

**THE DEPARTMENT OF ENERGY ORAL HISTORY
PRESENTATION PROGRAM**

OAK RIDGE, TENNESSEE

AN INTERVIEW WITH

RUBE MCCORD

FOR THE

**OAK RIDGE NATIONAL LABORATORY
ORAL HISTORY PROJECT**

INTERVIEWED BY

STEPHEN H. STOW

AND

MARILYN Z. MCLAUGHLIN (ASSISTANT)

OAK RIDGE, TENNESSEE

MARCH 26, 2003

TRANSCRIPT BY

BRIAN VARNER

STOW: Today, we're talking with Rube McCord. Rube worked at the Metallurgical Laboratory in Chicago in the early 1940s, came to ORNL shortly thereafter, and then returned in the later 1940s and spent his entire career here for four decades, working with reactors and reactor technology. Rube has a lot of good stories to tell, and we look forward to hearing from him.

Rube, we're glad to have you here today to talk to us and tell us a little bit about your recollections of the early days and your career here at Oak Ridge National Laboratory. You earned a degree in chemistry in 1942 from Erskine College, I understand.

MCCORD: That's correct.

STOW: How'd you get started in chemistry?

MCCORD: Well, I always liked chemistry in high school.

STOW: Yeah.

MCCORD: Because I was interested in chemistry, I took premed courses, which included many technical subjects. For some reason, I had a bent on the medical field. When I graduated from Erskine, I had a major in chemistry and a minor in mathematics.

STOW: And, this big company named DuPont came along and scooped you up then, right?

MCCORD: Yes. Of course, in 1942, we were just getting geared up for the war effort. I wasn't quite twenty-one years old when I graduated. It wasn't that I was so smart, but that we had only eleven grades then in South Carolina. So I didn't go to school for twelve years.

STOW: (laughs) Is that right? I'll be darned.

MCCORD: So, when I got close to graduation, somehow or another, my father heard that DuPont was hiring new graduates. And, they especially wanted people with a degree in chemistry. So I went to Wilmington (Delaware) for an interview.

STOW: Okay.

MCCORD: And, fortunately, they accepted me. I was hired to work for DuPont at the Oklahoma Ordnance Works. And, that was a smokeless powder plant that was just getting under way [to make powder for modern firearms.] I was supposed to get three months of training at the Indiana Ordnance Works, which was a little further along than the Oklahoma Ordnance Works. So, they hired me and I went to Indiana Ordnance Works for about a month -which was supposed to have been three months. So, I got a brief introduction to smokeless powder. And, then I was transferred on to the Oklahoma Ordnance Works in Pryor, Oklahoma. And, I was assigned to the chemistry lab there starting in February 1943. At that time, they were scaling down. A lot of people who had gone into the technical superintendent's office were terminated because they were reducing the workforce. The powder lines had gone into operation, but I was in for a big surprise. When I went to the technical superintendent's office for what I thought was my exit interview, I was told, "We are transferring you to the Metallurgical Laboratory at the University of Chicago."

STOW: This was February 1943?

MCCORD: February of '43.

STOW: Because, that's just about the time DuPont got involved with the Manhattan Project.

MCCORD: Yes, the man in the office said, "I cannot tell you anything about the job." All I got from him was some information on where to report. And, I believe that was on a Thursday. Of course, I was not married at the time. They told me that I needed to report by Tuesday. That was a fairly short notice. I had to get my clothes back from the cleaners and all that sort of stuff. But, anyway, I did. I did not know anything about the job that I was assigned to.

STOW: So, whom did you work for at Chicago?

MCCORD: I really had two bosses. I had my administrative boss, who was the DuPont boss. That was Logan Emlet.

STOW : He came down here and ended up at Y-12 as plant manager over there eventually, didn't he?

MCCORD: He did. So, he had several of us from DuPont under his wing at Chicago administratively. My initial bosses, David and Jane Hall, were trainers for us DuPont people. I remember them quite well.

STOW: Jane Hall. She went on to a fairly distinguished career.

MCCORD: Right. Los Alamos, I believe, did she not?

STOW: Yes, maybe so.

MCCORD: I think that he went on to Chicago. They were both Ph.D. physicists -- husband and wife. We were assigned to them. And, I remember, one of the first things I experienced when I was introduced to the work at the University of Chicago Metallurgical Lab was that they had just irradiated some foils in one of the Sigma reactors. They came into the counting room, holding this indium foil in their hands, and one asked, "Is it hot?" The other said, "Yeah, this is a hot one!" And, of course ...

STOW: You didn't know what they were talking about, huh?

MCCORD: Nothing. I didn't know anything. I thought, "That's kind of crazy -- a foil is hot and they're holding it in their bare hands." And, of course, that was my first introduction to Geiger counters and radiation.

STOW: You had a lot to learn then, didn't you?

MCCORD: I'm telling you, I was really ... you talk about green.

STOW: So, what was your first job there at the Met Lab?

MCCORD: I was assisting them in counting. They taught me how to use the Geiger counter, how to count the radioactivity on the foils, and get the data that they were looking for.

STOW: Were you doing any real chemistry?

MCCORD: No. It was physics, if anything.

STOW: Yeah.

MCCORD: Of course, I hadn't had a bit of new technology. But, I did other things there. I was, in a way, one of the so-called "day laborers."

STOW: All right.

MCCORD: As, we were involved in moving the reactor from Stagg Field out to Argonne.

STOW: My goodness.

MCCORD: And, they would ship... The graphite would come out and it ... Some of them had the uranium in it that was not canned or anything.

STOW: Yes.

MCCORD: And, I had a boss who was directing us in stacking or rebuilding the ...

STOW: Who was that? Do you recall?

MCCORD: The guy, who was my direct supervisor, I don't recall.

STOW: Okay.

MCCORD: But, the two physicists ...

STOW: The Halls?

MCCORD: No ... now, that was different.

STOW: Oh, okay.

MCCORD: They were Anderson and Zinn ...

STOW: Walter Zinn?

MCCORD: That's right, and Anderson ...

STOW: Yeah, okay.

MCCORD: And, they were, you know, directing the technical part. And, sometimes they had some disagreements on what the next layer should look like. They'd say, "We may have to take it off and put it back."

STOW: Well, there are classic photographs of the pile being built in Chicago with Walter Zinn standing there, directing where the different pieces of graphite go and so on.

MCCORD: That's right, that's right. Then we'd leave. And then Anderson would come up and change it. But, Zinn would prevail.

STOW: The pile there at Chicago went critical in December of 1942, I think.

MCCORD: That's right.

STOW: And, you weren't there then. You came in '43, though, right?

MCCORD: In February of '43.

STOW: Did you have any inkling about what really was going on?

MCCORD: Yes. They ...

STOW: How'd you find that out?

MCCORD: Well, the Halls told us.

STOW: Yeah.

MCCORD: You know, we were surprised. They told us, really. I was aware of the ultimate object of the Manhattan Project. STOW: To produce the nuclear weapon.

MCCORD: That's right, that's right. And, of course, things were super secret then, you know.

STOW: Sure.

MCCORD: I mean, you'd just talk to your colleagues, and then, that was about it. They told us, "Don't even talk to somebody in another group, other than the one you're in." And, of course, we speculated on what this massive production of energy would be at high temperatures. One other fellow in that bunch was Charlie Clifford.

STOW: Okay.

MCCORD: And, I was trying to think of some others. There were several of us DuPont people that were on this particular assignment up there at the Met Lab.

STOW: Well, when I think of the Met Lab and chemistry, I immediately think of Glenn Seaborg. Did you have any interactions at all with Seaborg?

MCCORD: Well, I saw him, and I went to one of his lectures.

STOW: Yes.

MCCORD: Now, you talk about a fish out of water ...

STOW: You mean ... you or he?

MCCORD: I was out of the water.

STOW: You were the fish out of the water.

MCCORD: I'm a chemistry ... and, here's this, you know, Ph.D. brain and they said, "Go to this lecture. You might benefit from it."

STOW: But, he was a young man, only about thirty ...

MCCORD: I believe he was twenty-eight at the time. And, I was amazed at the chemical and mathematical formulas that he put up. He was so fluent in talking about that. But, of course, that was miles over my head. Now, why they wanted me to attend that lecture, I don't know, but I did.

STOW: It might have done you some good. You never know.

MCCORD: That's right. Well, it did me some good. This really intelligent scientist impressed me.

STOW: He turned out to be, probably, the most premiere chemist of the last century, I would say.

MCCORD: He was great in discovering new elements.

STOW: Well, in discovering new elements, in heading up the Atomic Energy Commission, and in being an adviser to ten presidents. I mean, Seaborg is a pretty big name.

MCCORD: Yes, that's right -- real big.

STOW: And, he used to come down here.

MCCORD: Like I said, that might be one of my claims to fame -- that I heard a lecture by Seaborg. But, anyway, we did go occasionally to lectures. And we did know what the objective of the Manhattan Project was.

STOW: Did you realize at that time that Oak Ridge existed, or was being built, and what the purpose of Oak Ridge was?

MCCORD: We were told that our mission in Chicago was short-lived and that we would be going down to X-10, the secret name for the site there at that time. But, we didn't know exactly when we would leave for X-10.

STOW: Yes.

MCCORD: But, I had another unusual and interesting experience. Under the Sigma pile in the Metallurgical Laboratory basement were uranium slugs. We were given the assignment of unloading some uranium slugs. They had different shapes and we needed to take them out so they could be loaded with something else.

STOW: Yes.

MCCORD: And, we thought, "Well, you know, pushing that stuff out and catching each one of these pellets is kind of tedious." So, we started pushing them through with a rod, and they scattered all over the floor and sparked a little bit.

STOW: Oh, my goodness.

MCCORD: He didn't like that. He dressed us down.

STOW: Did he?

MCCORD: But, pretty well.

STOW: What was the concern while you were at Chicago about exposure to radiation? I mean, they knew that radiation was a danger back then. They didn't realize what we know today, but precautions were taken.

MCCORD: Well, that [potential hazard] was never really emphasized as far as the uranium oxide in pieces of graphite was concerned. We didn't wear masks and we didn't have gloves.

STOW: Uranium's not that radioactive, because of the long half-life and alpha particles that don't penetrate. What about plutonium? Did you ever have any contact with plutonium?

MCCORD: No, I didn't have any association with plutonium.

STOW: Okay.

MCCORD: But, I did know that the ultimate goal of the Manhattan Project was to produce plutonium, especially in the Hanford, Washington, reactors.

STOW: Okay. So, in 1943, you got transferred down here to X-10, or what was known as "Dog Patch" at that time.

MCCORD: Yes, I remember it quite well.

STOW: And, you were single, right?

MCCORD: I was single. We arrived here on May the 7th, 1943. And ...

STOW: You say, "We." You and ...

MCCORD: Well, this bunch.

STOW: Others from Chicago?

MCCORD: Charlie Clifford and maybe Bill Bennett. There were four or five of us in this group.

STOW: Yes.

MCCORD: And, we came down, pretty much, I think, as a unit. And, it was, you know, May. It was cold still, in Chicago. After we came down here, we couldn't believe this place. It was warm and people were actually going swimming.

STOW: What was your impression of the city of Oak Ridge? There wasn't much of a city then.

MCCORD: There really wasn't. When I came to Oak Ridge, Oak Ridge Turnpike had not yet been paved.

STOW: Sure. Yes ...

MCCORD: You'd see bulldozers and earth-moving equipment running around. We didn't have any housing facilities yet for us operating people. The several of us who came down from Chicago lived in East Knoxville. We looked for housing in Oak Ridge but you couldn't find housing anywhere.

STOW: I'll be darned.

MCCORD: The dormitories weren't available for us yet in Oak Ridge. So, we ended up renting a house in Knoxville and stayed there all the time.

STOW: Did you take the bus back and forth between Knoxville and Oak Ridge?

MCCORD: Early on, they furnished our transportation. When we got our assignment in Oak Ridge, our first job was to measure the diffusion length of the different batches of graphite using a radium-beryllium source and the Sigma Pile. At that time, we reported to Hayden Jones, who was at the University of Chicago. Then Logan Emler eventually came down and we reported to him. Later we worked for Joe Sinclair, a DuPont employee. But we seldom saw our DuPont bosses at that time.

STOW: So, you got here in May of '43, and the Graphite Reactor went critical in November, right?

MCCORD: An amazing accomplishment!

STOW: Where were you when the Graphite Reactor was loaded and went critical?

MCCORD: I was working with the physics groups. Of course, I knew the loading of fuel was going on and we were still measuring the graphite diffusion length in what we called the 101 Building at that time.

STOW: Okay.

MCCORD: That's where the Oak Ridge Research Reactor is located. Back then graphite was machined there. Then we ran these tests on the graphite, measuring the diffusion length using indium foils. Initially, we worked six-hour, rather than eight-hour shifts.

STOW: Why six hours?

MCCORD: I'll never know. Maybe our bosses thought that was a long enough time for us to be in there counting. It was supposed to be a very tiring procedure. But, it really wasn't. Anyway, we would meet at Pryor Brown Garage in Knoxville to pick up the government car that we used to drive here. Because we worked a six-hour rotating type of shift, there were no buses ready to pick us up.

STOW: So, you really weren't using your chemistry degree.

MCCORD: No, not a bit. The only time I used my chemistry degree was when I was in the chemistry lab at Oklahoma Ordnance Works. And, from then on, after I started with the Manhattan Project, I worked on what would be the beginning of nuclear physics, so to speak.

STOW: That's right.

MCCORD: I worked physics, but there was no literature to refer to. Most of the stuff I learned came from word of mouth and on-the-job training.

STOW: Well, did you know at that time what was going on at Y-12 and K-25?

MCCORD: I knew we had a Gaseous Diffusion plant and an Electromagnetic Plant. We knew quite a bit about what was going on over there.

STOW: Did you know what was going on at Hanford and Los Alamos?

MCCORD: Yes.

STOW: Of course, you went out to Hanford.

MCCORD: I went out to Hanford, right.

STOW: Tell us about your trip out there and what you did out there.

MCCORD: Okay, all right. It was in August 1944 that I went out to Hanford. We were working with people who had been at the University of Chicago, like Henry Newsom. He was from Duke University, and he had joined the Manhattan Project then. He was our supervisor. He drove us to work in his car. There, I may have come close to doing some chemistry, taking water samples and running some purity measurements on the water because the Hanford reactors (used to produce plutonium) were water-cooled reactors.

STOW: They were concerned about the effects of radiation on dissolved materials in the Columbia River water, right?

MCCORD: Yes, yes. The cooling water, of course, was held up in a holding pond before it was discharged to the Columbia River.

STOW: Well, how long were you at Hanford, Rube?

MCCORD: Well now, I got there in August and then the next spring DuPont transferred me to the rocket powder business. I left the Hanford project altogether.

STOW: Oh, you did?

MCCORD: My first stop was Lawrence, Kansas. I was training in ballistics again, not in chemistry. I was a trainee at the Sunflower Ordnance Works. I was going to go back to the Indiana Ordnance Works, where they were just beginning to get the rocket powder line started up. I was going to work in the ballistics lab.

STOW: Manpower was at a real shortage then. Why would DuPont transfer you off the Manhattan Project?

MCCORD: They needed staff for the rocket powder plants that were just getting started.

STOW: Well, okay, let's move to August 6th of 1945. Where were you at the time that the bomb was dropped on Hiroshima?

MCCORD: I was back at Indiana Ordnance Works, working on ballistics, getting trained. Actually, I was traveling in a car from the Indiana Ordnance Works to Kankakee.

STOW: How did you hear about the bomb being dropped?

MCCORD: I guess I heard about it on the radio.

STOW: What were your feelings?

MCCORD: I couldn't believe it. It was the strangest feeling. But, number one, I thought, "Hey, this whole project was successful." It gave me a high degree of satisfaction that I had been associated with something like that. After I left Hanford and started working with people in the rocket powder business ...

STOW: Yes.

MCCORD: I never dreamed a thing about what's going on. I wondered, "What's going on? How's that project going? What's happening?"

STOW: It wasn't in the newspapers or anything, and you couldn't tell ...

MCCORD: No. No, no. I had nobody to ask, and if I had, I had to be sure that they were also associated with the Manhattan Project and knew what was going on.

STOW: Okay.

MCCORD: And, it was just a wonderful feeling, that this thing was working. I said, "Sure enough, we're accomplishing the mission."

STOW: A real feeling of pride, right?

MCCORD: A real feeling of pride -- that's right. Me, you know, an ole country boy from South Carolina who worked on a project as great as that.

STOW: Well, things were just getting started for you. You went into the Army about that time, I believe. You got drafted?

MCCORD: I'll tell you what happened. They immediately shut down that rocket powder business. We had been hauling some sticks of powder they had made -- about four feet long in cruciform shape -- and putting the powder in magazines. That's one reason I was in a car. I got my notice of being laid off shortly thereafter. DuPont didn't waste any time shutting down the powder plants and getting rid of the people. They had no place to transfer them. By the time I got home from there, I had my greetings from Uncle Sam. I was drafted.

STOW: So, you had to go into the Army for some period of time.

MCCORD: Eighteen months.

STOW: And, then after those eighteen months were over, where'd you end up?

MCCORD: Well, of course, I came back home. I wanted to come back to Oak Ridge, so I applied for a job in Oak Ridge.

STOW: You did? Okay.

MCCORD: Of course, I had lost my security clearance, so I had to wait while they checked me out again. I think that was in July or August that I was hired again at Oak Ridge. And, I was assigned to the Physics Division.

STOW: Did you think, at that point, that you'd spend your entire life and career at Oak Ridge?

MCCORD: No, in fact, I didn't. When I left South Carolina -- some of my cousins still tease me about this -- I'd said something about, "I'll be back in about six months." I thought it was temporary.

STOW: Well, Oak Ridge National Lab was temporary. Originally, I mean, it was going to be here for a year-and-a-half.

MCCORD: That's right. It was temporary, and I still live here. I applied. I put in my application and Marvin Mann hired me. He was a Ph.D. physicist. And, my initial job was to run critical experiments in the Chem Tech Building there. We had a cell primarily for checking out critical experiments for the design of the MTR.

STOW: The Materials Test Reactor?

MCCORD: It was called the Materials Testing Reactor then. We were in that cell, where everything was kind of crude. I worked for Marvin Mann and Al Martin, another Ph.D. physicist. I believe, at that time, Dr. Weinberg was the technical director of the Lab.

STOW: Well, you've been involved with most all of the reactors here, all the way from the Graphite Reactor through, I guess, the High Flux Isotope Reactor, right?

MCCORD: That's right. Now, I wasn't directly involved in the operation of the Tower Shielding Facility or the Health Physics Research Reactor, but I was the administrative supervisor and handled the budget.

STOW: You know, I think it'd be useful to briefly go through those different reactors. I'm told maybe thirteen different reactors were built here. Can you recall the reactors projects or programs that you've been involved with?

MCCORD: After the Graphite Reactor, the Low Intensity Test Reactor, or LITR, was built. I think Sam Beall was pretty much the leader of the operation of that. The LITR produced three megawatts and used fuel elements similar to the ORR. The LITR was really operated by the Physics Division at that time. Eventually the management here at the Laboratory decided that Operations ought to take over the reactors.

STOW: Operations took it over, yes. Okay.

MCCORD: So, then I became involved in that. We did furnish the operators for the reactor.

STOW: What did you do with the LITR?

MCCORD: Well, when I got on the LITR, I was a shift supervisor at the ORR. Then, I was on the rotating shifts. I also was trained. John Hill, I think, was the lead man under Sam Beall in getting the LITR started. Then, I relearned enough, and that's when procedures really came into vogue. Up till then, things weren't as formalized.

STOW: What was the difference at that point? I mean, what caused procedures to come into vogue all of a sudden?

MCCORD: It was the committees. Management began to get concerned about the operation of reactors and to worry about having an accident or some other fiasco.

STOW: This would be in the early '50s, right?

MCCORD: Yes. Yes, the early '50s. As I can remember, Charlie Cagle was deeply involved in writing some of the early procedures for the LITR.

STOW: Were you in a position to reflect on the influence that the Atomic Energy Commission had on the reactor programs down here? Did you have any first hand knowledge of that?

MCCORD: Not to a large extent. Of course, I guess that was the AEC at that time. They were remote from my position. Because I had been working for Art Snell at that time -- one of my heroes.

STOW: Well, you've worked for some important people then.

MCCORD: That's right. I did work for him and for Tony Pleasanton.

STOW: Yes.

MCCORD: For maybe three years I worked in the Physics Division. I remember that Tony Pleasanton and I worked at the whole N-17 during the neutron lifetime experiments under the direction of Art Snell. Then I decided that I was more of an operating type man.

STOW: Yes.

MCCORD: Let's see. Who would be in charge of the Graphite Reactor? Maybe Jim Cox was on the scene at that time.

STOW: I don't know about that.

MCCORD: Well, anyway, I asked, "If you need to hire anybody, I'd like to go to work for the Operations Division and get out of the so-called physics part in basic research." So, they hired me and I went to do shift work.

STOW: Okay.

MCCORD: And, that was something that I detested, but I'd rather do that because I saw a greater future for me in the operating end of the business.

STOW: Well, you moved on to other reactors, didn't you?

MCCORD: That's right. Now, that's when I learned the Graphite Reactor and got into shift work there. And then the LITR came along, in addition to the Graphite Reactor. It wasn't until later that we took over the operation of the Bulk Shielding Reactor, or BSR. It was much later before I got involved with the HPRR and the Tower Shielding Reactor. That's when management decided that the Operations Division should be the operators of and onsite supervisors for the Lab's reactors.

STOW: And, what about the Reactor Division? When did that come about?

MCCORD: We got involved in the Reactor Division with the LITR. Sam Beall was the head of that division. And John Hill was his man on the site. We learned about reactors from him.

STOW: Well, what were you doing day to day, as you helped on the reactor activities and projects?

MCCORD: At that time, I was the direct supervisor of our reactor operators and made sure that the checks were made. I got involved in the accountability of the fissionable materials in addition to running the reactors.

STOW: What about the Homogeneous Reactor Experiment? Were you involved with that?

MCCORD: No. Again, that was Sam Beall's baby. I never got involved in the operation of that at all until we terminated the experiments and the Operations Division was given the responsibility of surveillance of the facility to make shift checks and ensure that we didn't have any problems that might cause the spread of contamination or radiation. We made a daily report on the checks we made. Now, that was the extent of my operation on both the Homogeneous Reactor Experiment and the Molten Salt Reactor Experiment, or MSRE.

STOW: In the 1950s, the Laboratory got a fairly major program dealing with development of a reactor for aircraft propulsion.

MCCORD: The Aircraft Nuclear Propulsion reactor project.

STOW: The ANP project. Were you involved in that in any way?

MCCORD: No. I never got involved in that in any way.

STOW: We built a reactor for the "Atoms for Peace" program in the mid-1950s. Did you have any involvement with that?

MCCORD: Not much. I think Tom Cole was involved in that pretty much. I knew what was going on. And, I remember that John Hill worked on that.

STOW: Well, you must be in a rather unique position to look back over the evolution of reactors here at Oak Ridge National Lab and see the changes that have occurred in procedures and requirements for running reactors. How do you think we got away with what we did in the early days without procedures? Was it luck, or was it wisdom or what?

MCCORD: I don't know. I like your "get away with" description. That's really true.

STOW: We can use those terms.

MCCORD: It's human nature to do more than you think you ought to do. But, our powers that be became concerned. And, procedures were started by either ERDA or DOE, I forget which.

STOW: It was AEC at that time.

MCCORD: AEC began to bear down on the Lab to have detailed and elaborate procedures.

STOW: Sure.

MCCORD: And we, of course, began doing that in a big way. The LITR was the first one. We'd never had any real detailed, elaborate procedures on the Graphite Reactor because it was so far along. As far as the operations business was concerned, the LITR brought on the advent of procedures.

STOW: I guess the last reactor built here at the Laboratory was the HFIR in the mid-1960s.

MCCORD: That's true. That's my pride and joy.

STOW: Tell us a little bit about your involvement there.

MCCORD: Well, I got involved in the design of the HFIR. I wasn't a design engineer, but when the Lab got the approval to build the reactor, it got under way in a serious manner. Jim Cox assigned me to work with the designers. And, I was the onsite Operations Division representative, as a matter of fact. I was housed in a trailer over there, and I followed the construction, along with Bernie Corbett.

STOW: Okay.

MCCORD: Then, we became a team of two. We worked with the HFIR from that point. I believe that was 1962, on until the reactor went critical. I was the reactor supervisor initially for the HFIR.

STOW: And HFIR went critical when?

MCCORD: In 1965. HFIR reached full power in the fall of 1966. Those dates were pretty close.

STOW: But, you didn't retire from here until '87 or so, right?

MCCORD: That's true. I loved my job. I enjoyed operating reactors and going through the startup procedure everything had to be checked out to make sure it was working. That was really fun. And, I told many people, "I can't believe they pay me to do this kind of work."

STOW: Hey, that's pretty good.

MCCORD: It was pretty good. It was enjoyable to be with the operating crew that I hired.

STOW: Yes.

MCCORD: I interviewed people and hired them. The supervisors and the crew -- we had great success. Fortunately, we had the on-stream time back then that hasn't been matched since. We were operating 90% on-stream time. And that's good. That included the shutdowns for refueling and maintenance.

STOW: Yes.

MCCORD: As a matter of fact, we hit one period when we had a 93% on-stream time.

STOW: What does "on-stream time" mean exactly?

MCCORD: Operating the reactor. "Reactor in operation." It was in operation 93% of the time.

STOW: Well, we sure haven't done that lately.

MCCORD: And we never will do it again because procedures are complicated now. You have to cool down the reactor for a lot longer now than we did. Back then we could change out a fuel element and get back on stream in about fifteen hours.

STOW: Well, the HFIR was built, as you said, in the early to mid-1960s. And, here we are four decades later, and HFIR's still operating.

MCCORD: That little ole twenty-year reactor is still going.

STOW: What is so unique about HFIR that has allowed it to persist for so long?

MCCORD: The designers researched everything that went into it and tested the materials. They were just good engineers. The gentleman who stands out, over and above anybody else, in my opinion, was Dick Cheverton, who designed the fuel elements. The fuel elements lived up to their design criteria. And Al Boch was responsible for a lot of that.

STOW: How?

MCCORD: Because Al Boch was the project manager at the HFIR. I did report to him during this period when I was working with the design group over there. And, it was knowledgeable engineering. The metallurgists did their job well. John Jones was responsible for doing a good job on the design of the control plates. Lester Oakes and E. P. Epler designed the control system. John Anderson was, I guess, the primary designer of some of the solid-state electronic material used to replace the vacuum tubes. Clyde Claiborne did a great job in the design. I learned a lot from them.

STOW: You're mentioning a bunch of names that were strong figures in the early days of ORNL. As you look back on your forty years at ORNL, starting when you came back from the Army in 1947, through four decades until you retired, is there any particular person who jumps out at you, as really having influenced your career, or somebody that you really looked up to?

MCCORD: Well, I'll tell you right now, the person that I admire and have the greatest respect for is Alvin Weinberg. He was way up the line. But, he was working on the Manhattan Project, even back when I was early on. And, he was outstanding at that time.

STOW: In what capacity did you get to know Alvin?

MCCORD: Well, I worked in the Physics Division when he was the director. Of course, I didn't interface with him personally, but I knew him. And, my boss reported to him.

STOW: Yes.

MCCORD: There are so many people at the Lab who were so outstanding, that it's just hard to believe. I had great respect and admiration for Al Boch as a manager. I really had great admiration and respect for some of my supervisors. One was Mansel Ramsey. He doesn't receive as much publicity as some of the other scientists. But, he did have a nice division that he ran it efficiently. And, I always admired Mansel.

STOW: Which division did he run?

MCCORD: Operations Division. And, of course, he had the Isotopes Division. And, I guess, at one time, he may have had the design or the engineering ...

STOW: Maybe. I don't know. But, it's significant, when I asked you that question, the first name you came back with was Alvin Weinberg.

MCCORD: Yes, that's right.

STOW: And, that's not unusual for somebody to think like that.

MCCORD: I've known him for a long time and admired him both as a scientist, an administrator, and a communicator. A guy that, you know ...

STOW: Oh, had tremendous foresight. I mean, he could look decades out ...

MCCORD: That's right.

STOW: ... and see what needed to be done.

MCCORD: But, I could name other people I interfaced with, like Mike Wilkinson ...

STOW: Well, yes.

MCCORD: Doug Billington, and the people who did research at the ORR and HFIR -- I thought they were really superior people.

STOW: Okay. Well, if you think of more before we finish, jump in and let me know. As you look back on your forty-year career here, what are you most proud of, as far as something that you've done and accomplished?

MCCORD: I am most proud of the operation of the HFIR and our accomplishment of high on-stream time. And, we did that without violating any technical specifications.

STOW: Yes.

MCCORD: Now, you might ask me, "What did you least like about your job."

STOW: Okay, what did you like least about your job?

MCCORD: All right. Well, of course, I mentioned shift work. The other one was going up before review committees.

STOW: Review committees at AEC or DOE?

MCCORD: Well, those and the ones at the Laboratory, such as the Operations Review committees.

STOW: Did you ever have ... ?

MCCORD: Bob Affel was head of one, and I managed to get along with [the people on his committee.] Other committees came in and tore you apart.

STOW: Alvin Weinberg had a reputation for having gone to annual information meetings for divisions and sitting in the front row and asking tough questions. Did you ever get caught by any of those questions?

MCCORD: Fortunately, I didn't. (laughs)

STOW: Okay.

MCCORD: Affel was one of the chairmen of the review committees. Another one was John Conlin. He was another outstanding individual who I thought was very effective as a chairman and a good scientist, too.

STOW: Well, you've mentioned a bunch of classic names in the history of the Laboratory. Is there anything you feel regretful about, that you didn't accomplish, that you would like to have accomplished? And, if you could do something over, what would you do differently?

MCCORD: You know, if I had it to do over, I think I'd do it the same way.

STOW: That's a good answer.

MCCORD: That's right. I really worried about making a big mistake of some kind or causing a big accident. Fortunately, we never had anything like that occur.

STOW: You've been gone for about fifteen years now. As far as retirement goes, you've kept up with nuclear reactors ... in the news or whatever ...

MCCORD: As much as I could. Yes.

STOW: Do you think the United States will ever get more heavily dependent on nuclear energy?

MCCORD: I think it will come in due time. And, the public has got to be reeducated that nuclear energy can be safe and is safe. We have never had a bad accident. Now, the one thing I remember, and I didn't mention it, when I talked about working at the ORR was, I did a little work for Louis Slotin.

STOW: Oh, you did?

MCCORD: Yes. I helped him when he was doing experiments at the top of the reactor in different configurations. I helped him in stacking and arranging [fuel elements]. And, of course, you know what happened to him ...

STOW: Yes.

MCCORD: He went to Los Alamos and had this criticality experiment [involving a plutonium core inside two beryllium half-spheres] get out of control, and he was the one that broke it up [manually lifted off the upper half-sphere when a screwdriver separating the half-spheres slipped out, causing the core to emit a burst of deadly radiation].

STOW: Well, he saved the lives of those who were in the room with him [by telling them to leave quickly].

MCCORD: Yes.

STOW: Did you get to know him personally at all?

MCCORD: Well, I worked for him. He was an easy guy to work for. Of course, you work around these guys who you call real scientists and real brains, and you get great respect and admiration for them.

STOW: Speaking of Slotin, it makes me wonder, do you know of any incident in Oak Ridge or at ORNL where there could have been or might have been an exposure incident because somebody wasn't careful?

MCCORD: Maybe the place where that might have happened was at the LITR. Because, we had to unload the fuel by pulling it out of the reactor, remove the fuel elements by pulling them into a lead shield, and pulling the door out. We might have dropped a fuel element on the floor. It would have been hard to retrieve it without getting a pretty good exposure.

STOW: What was the fuel in the LITR? I don't remember.

MCCORD: Just like the single fuel elements in the HIFR.

STOW: But, you don't recall any particular incident, right?

MCCORD: Nothing in particular. But, I guess it could have happened at the ORR, but I don't know of any particular incident.

STOW: Well, I just thought, when you mentioned Slotin, it makes me wonder.

MCCORD: And, also, early on, in moving these buckets of slugs at the Graphite Reactor, we'd pull them out of water -- sometimes they'd go from one ... "flash" them, as we'd call it -- do it quickly to move them over from the "deep pit," where we'd discharge the slugs from the reactor, on the mattress plate, and push them out, and load them in these buckets and move them on into the rest of the canal, and move them over to the 205 Building. But, without adequate supervision and education, we could have had something like that happen. But, it didn't .

STOW: Do you think that we've gotten to a point where we're overly safe now -- too conservative?

MCCORD: I doubt it. I don't know. I've been away from this thing a while.

STOW: I understand. Is there anything here that we haven't touched on, that you think we ought to go back and talk about? I don't have a lot to go on necessarily, and we've touched on various reactors that you've worked with, and the things that you've done. I may have missed something in there. So, if there is, let me know.

MCCORD: All right, there probably is something, but offhand, I can't think of it.

STOW: Let's ask Marilyn.

MCLAUGHLIN: Weren't you at the 1948 production of power with Mansel Ramsey at the Graphite Reactor, where they produced power for the steam engine?

MCCORD: Let's see. What was the question?

STOW: She was asking if you were at the Graphite Reactor in 1948, when they produced electrical power from the steam generated by the reactor's heat.

MCLAUGHLIN: The first production of nuclear power ... to prove that it could be done using the little steam engine

MCCORD: I was not.

MCLAUGHLIN: Okay.

MCCORD: At that time, I was working during the critical experiments over in the 205 building, working for Marvin Mann.

STOW: Okay.

MCCORD: And, I came to the Graphite Reactor in 1951, but I worked around the Graphite Reactor earlier than that.

STOW: All right. The 205 building -- that was the separations building, right?

MCCORD: That's right. They moved along to a certain point when they didn't use certain cells. We were operating in six or seven cells. We had little miniature fuel elements I'll call them, with different concentrations of uranium. They were each about one inch square. My job was to rebuild the configuration. They want me to rearrange maybe twenty or thirty fuel elements. I worked in there alone. Now, that was maybe a situation that wasn't too safe, but back then ...

STOW: Well, we didn't know it back then.

MCCORD: Then, we had the cadmium control rods and I had a window, just like a hot cell. The reactor was in what we'd call a hot cell, and it would go critical. We had shielding and piano wire that we'd raise with a crude pulley. And, then we would take the reactor critical and watch the instruments and then ...

STOW: Oh, boy ... (laughter)

MCCORD: ... drop the rods to shut it down. And we had a lot of beryllium. [Neutrons were reflected back into the reactor core by a beryllium reflector.] The beryllium reflector [was located] around the sides and top [of the reactor core, but] the bottom didn't have any reflector around it. We had some beryllium stored down in the basement, and I remember some of the plumbing was plugged up, and the water backed up in the basement. And the beryllium got wet and formed an oxide on its surface.

STOW: Okay.

MCCORD: I cleaned the stuff up by blowing off the oxide powder with no mask or nothing. We didn't know that [exposure to beryllium powder] was dangerous.

STOW: They didn't tell you at the time?

MCCORD: Nobody ... no. I just did it. I just did it.

STOW: Okay. What are you doing nowadays? I think I've seen your picture in the newspaper, haven't I?

MCCORD: Yes, yes. That's right. In my recent years, I've taken up dancing. At a rather old age, you might say. Ballroom dancing, square dancing ... I have been doing quite a bit of that. And, I've been associated with the AARP.

STOW: Okay.

MCCORD: I belonged to a chapter, and I went through the sequence of going up from the bottom to the top -- being the president for a couple of sessions. I do another job for the Sheriff's Department that is very interesting. It's called "SCAN" and that stands for the Senior Citizen's Awareness Network.

STOW: That's where?

MCCORD: In Knoxville. I work for the Sheriff's Department, and we visit older people and make "well-being checks." People ask for this service.

STOW: Great.

MCCORD: You have a certain number of people in the territory you work in. Most of the people are shut-ins, and a lot of them are on various medications. You just find out if there's anything you can do for them, or give them information that would be of value for improving their welfare.

STOW: Well, as you look back to the early 1940s when you first came here, you never would have imagined all that, would you?

MCCORD: Not one bit. Right. I've been blessed, I tell you. I've been real happy with my career and I've had a lot of enjoyment in running reactors. I think, someday, we'll have to depend on power reactors.

STOW: Well, the Laboratory's been blessed to have you here, so thank you very much.

MCCORD: Thank you, Steve.

STOW: We had a good chat.

----- **END OF INTERVIEW** -----