

CHEMICAL HERITAGE FOUNDATION

CHALMER G. KIRKBRIDE

Transcript of an Interview
Conducted by

James J. Bohning

in

Washington, D.C.

on

15 July 1993

(With Subsequent Corrections and Additions)

THE BECKMAN CENTER FOR THE HISTORY OF CHEMISTRY

Oral History Program

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Chalmer G. Kirkbride
Chalmer G. Kirkbride

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Chemical Heritage Foundation
Oral History Program
315 Chestnut Street
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CHALMER GATLIN KIRKBRIDE

1906 Born near Tyrone, Oklahoma Territory, on 27 December

Education

1930 B.S.E., chemical engineering, University of Michigan
1930 M.S.E., chemical engineering, University of Michigan

Professional Experience

1930-1934 Chemical Engineer, Research Department, Standard Oil Company (Indiana),
Whiting, Indiana

1934-1941 Director of Technical Services, Pan American Refining Company (Amoco),
Texas City, Texas

1935-1940 Second Lieutenant, Chemical Warfare Service

1942-1944 Chief of Chemical Engineering Development, Magnolia Petroleum Company
(Mobil Oil), Dallas, Texas

1944-1947 Distinguished Professor, Department of Chemical Engineering, Texas A&M
University

1946 Consultant, Secretary of War, Bikini Atomic Bomb Tests

Houdry Process Corporation

1947-1952 Vice President, Research and Development
1947-1962 Member, Board of Directors
1952-1956 President and Chairman of The Board

1952-1956 Director, Catalytic Construction Company

Sun Oil Company

1956-1960 Executive Director, Research, Engineering, and Patents
1960-1970 Vice President, Commercial Development, Research, Engineering,
& Patents
1963-1970 Member, Board of Directors

1958-1968 Member, Board of Directors, Sunolin Chemical Company
1959-1960 President, Avisun Corporation
1959-1968 Member, Board of Directors, Avisun Corporation

1970-1974 Consulting Engineer

1974 Petroleum and Chemical Specialist, Federal Energy Administration

1977- President, Kirkbride Associates

Honors

1951 Professional Progress Award, American Institute of Chemical Engineers
1959 Sc.D. (honorary), Beaver College
1960 Eng.D. (honorary), Drexel University
1964 Engineer of the Year, Delaware County Chapter, The Pennsylvania Society of Professional Engineers
1965 Kirkbride Hall of Science and Engineering, Widener University
1967 National Academy of Engineering
1967 Founders Award, American Institute of Chemical Engineering
1968 Distinguished Public Service Award, U.S. Navy
1970 Eng.D. (honorary), Widener University
1970 Engineering Centennial Medal, Widener University
1971 George Washington Award, Philadelphia Engineering Club
1976 Fuels and Petrochemical Award, American Institute of Chemical Engineers
1983 Eminent Chemical Engineer, American Institute of Chemical Engineering

ABSTRACT

Chalmer G. Kirkbride begins the interview by describing his family background and childhood in Oklahoma and Kansas. During high school, Kirkbride's interests were influenced by his brother-in-law, a chemist for Sherwin-Williams. Kirkbride studied chemical engineering at the University of Michigan and spent summers working in the oil fields. He was recruited on campus by Standard Oil of Indiana and worked at the Whiting refinery. Kirkbride also worked for the Pan American Transport Company and Magnolia Petroleum Corporation before being appointed as the first distinguished engineering professor at Texas A&M University. In 1947, Kirkbride returned to industry when he was recruited by the Houdry Process Corporation. He became president of Houdry before moving to Sun Oil Company where he created a commercial development department and began taking an active interest in environmental issues. After his retirement he became president of the Cecil County Anti-Pollution league, founded Kirkbride Associates, and participated in board activities at Widener University.

INTERVIEWER

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

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INTERVIEWER: James J. Bohning

LOCATION: Washington, DC

DATE: 15 July 1993

BOHNING: I know you were born in Oklahoma in 1906, before it became a state.

KIRKBRIDE: Not Oklahoma, but Oklahoma Territory! I'm one year older than Oklahoma.

BOHNING: How did your parents become pioneers in Oklahoma?

KIRKBRIDE: My father was practicing law in Ohio and he had decided that he would go down to Oklahoma and practice down there. It was going to be a new state. And that's what he did. He met my mother down there. She and her father, the whole Gatlin family, had moved over from Arkansas. My grandfather was in the mercantile business in Little Rock, and the whole family moved over to Oklahoma. It ended up that the boys went on further west, but the girls went out and headed up near Oklahoma City. My mother and her father went on out further and settled in Tyrone. My mother staked down a claim, six hundred and forty acres. Those claims, at that time, were all one square mile.

My two aunts weren't too far from Oklahoma City. One of them was in Enid and one of them was in El Reno. My mother staked this claim out, and when my father and mother were married there, they decided they would farm that claim for wheat. Tyrone, Oklahoma Territory, was noted for its wheat production.

I was born on that claim. Frankly, what was there was nothing but a hole in the ground, called a dugout. I was born in that dugout. Then my mother and father built a house on top of it. Not too long after I was four years old—I became four years old on December the 27th—I woke up on a mattress out on the road near the house, and the house was on fire. In fact, it was in the final stages, and it burned to the ground completely.

So my father decided he would go to Hooker, Oklahoma—that was the county seat—to practice law. And he did. Of course, that was a very poor place to practice law. He should have come to Washington. [laughter]

BOHNING: Where in Ohio had he come from?

KIRKBRIDE: He came from Corning, Ohio, which is near Zanesville.

BOHNING: Do you have any recollections of your time in Oklahoma?

KIRKBRIDE: Oh, yes. I have quite a number. I distinctly remember the fire. I remember when we moved in to Hooker, Oklahoma, where he was trying to practice law. I recall very distinctly that we had a very hard time. They were also farming the land of the claim. They had three beautiful crops of wheat coming on each year, and the weather caused problems. I think the first year, it got up to the point where the lightning hit, and it was all crisp and nice and ready for a fire and the whole six-hundred and forty acres went up in a gust! The next year, it rained. They had the wheat in stacks, but the wheat soured before they could get it threshed. The third year, the wheat was up, and a storm came up. Lightning and hail, particularly, beat it into the ground.

For three successive years they had bad luck. My mother was really fascinated by the oil business, which was getting started in Bartlesville and Tulsa. They traded the claim for a rooming house in Caney, Kansas. Caney, Kansas is right on the state line. When we went there, I was seven years old. The Phillips Petroleum Company was just getting started. I remember a lot of those old casinghead plants around, and that was how Phillips got started. They were quite successful. Of course, Phillips now is even a larger company than Sun, the company I finally ended up with. It's not larger than Standard Oil of Indiana, where I started my professional practice of chemical engineering at Whiting.

BOHNING: Was oil ever discovered on your mother's claim?

KIRKBRIDE: No. In fact, if they had looked for gas, the largest gas field in the contiguous United States is the Hugoton field. It extended all the way from Hugoton, Kansas down to Amarillo, Texas. Tremendous field! My mother's whole six hundred and forty acres was in this gas field. They would have been prosperous right there. That's a very good example of the story, *Acres of Diamonds* (1). I'm sure you've read that; that's a classic text. So if they would have stayed right there, they wouldn't have made it in wheat, but they would have made it in natural gas.

They went to Caney, Kansas, because Caney had discovered gas in a shallow field there. They really attracted a lot of industry by intentionally lighting one of those gas wells. It would

throw a gas flame about three hundred feet in the air and would go night and day for quite a long time.

BOHNING: Did you grow up there?

KIRKBRIDE: I went through grade school and high school in Caney.

BOHNING: Do you have any remembrance of that time? What about teachers, or anything that fascinated you in school?

KIRKBRIDE: Yes. I had several excellent teachers in the grade schools. I think Caney had an unusually good school system. Frankly, it was far better than the Washington system; they can't even teach them to read here. When I went into high school, I had a number of teachers there who were excellent. One of them is still active; she's ninety years old.

I played basketball in high school. That was when people my size could play basketball and become proficient at it. There was a basketball player at KU; that's the University of Kansas, in Lawrence, Kansas. As a kid, I sort of idolized him. He went to work for Phillips, where he and this school teacher met and married. He became the chief executive officer of Phillips. I still correspond with him. In fact, I'm corresponding with him concerning a paper that I have written that deals with the production of synthetic crude oil from oil shale (2). In the Eastern states there is an adequate amount of shale to last a couple of thousand years, replacing the crude oil that's being imported. We import approximately seven million barrels a day of crude oil, and that could be replaced with this oil shale. I've gone through a preliminary process design of a plant to recover this oil from shale. I think I sent you a copy.

BOHNING: Yes, you sent me a copy.

KIRKBRIDE: Okay.

BOHNING: Who is the person at Phillips you're talking to?

KIRKBRIDE: He's retired, and he's very careful that he doesn't meddle in the affairs of Phillips, although Phillips had sixty thousand acres leased in Indiana for shale oil. They were going to go

into it in a big way, but they discovered the Ekofisk oil field over in the North Sea, near Norway. After they discovered that field, they were not interested in oil shale.

BOHNING: I was in Bartlesville in February. I was working in the Phillips archives, where I picked up literature on that field. They have a good museum there.

KIRKBRIDE: His name was Paul Endacott, in answer to your question.

BOHNING: One of the reasons I was asking about him is that you said he was a star basketball player.

KIRKBRIDE: Yes, he was an All American!

BOHNING: Phillips had a basketball team for a long time, and I wondered if there was a connection there?

KIRKBRIDE: I have a picture of the basketball team that Paul played on at Phillips. When Phillips was sixty-six years old, they put out a book on the company (3).

BOHNING: Yes. I have a copy of it.

KIRKBRIDE: There's only one picture in there of a basketball team, and Endacott is in there. He got his degree at KU in business administration. The University of Kansas was always good in that field. He did quite well at Phillips. As a matter of fact, he was the third chief executive officer that Phillips ever had. Frank Phillips was the first; [K. S.] "Boots" Adams was the second, and after him it was Paul Endacott.

BOHNING: One of my notes says that when you were growing up, you were delivering newspapers and mowing lawns to help with your family income.

KIRKBRIDE: Oh, yes. Well, I did. I delivered the *Kansas City Star*, which was a good paper. Even today, it is a very good paper. I was telling this story to a friend of mine here in the building, and he said, "Oh my, the *Kansas City Star*. I used to read that regularly." I found a lot

of people who thought that paper was the best. In Kansas City, we really had two papers; one was the *Post* and one was the *Star*. The *Post* has disappeared, but that was part of the empire that was built up by William Randolph Hearst.

BOHNING: When did you start thinking about going to college, or was it always assumed you were going to do that?

KIRKBRIDE: No. I was too fascinated with playing basketball and football and couldn't think about college, although my mother got me started thinking about college. She kept telling me that I was going to college, that I had to go, that she and my father did not have the money to send me, but I could work my way through. She was always pointing out young men who were really making a name for themselves and had done that.

BOHNING: Did your father have any influence? He had a law degree.

KIRKBRIDE: No, he didn't get his degree in law. Back in those days—that was back in the latter part of the 19th century—people would just work themselves up to a point where they could pass the bar examination. He was really what they would call a paralegal now. That's what he did. He was never very successful. In fact, Oklahoma was a bad place to go into law, unless you went into the oil industry, and he did.

My father and I were never very close. I was very close to my mother. She was a very capable person; unusual, I would say. She was extremely good in math, much better than my father. I think that's probably one of the reasons that I learned to go to her for the help that I got. But she kept telling me, "You can go to college. You can work your way through." She'd point out any number of young men whom I looked up to and admired and who had succeeded in doing that.

I made a reputation in high school. I was on several all-star teams in southeastern Kansas, and I had dreamed of going to KU, where Forrest Claire ["Phog"] Allen was the great basketball coach. My brother-in-law, who worked for Sherwin-Williams, was a chemist, and I was interested in chemistry. I made high marks in high school, and also I made high marks at [University of] Michigan too. I haven't made anything in my whole life less than an A in math, in high school or at Michigan. Every math course I took there, I made an A in.

My brother-in-law said, "In view of your capabilities in math and your demonstrated interest in chemistry, I wouldn't be a chemist, I'd be a chemical engineer." There was a journal that was put out by McGraw-Hill, *Chemical and Metallurgical Engineering*. There had been a study made—this was before the day of accrediting schools, particularly professional schools,

like chemical engineering—and he told me that there were three schools that were tremendous. One of them was MIT [Massachusetts Institute of Technology], which was a rich man's school. He thought I probably would not be able to achieve a degree in chemical engineering at MIT because I didn't have the money to pay tuition and all the other things.

Actually, he didn't say Michigan, he said Ann Arbor. He said, "I think Ann Arbor has the best faculty in chemical engineering in the country." Frankly, there was a friend of mine who went up to high places in DuPont, and he got his doctorate at Michigan. I call it the golden era of Michigan [laughter] in chemical engineering. I knew that Michigan was quite bent in the direction of athletics. Particularly, at that time there was Fielding H. Yost in football.

They didn't have any scholarships in those days. They assured me that I would not be given any money, but they would get me a job, so I could work and pay for my board. That's all. But I had borrowed enough money in 1925—that was right after I graduated from high school—that I could pay as an out-of-state student. I think you had to have one hundred and twenty-five dollars for that; otherwise, it was free. I matriculated at Ann Arbor, at the university.

BOHNING: That was in 1925?

KIRKBRIDE: Yes, 1925. I had been working in the oil fields in Oklahoma making the whole sum of four bucks a day, and saving every bit of it. That was how I accumulated the meager amount of money that I did, so that I could get into the school. Then I went out there and they got me a job immediately for my board, and I found out that jobs were easy to get.

BOHNING: So your work in the oil fields was just during summers?

KIRKBRIDE: Yes. It was hard work. During that summer there was quite a bit of work available. There was a lot of highway building going on. At that time, in 1925, practically all of the United States highway system was dirt roads. In fact, I thought it was quite a feat when the parents of a high school friend of mine were talking about driving from Chicago to New York City, and they were on pavement the whole way. [laughter] I thought, "Well, my God!" We didn't have any pavement around there at all; it was in the cities or towns, but not outside the towns. So I lived to see the whole highway system in this country mature.

BOHNING: Did your interest in chemistry come from when you were in high school? Where did it start?

KIRKBRIDE: Yes, high school. I used to go over to Coffeyville, where my brother-in-law was a chemist at the plant that Sherwin-Williams had there. He taught me more chemistry than I learned in high school, but I learned some in high school too. But I did have a fascination for it, and I still do.

BOHNING: Did you ever have a chemistry set at home?

KIRKBRIDE: No, I never did. A lot of chemistry involves mathematics, particularly physical chemistry. That was really one of the foundations of chemical engineering. I ate that up. I was really fascinated by that.

I find that I'm still doing it. A big part of the paper that I wrote was to explore the cycloalkane fuels (2). A molecule of benzene has six carbon atoms, and each one of them has a hydrogen atom attached to it, and it's in a ring. But the alkanes have two hydrogen atoms each. Now, the reason benzene became so prominent in the early years of chemistry was that it was produced from the coking of coal. We've learned how we can hydrogenate it, and we make what I used to call cyclohexane, and I still do. That's an alkane. In alkane molecules, the carbon atoms each have two hydrogen atoms; benzene only has one. But I went through and designed a plant.

[END OF TAPE, SIDE 1]

KIRKBRIDE: I designed a plant, and it's a rather simple plan. It processes 180,000 tons a day of shale and produces 145,000 barrels a day of synthetic crude oil. A very interesting thing about that was that at one time we thought that eastern shale was no good at all, because it didn't make very much oil by processing it. The western shale, the shale that's deposited in Colorado and Wyoming and Utah, in that area, is much better because it gave a high yield of oil.

It's very interesting. The eastern shale is all very aromatic in chemical structure. I can hypothesize two good theories of how that happened geologically. The western shale all has a cycloalkane type fuel. I bring this out in this paper, and I'm sure that's not a subject that you're too much interested in.

BOHNING: It is a fascinating area. I'm a chemist, by background.

KIRKBRIDE: Oh, you are?

BOHNING: Yes. Not a chemical engineer, but a chemist.

KIRKBRIDE: Well, some of the best chemical engineers I ever ran into got their degrees completely in chemistry. One of the fields of chemistry that they studied very carefully was physical chemistry. That's the backbone of chemical engineering.

BOHNING: Have you had any reception to this paper?

KIRKBRIDE: I've gotten a couple of nice letters from the Vice President [Albert Gore, Jr.], asking me to keep him informed. If we produced all the oil that we were importing, if we produced that here in the United States, we can provide about twenty million good jobs for people. He's very interested in that, and assured me that when he and the President really begin—and he didn't tell me when they were going to do that—the study of providing jobs, he wanted to look very carefully at this. I have a copy of his letters in my files in there, if you would want to read them. They're very short. I'll be glad to get them for you.

BOHNING: Maybe we can do that later. At this point, I'd like to go back to Michigan.

KIRKBRIDE: Okay, let's do that.

BOHNING: First of all, did you play any basketball at Michigan?

KIRKBRIDE: No. I found that working and carrying a full load didn't leave any time. I went through Michigan and got my bachelor's degree and master's degree in five years. To do that and completely support myself there was very much unheard of, but I did it.

BOHNING: What kind of work did you do to support yourself?

KIRKBRIDE: For the first two years at Ann Arbor, I worked in the cafeteria. The man who owned the cafeteria was a very high-tempered Irish man. He fired me, I expect a dozen times, [laughter] and I just went back and went to work, and he'd forget about it. I learned an awful lot from him about people. I worked there for a little more than two years, and then I got a job in

the department of engineering research at the university. I worked there until I got my degree. It paid more, and besides, I was actually practicing, in a mild way, the profession that I was going to enter.

BOHNING: I've talked to both Donald Othmer and Donald Katz (4).

KIRKBRIDE: Donald Othmer got his doctorate at Ann Arbor, just a little ahead of me. I didn't get my doctorate there. I got my master's degree there, and Professor [Walter] Badger wanted me to stay on and work under him and get my doctorate. When he talked to me, I had a firm offer of a good job at the Whiting research department of Standard Oil Company of Indiana, and I also had an offer from Standard Oil Company of New Jersey down in Baton Rouge.

BOHNING: This was during the Depression?

KIRKBRIDE: In 1930. Oh boy, they thought the depression was over; we were being told that in 1930. Ho, ho, ho! [laughter] Just like this one. This one's just getting up to speed, and that one was just getting up to speed in 1930.

I learned an awful lot in the field of practice, by rubbing elbows with some very, very smart men. My boss was Walter Whitman.

BOHNING: Before we go to Standard, I would like to talk a little bit more about Michigan, and your experiences with George G. Brown.

KIRKBRIDE: Oh, my God! [laughter]

BOHNING: Also Badger, as well.

KIRKBRIDE: Yes, he was fair.

BOHNING: That's what I've heard. Donald Othmer told me stories about him. I was wondering if you have any?

KIRKBRIDE: Well, I have a lot. I worked for Badger. Actually, he was the most severe taskmaster I ever had, but I learned. Boy, he was nasty! I also found out that he and his wife couldn't even get along. I understand nobody could get along with him. But I set my sights that I was going to get along with him, because I was going to learn from him, and I did.

BOHNING: What was the curriculum like? What kind of courses did you take?

KIRKBRIDE: The curriculum was pretty much like it is today. It was a very modern chemical engineering curriculum like the one MIT had. The founder of that curriculum was W. [Warren] K. Lewis at MIT. Lewis was a much better teacher than Badger. Although Badger taught the same things that Lewis taught, I think Lewis taught in a more acceptable way to me. But I accepted Badger as he was, not to try to make him as he ought to be.

Brown was an entirely different teacher. I think Brown handled the theory of chemical engineering much better than Badger. Badger had been out in the field in practice and learned a lot of the problems that they had in the field. He could teach that too. But Brown was extremely good. In an applied mathematics way, Brown was super. Then there was a young man there who got his degree under Badger and went to MIT and got a doctorate under Lewis. His name was Warren McCabe. I got my master's degree under him. He was an extremely capable individual in applied math.

BOHNING: Yes. In fact, you had a paper. I was wondering if it was your master's research, because your first publication was with McCabe (5). It was in *Industrial and Engineering Chemistry* and was titled "Heat Transfer to Liquids in Viscous Flow."

KIRKBRIDE: That's correct. Once I thought I was going to live and die in the field of heat transfer. Well, I found out there were much more interesting fields to me, and I pursued those.

BOHNING: Was your master's work a practical, laboratory type of work?

KIRKBRIDE: Yes, I had to carry out an experimental program to demonstrate viscous flow, which is straight-line flow, and could be reduced to mathematics. I did that in that paper. Now, of course, they've gone on to various applications.

BOHNING: As I recall, there was a specific equation which had been developed by [Wilhelm] Nusselt which you then built on.

KIRKBRIDE: Yes, I did. I was the first one to put together what they now call a condensation number.

I had a stroke about four years ago, and my short-term memory is not as good as it used to be; my long-term memory is pretty good.

BOHNING: Well, you're doing fine. [laughter]

Who were some of your fellow students at Michigan at that time?

KIRKBRIDE: Well, most of them have passed on; I'm outliving all of them. George Holbrook was very close. He worked at DuPont. He and Crawford Greenewalt were the fathers of the plant out in Washington, where plutonium was made. That was the first time plutonium was made. In Tennessee, we made the U-235 there, and that was really the first atom bomb—the first and also the second. The first one was at Alamogordo, New Mexico. Alamogordo in Mexico was where that first bomb was detonated. There was an awful lot of chemical engineering involved in the purification of plutonium and also the production of U-235. I headed up two organizations in the Catalytic Construction Company, which was a part of Houdry [Process Company]. I headed up this group that built the first plant in Ohio, where U-235 was separated, and Mallinckrodt Chemical Company carried out the chemistry of it.

I remember one weekend going out to St. Louis with a group of about four or five people. This group designed the plant in Ohio. That plant was built by Catalytic.

BOHNING: Let me come back to your first position. You got your master's degree and your bachelor's degree together in 1930, and then you went to Standard of Indiana.

KIRKBRIDE: Yes.

BOHNING: How did you make that contact? How did you get that job?

KIRKBRIDE: Well, they came looking for chemical engineers.

BOHNING: So they came to the campus?

KIRKBRIDE: It was always very good to have high marks, because they always wanted the smartest in the class, if they could get them, and they were a plant paying top prices. They talked to me to see if I had any interest in the oil industry. I told them that I was from Oklahoma and I was raised in the industry; I was very interested in the oil industry and that is where I would like to go. I remember Dr. Fred [Frederick W.] Sullivan [Jr.], who had gotten his doctorate at Michigan in chemistry years before. I went out to Whiting on that job because he hired me. He said they were paying two hundred dollars a month, and I said, "Well, I want two hundred and twenty-five." He said, "All right. In your case, I'll give you two hundred and twenty-five." [laughter] And I said, "All right then, it's a deal!"

The New Jersey [Standard Oil] people came in and talked to me and said, "You ought to make a career of this." I said, "Well, that's what I'd like to do." They offered me two hundred dollars a month, and I said, "I've already had an offer of two hundred and twenty-five." They said, "We'll make it two twenty-five, but that's all."

I had a hard time in deciding whether to go to Baton Rouge or Whiting, Indiana. But I got one letter from my mother. She was from the South, and she referred to Baton Rouge as "skeeter" country. I said, "Boy, I don't want to go down there and fight those mosquitoes." I'd had a little of that, and I didn't want that. "I'd rather go to Chicago." That was really the basis of my decision to take the Standard of Indiana job rather than the Standard of New Jersey.

Actually, I think I would have done much better professionally if I had gone with New Jersey because I could have gotten into a much broader field. But, anyway, I didn't. I shouldn't complain about what I got at Indiana because I got an awful lot of good training there.

BOHNING: I was at the Whiting refinery many years ago, back in the 1950s. I had a college roommate who lived almost across the street from the refinery.

KIRKBRIDE: Oh really? On Indianapolis Boulevard?

BOHNING: Yes, I know the territory very well. I used to go by it, when I would go into Chicago.

You worked there with Walter Whitman?

KIRKBRIDE: Yes. He left a little after I transferred to Texas City; he left and went to MIT as head of the chemical engineering department.

BOHNING: What kind of person was he to work for?

KIRKBRIDE: Wonderful. I learned some bad habits from him, but that was my own fault. But he was really a sharp chemical engineer.

BOHNING: Can I ask what kind of bad habits you learned from him?

KIRKBRIDE: Drinking. My wife and son persuaded me to go in to a psychiatric institute here in Washington for alcoholism, and thank God I did that!

BOHNING: But that was pretty common in those days, from what I have seen in talking to people in the chemical industry, especially when I talked to people who were in sales. In the sales end, that was very common then. It was a real problem.

KIRKBRIDE: Oh yes, that's right.

BOHNING: Whitman died young, didn't he?

KIRKBRIDE: Yes, he died prematurely.

BOHNING: Professionally, what were your first assignments? What were you doing at Standard?

KIRKBRIDE: Every two weeks I had to write a report, pointing out the profitability of the work that I had done. In other words, how much more profit I could get out of what I had done. I worked out a schedule there of cleaning heat exchangers. They never did that regularly. They ran a heat exchanger until the wheels fell off of it, and then they did something. But I said, "These plants are shut down by regular turnarounds. Why don't they clean these heat exchangers every time, and then they won't have to run it until it gets so it won't transfer any heat. Let's clean that too." Actually, that turned out to be an extremely profitable end of the business.

One of my college professors at Ann Arbor had told me that any chemical engineer who can't earn his salt in the hardest of times saving fuel is no damn good! I think that's why I survived. [laughter] I got into that field, and I got a reputation. It was pretty easy. Fuel oil, in those days, was only a dollar a barrel. I made Standard of Indiana a lot of money compared to the two hundred and twenty-five dollars they were paying me every month. [laughter]

BOHNING: While you were there, you also wrote two papers that were published in *Industrial and Engineering Chemistry* (6). Again, heat transfer was one, but in the other you evidently did something on vertical tubes, which weren't yet in common practice.

KIRKBRIDE: One of the jobs I had for Badger was to help Carl Monrad in getting his Ph.D. Carl got his degree in heat transmission on vertical tube condensers. The theory that Nusselt had was straight mathematical. He had in his mathematics that as the oil comes down the tube, the film of condensate gets thicker as it goes down. Well, of course, it should. You're condensing oil and eventually the total amount of condensate on the tube represented the total thickness, but that tube causes it to be condensed, and the thickest film is there.

That's not true. Actually, what happens is that you encounter turbulent flow. You don't have straight-line flow. When the Reynolds number gets up to a certain size, turbulence starts. I figured out how much that was, and that was the first time the so-called condensate numbers were used.

[END OF TAPE, SIDE 2]

KIRKBRIDE: That was a paper that I published. I used all of Monrad's data that he never could correlate because he tried to correlate it with the Nusselt theory, and the Nusselt theory is all based on viscous flow. After I got this thing worked out, I used that to estimate the heat transfer coefficients. What happened was that the heat transfer coefficients went up to a high level because you got into the turbulent flow. It wasn't like the Nusselt theory said.

In fact, it was a professor at MIT by the name of Bill [William Henry] McAdams. He was an expert and really an outstanding professor in heat transmission. He wrote a nice letter to Walter Whitman. Of course, he and Whit knew each other. Whit took a lot of course work under McAdams. McAdams was one of the principal authors of the first book that taught fundamental chemical engineering (7). [William H.] Walker, McAdams, and Lewis were the three professors.

I used to have a copy of that book. I sold a lot of my library. That was an old book. In fact, the back had come off of it. I had someone in here and I think they swiped the book from me.

BOHNING: Would you like a copy?

KIRKBRIDE: Would I like a copy? Sure, I would.

BOHNING: I think I can get you one.

KIRKBRIDE: I'd be very grateful. How much is it going to be?

BOHNING: We have had many donations, and I believe we've still got some sitting there. If so, I'll send you one.

KIRKBRIDE: That was my first book in chemical engineering, and they swiped it from me.
[laughter]

BOHNING: I'll send you one.

KIRKBRIDE: Well, I'd be grateful. That's very kind of you. Badger and McCabe wrote one similar to that, and they called it *Elements* (8).

BOHNING: Would you like a copy of Badger and McCabe?

KIRKBRIDE: Yes.

BOHNING: I think I can get a hold of that too.

KIRKBRIDE: That would be great. In school, I used Walker, Lewis, and McAdams. Badger and McCabe came in about the time I left Michigan.

BOHNING: What about any other experiences at Standard Oil? You were there four years before you moved.

KIRKBRIDE: Practically all I ever learned about what they now call "process engineering" I learned there. I was making those kinds of flow sheets [pointing to diagram] back when I was working at Whiting, Indiana. I worked in that group of men in Whitman's organization. There was a man by the name of Joe [Joseph Kastle] Roberts. Joe never taught, I don't think. He was an MIT product. He got his baccalaureate at the University of Kentucky and went to MIT. He was a very smart guy, but he had a nasty disposition. If there were three ways of doing it, and one of them was insulting and two of them were gracious, Joe would use the insulting one. [laughter]

But he was smart, and he knew a lot. He was designing and building plants at that time, and I couldn't do it. I decided, "Well, I'm going to do it!" And I did. But I learned an awful lot of that from Joe Roberts. He insulted me in so many ways, but finally, he got so he was nice to me. After I transferred down to Texas City, he used to come down there, and we would sort of pal together. But God, he was nasty!

After a while, you look at this and say, "Well, I don't have to endure this forever, but I am learning, and I'm learning a lot." When I evaluate my experiences at that time, I just thank God that I got the opportunity to work under Joe. For the first plant that was built in Texas City, Joe selected me to process design all the heat exchangers. The reason was that with all my experiences and things that I had done there at Whiting, this was what they were looking for—the profitability. They wanted to make damn sure that these heat exchangers did the job in the way that they should do it. So I did that.

BOHNING: I'm not clear. When you went to Texas City, was that still part of Standard?

KIRKBRIDE: Oh, yes. Sure. I was transferred down there. In fact, it was a separate company, and still is today, although it's called Amoco today, and it probably is part of their parent Amoco organization.

BOHNING: Was that Pan American Refining?

KIRKBRIDE: Pan American Petroleum Transport Corporation, back in those days. Originally, Aruba was also part of it at that time. Standard Oil Company of New Jersey, at that time during the Depression, bought Aruba from the Standard Oil of Indiana.

BOHNING: So Pan American was a subsidiary of Standard of Indiana?

KIRKBRIDE: Yes. One hundred percent. That's why they traded in and out. As a matter of fact, we worked together, technically, like we were the same company. Even after I went down to Texas City, I learned a hell of a lot from Standard of Indiana.

That was about the time catalytic cracking began to come in, all the different catalytic processes. I was selected by the vice president of Pan American, Don Smith, as the guy who should keep up with the new things. Don took a liking to me, and I liked him very much; he was sort of fatherly. He was working for Standard of New Jersey, and his brother was working for them when Aruba was sold. In fact, Don really built the first plants that went in at Aruba.

Then Standard of New Jersey looked at the personnel that they had inherited and said, "Oh, we have a policy. No nepotism." Don and his brother couldn't work in the same company. So Don was pushed out, and he was one of the smartest men they had. Lloyd was his brother's name, but I don't know him. He was a very smart individual, but I don't think he was as clever as Don. Don knew people and also engineering, and this combination was very valuable to Standard Oil Company of New Jersey and to the Standard Oil Company of Indiana, after New Jersey wouldn't have him.

BOHNING: How did you feel about being transferred to Texas?

KIRKBRIDE: I was given the option. In the first place, I was given a twenty-five-dollar-a-month raise. [laughter] In those days, believe me, you didn't get a raise unless it was something like that. It's not like people today who think they have a God-given right to a raise. You didn't have any rights then, I'll tell you.

BOHNING: That was 1934, and the Depression was still on.

KIRKBRIDE: I'll tell you, it really didn't end until Roosevelt began to prepare for war. That's part of this paper (2). In a letter that I wrote to the Vice President, I emphasized the importance of what took place in Roosevelt's administration. It was a pattern that I thought could be used today that Roosevelt learned the hard way. In his first term in office he wasn't too popular; he

wasn't too successful. But there were a lot of people who thought that he was a person who had started something that had to go further in America. I'm sure that's correct—the labor movement, particularly. He set up a procedure to do business with England, and it was up as soon as we got into the war ourselves, when Pearl Harbor was attacked.

But Roosevelt paddled down that stream himself. He did a lot of things that he tried by trial and error, and he made a lot of errors, but also he made a lot of marks by hitting the target.

BOHNING: One of the things that happened when you were in Texas was that you met your wife.

KIRKBRIDE: Yes, that was the greatest thing that ever happened to me. I met her right after I went down there. She was a vivacious blonde and a beautiful woman. She was very smart too. I had just come down there from Chicago, and I had a lot of ego; she used every opportunity she could to deflate that ego. [laughter] I didn't get along with her at first.

She and a mutual friend were driving by where I lived in Galveston, and this mutual friend told me, "I told her that I felt sorry for you." And I said, "I wonder why you felt sorry for me." She said, "Why, you're always alone. I drove by your house, and I knew your room and saw lights on late at night, and I knew you were working." I felt good about my life because I was learning. I knew when I was learning—I knew that I could do things that I could not do when I came down to Texas City.

When I first went to Texas City, I thought, "Oh, my God!" I used to go out dancing in Chicago, up on the north side at the Aragon Ballroom, and Trianon on the south side. They had the best bands in the country! It was inexpensive, too, and I could afford it. Well, by golly, when I went down to Texas City, there were two wide streets! I went to the intersection. Oh my God! They were wide! But there wasn't a building on either one of those streets that was taller than two stories. [laughter] I thought, "Holy cow! How did I ever allow these guys to sell me on coming down here to this God-forsaken country."

They had brought a sugar refinery in and it had gone broke. They were skeptical that Pan American was going to go broke. [laughter] I told everyone I could discuss the problem with that this was Standard Oil Company, and "It ain't going to go broke. They are a bunch of very smart entrepreneurs, and they aren't going to go broke." The sugar refinery was sold to Monsanto Chemical Company. That was where the [ship] blowup took place, and my God, it was pulverized.

My son and I went to that place. I took a great part in the operation of the American Institute of Chemical Engineers, back in those days. I was putting on a meeting in St. Louis, and Monsanto had a plant in St. Louis. I wanted this fellow whom I knew there in Texas City to

participate heavily. So I brought my son over there and parked up in front of the building and I went in and talked to him. That was a Friday. My son and I left. After this, the ship with ammonium nitrate blew up on the dock, right adjacent to the office.

BOHNING: The *Grandcamp*, as I remember.

KIRKBRIDE: Yes, that's it. My God, I'm telling you, all they found of this man was that the ring on the finger was his. And I was in his office there, talking to him, just the Friday before. The problem [with the ship] was going on right then. Now they know why, that ammonium nitrate is an explosive if you get it mixed with carbon.

I was doing a lot of hunting in those days with a group of men from the DuPont Company in Wilmington, near Rock Hall, Maryland. I learned a lot of chemistry there, too. This was a catalytic reaction and carbon would set it off, if you get the proper exposure to carbon. I was hunting with this fellow down there in Rock Hall and we were talking about this. He said, "We're not sure, but we're going to find out. I really think that it was the burning of the paper bag that really caused that problem." And that is what they finally concluded.

BOHNING: Was that somewhere in the 1940s? I don't remember the exact date.

KIRKBRIDE: I think it was 1942. I have in my files in there a pamphlet that deals with that.

BOHNING: I remember, as a kid, seeing pictures of it in *Life* magazine; that's how I remember it.

KIRKBRIDE: Maybe it was more like 1947 or 1948. In 1942 the war was on.

BOHNING: You obtained your first patent when you were down there. It was a Canadian patent, "Recovery of Liquid Hydrocarbons from High-Pressure Wells" (9).

KIRKBRIDE: Oh, yes. That was also an American patent. Standard of Indiana got those patents.

BOHNING: Then you had another paper with [John W.] Bertetti (10).

KIRKBRIDE: I was working with Bertetti on that specific problem.

BOHNING: "High-Pressure Absorption of Low-Boiling Hydrocarbons," which evidently came out of some state regulations. If I read the paper correctly, there were some state regulations that required you to do something like this?

KIRKBRIDE: Yes. The Pan American Production Company was a crude oil producing company, and they got in conflict with the state. The state was passing some regulations that you couldn't just burn all the substances you didn't want and get rid of the problem. There were problems concerning that, and I just applied what we had found out in high-pressure condensation. We had retrograde condensation. When you expanded them, you have a Joule-Thomson effect. It cools them down. It cools it down to the point where you can expand it, but it will condense. And that's what happened. That's why they call it retrograde.

I was brought in to go over to Austin to testify. I made some very good friends over there, including many of the lawyers who were on the other side of the fence. Dr. [Eugene P.] Shoch of the University of Texas tried his best to persuade me to come to the University of Texas as a professor. Later, he and I became very, very close friends when I was a professor at Texas A&M. I got a distinguished professorship there.

BOHNING: I have a note that also during this time period you were in the Chemical Warfare Service. Is that correct?

KIRKBRIDE: Yes. That was up until the early part of the war, and Pearl Harbor may not have happened as of yet. Roosevelt was working like mad to get toluene, and toluene was in very short supply because they only made the amount of toluene that was made when they made coke in the steel mills. It was a limited production, and there was only so much produced. They knew that it had to come from another source, and the Chemical Warfare Service was looking for it.

I knew certain crude oils had a certain type of chemical that could be converted by dehydrogenation to toluene. In other words, cyclohexane with one methane group stuck on that ring could be converted by dehydrogenation. Cyclopentane, with an ethane group stuck on there, could be converted by just plain dehydrogenation. We did that in Texas City. A colonel from the Ordnance Department came down there to Texas City, and they told us what we had, but we knew we had it; we weren't that dumb. But the government was going to take it.

We were using that to make Amoco gasoline. Amoco gasoline originally was nothing else but benzene that Louis Blaustein would go to the steel mills and buy. He paid a very good price for it. But that was Amoco gasoline, and damn good gasoline—100 percent benzene.

We couldn't get benzene because it was in short supply, just like toluene. So we were making our aromatic hydrocarbons that we were putting in Amoco. That was the premium grade gasoline that was sold by Pan American.

BOHNING: Did they commission you into the Chemical Warfare Service because you were doing this?

KIRKBRIDE: No, I had been in the Chemical Warfare Service when I was in Whiting. But they wanted this toluene. I knew how it had to be made. We could make it; we could separate it. We had it made; it was just mixed up with a lot of other hydrocarbons and we had to separate it. It had to be done by two different refineries. There was a refinery in Baytown, Texas, that Humble had in mothballs that could be used. We would have to separate that in Texas City and pump over what we called the hard cut to the dock and load it in a barge. It was three miles over to the dock. We would load it in barges, and barge it up to Baytown. They would extract it with liquid sulfur dioxide. That's the Edeleanu process.

They would separate it in Baytown. I had my picture taken with the first tank carload of toluene that we made that way. It was being shipped out to Pine Bluff, Arkansas, where the Ordnance Department had plant facilities to nitrate it and convert it to trinitrotoluene—TNT. I can remember that I had an envelope in my pocket and I was making some figures there. I said, "You know, that toluene is going to cost over three dollars a gallon." The colonel was a great big guy. He could fit on a Redskin football team. [laughter] He said, "Young man,"—and he had eyes that would look through you—"we're training men with broomsticks now, much less we can't even get bullets. Even if we had guns, they couldn't shoot them, because we don't have the trinitrotoluene."

That colonel never told a joke. There wasn't anything funny to him. So I quit trying to be pleasant and stuck to what I was there for, and I knew what it was. He said, "You know, they tell me over at the plant that this toluene isn't going to be any good." And I said, "Why?" He said, "They say it has bugs in it." [laughter] So I laughed and said, "This will be the best toluene you've ever had." It was 99.9 percent purity. God, I'll tell you, it was really pure.

When they carried out the first detonation of that TNT, they said it was giving the best results. [laughter] Well, that doesn't surprise me one cock-eyed bit, because I knew they would never have gotten those results with steel-mill toluene. What we made was as pure as it was going to get.

[END OF TAPE, SIDE 3]

BOHNING: I'm not sure when you went to the Magnolia Petroleum Company in Dallas. Was it in 1941 or 1942?

KIRKBRIDE: That was right after the war had started. Billie [Lucille Skains] and I were married in 1939. At this time she was carrying Chalmer [G. Kirkbride, Jr.]. She was scared to death that I would be drafted. She knew I was in the Chemical Warfare Service and retired. She was concerned that her husband was going to be over some place in Europe in the war and her child wouldn't have any father. She was begging me to resign, to get out of it while I could. I told her, "Well, I worked all these years because I wanted to be in to help the country," and the country needed me. And I was sure the country was going to need me. She really begged me, crying. I had not decided to do it, but I was pretty close. Then this colonel told me, "You know, you're going to get an opportunity to resign." I didn't know that, but he did. He said, "I want to urge you to accept the invitation and resign, and get out. We need this a lot. Besides, chemical warfare is not going to be anything in this new war." Billie got her way too. [laughter] She was very, very happy about that. She and the colonel were on the same side.

We made a lot of good toluene for TNT. Then I wanted to get into an area of chemical engineering development that Texas City didn't carry out, and that was pilot plant development. So I took a job with Mobil; that's just another part of Standard Oil Company. That's why they were so agreeable to my leaving. Then I transferred, and we went up to Dallas and worked in the Field Research Department, just outside Dallas, but within city limits. We made lots of products there.

Here is the book that I wrote while I was at Texas A&M (11), and here is my high school annual from 1925. My son was helping me straighten things up in here. I tend to operate with a rather cluttered desk. He is very neat. He went to a military school [Valley Forge Military Academy]. He then went to Pennsylvania Military College before it became Widener University.

BOHNING: I wanted to talk to you about your book. But before I do, you started teaching back when you were in Whiting. You were teaching night courses.

KIRKBRIDE: Yes. That was in Whiting, at the Standard Oil Company refinery. Walter Whitman was the guy who got that organized. It was really a school in chemical engineering.

BOHNING: Somewhere I've read that when you started teaching these courses, you felt that, and I'm quoting now, "Chemical engineering is being taught in unrelated pieces, with inadequate regard for the humanities."

KIRKBRIDE: Yes.

BOHNING: I was curious about that because engineers are not known for their work in the humanities.

KIRKBRIDE: I actually think they're more humane than the lawyers are. But I still have a very severe criticism about education today. I don't think we are devoting enough attention to ethics and morals. I've always been pretty strong on that feeling, anyway. My father, when he was afraid I was going to select law as a field to go into, told me that if I did, I would be eternally unhappy, because I had too many strong ideas on morals and ethics. I've always been that way.

I feel now that one of the severe weaknesses in this nation is the lack of morals and ethics. My God, as straight a guy as J. Howard Pew was, I always got along a lot better with him if I didn't take a drink. But there were things that he said, statements he made, about how he would hang on to a property and keep other people from getting in that had a right to come in. I was amazed at this; ethically, I thought, "This is a hell of a way." I think this nation today is confronted with this. There's just too much of it. The lawyers have had a big hand in creating this. This nation is going to have to come face-to-face with morals and ethics, sooner or later. That's what I'm trying to get Widener University to do.

BOHNING: I want to talk about your association with Widener a little bit later, because that was very strong. You were very active there for a long time.

KIRKBRIDE: Well, I still am. I'm an honorary trustee there. I have as much influence there now as if I were on the board of trustees.

BOHNING: You were only in Dallas a couple of years before you went to Texas A&M.

KIRKBRIDE: Yes.

BOHNING: Why did you make that change?

KIRKBRIDE: At Texas A&M, the president, Gibb Gilchrist, who was quite a politician in the state, got the legislature to pass a law creating what he called distinguished professorships in various fields of engineering. I got the first one that they created. This was a test to see whether or not they were going to do this further. The pay was almost as good as I got out in industry, and there was a great deal of pleasure I got out of teaching.

BOHNING: Did they approach you?

KIRKBRIDE: Yes, they came to me. I was quite active in the professional societies, and Don [James Donald] Lindsay, who headed up the chemical engineering there, came to me and asked me if I would consider this. I said, "I sure would." I knew that the way that the Field Research Department was being managed there in Dallas, it was going to be destroyed by Mobil.

You couldn't be as insulting to the owners as was Dr. Armand Abrams. He was Jewish, but he was nasty. Most Jewish people I've known have been very kind, very nice, very learned in the field of ethics and morals. But I knew full well that the New York crowd was going to come down there and put an end to all of it, so I thought that was an opportunity to get out of there before it all takes place. And it was. Before I left that year, one of the men who was in charge of getting rid of them came down and stayed at our home in College Station. I had worked with him at Whiting when he was there. That was a very unusual collection of men that they had there. Very smart. They taught me a lot.

I still think this nation is going to have to change. I'm concerned about the future, unless we do. We can't go on in this direction, where it's morally bad. Ethically, terrible! The only ethics they have is, "How much money am I going to get out of it?" [laughter]

They have worked and they have worshipped at the altar of money. And everybody now is involved. Any field that you go into, you find out that that's what they think. I talked to my son, and that's the way he talks. He was in real estate. Now he's living here with me and trying to help me, since his mother died.

BOHNING: How did you enjoy teaching?

KIRKBRIDE: I enjoyed it.

BOHNING: This was still during the war, and Texas A&M has a military aspect to it, doesn't it?

KIRKBRIDE: They had a very active ROTC, Reserve Officer Training Corps. At one time they were not co-educational, but they became a co-ed school soon after I left there. But there was no problem.

BOHNING: Did you do any research while you were there?

KIRKBRIDE: Yes.

BOHNING: I know that you had several papers published during that time in the *Petroleum Refiner*. For example, "Method for Predicting Phase-Equilibrium Constants" (12).

KIRKBRIDE: Yes. That was mathematical, using other people's research and what I learned from Joe Roberts at Whiting.

BOHNING: Then there were several others. "Desalting of Petroleum by use of Fiberglass Packing" (13).

KIRKBRIDE: That was research I did there, and also I got Standard of Indiana to finance some of that. I used to go up to Whiting regularly. Bob [Robert C.] Guinness was an MIT product, and he was a very brilliant man. Bob took quite an interest in that project. The best paper I wrote down there, though, was a paper entitled, "Process Design of Fractionating Columns" (14). They used that method for designing the propane and propylene separations at Marcus Hook.

BOHNING: That's when your book came out too, at this same time (11).

KIRKBRIDE: Yes.

BOHNING: Did it take a lot of your time to put this together?

KIRKBRIDE: It took several years. It takes a long time for me to write a book.

BOHNING: I noticed that the dedication is to your wife.

KIRKBRIDE: Yes. She had been so insistent that I do it. She kept badgering me about it. She got well acquainted with the McGraw-Hill people and they were really close friends. Sid [Sidney D.] Kirkpatrick was the vice president of McGraw-Hill. She and Sid hit it off very well. I'm sure [laughter] he poured oil on the fire, and she used it [laughter] to get me to do this. I worked on it night and day.

In fact, if you would like to have a copy, I think I can scrape up one here for you.

BOHNING: We don't have it in our library.

KIRKBRIDE: Oh, you don't? Well, I think you should have it.

BOHNING: That would be fine.

What was different about your book, from the others? I know McGraw-Hill published many books in this series, but what made your book different?

KIRKBRIDE: Most of them divided up the principles, as in chemistry. I divided it up as an engineer would practice and I used them. One of the first things I would do would be to make what I called the mass balance. Then, with that, I would make the heat balance, which would be applied to that mass balance. Heat balance and mass balance. Then I would have to make a phase-equilibrium balance, and that was to define temperature and pressure all through the system. I called that the static equilibrium. Then I used what they called, and still call, a continuous system. It's really dynamic equilibrium. That was the system I used in designs.

BOHNING: It sounds like a very logical development.

KIRKBRIDE: If I had stayed in teaching, I would have had that system throughout everything.

BOHNING: How well was it received? Was it adopted at many places?

KIRKBRIDE: Oh, yes. It was well received. But the problem was that I didn't have the time to revise it, and it did need some revision.

BOHNING: One of the other things I wanted to ask you about, while you were still at Texas A&M, was that you were a consultant in some of the Bikini atomic bomb tests.

KIRKBRIDE: Yes. I got a letter from the man who at that time was president of the National Academy of Science, and he wanted to know if I would consider going out to Bikini—we didn't call it Bikini at that time—and if I did, how did I visualize that might help me in my profession, teaching? I was eager to go because I could see how this was going to be the future in energy, and I think it could have been, had not the environmentalists gotten into it. There's another place where ethics and morals are broken down.

BOHNING: Was this Project Crossroads? Were you there for the very first test or later tests?

KIRKBRIDE: No, I wasn't on the next tests. Crossroads was the one at Bikini.

BOHNING: Right.

KIRKBRIDE: I have two books in my collection that go into the details of that.

BOHNING: So you observed the tests?

KIRKBRIDE: Yes.

BOHNING: What was your reaction when you saw it?

KIRKBRIDE: The first test was the air drop. The second test was under water.

BOHNING: Yes. I think they were called Able and Baker.

KIRKBRIDE: Yes.

BOHNING: I'm just curious. I've seen many pictures of these tests but wonder what it must be like to see the real thing as opposed to a picture of the tests. What was your reaction like? Was it more than you expected?

KIRKBRIDE: The one underwater was. The air drop was not; it was actually less than I expected. I think that was true of practically all the scientists who were on board the *Panamint*, and they were some really outstanding men in that group. I was very privileged to be with them. I was with them all summer. We gave lectures on our expertise. I learned an awful lot from these men. I could appreciate their field of endeavor, as they could mine. I could see there was tremendous opportunity there; every place there was opportunity.

[END OF TAPE, SIDE 4]

BOHNING: You left Texas A&M in 1947 and went to Houdry. How did you make that connection?

KIRKBRIDE: They came to me.

BOHNING: Really?

KIRKBRIDE: I met Art Pew. He was one of the members of the Pew family, and they were filthy wealthy, like the Rockefellers. Art gave a paper in Chicago that I was tremendously impressed with. That was the first paper that was ever presented on catalytic cracking. I knew damn well that what he was talking about was going to come about in the petroleum industry. That was a major process because it dealt with the big volume of oil that was unprofitable.

I became very friendly with Art after that. Particularly, Art was paying great attention to all those papers that I was writing in the *Petroleum Refiner*. He and Art Danner—Art Danner was a patent attorney for Mobil—came to me. They were having trouble with Eugene Houdry. Gene was really an artist, although he did get his degree in mechanical engineering from that school in Paris, the MIT of France. But Eugene was basically an artist, and his concept of the

research laboratory was that of having ideas that were scientifically sound. His concept was that if he could have all those ideas, he could keep a whole army going; yes, he could. [laughter] He could, but not on good things.

They were trying to get him to fit into an organization. Well, Eugene Houdry is never going to fit into anybody's organization; he's going to fit into one organization, and that's Eugene Houdry's.

I liked Eugene, as a man. He was a very complex individual. He did original thinking. A lot of it wasn't sound, but he was the original thinker in the field of environmentalism. He was the original person I knew was working in the field of cleaning up the atmosphere. He knew that the automobile exhaust had to be cleaned up; he knew it then. With things like that, he had fundamental thoughts; he was like a bulldog.

So Art Danner and Art Pew cornered me at a meeting. I think it was one of the American Institute of Chemical Engineers meetings. They wanted to know if I would consider coming to the Houdry Process Corporation as a director of research. I was fascinated by that. Here was a field that I was interested in.

Art Danner was a tremendously good patent attorney. I met him when I was working at the Field Research Laboratories there in Dallas. He had the capabilities of working with Armand Abrams and getting along with him. Nobody could get along with Abrams; God himself, I'm sure, couldn't.

But that's how I happened to be talked into it. Now I'm still doubtful that I should have left teaching, because I loved it. It was always a great thrill to see these young kids learning engineering, and it was so easy to teach them. That's one of the reasons I wrote that book, for the students whom I was getting. I went to Texas A&M with the understanding that I would have to teach only graduate students. I thought, graduate students? Hell, they don't know what they should know in engineering, and I would have to spend a lot of time teaching them this. So I finally decided to give this course and write this book and teach it to the undergraduates. And I did.

BOHNING: How large was the chemical engineering department at Texas A&M when you were there?

KIRKBRIDE: There were between five and seven people on the faculty.

BOHNING: It wasn't a very big department then. But were they giving graduate degrees, like a master's degree?

KIRKBRIDE: And a doctorate, too. The chemical engineering department began to grow rapidly. At that time it was difficult to get good students because most of them were in the military. Then they began to come out, and they were not properly trained. They had gotten degrees someplace. They were coming in as graduate students, and I was supposed to teach them. Well, I felt that I was a teacher, but I wasn't a magician.

I talked to Don Lindsay about what they were like, in the way of their understanding. I couldn't pick them up right where they thought I could, but I gave them this one course that I taught and used what was in that book. One of my graduate students there came out, and I brought him up to Marcus Hook and he worked in the Houdry Process Corporation there. When Sun sold the Houdry Process Corporation to Air Products, it was amalgamated with the rest of Air Products, and I got well acquainted with Leonard Poole and his wife Dorothy. Dorothy was the daughter of one of the original investors in General Motors.

One time, Leonard wrote to the Air Products Company. He needed a little money and he was selling stock; stock was twenty-five cents a share for Air Products, and she bought fifty thousand dollars worth of stock. [laughter] Leonard was president of the company and was a damn capable entrepreneur. He headed up one of the Federal Reserve banks. I guess it was the one in Philadelphia.

BOHNING: When you went to Houdry, were you given any specific charges? You were vice president in charge of research and development. Was it left up to you to decide what you wanted to do?

KIRKBRIDE: Yes. And I brought in some very capable men. I brought in Dr. [Alex G.] Oblad, who now is a distinguished professor out at the University of Utah. I brought in Jack Dart, and he's up in Canada now, fishing. [laughter] Jack made quite a pile of money.

BOHNING: Was Ted [Theodore A.] Burtis there?

KIRKBRIDE: Ted Burtis was one of my graduate students, and I brought him up too. I knew that Ted was the kind of a man who wherever he went, he was going to go to the top. I told Art Danner that, and he said, "hire him." So I did. I think I paid Ted three hundred dollars a month. He was just out of graduate school at Texas A&M, and they thought I paid this guy too much. I said, "The reason I have this job and the reason you have that job is because I know what I'm doing, and you know what you're doing. We're doing two very essential things for this company. But, believe me, I don't think you can do my job, and I know damn well I can't do yours."

Well, they backed off and left me alone. Pretty soon I said, "Wherever this man goes, he's going to be the president of the company before he leaves. I'm telling you, I had him in class and I've dealt with him, and I know him well." Ted did just what I said. I told [Robert G.] Dunlop that. Dunlop knew damn well I was right. [laughter] But J. Howard Pew had his way on it, putting in H. Robert Sharbaugh.

They finally had to get Sharbaugh out of there. They had already brought Ted into the Sun Company, so they put Ted in his spot; he ran away with the job. I knew he would.

BOHNING: He's one of the people I would like to talk to.

KIRKBRIDE: Oh, you should.

BOHNING: I'm going to be seeing Jerry McAfee in another week or so (15). He was at Gulf most of his career.

KIRKBRIDE: I know Jerry well. A tremendous man.

BOHNING: I'm going to see him in Pittsburgh in a week and a half.

KIRKBRIDE: The last time I was in Pittsburgh I wanted to see Jerry, but Jerry was in the hospital. I knew his father [Almer McDuffie McAfee] well.

BOHNING: Oh really?

KIRKBRIDE: There in Texas City I got the local section of the American Institute of Chemical Engineers started there. We called Jerry's father "aluminum chloride McAfee," [laughter] because he was the first chemical engineer who manufactured lubricating oil for the Cadillac.

I met Jerry for the first time at a meeting of the Catalytic Refining Association. That was a tremendous bunch of guys during the war. There was Standard of New Jersey and Standard of Indiana, Shell, Texaco. It was a collection of the companies that worked together to learn catalysis. I'll tell you, I learned a hell of a lot about catalysis there—how you make catalysis work, really, not just the theory. This was practical catalysis.

BOHNING: Certainly when you were at Houdry, that was a major part of what Houdry was doing.

KIRKBRIDE: Well, that was it. Of course, Houdry was the first one. He got it started. After the Sun Oil Company commercialized the Houdry process, they were making gasoline that we couldn't compete with. I was working for Pan American at the time. We were trying to do it with tetraethyllead [TEL], and he was doing it with just straight chemicals. I'll tell you, we had some pretty blue meetings there in New York at Pan American. We were losing our business.

BOHNING: At that point, was the Houdry process running away with the industry?

KIRKBRIDE: Yes, Sun was. Sun had come from a third-rate company up to a first-rate company, and they were just beating the hell out of Jersey and Indiana, all of them.

BOHNING: I know it's been written down, but I've forgotten how Houdry and Sun made that connection.

KIRKBRIDE: Eugene Houdry was a race car enthusiast, and he was the son of a wealthy Parisian. Eugene found out that a pharmacist—they call them chemists there, but this guy was really just a pharmacist—had found out that you could take just plain gas oil and pass it over this clay, which was a catalyst, and end up with a gasoline. Eugene hadn't won any of his races, and then he began to win all of his races. My God, they began to wonder: What the hell is going on here? [laughter] Eugene let them know that he was making this gasoline. They found out how he was making it. This was the first catalytic cracking process, and that was catalytic cracked gasoline.

Eugene paid the pharmacist thirty-five thousand dollars for his process, but the pharmacist neglected to tell Eugene that the catalyst's life was only about one minute. Then Gene went to work learning how to regenerate the catalyst. He found that he could burn the coke off the catalyst and regenerate it, but he spent a long time learning that he could not exceed 1100°F or he would kill the catalyst. So regeneration was impossible. And there was a vice president of the old Standard Oil Company, part of Mobil over in France, who came to him in Europe and asked, "How long will it take you to get this ready and build a commercial unit?" Eugene replied, "Well, six months and fifty thousand dollars." [laughter]

Finally Mobil told Houdry they would not put any more money into the venture. He would have to get another oil company to put up money. Houdry went to Standard Oil Indiana, Standard Oil New Jersey, Texaco, and Shell, all of whom turned Houdry down. He finally went to Sun and Sun bought the thing. Arthur E. Pew Jr. told Houdry that Houdry would be in charge of the work but he would have to use Sun personnel who would be paid by Sun at Marcus Hook. They brought Eugene across the river to Marcus Hook and put him in charge of the project and said, "Now, we're going to finance this whole thing, but we don't think you're even close at fifty thousand dollars, and we don't think you're close at six months; but we're going to finance the whole thing. We want a finished project, and we'll tell you when you've got it finished to where we can build commercial units." That was Art Pew talking then. Art Pew was the guy who persuaded me to leave the teaching profession. I must say that I was pitted against a very clever man.

So they brought Houdry in there and they turned him loose, but they gave very careful supervision to the thing, so it would go in the right direction. They spent about ten million seven hundred thousand dollars in three years, [laughter] as compared to Eugene Houdry's fifty thousand dollars in six months. It wasn't even close. Sun spent three years developing the process, and Sun built the first commercial unit in the Sun refinery at Marcus Hook. Sun had been denied a license for tetraethyllead and needed the high octane cat-cracked gasoline. This gave Sun what they needed to compete with TEL gasoline. Indeed, the high octane cat-cracked gasoline was better than the leaded gasoline all of their competition had.

Sun was taking their business from the Standard Oil crowd. Indeed, Sun could make the high octane fuel needed for aviation, whereas the Standard Oil crowd gasoline was not good enough except with too much TEL. Standard Oil New Jersey and General Motors were in a conspiracy wherein GM would increase the compression ratio each year on all new cars so higher octane number gasoline would be required by the new heat engines. This was causing Sun extreme trouble. But Sun beat them at their own game with cat-cracked gasoline that also gave a higher percentage yield of gasoline from gas oil charge stock than thermal cracking, which was invented by Dr. William Burton of Standard Oil Indiana. Thermal cracking gave much lower octane gasoline than cat cracking: 72 to 73 versus 85 to 87 octane number. Thermal gasoline could be leaded with 3 cc per gallon TEL to 82 to 85, but cat-cracked gasoline could be leaded to 88 to 92 octane number.

Indeed, Sun learned how to make 100 octane aviation gasoline, which helped England in their defeat of the Nazi Luftwaffe in the Battle of London. It was Sun's 100 octane aviation gasoline that gave England the decisive edge. This also defeated Standard Oil of New Jersey and GM and made Sun a first rate oil company.

So Sun built a commercial unit and it worked. It was a fixed-bed unit. This is one thing that W. K. Lewis got to looking at. He is the one who put his finger on the use of the fluidized-bed catalytic cracking. That is the simplest and the cheapest way in chemical engineering to

build a plant. That's the Jersey plant.

BOHNING: When you went to Houdry in 1947, where were they in this process? Was it already on stream?

KIRKBRIDE: Well, we had one, but it wasn't the best one; they improved on the design.

BOHNING: Was it still a fixed bed at that time?

KIRKBRIDE: No, at that time it was all fluidized bed. There was a fellow by the name of [Thomas K.] Sherwood from MIT. He was telling me how Doc Lewis was always very careful—that with any of the inventions that he made, he gave the faculty there the opportunity to say, "We think that belongs to us." He put on a show for them and showed them how the program worked, and nobody had any ideas. [laughter] That was all he wanted to know. They were then his ideas, and he went forward with them, and they became Standard of New Jersey's.

He was a very, very fair man. I'm sorry I never had the money to study under him. I would sure have liked to, but I studied under a number of his protégés: Joe Roberts, Walter Whitman, and several others.

BOHNING: During those early Houdry years, there were a number of patents that came out. Did you work on them, or were you more administrative?

KIRKBRIDE: Oh no, I participated in that arena too. We were agreed on our research projects, mainly with Oblad and Dart and Harry Milliken and Art Shaybaker and a few guys like that. They were really capable men. They really had their ideas. Well, I had one or two, but they were mainly from this group of very powerful individuals. Ted Burtis was there too.

BOHNING: Was it an exciting place to be, with a lot of things happening?

KIRKBRIDE: I always thought it was. I was persuaded to leave the Houdry Company and go over to Sun, which was a mistake. In fact, if the situation had been presented to me honestly, I would have not gone. But I did. After I made the mistake, there was no turning back.

BOHNING: I'm looking at the period from 1952 to 1956, because then you were president and chairman of the board of Houdry.

KIRKBRIDE: At the end of that time is when I made the very serious blunder of leaving the Houdry company and going to Sun, the parent company.

BOHNING: But when you were made president of Houdry in 1952, how did that come about? You went from vice president of research to president.

KIRKBRIDE: J. N. [Joseph Newton] Pew, Jr., had persuaded Eugene to get into working on a catalytic process for cleaning automobile exhaust, and Eugene did that. Joe Pew, Jr., was the youngest of the original Pew family of Joseph N. Pew, who founded the Sun Oil Company.

How did I get boxed in there? I was promised a whole lot of things that I knew damn well they couldn't deliver, and they didn't. But it turned out all right in the long run. It turned out good for Ted Burtis. They asked me to select an individual who would be the best one for the long run, and I selected Ted Burtis.

I had worked with Alex Oblad and Jack Dart so long, and both of them felt I had betrayed them because I didn't select one of them. Well, it would have been bad if I had selected one of them. But they had put another limitation on me in my selection, that he had to be young. I didn't have to think twice about that.

That was after J. Howard kicked Arthur E., Jr., out of the company because Arthur drank; he was a heavy drinker. He and his sisters Mary and Ethel were the three of the five whom the original stock was divided up among. One of them was dead. Of course, his two sons Arthur E., Jr., and Walter got a fifth share, so that's the sum of two-tenths. That was the Sun Oil Company.

[END OF TAPE, SIDE 5]

BOHNING: During your time as president of Houdry is the period when there were patent infringement suits with Mobil. Were you involved in that?

KIRKBRIDE: Yes. In fact, I settled it. For three million dollars. Cash. I remember going over to the Mobil lawyer. It was right at Christmas time and we were in his office. I was handed this

three-million-dollar check, and I said, "I'm going to get this in the bank right now." He said, "Well, you'd better." I had the comptroller of the Houdry Company with me, and he and I went over to the bank and handed them this three million dollars. [laughter]

These were experiences that I wasn't prepared for. You try to do the best you know how, but really, if you had time to think about the experience, after you have done it, you know that there are better ways. I worked out the agreement and settled it with one of the senior vice presidents of Mobil. He and I would meet at the University Club in New York. It was new and nobody knew that we were meeting. That was the one thing that we wanted. We didn't want anybody to know that we were meeting, because it was a settlement of a big oil feud.

BOHNING: As I understand it, Mobil had been an early partner in the whole process.

KIRKBRIDE: Yes. Originally, they owned Houdry. The thing was set up as the Houdry Process Corporation, and Mobil had forty percent of the stock.

BOHNING: But in the settlement were they free to go ahead and use any of the processes?

KIRKBRIDE: No, they weren't. But they did it anyway. That was how we put the deal on them in the patent lawsuit. We had a pretty good idea about how much money they'd made on it; they had made about three million dollars. We got the three million dollars, and they got out of the field entirely and left the field open to Houdry.

BOHNING: At the same time, from 1952 to 1956, you were director of the Catalytic Construction Company, which you mentioned earlier.

KIRKBRIDE: Yes, that was a wholly-owned subsidiary of Houdry. That started out to be part of Sun Oil Company. Art Pew set that up before he left the Sun Oil Company. It could be very dangerous on many accounts from a standpoint of law, and it was a liability to Sun Oil stockholders. When you talk to Sun Oil stockholders, the Pew family didn't want to say Art Pew had gone ahead with setting it up as he saw fit, without properly talking it over with the rest of the family.

After they'd looked into it from all the legal angles, they did not want to jeopardize the whole company being involved in the engineering construction business. There was a lot of money in that, but it didn't match the money that Sun Oil Company was making with its crude oil production and all the other things that they had. Art wasn't there at that time, but I'm sure he

agreed that these liabilities were too great.

BOHNING: You've made a few comments about your move to Sun, which happened in 1956.

KIRKBRIDE: That was just one month before I became fifty years old.

BOHNING: Your title was executive director of patents, research, engineering and commercial development.

KIRKBRIDE: That was part of it. There wasn't any executive director of research and development at the time, but I created the commercial development department there; it was part of my job. We started working on the commercialization of polypropylene. We didn't know how really to go into the polypropylene business. I had the job of setting up a team of people who found out how to do it. It was highly successful. It was so successful that Sun Oil Company sold the polypropylene business to Amoco, Standard Oil of Indiana, for eighty-seven million dollars! That was a lot more money than I put into it. [laughter] Sun came out of that very well.

BOHNING: Was Avisun the name of the company?

KIRKBRIDE: Avisun Corporation. Sun sold Avisun to Amoco Chemical Company. They made more money the first year they had that company than they paid for the company. I know because John Swearingen, CEO of Standard Oil Indiana, told me this, and I know he wouldn't misrepresent it.

BOHNING: In the first year? [laughter]

KIRKBRIDE: John Swearingen and his crew figured this out and said, "Oh boy, we've really come out with a great deal!" [laughter] You've got to recognize that they still held a lot of strength in these earnings in the first year from the Amoco Chemical Company itself. They weren't a bunch of dumbbells; they were pretty smart people.

BOHNING: You're quoted as saying when you moved to Sun, "My most difficult change-over was going from technical work to administrative."

KIRKBRIDE: My hardest lesson there was that Sun Oil Company was an old company compared with Houdry, and there were a lot of people in the wings who thought they should have had the job I was given. It was just like my leaving the Houdry Process Corporation and selecting the guy who took my place. There were people in the Houdry Process Corporation who thought they should have had that job rather than Ted Burtis. They put all these other limitations on me. In the first place, they were looking, eventually, that this man might head-up Sun Oil Company. As it turned out, they were lucky that they had him. They were lucky. Dunlop and J. Howard had made a very bad mistake by putting Sharbaugh in that spot. Sharbaugh was not as pliable a man as Burtis was. Burtis ran away with the job. He was just temperamentally and professionally fit. He was a perfect fit for the job; we couldn't have had a better one.

BOHNING: You and Charles Thomas had a patent (16).

KIRKBRIDE: Charlie Thomas was a great guy.

BOHNING: The patent involved a rocket fuel containing polyolefin and boron. I know boron compounds are used in rocket fuels, but I was intrigued by the polyolefin aspect of it and how you got involved in rocket fuels.

KIRKBRIDE: That was a paper patent. I thought about it and he thought about it. We put our thoughts together, and that's how the patent came to be. I have a book that Charlie wrote.

BOHNING: What is the title of that book?

KIRKBRIDE: *Catalytic Processes and Proven Catalysts* (17). In fact, it's one of the best books I've seen, particularly if you're out in the field practicing. Here's a copy of it.

BOHNING: This was published around 1970.

KIRKBRIDE: That's pretty close to the time I retired. I remember going in and telling J. Howard that I had decided to take early retirement. They had a system there that they were going to retire me anyway, in maybe two or more years. I could retire at that time and go into consulting, which I did. I probably would have done better if I had stayed with them, but I

didn't.

BOHNING: In 1960 you were made the vice president for commercial development, research, engineering, and patents. Was that just a change in title from the previous position as executive director?

KIRKBRIDE: That's correct. Actually, the Pew family have never had anybody who came into their company advance as rapidly. If you look back on family members themselves, like J. Howard Pew, he worked a hell of a long time before he became president. And there were other people in the company. Bob Dunlop worked a long time as a comptroller in the company. They made him president because Art Pew told me he wasn't going to let them shape his life. So they said, "Okay, then we're going to make some changes." After they got through making those changes, he decided to leave.

That's another one that I looked at carefully, and I think some very bad mistakes were made. They let a genius leave. Art Pew was a genius. There were bad feelings between Uncle Joe and Art.

Art Pew's father was an alcoholic, and he died as an alcoholic. He wouldn't listen to them, when they were trying to get him to stop drinking, and that's what he would have had to do. But I think they went about it the wrong way.

BOHNING: You were involved in some respects in the Puerto Rico project.

KIRKBRIDE: Oh, yes.

BOHNING: I understand that you headed the task force. Can you tell me something about the Puerto Rico project and what it was all about?

KIRKBRIDE: It was created because of laws here in this country that made great concessions to industry set up in Puerto Rico. Actually, we could manufacture lubricating oils down there, rather than at Marcus Hook, and we could make a killing on it. It just turned out a better way to do it. We could import it into this country without any import duty or anything. So the company was set up down there primarily to manufacture lubricating oil, rather than do it at Marcus Hook. It's been very successful.

BOHNING: It was also at this time, in 1967, that you called Dunlop's attention to a talk by Stewart Udall about the environment. You started then, warning the company that they were going to have to do something about their relationship with the environment.

KIRKBRIDE: Yes, I did. I felt they were going to have to stop marketing leaded fuel. Actually, Sun didn't market leaded fuel until after World War II. The reason they got into leaded fuel then was because of war-time restrictions.

I could see that all of our planning was in the direction to get out of leaded fuel because lead was poison; we knew it was poison. We didn't have to run any tests on that. Frankly, we're now just recently finding out how terribly poisonous it was. On any thruway, any place where there was heavy traffic, the lead was deposited out on the ground rather than on the thruway; it was saturating the ground with lead. In many schools near the thruway, I think the kids in the schools were being poisoned with lead. It's still going on, even to this day. Sun was glad that I did that.

Dunlop was president of API, the American Petroleum Institute. I had a program that was helping all of the members of the API. That program was put together, but I didn't want to be a part of it. I was getting out; I was leaving Sun. There was a friend of mine at the Texas company who came to me and said, "Look, our company feels that you are the one who should handle this." I finally decided I would, because I always felt so keenly about the environmental impact of it. And so we did.

Fortunately, I had Dunlop as the president of the API, and I could get my program put through pretty quickly. [laughter] In fact, I gave a speech at the annual meeting of the API in Chicago, laying out the program and telling them how much it was going to cost. It was all cut and dried. One guy from the Standard Oil Company of New Jersey got up and moved to accept it. A Texas company representative got up and seconded the motion. Hell, it was unanimous; they approved it.

This thing was clear. It was screaming at us, "You're going to have to stop this!" These were the sorts of things, even now today, that are negative doings, and we're going to have to change. We're going to have to change. I may not be around when the change takes place, although I do think I'm going to be around another ten or fifteen years. I figure some radical changes in ethics and morals are at the bottom of it. That's why I put that on my program. It's probably the most important area that will occupy our attention in the future.

BOHNING: In the late 1960s, just before you left Sun, you were involved in oceanography.

KIRKBRIDE: Yes! I still work with some of those people.

BOHNING: I'm curious how you got involved in ocean work, as it were. You were on Nixon's task force on oceanography and you received an award from the navy. How did you get involved in that aspect?

KIRKBRIDE: The Sun Oil Company joined an organization that had an ocean science and technology advisory committee and I was chairman of that committee. I knew all the presidents of the big oil companies by first name; they respected me, and I respected them. I contacted them and told them, "Okay, there's going to be a movement taking place with regard to the handling of crude oil and all crude oil products. Unless the oil companies go into this and get on this ocean science and technology advisory committee and put key people on there to shape the future of this, you're going to get it rammed down your throat by the government. I would urge that you go back and think about it very carefully."

Most of them didn't have to go back and think. They knew damn well what I was telling them was true; they had been around. One of the key people on that was Amor Lane, a Jewish boy who lived over here in Washington. Amor really was an electrical engineer, but he had a lot of experience with the ocean. I hadn't had any experience with the ocean, but I did have a lot of experience in the petroleum industry. I knew the way things were going, that the oil industry was not going to be able to get by with what they had been doing.

They were going further into the ocean to find and produce oil. They were going to have to pay more attention to this situation. They still haven't paid enough. That's how Exxon got tripped up in Alaska. They didn't give the attention that they should have. I knew damn well that the inland sea up there was hazardous. I knew that. In fact, when I was with ERDA [Energy Research and Development Administration] and I guided studies that we made there, we knew that this was a terrible place for bringing a sea-going tanker in to pick up a million barrels of oil and then go try to get it out through that hazardous area.

I think this captain probably got drunk and he ripped a hole in his tanker. They spilled oil all over up there.

[END OF TAPE, SIDE 6]

KIRKBRIDE: One of the programs that I got started at Sun before they killed the research department was a program that dealt with microbiological conversion of oil. That's one of the ways they get rid of the oil in the ocean. The microbes are there all the time. They get something to eat and that's how they develop.

J. N. Pew told me that when he first went to Lake Maracaibo in Venezuela, there was oil floating around every place. The next time he went down there, there wasn't any oil any place. What happened was that the microbes got to working on it, and they developed. They developed a big supply of microbes and they chewed up the oil and got rid of all that waste oil.

We developed a very successful process at Sun to convert methane into sugar. You can grow sugar cane a lot cheaper. [laughter] We had a hell of a good process, but profitability wise, it wouldn't stand up.

BOHNING: When you first went to Sun, did you have any ambitions to become president of the company and move up into the company in any way?

KIRKBRIDE: Yes, I was promised that. But after I got there, I realized that it was hopeless, that there were too many people in the wings who thought they should have that opportunity. It was the kind of competition you had there that was a deadly kind. In other words, you had the very people that you should count on as competition. You've got to surround yourself with people who know more than you do and know how to do it. They've got to have the freedom to do it.

If that latter limitation were not in it, I probably might have made the job, but I wasn't young enough. In fact, Bob Dunlop was younger than me by at least five years. And after all, he was already president. Well, there wasn't any reason why they should get rid of Bob Dunlop and put me in as president. But I didn't use my head. I was led in there by Clarence Thayer, in whom I had complete confidence. He needed me very badly in that organization to conduct the research for Sun.

Dunlop put together a conglomerate that was Sunray DX, and it was absorbed by Sun. It was a major mistake. But Dunlop put it together, and the man who came in and headed Sunray DX never had any research that he paid for. He went to UOP [Universal Oil Products] and some of the other companies that peddle their research. Sun always had a powerful research organization, and they still don't have anything. The research organization was destroyed, the very organization that created catalytic cracking. Too bad! The nation lost out on that.

BOHNING: Are those the reasons you took your retirement in 1970?

KIRKBRIDE: Well, yes. I was going to be forced to retire in two years, and I didn't know what the situation was going to be in two years. I did know what it was then, and I'd had contact with General Electric and they wanted me as a consultant. There were some others that wanted me.

So I did. I thought, "Well, what the hell? I'll get out of this mad rat race."

BOHNING: Were you living in Wallingford all that time?

KIRKBRIDE: No, by that time I had moved up to the Eastern shore. My wife and I built a place up there. We got into a big fight there. That's how I met Allaire du Pont and that crowd. That was the B. F. Goodrich Chemical Company where they were going to build what they said was an innocuous plant on the Chesapeake and Delaware Canal. They were going to ship in the monomer and polymerize it there, and just ship out the polymer. That sounds very innocuous, but it wasn't quite that.

They had picked up about three or four thousand acres of land right on the canal. They were setting it up where they would take boats from the canal into their docks. They were putting up a real chemical plant. They were also working on several other processes through an espionage system that I employed while I operated the research there at Sun. I employed an espionage system where I found out what my competitors were working on in the research field. If I knew what they were doing, I knew damn well that I wasn't going to get caught with my pants at half-mast.

They were going to make acrylonitrile there. They were going to go out and buy cheap, very low-cost petroleum naphtha and crack it there at the plant. They were going to make acrylonitrile. Well, you being a chemist, you'd recognize that the word acrylonitrile is a disguised word. That's another name for ethylene cyanide. And believe me, it is cyanide. Acrylonitrile is nothing else but ethylene cyanide.

I sure remember crucifying that bunch of lawyers from B. F. Goodrich at a meeting the Corps of Engineers put on at Elkton. I had a group of men in the research department who carried out the computations. They knew what the problems were in this kind of a design. One of the problems was that they had fifty pounds per day of hydrogen cyanide as a by-product. What can you do with it? How can you get rid of hydrogen cyanide? They even thought about pumping it down in the ground. [laughter] Well, if they had gotten it down in the aquifers, they would have polluted everybody's wells all over the county.

My wife was a very brilliant woman. This is a picture of her. She called me, right at Christmas time, and said, "I have been over to the courthouse here in Elkton, listening to a trial that was in regard to conflicts between B. F. Goodrich Chemical Company and the people here in the county. We're building our home down here, and you're going to have to get into this fight, whether you want to or not. We can't allow this pollution to take place." And that was right.

So I attended a meeting maybe one or two nights later at Allaire du Pont's home there in Chesapeake City. She had a horse breeding farm there; they called it Woodstock Farm. She

went to these meetings that I went to. My adrenal gland was in total reflux and she'd go there and work needlepoint. I can't understand how the hell she ever did it, but she did. You wouldn't think that she had a nerve in her body. But, I'll tell you, that woman is a vicious fighter. Don't ever get in a position where you are fighting with her, because you'll lose the battle. [laughter]

I agreed to take on the job of president of the Cecil County Anti-Pollution League. She had a friend who was on vacation down in Florida by the name of Brian Field. He was a former writer for *The New York Times*. William du Pont III had employed him to come up and help him create Delaware Park, I guess it's called; it's a racetrack. Allaire recognized that this problem was pretty damn deep, and Brian Field had too. He said, "We can't have anybody by the name of du Pont president of this organization, because B. F. Goodrich Chemical Company happens to be the best customer that the DuPont Company has. We can't have anybody with the du Pont name in the management of it. So he looked at me and said, "You're the vice president of Sun, aren't you?" I said, "Yes." He said, "You fit the bill. You could be president of this. I think that you should be, because you have the knowledge to be effective."

So I was talked into being president of it. I did have a home over there that was going to become valueless very soon, because the C&D Canal was going to be as polluted as the Houston Ship Channel. And believe me, it's polluted. So I finally ended up as president of it. We were fighting them on every street corner. They were bringing the Corps of Engineers in to it. I knew that was one of the final steps they were going to make; in other words, really to get the laws up and on their side. They had a pack of lawyers at this first meeting that I attended. We didn't have any more meetings like that, after that. I carried on a running battle with them in the newspapers.

I had all the information that I needed as to what the problems were in building an acrylonitrile plant there on the Canal. I can recall getting up before this group and saying, "And that bunch of lawyers over there doesn't know what they're getting their heads into. Acrylonitrile; now that sounds like a fairly tame material. I know you make Orlon from it. These clothes that I have on are made of Orlon, and I like the material very well. That's polyacrylonitrile.

"But let me tell you something. One of the products that they have as a waste product is something that's very bad. That's hydrogen cyanide. But do you know what? Acrylonitrile is also a cyanide. They call it acrylonitrile, because that's a nice name. They weren't going to call it ethylene cyanide because that has a bad ring to it."

Those lawyers didn't know their ass from first base about what I was talking about in chemistry, but these people in the audience knew what cyanide meant. That's what I knew, and I could see their eyes sticking out like crawdads eyes. [laughter] I said, "Well, I'll follow this up. Now, from the size plant they want to build over there, they're going to have about fifty pounds a day of hydrogen cyanide. And do you know what? Here in the state of Maryland, we have a gas chamber where we put these people to death, rather than hang them. It takes seven grams of

hydrogen cyanide to kill a person. Now, let's see, how many grams are there in a pound?" And I figured that out for them. I said, "Now, we can kill that many people every day! Because we're going to have fifty pounds of this every day!" [laughter]

I'm telling you, I was walking out of the meeting—my wife was with me—and there was one of the bigwigs in politics there in Cecil County in the vestibule. Somebody asked him, "How are we coming out on this?" And he said, "We are in for a l-o-n-g time, I can tell you." [laughter] He was ready to get out of the fight. [laughter]

Allaire du Pont and I became very good friends. She financed the whole deal. I got acquainted with a lot of people who were very powerful in the state of Maryland. She owned the "horse of the year" who was undefeated for three years. That was Kelso. I guess she still does. She talked like an old country gal. [laughter] She's no country gal; she's a very sophisticated woman. She was the first environmentalist I ever met who was really and truly an environmentalist who wasn't in it for what they could get out of it. She was in there on a defense, and she was going to fight; and we won.

Spiro Agnew was governor then. They finally got rid of him in other ways. I went to talk to the head of the Corps of Engineers, and he let me know in no uncertain terms, "If the governor wants this, the Corps is going to be buying it." Well, I knew that beautiful house I was building would be worthless, after they got through polluting the grounds around it with some of the by-products they had.

I go up to see Allaire every now and then. She's always been very nice to me, because I did a favor for her that she will never forget. But she was a worthy woman; she's a good woman. Her husband [Richard Chichester du Pont] was killed in World War II in a glider. In fact, he was the guy who founded the concept of bringing a whole lot of troops into a small area with gliders. He got killed in that.

I never knew him; I knew his son, Kippy du Pont. I got to know a lot of the du Pont family. It's a very interesting family. A very smart bunch of people. I haven't met any one of them I thought was stupid. [laughter] Every damn one of them is clever; some are just more clever than others.

BOHNING: After you left Sun in 1970, you did a number of things as a consultant before you set up Kirkbride Associates in 1979.

KIRKBRIDE: Yes, I did.

BOHNING: One of the things that I noticed that I was intrigued by was the fact that you were

the executive producer of a motion picture.

KIRKBRIDE: Yes. Now, my son can probably give you more information on that. He was the power behind it. I lost my shirttail on that. And I was warned about it. I had a Jewish friend on Wall Street who was trying to persuade me to go in the production of oil, and I said, "That's too risky." He said, "Man! You think `risky'! Making a motion picture is far more risky." [laughter] Besides, I didn't know a damn thing about it.

BOHNING: How did you find your consulting contacts during that period, after you left Sun? What were you doing? Who were you consulting with?

KIRKBRIDE: Pretty soon after I left, I got tied up with a bunch of patent lawyers in New York, and they were representing Mobil in a patent lawsuit. This lawsuit went on for quite a long time. It was a lawsuit that pertained to molecular sieves catalysts, and that was a very excellent type of catalyst. Mobil had the original basic patents on that. Later I was told something by the vice president of the Grace Chemical Company who got beat. It happened in Hartford, Connecticut. I don't think I ever met him, but he said I did, at the time of the lawsuit. He and I talked for a while, and I told him that it was a pleasure to know him. He said, "Well, I can't tell you that it's a pleasure for me to know you, because you cost my company two hundred million dollars." [laughter] And I said, "How is that? I don't remember that." He said, "Well, I'll refresh your memory." [laughter]

In my testimony up in Hartford, the judge in his final verdict pointed to that testimony and said it was very convincing, that I had given scientific fact. They showed that they were infringing the patents. It was a very clear case.

Then I went out to California, to Los Angeles, where the first lawsuit was Mobil vs. Grace Chemical and Texaco, and then the next one was out in Los Angeles, and that was a corporation in California and Texaco. [laughter]

BOHNING: It's somewhat ironic that after the Houdry-Mobil affair, now you're on the other side for Mobil. Am I correct?

KIRKBRIDE: How is that?

BOHNING: With the patent lawyers, you were testifying for Mobil.

KIRKBRIDE: Yes, and they won the lawsuit.

BOHNING: But earlier, when you were at Houdry, you were on the other side fighting Mobil.

KIRKBRIDE: I was on the other side. But when it came to the settlement of the lawsuit, they paid three million dollars. There would never have been a lawsuit had I been president of the company, the Houdry Process Corporation, at the time. I knew enough about the operation that I could have sat down and worked out a settlement agreement with the people whom I had to work it out with eventually, if I had been given an opportunity when I was the vice president of the company.

A general was there, Dave Hausman. He was a nice guy, and he liked me, but I didn't like his operation; I thought it was terrible. He had a patent attorney there who enjoyed lawsuits. His negotiations with Mobil weren't even directed towards settling it; he was directing it towards a patent lawsuit, and he was in his glory. In fact, I had to fire the guy later, after it was settled. Which I did; it wasn't a very pleasant task, because I liked him personally, although you can't let your personal likes and dislikes bend you too far.

[END OF TAPE, SIDE 7]

BOHNING: I'd like to spend a little time talking about Widener University.

KIRKBRIDE: That's good. I still enjoy that.

BOHNING: Did you become associated with Widener before your son went to school there, or after?

KIRKBRIDE: It was about the same time. I went on the board there. I didn't get along with the lawyers too well. Every lawyer who was on that board was taking money from the school. He was charging fees for his time. I brought that out because I was donating my time to the school. I wasn't charging anything for my time. In fact, I thought it was very bad policy for a director to take money. Some of them got mad at me, but it ended up that they all stopped taking money.

Chalmer got his baccalaureate degree there and went out to California. He thought he was going to make movies. My wife also got involved. She had owned our home in

Wallingford, and she gave that to Widener as the president's home. I got a resolution from the board stating that they were going to use it as the president's home, but if they ever decided to do otherwise, it would revert back to my estate or my son's estate. Chalmer came here and got his master's degree in public relations over at American University.

I have enjoyed working with Widener. I was responsible for raising a great deal of the money that went into the Kirkbride Hall of Science. They named that after me. Also, my wife gave her home, and it's called the Billie Kirkbride House. The emeritus president Clarence Moll and his wife Ruth liked it very much. So does Bob [Robert J.] Bruce and his wife.

BOHNING: I've never been on the Widener Campus. I'll have to go there someday. I was on the faculty at Wilkes College up in northeastern Pennsylvania for a long time, and we played Widener in intercollegiate athletics.

KIRKBRIDE: You probably heard of Billy "White Shoes" Johnson. He was a football player. He was very successful at Widener and also in professional football.

BOHNING: In looking at the ceremonies of the dedication and the description of the building, I was intrigued by that science building. It had a sub-critical nuclear reactor. It had a wind tunnel. I thought that was quite a science building for a small college.

KIRKBRIDE: It is. We had some really powerful people on the board at that time. Caesar Grasselli was on the board. Caesar was actually the person who raised the most money for that science building. It really should have been called the Grasselli Hall of Science and Engineering rather than the Kirkbride Hall. But Caesar was highly connected with Cornell and did this for me, and that was great. He was one of the finest people, and his wife was the most interesting woman. Duzzy Grasselli. She told the story about how Caesar proposed to her. He said, "I want you to go to the dentist and get your teeth fixed up. I'm going to marry you." [laughter]

Here was this guy, wealthier than all get out. He was more of a Britisher than an Italian. He was a good friend, and I got him to come on the board. I was trying to get one of my neighbors in Wallingford to come on the board. This neighbor said, "Look, you don't want me. I'll tell you the guy you want—Caesar Grasselli. Caesar doesn't have anything to do, and I've got a job. This would be good for Caesar. If you go after Caesar, I'll urge that he accept." And he did. So Caesar came on the board, and he was a wonderful person. I've been very fortunate in my life. I've known some very unusual people. Caesar Grasselli was one of them. Allaire du Pont was one of them. Caesar was connected up big with the DuPont Company when he came on the board. He had some big friends.

BOHNING: I've come to the end of notes. Is there anything that you would like to cover that I haven't asked you about?

KIRKBRIDE: I can't think of anything right now. My mind doesn't work quite as fast or as clearly as it used to before I had the stroke, but it still works pretty good.

BOHNING: Oh, yes! We've been going a long time already, and I appreciate your taking the time to talk with me this morning.

KIRKBRIDE: This was really nice. I'm glad to get to know you. It's a pleasure for me to reminisce about some of the things that have happened in my life. I have had an interesting life.

I can't think of anything else. Maybe after I see the transcript I can think of something at that time.

BOHNING: Let me thank you again, very much. I have enjoyed it.

KIRKBRIDE: It's been a pleasure for me to know you.

[END OF TAPE, SIDE 8]

[END OF INTERVIEW]

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