

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

OAK RIDGE, TENNESSEE

AN INTERVIEW WITH CHRIS KEIM

FOR THE

**OAK RIDGE NATIONAL LABORATORY ORAL HISTORY
PROJECT**

INTERVIEWED BY

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TRANSCRIPT BY

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STOW: Today, we're going to be talking to Chris Keim. Chris came to Oak Ridge, first to the Y-12 plant in 1943, and then he transferred to X-10, where he was very much involved with the ORNL Isotopes Program and other activities. Chris has some very interesting stories to tell us, so we'll be hearing about those today. Chris, on Christmas day of 1943, you got a phone call that kind of changed your life. Tell us a little bit about that.

KEIM: It was a phone call from Tennessee Eastman, a subsidiary of Eastman Kodak. I had actually submitted an application for employment to Eastman Kodak, after receiving my Ph.D. in chemistry. And, Tennessee Eastman had all those applications in Oak Ridge, which they went through. They came across my name and called me in Pittsburgh, where I was working at Mellon Institute of Industrial Research . . .

STOW: Yes.

KEIM: ... and was enjoying the work. But, like everyone else, I was concerned about the war -- the war in the Atlantic, the war in the Pacific. And, I wanted to do what I could to serve in whatever capacity came up, whether it was in the military or elsewhere. This telephone call from Oak Ridge changed my future completely, and the future of my family. I came to Oak Ridge on the train, and a Tennessee Eastman car met us at the L&N Depot on Sunday evening. I think that might have been Christmas Day, or the day after Christmas. And, there were several other interviewees who were coming to Oak Ridge. On the way to Oak Ridge, via Clinton, one individual in the car kept up an incessant chatter, asking questions, talking needlessly. And, the next day, he and I exchanged notes as we left the Guest House. And, I was going to Y-12, and he was staying in Town Site to be interviewed. That evening, I found a note in my post office box, marked 10:00 a.m. And, he informed me that he wasn't even going to be interviewed. He was on his way back to Michigan.

STOW: (laughs) Talked a bit too much, didn't he?

KEIM: He had talked too much in the car, on the way from the airport, on the way from the L&N station, to the Guest House. The driver of the vehicle was apparently military intelligence. But, anyway, he wasn't even interviewed. I spent the first day of my interview at Y-12. A supervisor in the Y-12 plant's Process Improvement Division came for me the next morning, and as I waited for his car, outside the Jackson Square post office, I saw hundreds of people going in and out of the central cafeteria, getting on buses and driving Army vehicles. And, I saw thousands of people milling about, and I thought to myself, "This is sure costing the taxpayer a lot of money."

STOW: Well, it was, wasn't it?

KEIM: And, it was -- and it has continued to do that. But, eventually my car came to take me to Y-12. We came on a shortcut through, what is now the Woodland area, which was just Woodland at that time, to the east portal of Y-12. I spent the day at Y-12, meeting and talking with different people, some of whom talked with me, to find out what I could do. Some went to lunch with me across the street at the Y-12 cafeteria. A guard stood behind my chair, continually, during lunchtime. He had a heavy cold, and did a lot of sneezing and coughing ...

STOW: (laughs)

KEIM: ... and, after I returned to Pittsburgh that week, I had a heavy cold.

STOW: You caught a cold.

KEIM: (laughs) And, I had gotten it from the guard. But, I was scheduled to fly back to Pittsburgh the next morning and the car picked me up at the Guest House at 8:00. My plane was due to leave at about 9:00. The woman driver said, "I'll get you there on time." We had to go by way of Clinton and 25-W to the airport.

STOW: Yes.

KEIM: And, she had a fur coat that she tossed to the back seat. She said to me, "You watch out the back window, and see if there are any police following us, and I'll get you there in good time." There were no police following us, and we made it to the airport in time.

STOW: (laughs)

KEIM: I returned to Mellon Institute and checked in with Dr. Wideline, director of Mellon Institute, ...

STOW: Yes.

KEIM: ... and, he said, "What are they doing in Oak Ridge?" And, I said, "It looks like atomic energy to me." He said, "Don't you ever say that to anybody else."

STOW: Yes.

KEIM: He was -- I found out later -- the chief chemical consultant on the War Production Board. He knew about not only all the projects that were being done for the military, but also the assignment of personnel. And, he asked me, "Did they assign you to a dormitory in West Village?" And, I said, "No, they didn't." He said, "They will."

KEIM: And, he asked me, "Did they tell you about Site X and Site W?" And, I answered, "No." And, he said, "They will." And, I told him I wanted to return to Oak Ridge as soon as I could.

STOW: So, you knew you wanted to work down here?

KEIM: I knew I wanted to be here, because many people I visited in my interview at Y-12 were people I had only read about in textbooks, like Dr. (Arthur) Holly Compton, chancellor of Washington University at St. Louis, and K. T. Compton, his brother, who was president of MIT in Cambridge, Massachusetts. And, then I also visited with E. O. Lawrence, the inventor of the cyclotron, which was really the basis of the calutrons developed for electromagnetic separation of uranium isotopes. The name calutron is a condensation of "cyclotron" and California, where the cyclotron was developed. So we called the machines at Y-12 calutrons. But, I had met those men and talked with them, and I knew if this invention was important enough for them...

STOW: Yes?

KEIM: ... I wanted to be associated with it.

STOW: Well, tell me about Ernest Lawrence. He was a very highly respected man.

KEIM: Oh, yes.

STOW: What impressions did you get of him?

KEIM: He not only was a strong technical person, but he was very personable. We used to go to Berkeley to visit the calutron ... or the cyclotron ... and to visit his research program in Berkeley. And, he would take us all out to dinner at Trader Vic's.

STOW: Trader Vic's, yes.

KEIM: ... in Oakland, California. And, one day, I had taken a trip to Berkeley, and we stayed in San Francisco, and took the Interurban over to Oakland, and transferred to what was called the K Car, which took us up to the campus of the University of California. I got on that K Car one morning, and the motorman said, "Well, good morning, Mr. Keim. How's everything in Oak Ridge?" And, I was so startled that I couldn't answer him. And, I just went back and sat down in the empty streetcar. I concluded later that, had I answered him and admitted I was from Oak Ridge, I would have been taken off that streetcar. And, he was probably a military intelligence agent.

STOW: Smart move on your part, right?

KEIM: And, he knew ... he knew that different ones of us were coming to Berkeley.

STOW: So, you knew ... you came to work at Y-12 in, I think, February of 1944, as I recall.

KEIM: I hired in the first of February of 1944, and I had to go through, as many did, what we called a bullpen. It was a clearance in those tile buildings on Laboratory Road now, still in use, for orientation. And, we were there for the purpose of receiving indoctrination by Tennessee Eastman personnel. And, it had nothing to do with the project. But, we were awaiting Army clearance, in order to go to Y-12. There were several people in my class ... in the bullpen, who never made it to Y-12. One, for example, was a locksmith from Knoxville.

STOW: Yes.

KEIM: And, he bragged there was no lock that he couldn't open. He never got to Y-12 to try it.

STOW: (laughs)

KEIM: But eventually, after ten days to two weeks, we went to Y-12, and we went through another orientation in Y-12, which gave us more of the technical aspects of what they were doing in the electromagnetic process.

STOW: So, you knew early on what the process was, and what you were trying to separate?

KEIM: Yes. I had known of the cyclotron. I had known of the mass spectrographs. And, the day I was interviewed, I saw packing cases with the Westinghouse name on the outside. I saw other packing cases with the name General Electric on the outside ...

KEIM: I saw huge metal magnets with the name Allis Chalmers on the outside, and I concluded that they were separating the isotopes of uranium.

STOW: Did you have any idea, early on, about K-25?

KEIM: No.

STOW: You didn't know about that?

KEIM: I knew about K-25, when it was in existence. I knew X-10 was in existence, but we were totally occupied in our work at Y-12.

STOW: Now, you came here with a wife and family, right?

KEIM: Yes.

STOW: What were their impressions of Oak Ridge, when they showed up in '44?

KEIM: Well, first of all, I was assigned to a dormitory, and my wife and little girl had to stay in Pittsburgh until I could get a house. I was on the housing list of Tennessee Eastman. I had picked out the house I wanted, and I had signed up for 98 C, Outer Drive, at the corner of Outer Drive and Georgia Avenue. I didn't get that house after waiting for it for two or three months, so I went to Eastman Kodak, or Tennessee Eastman, and asked, "What happened to my assignment in that house? It was finished a long time ago and I haven't gotten it." And, finally, I did get it, after the contractor quit using it as a field office for the construction of houses in that area. I finally got the house, and I called my wife and said, "You can come." But, it was in June or July, after I had come here the first of February, and she was surprised. .

STOW: You mean, surprised when she saw Oak Ridge?

KEIM: Well, she was first surprised to walk into that house, which was all furnished because we had moved our furniture from Pittsburgh to Knoxville, put it in storage, and then moved it to Oak Ridge. And, she was impressed with Oak Ridge, but had no idea, when I got on that Army bus each morning, where I was going.

STOW: And, you couldn't tell her -- you didn't tell her.

KEIM: I couldn't tell her. And, all the wives in the area were in the same boat. They did not know what their husbands were doing. One day, I decided to stay home, because I wasn't feeling well. But by noon, I was concerned about my little daughter, who was then about two-and-a-half years old. She was seriously ill, and I took her to the Army hospital in Oak Ridge to see Dr. (Lewis) Preston ...

STOW: Yes.

KEIM: ... and Dr. Dwight Clark, the chief surgeon there. They were her doctors, and they decided to do exploratory surgery. Her illness was due to a pain in her appendix area, but there was no infection indicating that she had appendicitis. Dr. Dwight Clark performed surgery and removed a cyst.

STOW: Yes.

KEIM: He told me later that she had a benign cyst that was probably the start of a twin.

STOW: Oh, my goodness.

KEIM: And my daughter would have been a twin, had that continued to grow. But, it grew in her and got larger and larger until they had to remove it by surgery.

STOW: Well.

KEIM: Dr. Dwight Clark returned to the University of Chicago and later died of hepatitis. He was a super surgeon. In fact, along about 1950, my brother in Nebraska developed thyroid cancer ...

STOW: Yes.

KEIM: ... and his doctor called me and said, "Being in Oak Ridge, you know something about radioiodine, don't you?" And, I said, "Yes, I know a little bit about it." And, he asked, "Do you know any doctors who are experts in doing surgery for thyroid cancer?" And I told him Dr. Dwight Clark at the University of Chicago was an expert. My brother went to University of Chicago from Nebraska, and Dr. Dwight Clark did his surgery around 1950. And, my brother never had a recurrence and lived to be ninety-five years old.

STOW: Small world, isn't it?

KEIM: Yes, small world.

STOW: You mentioned that the doctor left and returned to where he came from. You didn't leave here but an awful lot of people left after the war. What kept you and your family here in Oak Ridge?

KEIM: I considered leaving. I wanted to go back into the academic field, because I felt I had something to offer. But I was working in the Stable Isotope Separation program when the Army left and the Atomic Energy Commission took over on the first of January 1947.

STOW: Forty-seven, yes.

KEIM: The physicist, Dr. Bob Docker, on the Atomic Energy Commission, asked us what we were doing in our program for separating stable isotopes. We had separated the isotopes of copper-63 and copper-65 from copper samples. And, we had published our first paper in 1946, on the uses of copper-65 and our success in converting it to radioisotope nickel-65.

STOW: Nickel-65 ...

KEIM: And, we told Dr. Docker and the Atomic Energy Commission that, to go through the entire periodic chart of the atoms -- about sixty of them -- it would take us ten to twelve years to separate them into stable isotopes and convert them to useful radioisotopes.

STOW: Yes.

KEIM: Dr. Docker said, "How much are you spending now per year?" And, in 1946, we were spending about two million dollars a year in that program. He said, "We want you to do it, and we want to know what those isotopes will be used ... will be good for." They were interested in knowing the cross-sections for neutron absorption in reactors, especially. But, they were also interested in converting those separated isotopes into radioisotopes for medical purposes. And, he said, "We want you to continue doing this, and if anybody ever tries to stop you, let us know." And Bob Docker became president of the California Institute of Technology later.

STOW: Yes.

KEIM: And, I never had to contact him. And, this was one of the reasons I stayed in Oak Ridge. I was associated with that program, and I knew it would take us from 1946 to at least the middle of 1955 or later to complete it. And, I wanted to be associated with the program at that time.

STOW: I want to come back to what happened in the mid-1950s in a moment, because your career changed at that point, I believe. But, let's go back to the mid-1940s, as the Stable Isotope Program got under way. Eugene Wigner played a part in helping to get that going, did he not?

KEIM: Yes, Eugene Wigner became acting director of Oak Ridge National Laboratory in the late 1940s, I think.

STOW: Of course, it was known as Clinton Laboratories still, then.

KEIM: Yes, it was the Clinton Laboratories. And, we were then part of the Y-12 organization.

STOW: Yeah.

KEIM: We had not yet been made a part of Oak Ridge National Laboratory. Union Carbide was our contractor, succeeding Tennessee Eastman. And, Dr. Wigner called me the day he was appointed acting director of the Laboratory and asked me if he could drive me home after work that day. Well, I agreed. And, I thought, "That's very unusual." But, he wanted to assure me that Oak Ridge National Laboratory was supporting, and that he personally supported, our work in the separation of isotopes. Stable isotopes are naturally occurring isotopes, and most of them are nonradioactive.

STOW: Yes.

KEIM: A few elements do not have isotopes. For example, gold and beryllium do not have isotopes. But, most other elements have nonradioactive isotopes. We don't know why. We don't know what is the origin of the stable isotopes, but many elements have two isotopes, such as copper and silver. Uranium has three isotopes.

STOW: Yes.

KEIM: But, some have many more. Tin has ten isotopes, naturally occurring.

STOW: And, could you, or did you try to separate all those isotopes there?

KEIM: Yes, yes. We were separating all those isotopes, one after the other, and we'd process a new element about every two months.

STOW: Yes.

KEIM: And, some isotopes have become very important for medical applications. For instance, thallium has an important use. After the isotopes of thallium are separated, one thallium isotope is irradiated to produce a short-half-life radioisotope. Cardiologists use it as a tool to determine the performance of the heart.

STOW: That's right.

KEIM: And, I think, around 150,000 cardiologists use that isotope every year. I used to fly an airplane, and during the annual physical I had to take, a cardiologist would give me a cocktail of the radioactive thallium isotope. And then, using a Geiger counter, he would be able to measure the performance of the heart's muscles and valves.

STOW: That's right.

KEIM: And, in their annual physicals all pilots are required to take the thallium test.

STOW: What happened in 1957, as, I guess you had then achieved the goal that Bob Docker had asked for in separating isotopes?

KEIM: Yes.

STOW: So, you came over to X-10, at that point, to develop the Technical Information Division?

KEIM: Yes.

STOW: Tell us about that.

KEIM: By then, Alvin Weinberg had become director of Oak Ridge National Laboratory, and he asked me if I would come to X-10 and develop the Technical Information Division. What he wanted to do was pull together a number of service activities, such as the Libraries, Graphic Arts, Laboratory Records, Photography, and Technical Editing.

STOW: Yes.

KEIM: I decided I would want to do that. It would be an interesting program, because I would not only read all the information that was coming into the Laboratory, but I would also be responsible for the classification of all information going out of the Laboratory.

STOW: Okay. Was that a difficult transition for you to come from the calutron isotope program at Y-12 to the X-10 site?

KEIM: Yes, yes.

STOW: Tell us about the problems that you faced then.

KEIM: It was difficult. I had a personal adjustment to make, because I had been associated with a technical development division and then was shifted to an administrative position, which involved paperwork.

STOW: Yeah.

KEIM: A lot of paperwork. I had to review, every week, papers that various scientists in the Laboratory wanted to submit for publication in various journals. I estimated once that I reviewed approximately eighty-five papers a week. And, I had to review the papers from the standpoint of whether the information they presented should be classified, and if so, whether the information should be classified as secret or top secret.

STOW: Was that a fulfilling job for you at the time?

KEIM: It was interesting. Fortunately, in my undergraduate days at Nebraska Wesleyan, I was editor of my college newspaper, and I had learned to read and to proofread.

STOW: Yes.

KEIM: And so, in reading these papers, I could go over them rather quickly, and I would actually proofread them.

STOW: So, this was in 1957, and you retired in 1971, I believe.

KEIM: Yeah, yeah.

STOW: Or, early 1970s ... did you stay in that job capacity for fourteen years?

KEIM: I stayed in that job from 1957 to 1971. In the isotopes work, I had done some international travel. In the technical information work, I did not do any international travel.

STOW: Yes. In looking back at your career, I mean, you were very instrumental in establishing the Stable Isotopes Separation program. Then you established the Technical Information Division. Which of your career achievements stand out in your mind as something that you were really proud of, while you were here in Oak Ridge, either at Y-12 or ORNL?

KEIM: Well, I'm especially proud of the ORNL Stable Isotopes Division, which involved a couple hundred people. It included a mechanical servicing area, a chemical section, and the operation of the calutrons. We went from one element to another, rather steadily, and we had to adjust the equipment, magnetic fields, and temperature of the charge bottle in the calutrons. We had to take care of all those details, in going from one element to the next. That was a very satisfying activity, for which we received a lot of international acclaim.

STOW: Well, at the same time that you were separating stable isotopes using the calutrons, there was a group at X-10 separating radioisotopes. Did you have much interaction with the group here?

KEIM: The only interaction we had was when the radioisotopes people wanted to take separated, and enriched, stable isotopes ...

STOW: Yes.

KEIM: ... and convert them to radioisotopes using the Graphite Reactor and other research reactors there.

STOW: For medical purposes, right?

KEIM: Medical purposes and other purposes.

STOW: Let me ask you another question. You've mentioned a number of very famous individuals, such as Ernest Lawrence, Arthur Compton, Eugene Wigner, and Alvin Weinberg. Did you have any interactions, in early years, with General Leslie Groves, or did you ever see him?

KEIM: Oh, yes.

STOW: Tell us a little bit about what Groves was like, and which of these individuals really stands out in your mind as an outstanding contributor to nuclear science.

KEIM: When we were operating the pilot plant during the uranium days, General Groves would sometimes come in, say at 11 o'clock at night and ask us what we were doing. And, he'd say, "I want to see your log book."

STOW: Yes.

KEIM: And, we'd show him our log book. And, he would say, "I have to make a decision by 8:00 tomorrow morning, whether to use the equipment that you are working on, or use the equipment that is established in the calutron buildings ... the isotope production buildings." And, he would ask for our opinion, and we would sometimes tell him that this equipment is not ready for production. "If I were making a decision, I would stay with the old equipment," we said. He would make that decision the next morning.

STOW: He was a very decisive man.

KEIM: And, he would give us credit for helping him make the decision. Now, E. O. Lawrence, he was an interesting individual. He made decisions with full knowledge of the information that he could get. Unfortunately, he died in his late '50s. But, he would come into the pilot plant, where we would be working, and he would sit down at the calutrons, turn up the voltage, increase the temperature, and get ...

STOW: More and more sparking in there, right?

KEIM: Yes. And, one evening when he was doing that, he increased the production quite appreciably. And he said before he left, "See, you've got to push it. You've got to push it for all it's worth." He hadn't gotten out of the building very far, when everything in the calutron chamber blew up.

STOW: I understand that Lawrence felt it took a scientist or an engineer to get in there and play with the calutron dials ...

KEIM: Yes.

STOW: ... whereas Leslie Groves said, "No, I want East Tennessee women with a high school education in there, adjusting the dials." And, that's what we ended up doing.

KEIM: Yes. I asked one of the girls at the calutron control panels in one of the production buildings if I could look at the meters. I said, "You're doing a good job. You're getting good production." And she said, "Well, I appreciate that. I can't even operate the radio at home." But, she was trained to watch that meter and make adjustments.

STOW: They were trained. Well, among these individuals are Lawrence, Groves, Wigner, and Weinberg.. Does any one of them stand out in your memory, as just outstanding in their contributions?

KEIM: No, all of them. Leslie Groves was a manager .He was an administrator. E. O. Lawrence was a technical man, a research man, a developer. As for Wigner, I had a lot of regard for Wigner.

STOW: Everybody did. Tell us a little bit about what went on after you retired in 1971. You were not inactive at that point. You were involved with a rowing group on the river, your church, and talks back here at ORNL. Tell us a little bit about what has driven you for the last thirty years.

KEIM: Well, I became interested, first of all, in Roane State Community College.

STOW: Yes.

KEIM: Roane State had not yet opened when I retired. I went to the president, Kyler Dunbar, at the main Harriman campus ...

STOW: Yeah.

KEIM: ... and I said to him, "Kyler, I want to work for Roane State."

STOW: Okay.

KEIM: He asked, "What can you do for us?" And, I told him that, first of all, "Roane State needs Oak Ridge, and Oak Ridge needs Roane State."

STOW: Okay.

KEIM: He said, "You're hired."

STOW: Yes.

KEIM: And that was all he wanted to know. But, I was involved with the transition of the Oak Ridge hospital from Army operation to the Methodist Medical Center. I was involved with the installation of natural gas in Oak Ridge. I was on the first commission. I was involved with Management Services, Inc., or MSI, which was a successor of the Roane Anderson Company, which managed property in Oak Ridge.

STOW: Yes.

KEIM: But, when their work was done in Oak Ridge, Management Services was successful in getting NASA contracts. I was close to the Space Program for several years. When the president of MSI died of Hodgkin's Disease, I became president of MSI.

STOW: All right.

KEIM: I had to commute from Oak Ridge to Huntsville at least once a week, so I learned to fly an airplane when I was sixty-seven.

STOW: Oh, my goodness.

KEIM: And, I would fly from McGhee Tyson Airport in the morning

STOW: Yes.

KEIM: ...to Marshall Space Flight Center and fly back in the evening. I did that for several years until we closed out the MSI contract, but, in closing out our contract with NASA, we set up a new corporation called MSI of Alabama.

STOW: All right.

KEIM: The heads of our different activities were members of the board of directors of MSI of Alabama. Our chief pilot was the president of the corporation. And, the members continued until they retired. Then they sold the company to somebody else. By then I was in real estate for a little while, but it's a 24-hour-a-day ...

STOW: It is.

KEIM: ... seven-days-a-week job. So, I decided to give up real estate, because it was taking time away from my rowing activities, and I was interested in rowing with disabled people.

STOW: Well, it's amazing what you've been involved with, not only in Oak Ridge and at Y-12 and X-10, but since you've retired. And, I guess it's to our benefit that you took that phone call back in Christmas of 1943. You had no idea what that would evolve into, did you?

KEIM: (laughs) It's been an interesting life here in Oak Ridge, and when I decided to stay in Oak Ridge, it was because of the new technology and also a new community, and the combination of the two made it extremely fascinating.

STOW: And, have you ever had any regrets at having made those decisions?

KEIM: No. And, my children, when they went away to college, they would come back home at Christmas time and other times, and they would say, "We're sure glad we grew up in Oak Ridge. We know so much more than ... what's going on in the world and internationally, because we've grown up in Oak Ridge.

STOW: And, where are your children now?

KEIM: My daughter is retired. She lives at Pawley's Island, South Carolina.

STOW: Yes.

KEIM: My son is a CPA in Nashville. He decided he didn't want to be a physicist or a chemist. But he was good in math and he became a computer expert.

STOW: So, you didn't try to influence their careers in any way.

KEIM: Oh, no. No.

STOW: All right.

KEIM: But, when my son was at the University of Tennessee, he wanted a motorcycle.

STOW: Yes.

KEIM: And his mother and I decided we didn't want him to have a motorcycle. It was too dangerous. You know what we did? We let him learn to fly.

STOW: (laughs) You hear that, John? Motorcycles are more dangerous than flying.

KEIM: A motorcycle was too dangerous. And, my son became a very good pilot. He's no longer a pilot, but, he did a good job when he was.

STOW: Well, good. Thank you.

MCLAUGHLIN: John Smith, who recorded this oral history, is a motorcyclist. That's why we were laughing.

END OF INTERVIEW
