

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

OAK RIDGE, TENNESSEE

AN INTERVIEW WITH ROGER S. CARLSMITH

AND

WILLIAM FULKERSON

FOR THE

OAK RIDGE NATIONAL LABORATORY ORAL HISTORY PROJECT

INTERVIEWED BY

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STOW: Today, we're going to be talking to two individuals who were very instrumental in the energy policies and programs of Oak Ridge National Laboratory. Roger Carlsmith, who came in 1950, was involved with energy conservation, and Bill Fulkerson, who came in 1962, later headed up the Energy Division.

Roger, you did your undergraduate work at Harvard and earned a master's degree at MIT.

CARLSMITH: That's right.

STOW: A pretty distinguished academic background. What got you interested in science and engineering technology? Can you think back to those early days?

CARLSMITH: Well, I suppose in high school, those were the courses that interested me most -- particularly algebra, which I found fascinating.

STOW: Yes.

CARLSMITH: In chemistry, I had a good teacher. Also, my father was an engineer, so it seemed sort of natural to think in those terms.

STOW: That makes a big difference, doesn't it? You came to Oak Ridge National Laboratory in 1950. What was it that attracted you to ORNL?

CARLSMITH: Well, actually, I first saw Oak Ridge when I came to the MIT Practice School in the spring of 1949. I was here for five months during a session of practice school. That was an integral part of the MIT chemical engineering curriculum. They said, "That's where you're going" when I arrived at MIT.

STOW: Okay.

CARLSMITH: When I was to come down here, I asked my advisor, "Where is Oak Ridge?" And he said, "Well, we don't know. But you can drive to Knoxville and you can ask the people there, and they should be able to tell you." So, that's what we did.

STOW: (laughs) Did you know that this place had a history of bomb development and . . .

CARLSMITH: Oh, yes. I read the Smyth Report when it was first published and was very familiar with everything that had been published on the subject.

STOW: Were you married when you came down here?

CARLSMITH: No, no.

STOW: What was your first impression of Oak Ridge? In 1950, it was still pretty antiquated.

CARLSMITH: I felt right at home here. It looked just like an Army camp. I spent three years in the Army Air Force moving from one place to another. The guards guarding the entrances to the city, the barracks buildings called dormitories where single people stayed, and all the administration buildings looked exactly like an Army camp.

STOW: Did you have any idea that you would spend your entire career here at this place?

CARLSMITH: No. I guess not. After I'd finished the practice school, I went back to MIT and finished up the work there. And, I got a call from down here offering me a job, so I came back.

STOW: Good. We're glad you did. Bill, you're the new kid on the block. You came in 1962. What was it that brought you from Houston, Texas, where you got your degrees at Rice University, to Oak Ridge, Tennessee, and to ORNL?

FULKERSON: Well, I had an Atomic Energy Commission scholarship that put me through graduate school and I had my wife Julie. So I was attracted to the prospect and was offered an interview here. I came and liked what people were doing. I also had some contact with a number of the investigators on the impacts of transmutation of radioactive elements in chemical reactions. I was a chemical engineer because my father was a chemical engineer. The same as Roger ... (laughter)

STOW: A similarity there, yes. What got you interested in engineering originally?

FULKERSON: My father, basically. And following up, at Rice it was the thing to do. It was an engineering school, basically. It was Rice Institute at that time.

STOW: Yes, I went to Rice a few years after you did. It was a university then, though.

FULKERSON: It was a university then.

STOW: Let me come back to you, Roger, and talk to you a little bit about your early years at ORNL. You came in 1950. Describe to us what your first job assignment was and whom you worked for.

CARLSMITH: Well, actually I came first to K-25, rather than to ORNL.

STOW: All right.

CARLSMITH: I worked for several years on in the Engineering Technology Division at K-25 doing special projects for the director. I think what particularly interested me about Oak Ridge was that some of the nuclear energy going on here seemed most exciting. K-25 was in the midst of a very major expansion program in which they constructed K-31 and K-33 and then the plants at Paducah and Portsmouth. All that sounded very important and interesting to me at the time. I came over to ORNL, probably in '56, and worked for a couple of years on the ANP project, which again, for a few years, seemed like one of the more important things that was going on in the country.

STOW: Yes. There were lots of people here working on Aircraft Nuclear Propulsion projects.

CARLSMITH: It had the highest priority for getting people assigned to it and all the money they wanted to spend, and then that suddenly collapsed. And at that point, I went to the ORSORT -- the Oak Ridge School of Reactor Technology -- and spent a year learning about reactor analysis. Then I went on and spent a number of years doing analysis design of advanced nuclear reactors, particularly the High Temperature Gas-Cooled Reactor.

STOW: Whom did you work with on these projects? Can you recall names of colleagues and supervisors?

CARLSMITH: Yes, at K-25 I worked for Sylvan Cromer, director of engineering development there. Then I followed him to ORNL when he became director of the Aircraft Nuclear Propulsion Division.

STOW: Okay.

CARLSMITH: Later, after I started doing reactor design and reactor analysis, I was in the group headed by A. M. Perry, or Bud Perry, as he was called. That covers the people I worked with most directly.

STOW: Okay. Bill, let me turn to you and explore what you did when you first came in 1962. I think you went in to the Metals and Ceramics Division, didn't you?

FULKERSON: Yes. I joined the thermophysical properties group headed by Dave McElroy when I began to become proficient at doing research. At Rice my Ph.D. dissertation was not a particularly noteworthy piece of work. But, here at the Lab, I began to really learn how to do research. And, Dave McElroy was a big factor, because what he insisted on were precise measurements of thermophysical properties of solids at high temperatures. We blazed a trail in that time. Then I got off on a project investigating the properties of uranium nitride, which was a potentially high-performance fuel, but it never actually was put into anything that I know of. But, it was a very good way to begin to integrate the pieces of research and research groups in the Metals and Ceramics Division and other divisions [and focus them] on a particular project. That became my interest throughout my career – bringing and putting pieces together.

STOW: When did you two fellows first cross paths and meet each other? Can you recall when that was?

FULKERSON: The summer project.

STOW: The summer project. Okay.

CARLSMITH: Well, actually, we met before that.

FULKERSON: No. Oh, in dog school.

CARLSMITH: Yes. That's right.

FULKERSON: We did meet in dog school

STOW: In dog school?

CARLSMITH: We were both dog-obedience trainers.

STOW: Oh, is that right?

FULKERSON: And, he is an absolute marvel at it. His little fox terrier was absolutely incredible.

STOW: Dixie Lee Ray used to bring her dogs with her, I understand.

CARLSMITH: Yes, to her office.

STOW: To her office ... and actually, when she traveled. So, you never had the opportunity to dog-sit with her dogs, did you?

CARLSMITH: No, I didn't. I don't remember seeing them when she came down here.

STOW: Oh well.

CARLSMITH: But, I know they were with her in her office in Washington.

STOW: It turns out our good friend, Don Trauger, got to dog-sit with her dogs one time. That came out of this interview process. (laughter) Let's turn to the summer program here.

FULKERSON: This was a very interesting and important phenomenon, I think. And I think Roger would agree. What happened at the end of the '60s was that the Lab was without a mission. It really was kind of floundering, if you will. Anyway, Alvin Weinberg recognized this, and he brought David Rose down from MIT to, first of all, run a series of what I'll call "skunk work" meetings with the bright staff from around the Laboratory. And, they mistook me for a bright staff person and put me into this. And, it had a great influence on me. Dave Rose had a great influence on me. He began to evolve the idea that the future of the Laboratory should be as a national environmental laboratory. And, he wrote a paper to that effect, which was thoroughly disliked by the AEC. It was thought that the nuclear lab here shouldn't be an environmental lab.

STOW: Yes.

FULKERSON: So, that idea never actually got anywhere. But, it generated the ideas that led to proposals to the National Science Foundation for originally a summer program involving Roger who headed the Energy group. I headed something called Materials Resources and Recycling. There was one on Environmental Indices. There was one on Regional Studies. There was one on Information. So, Dave Rose really got this effort going in trailers in the middle of the Lab during the summer of 1970. And it resulted in a major transformation of the Laboratory. Alvin Weinberg used to come down every other day and try to find out what we were doing and what progress we made since last Monday.

STOW: Roger, what was your role in that summer program now?

CARLSMITH: Well, I was co-director of the energy study with Jack Gibbons. I guess the official title was "Environmental Impacts of Energy Production."

STOW: All right.

CARLSMITH: And, Dave Rose encouraged and kept pushing all of us not to start individual research projects but to look broadly at what needed to be done in the subject area. And, as Bill was saying, there were several distinct subject areas that each had a group of people working on it. Probably about half the people working on the summer study were people recruited from various parts of the Laboratory. The other half were people that Dave Rose had brought in as temporary employees and consultants to give breadth to a study, so that it wouldn't be entirely limited to what people here at the Lab were thinking about already.

STOW: Now, this was somewhat of a career change for you in 1970, wasn't it?

CARLSMITH: Well, it wasn't really thought of during that summer as a career change. As Bill said, it was originally intended to be just a three-month study. But, several of the studies took on a continuing life of their own. We were able to get follow-on funding from NSF in a new program that they, by coincidence, were just starting at that time, called "Research Applied to National Needs."

STOW: The RANN Program.

CARLSMITH: The RANN Program. This was a new departure for NSF in that they were giving funding to institutions other than universities. It enabled the Laboratory and several other different kinds of institutions to get involved in NSF programs.

FULKERSON: Most of the money went to universities still. Some money came here because of some political pressure ... (laughs)

STOW: I was going to say, we can't get NSF money here now.

FULKERSON: We had a prominent congressman named Joe Evins.

CARLSMITH: He was head of the House Appropriations Committee. When the NSF testified before the Appropriations Committee, Evins's only question was, "What is Oak Ridge going to get?"

STOW: There's probably more truth than we want to realize in that. Roger, you ended up heading up an Energy Group, did you not?

CARLSMITH: Yes. Along with Jack Gibbons, actually.

STOW: And, you headed that group until the Energy Division was formed, I think, in 1974.

CARLSMITH: Yes. I guess what happened was that after the summer study, Dave Rose went back to MIT. MIT people had told him that if he wanted his tenure to continue, he needed to come back and go to work. At that point, Jack Gibbons took over the direction of the NSF program.

STOW: All right.

CARLSMITH: And, the energy part of the program, which I was directing, came to a conclusion at the end of that first few months. We didn't want to continue looking indefinitely at all of the various environmental impacts, but instead felt that we should concentrate on one area, which was receiving virtually no attention at that time, and that's energy efficiency, also known as energy conservation. In the next couple of years, we began to concentrate exclusively on that area. We had a great deal of encouragement from our program sponsor, who was a woman named Maxine Savitz, who worked first in NSF and then continued to sponsor our work as she moved to the areas that developed into the Department of Energy.

STOW: I want to come back to the energy conservation story, because we need to get the details on that in a minute. But, let me turn back to Bill here, because you guys both emerged as section heads in the Energy Division, I think, if I'm not mistaken. Go on and explain your role there, Bill.

FULKERSON: Well, I was on loan from the Metals and Ceramics Division to the summer program and had thought that materials resources was one area that had been neglected in our thinking about environmental questions. So, I started that group and proceeded with it in the year after the summer study. But, the NSF made a decision not to continue it. But, at the same time, in parallel, Dub Shults, Bob Van Hook, and I had come together to propose a program to NSF on toxic elements in the environment. And, that turned out to be a hit. It was popular in NSF and it was popular. They had a program that was not just at Oak Ridge but also at a number of universities. We focused on mercury, cadmium, and various other toxic elements and their use, production, and disposal in society. Along with that came a lot of work on analytical techniques. The ecology program at ORNL at that time was very interested in it. It became some of the basic work of the future Environmental Sciences Division. And, that program lasted for a few years. We even did a trace element balance around the [coal-fired] Allen Steam Plant in Memphis, during a very hot summer. We measured the flow rates of toxic materials in that plant. Nula Volton, who headed Industrial Hygiene here, was the guy who put that together. That study actually showed that certain elements, like selenium, went through the plant and right out the stack ...

STOW: Yes.

FULKERSON: And, it's still an issue of great concern. In fact, the President has said that's one of the new environmental impacts that we're going to look at. We're going to do something about mercury from [coal-fired steam power] plants. So, that program went very well. And then the National Environmental Policy Act of 1969 was passed. The AEC then had to very quickly do environmental impact statements on all of the nuclear power plants in the country. So, they mobilized their labs, particularly Argonne and Oak Ridge. As that proceeded, as the toxic elements in the environment went away with NSF, I became the head of that environmental impact statement work, which was begun by Ed Struxness, Tom Row, and Bud Zitell, who were all very prominent in getting that going. I was sort of given it, you know. I was told to just 'take that over.' And, that became one of the sections of the Energy Division. And then finally, I became director of the Energy Division.

STOW: Yes. You two guys ended up in kind of parallel positions in the Energy Division at first.

FULKERSON: Actually, he wasn't in the Energy Division, were you? The Conservation Program was separate from the Energy Division for a number of years.

CARLSMITH: No. I joined the Energy Division when it was formed.

FULKERSON: Did you?

CARLSMITH: Yes. But, of course, in that program, we used personnel from a number of other divisions.

STOW: Sure. It was an agglomeration of many different disciplines, wasn't it?

CARLSMITH: That's correct.

STOW: And, Sam Bell headed it up. And then, you took it over in '75.

FULKERSON: Yes. I'm glad you remembered that, because I didn't. I'm glad it was called the Energy Division, because then later it disappeared.

STOW: Let me come back to you a moment, Roger. You got into the conservation game in the mid to late '70s. Well, you were probably already in the conservation game, I guess. Tell us about the energy conservation program and how it evolved here.

CARLSMITH: Well, as I said a few minutes ago, the NSF study on energy was toward the end of that first summer in 1970. We decided that what we should really be looking at is energy conservation. And so, during the next few months we started concentrating all our efforts on energy conservation. The situation in Washington gradually changed with sponsorship and with the energy crisis and oil embargo in 1973.

STOW: Yes.

CARLSMITH: Energy conservation suddenly became a hot topic. It was one we'd already been working on for three years. But at that point, energy conservation had a home, first in the Federal Energy Agency and then in the Energy Research and Development Administration and [then in the] Department of Energy, as those institutions were formed.

STOW: What groups and what disciplines were involved in this energy initiative and energy program as it evolved here? I think there were many different divisions involved, were there not?

CARLSMITH: Yes. I think we had perhaps contributions from research in about six different divisions at ORNL. The biggest parts of the program were in the Energy Division and the M&C Division, where the materials work was being carried on. But, we also had projects in several other divisions, such as Chem Tech, Solid State, Engineering Technology, and Environmental Sciences.

STOW: And, the Energy Conservation Program emerged as the largest program at ORNL, did it not?

CARLSMITH: It did, over a period of time. It started out fairly small with our funding originally from NSF being something like a quarter-of-a-million dollars.

STOW: Yes.

CARLSMITH: That grew over time as we added some quite different projects from various divisions. By the time I retired, it was something like \$60 million a year.

STOW: A moment ago, you mentioned the M&C Division. What was the involvement of the M&C Division in ceramic development and so on for energy conservation?

CARLSMITH: Well, basically what was found, as people worked on energy efficiency, is that the efficiency of use of energy is limited by the materials that can be used. [With certain materials higher temperatures, higher efficiencies, and longer life can be obtained.]

STOW: Yes.

CARLSMITH: And so gradually, more and more emphasis was put on developing high-temperature materials, particularly ceramics and intermetallic compounds.

STOW: And, that's grown over the years. That's now one of the strongest programs we have, is it not?

CARLSMITH: I believe that's right, yes.

STOW: Bill, in 1975, you took over as director of the Energy Division, and you began to bring in sociologists and economists and nonscientific sorts of people. Give us your thoughts on how you were thinking about running the division at that time -- where you saw things going through the 1970s and even beyond that. And, did you get any resistance from senior management at expanding into these new areas?

FULKERSON: The Energy Division was a bit of a hodgepodge. And, it tried to combine the remnants of the summer program -- programs basically -- and environmental statements. What we began to realize was that if you are going to work on the adoption of technologies, then you needed to worry about policies as well as technologies. It was not just simply a matter of improving technologies that would somehow magically be accepted and move into the economy in massive doses.

STOW: Yes.

FULKERSON: And so, one of the continuing issues with both the impact of technologies and with promoting them, was this question of policy drivers and the interaction between technology and policy. That was certainly evident in the efficiency area. One of the early things that happened in the efficiency

program was the impact of our research on the effectiveness of insulation and changes in the regulations that affected the use of insulation in houses. You could show what the economic value was, and that caused a change in [Department of Housing and Urban Development] HUD regulations, right?

CARLSMITH: Yes.

FULKERSON: Regulations that were changed and continue to change -- it turns out that that's a continuing problem today. One of the things that the Energy Division tried to do was to marry technology and policy considerations. We're a bit of a jack-of-all trades. We got into, for example, helping the military develop data systems and get transformed, if you will, into [a strong player in] the digitized age. And, that turned out to be a very huge program, but it didn't have anything to do with energy. It really had to do with one of the sidelines that we picked up. But, this business of coupling policy and technology requires different skills from just those of engineers and scientists.

STOW: Yes.

FULKERSON: And, I might point out that one of the latest products of the energy work here [was a report] called *Scenarios for a Clean Energy Future*, which basically [examines] what can be done about climate change, about oil, and so forth, with advanced technologies coupled with policy. This is probably one of the better pieces of work on that topic.

STOW: Now, what was your involvement in that particular document?

FULKERSON: Oh, I was just on the advisory committee for this. That was after I retired.

STOW: Well, you've headed up a number of special studies and there was one that I recall from the late 1980s called, *A Special Study on Energy Technology R&D: What Can Make a Difference?*

FULKERSON: That's right.

STOW: Tell us briefly about that.

FULKERSON: Murray Rosenthal got me into that. He said, "You know, it's time for the Lab to do something comprehensive again." The Lab had not done it really since the summer study. I was very excited about doing it, so I took a year off from being director of the Energy Division to get people across the Lab to work on this. And, it turned out, I think, to be a very important study. It laid out for people what were the most important technological options for problems like CO₂.

STOW: Yes.

FULKERSON: This was in 1989, I guess, that it was published. It led to a nice policy piece in *Science*, and I think it had some impact. It turns out that [this study has] been repeated a lot of times, too. But, we were at the forefront at the time.

STOW: I remember that 1989 was an important year. I think that was the year that Secretary of Energy Watkins wanted some help on a national energy strategy, and I believe both of you fellows were involved. Roger, can you tell us a little bit about what that constituted and where that ended up?

CARLSMITH: Yes. That was one of a number of studies in that general area. I think going back to your question about the beginnings of social science participation in laboratory research -- a great deal of it can be traced back to the NSF summer study, which for the first time brought into the Laboratory a

considerable number of social scientists from various disciplines. At that time, Dave Rose and Jack Gibbons, particularly, kept emphasizing the need for public participation in decisions on the implementation of science.

STOW: Right.

CARLSMITH: And, on the need for considering the social science implications of technological decisions. I think much of the Laboratory's subsequent work dates from that study.

STOW: It's interesting to go back and figure out the origins of the roots of our present strengths in that sense. No. I'm glad you added that. Thank you. Let me go back to my question about Watkins and the national energy policy. Can you reflect back on our involvement there?

CARLSMITH: Well, we participated with several other labs in that study. And, I guess we spearheaded the effort of getting several different laboratories to cooperate in doing that work. I think the [multi-laboratory study] may have had some impact on national policy at that time.

STOW: Well, it's my understanding it may have had some impact on the 1992...

FULKERSON: ... National Energy Policy Act.

STOW: ... Energy Policy Act. Is that true?

FULKERSON: Yes. The Department of Energy, under Watkins, came out with the National Energy Strategy Report, which was based on the blueprint for the National Environmental Policy Act, or at least the starting place for it. You remember that every two years since the birth of DOE, the Department of Energy is required to put out a National Energy Strategy Document.

STOW: All right.

FULKERSON: By the time Watkins became the Secretary of Energy, there was a great deal of interest in doing this more extensively and more completely than had been done in previous years. So, he put a lot of effort into it and he involved the labs and produced quite a document, which was the basis for this very significant piece of legislation. It was changed a lot from the documentary, by the way.

STOW: I guess the point that I wanted to leave is that you guys had some significant input on that interaction there that eventually ended up in the 1992 Energy Policy Act. Let me go back to 1989 with you, Bill. That was the year, you succeeded Murray Rosenthal. What were your thoughts on moving to an associate director position.

FULKERSON: That was the year when the Berlin Wall was brought down. In a way, I think that was the most important thing that happened.

STOW: Yes, I think it was. What were your thoughts on going from a division manager to an associate laboratory director at that point? That was a big new burden on you and a change in career, and so on.

FULKERSON: Yes. I think it was a mistake, actually.

STOW: Do you?

FULKERSON: Yes. (laughs)

STOW: Explain what you mean by that?

FULKERSON: Well, I think I was comfortable being the director of the Energy Division and I wasn't very comfortable being an associate laboratory director. I think that the times were also quite turbulent in Washington, particularly, with the transition of administrations and with changes in the way laboratories were funded. That evolution was something that I never really got very comfortable with.

STOW: At about that same time, I think you got involved with the Tiger Team interactions, did you not?

FULKERSON: Unfortunately, yes. That was another Watkins thing.

STOW: Is that something you stayed away from, Roger?

CARLSMITH: (laughs) Pretty much.

STOW: Lucky you, huh? What was your involvement in the Tiger Team, Bill?

FULKERSON: Well, Murray asked me to head it. And, it was a hectic three- or four-month process, which also was another transformation for the Laboratory. We were learning a new approach to ES&H [environmental safety & health] in the Laboratory, basically adopting the Navy approach to managing submarines and applying it to the Laboratory. It was probably one of those painful things that we all had to go through because we probably had neglected that area more than we should have.

STOW: Yes. No question.

FULKERSON: So, I think that the whole system is better managed today in that regard than it was before. We learned a lot.

STOW: Yes, we did, too. I remember that very clearly now – we cleaned up a lot, too.

FULKERSON: Yes.

STOW: So, you're off struggling with Tiger Teams and with being an ALD of the Lab in those years. What was going on with the conservation programs, and so on?

CARLSMITH: Let's see, which year are we talking about?

STOW: Well, we're talking about in '89 to '90. The early '90s.

CARLSMITH: Well, the conservation program was going well. And, we were continuing to get involved in new areas. We expanded our work from primarily studies of residential energy use to utility and industrial use of energy. We were getting deeply involved in the use of energy for transportation, particularly in the materials areas where we were starting to develop high-temperature ceramics and intermetallics that could be used to increase the efficiency of propulsion systems.

STOW: Did we split or branch out beyond DOE, as far as primary sponsors go?

CARLSMITH: I guess our primary sponsor was always DOE. But, we increased our participation in programs with industry, particularly various mechanisms of doing cooperative work with industry, where DOE would provide part of the money and industrial firms would provide the rest of the money. [One example was the cooperative research and development agreement, or CRADA.]

STOW: And, that has persisted to today and actually is a mainstay of many of the programs now. So, it's interesting to see what some of the roots of that was.

FULKERSON: Let me interrupt here and elaborate on one of these programs.

STOW: Okay.

FULKERSON: That was the so-called Partnership for a New Generation of Vehicles, which was Vice President Al Gore's effort to get industry to develop an 80 mile-per-gallon vehicle that would [be] a regular family-sized vehicle with very low emissions and adequate safety. And, the labs actually generated the road map for that PNGV by getting together in Washington under Tom Gross's leadership and coming up with a really effective structure for that program, which then involved a partnership with the Big Three automakers. There was a big production on the White House lawn that all the labs worked very hard on. ORNL really had a major lead in that. And, Tony Schaffhauser, one of Roger's major lieutenants, basically put that on.

STOW: Good.

FULKERSON: And, it was a big deal. And now, the Freedom Car is derived from the PNGV. The PNGV program worked on a hybrid gasoline-electric car, which, of course, the Japanese beat us to, although the Japanese got the idea from us. But also, the PNGV worked on the hydrogen fuel-cell vehicle, which is the Freedom Car basically.

STOW: I didn't realize that at all. That's all news to me.

FULKERSON: All this started, you know, with the work of the labs. One of the things that has evolved, and I think is very important, is that the labs are working much more now as a unit than they ever were before. Whenever we have a big problem, it's usually not just one lab [that works on it]. It's multiple labs [that team up to tackle the problem].

STOW: Yes.

FULKERSON: Helping the labs work together has been one of my missions. It's one of the things that's given me the most excitement, recently.

STOW: Well, I'll let you expand on that in a moment. Let's look back over your careers here a little bit and see [what influenced you] and what your accomplishments are. Roger, as you look back all the way to 1950, can you identify any particular accomplishment that you're most proud of that you were involved with while here at ORNL?

CARLSMITH: Well, I think, certainly the origination of the Conservation Renewable Energy Program. That was a program that was not obvious at that time. And, it was received with considerable less than enthusiasm from many quarters. So, it took a considerable amount of initiative on our part to get it started.

STOW: And, probably a thick skin too, right?

CARLSMITH: The reaction from industry was generally that if any aspect of energy conservation is worthwhile, the free enterprise system in this country would have caused it to happen.

STOW: Okay.

CARLSMITH: So, they felt that trying to encourage conservation was something that was just not worthwhile. I think our initial studies surprised us. A study by John Moyers on the use of greater amounts of insulation in homes showed that people would save money by adding insulation. We were a little surprised at that. But, what we found as we went on is that the same sort of savings would occur in many different applications, in many different sectors. There were a great many places where energy conservation would be very much worthwhile. And, then, of course, in 1973 with the first Arab oil embargo, prices of gasoline shot up, and the things that were already worthwhile became very much worthwhile. The whole government emphasis was transformed into encouragement of more energy conservation.

STOW: Yes, very true. I want you to look back again. Is there any particular individual -- scientist, engineer, mentor -- who has influenced you in your career that you want to acknowledge? Or, any particular person that you really admire that you worked with?

CARLSMITH: I think you'll be getting the same answer from almost everyone you talked to at ORNL...

STOW: I'm going to let you say it, though.

CARLSMITH: Alvin Weinberg certainly stands out as the person who encouraged and instructed all of us, and was probably the reason that many of us stayed and spent our careers here. There are others I could mention. I think I was particularly inspired by Dave Rose and Jack Gibbons.

STOW: Yes.

CARLSMITH: At the start of the NSF program, Dave kept telling us that we needed to look more broadly at the societal impacts of what we're doing, rather than just considering what's technically feasible.

STOW: Okay. Let me turn to you, Bill, and ask you the same questions. Any particular individual who has influenced you?

FULKERSON: Well, you know, what is really special to me about ORNL is knowing and working with brilliant people. And, Roger has named some. I would certainly reiterate Dave Rose. He transformed my life enormously, both early on and later when he made me focus on CO₂, long before it was a popular thing to do. We wrote a paper in '81. I just read a recent one in *Science* that basically rehashes the same conclusions we reached in '81, which were pretty unpopular in '81. But, you know, it's those brilliant people -- Roger is one of them, Murray is one of them, Herman Postma was, too. To me, the greatest gift has been the privilege of being a member of the staff of the Oak Ridge National Laboratory. I'll just forever be grateful of having the opportunity to meet, work with, and be associated with a whole variety of really brilliant people over time. Not being one myself, I really appreciated that. (laughter)

STOW: Ah, you're too modest, to be sure. Now, you both retired in 1994, I believe.

CARLSMITH: That's right

STOW: Now, Bill, briefly tell us what you've been doing since. I know you've been with JIEE, I believe.

FULKERSON: Yes. I have an office with the Joint Institute for Energy and Environment at the University of Tennessee at Knoxville, and I chair an interlaboratory group, which is called the Laboratory Energy, R&D Working Group, or LERDWG. It is composed of members from thirteen national labs -- basically, the DOE national labs working on energy. Our focus is energy R&D policy. That's what we are about -- trying to ensure that the nation has a balanced energy R&D portfolio that's adequate to meet the

challenges of the nation and the world to a more general degree. That's been a fun thing to do. We meet every other month or so in Washington and talk about energy development and energy R&D policy.

STOW: Well, that's kept you very active and current.

FULKERSON: It's kept me very active.

STOW: Good. Roger, after you retired, I believe you were honored for your work in energy conservation.

CARLSMITH: Yes.

STOW: Tell us a little bit about that.

CARLSMITH: I was fortunate enough to receive the Sadi-Carnot award for lifetime achievements in the field of energy conservation. This was established by the Department of Energy.

STOW: Yes.

CARLSMITH: I think they give the award to one person each year, and it also has with it a gold medal and a cash award.

STOW: Real gold?

CARLSMITH: (laughs) Yes, real gold.

STOW: My goodness.

CARLSMITH: The Laboratory made me a plastic replica of it that I can show people, and I keep the actual award in the safe deposit box.

STOW: You didn't bring the replica today, did you?

CARLSMITH: No. (laughs) I'm afraid not. No, I don't have it.

FULKERSON: It was supposed to be the equivalent of the E. O. Lawrence Award, which was basically given to people in the nuclear area.

STOW: Oh, yes. Sure.

FULKERSON: And, this award recognizes the area of energy efficiency.

CARLSMITH: Actually, I guess I should mention that Bill was responsible for my nomination -- for putting together all the supporting papers -- to cause it to happen.

FULKERSON: Well, some of them.

STOW: All the more appropriate that we have you both up here today then. Roger, as you look back, any regrets? Anything you would have done differently? Over those forty-four years of actually working here?

CARLSMITH: No. I'm glad I came down here and stayed. I was able to work on a number of interesting programs so that each time one of them seemed to have lost its significance for me, I was able to move into another one that was even more interesting.

STOW: Well, that's one of the joys of ORNL. There's always something new and different going on. Bill, any regrets from your perspective?

FULKERSON: Oh, lots of regrets. Yes. (laughter)

STOW: Okay.

FULKERSON: Some of which I've already mentioned...

STOW: Sure you have.

FULKERSON: ... which I won't repeat. You know, you wonder sitting here what the Laboratory's future is, where we're going...

STOW: Yes...

FULKERSON: ... And, I guess that I think, looking around me, that it looks pretty darned healthy right at the moment. But, I wonder whether the changes going on in the world -- and particularly an international focus -- shouldn't be encouraged more.

STOW: Okay. Very fine. We appreciate your coming over today. It's been a good discussion and you guys complement each other very nicely. Thanks very much.

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