Don, it was hard to think of the two of them as having ever been apart.

KATZEN: That's right.

We always kept in touch. Anytime I was in New York, we visited. They lived in the townhouse that he bought when he was a professor. Down the line, he donated that house to Poly. Selma, who's a fusspot, always said, "Why don't you spend money on this house to fix it up? It's worn out." Don and Mid were so frugal. Don worked frugality to the extreme. Have I told the story about Don raising funds for the chemical engineering department? This was when Othmer was about eighty. I was working in Cincinnati, but I helped organize the celebration.

I was at the Chemists' Club if I recall right. Someone in administration said, "You know, we ought to get a committee together, Ray, to raise a ten million-dollar fund to build up the chemical engineering department. We will name it in honor of Don and Mid." I'm a sucker when it comes to doing things that honor my professor, so I said, "I'll take it on. I'll put a committee together." Martha Livingston, who was part of the administration, was very capable, but she was getting ready to leave. I went to see her and asked her to get some paperwork done because I couldn't handle the mailings. "Before we start, why don't you approach Dr. Othmer and see if you can't get a million or two from him?" I responded, "A million or two from my professor?" Keep in mind this is twenty years ago or more. She replied, "Yes, he's worth nineteen million." I was baffled. I knew he had worked at Kodak for five years and hadn't received much for his patents. That was one of the reasons he quit. He consulted. I'm sure he didn't get rich on consulting. Being Ray Katzen, I went to see Don in New York. I sat down and explained what we were trying to do. Don said, "Ray, I appreciate what you're trying to do, but I have a three-tier will that contains small bequests and medium bequest. The third tier is uncertain, but I'm not going to give Poly anything at present. It will be taken care of in my will." Well, that was very disappointing. I talked to the committee and realized that they weren't getting help from any other place. We threw up our hands and said, "Forget about it." As it ended up, Don was a lot smarter than we all were. Instead of two million, Poly got one hundred seventy-five million dollars from Othmer.

THACKRAY: It's interesting that Poly knew that Othmer had significant assets since he lived very modestly and did not advertise his wealth.

KATZEN: That's right. He didn't. That was the point. In fact, I was surprised Poly knew he had nineteen million dollars. I don't know where they got that information. Apparently the money, all of his and Mid's, came from Berkshire-Hathaway [Inc.]. I heard the story from my brother-in-law. His law firm is the one that handled Don's estate. I even met the lawyer who handled the Othmer estate along with Gerhard Frohlich. Finally, the pieces began to fit together.

THACKRAY: Have you been engaged with fundraising for Poly in other contexts?

KATZEN: Yes. I've always been involved with Poly. I was the vice chairman of the board of fellows and attended commencements quite frequently. I contribute to Poly every year. In that way, I've participated in fundraising. I just made a pledge for the next four years. There will be a "brick wall" in the lobby of one of the new buildings showing support for Poly, so there will be a "brick" on the wall with my name on it. I've always been interested in Poly, but not too happy with some of the things I see happening. The quality of the education has changed. The interdisciplinary approach I was fortunate enough to have early on, no longer exists. The new program de-emphasizes engineering too much. It's difficult enough to get students to go into chemical engineering when they also have the choice of bioengineering, electronics, and what-have-you. Now it's particularly difficult. For one thing, in recent years, there has been a weak head of the department. The head of the chemistry department was more positive, more influential and started consolidating chemical engineering back into chemistry, which is ancient history, from which Poly departed with Kirk and Othmer. That's a mistake. Anyway, I try to help however I can.

THACKRAY: Have you become engaged in government and philanthropic activities elsewhere?

KATZEN: Yes. I am a trustee of the AIChE Foundation. That's real fundraising. We are working on a nine million-dollar fund, which will close in April. Most of the donations have come from industry. Members, as you know, have been weak in their participation. Members have only put in about 1.5 million so far. It's a shame. There are sixty thousand members, and if they each donated fifty dollars, we could go way over our target.

THACKRAY: Fund raising is very difficult.

[END OF TAPE, SIDE 3]

THACKRAY: Poly was very fortunate so many years ago—Don was there, you were there, and Joseph Jacobs was there.

KATZEN: Yes. I taught Joseph Jacobs chemical engineering.

THACKRAY: Well, you did a good job. [laughter]

KATZEN: I always say that's my claim to fame: I taught Joe Jacobs. Joseph and I were very close. He was in his senior year taking chem engineering while I was a graduate student. Then I came back for my doctorate, and Joe and I got our doctorates together in 1942.

THACKRAY: So you really saw quite a bit of him?

KATZEN: Indeed. Back then, Selma and I were the only married students on campus—usually students didn't get married until they were off and working. Joe and Vi [Violet J. Jacobs]—I don't know if they were engaged yet—were going out, so Selma and I acted as their chaperones. We've been close ever since. At one time, Joe was interested in buying my company, which would have been good since his company is very well run and very successful. However, he didn't do innovative engineering—our company would have added something to what he had. Nevertheless, we never could agree on a price.

THACKRAY: Do you see Joe when you go to Poly?

KATZEN: Poly and Pasadena, California. I've gone to his office; I've been to his home. We're good friends. To give Joe credit, I've always told the story that I started my consulting in 1953, and shortly thereafter, Joe, after working at Merck, went off on his own. Joe was the first person to use penicillin. It saved his life. In any event, he called me one day and said, "I'm thinking of going out on my own. I want to get out of representation and into contracting." I replied, "Well, Joe, I've done it before. I've had nine years of it. I don't want any more of it. It's too up and down. But if you have the interest and the capability—go to it." So he did. He did very well. He's a good businessman. He was smart in that he kept control of his company. It was well run then and runs well today. He's also been very good to Poly.

THACKRAY: Ray, thank you very much.

[END OF TAPE, SIDE 4]

[END OF INTERVIEW]

## NOTES

1. See for example:  
Raymond E. Kirk and Donald F. Othmer, ed., *Kirk-Othmer Encyclopedia of Chemical Technology* (New York: Interscience Encyclopedia, Inc., 1947-1960).
2. W. H. Bates, *Perfect Sight Without Glasses: The Cure of Imperfect Sight by Treatment Without Glasses* (New York: Central Fixation Publishing Company, 1920).
3. See for example:  
David R. Lide, ed., *Chemical Rubber Company Handbook of Chemistry and Physics*, 84<sup>th</sup> ed. (Cleveland: CRC Press, 2003).

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