BOB (ROBERT) W. BISTLINE.

Transcript of OH 1334V A-B

This interview was recorded on May 31, 2005, for the Maria Rogers Oral History Program and the Rocky Flats Cold War Museum. The interviewer is Dorothy Ciarlo. The interview is also available in video format, filmed by Dorothy Ciarlo. The interview was transcribed by Sandy Adler.

Notes: Interviewer's questions and comments appear in parentheses. Added material appears in brackets.

Abstract: This is the second interview done with nuclear physicist Dr. Bob Bistline. In this interview he continues to discuss his work to safeguard the health of workers during the production phase of work at the Rocky Flats nuclear weapons plant and also discusses his similar efforts during the cleanup phase, as well as his work to help create accurate health records for former workers so that they will be eligible for compensation benefits, where appropriate.

[A].

00:00 (This is an oral history with Dr. Robert Bistline. Today's date is May 31st, 2005. We're meeting at the building that's being rented by Department of Energy relating to Rocky Flats closure, is that correct?)

That's correct. Mountainview facility by Jefferson County airport.

(We have done an oral history before in December 1998 for the Carnegie Library [see OH 0959]. This oral history will be for both the Carnegie Library collection and for the Rocky Flats Cold War Museum. I want to thank you very much for doing this again.)

Thank you.

(We'll touch on some things that we talked about before, and the transcript of that oral history will be available.)

(Should we begin first with talking a little bit about the buildings as they existed? I guess they don't exist any more. Would you mind saying a little bit about the building maybe that you were most familiar with, that you spent most of your time in?)

OK. The two buildings that I spent most of my time in were buildings 123 and 122, which were basically the buildings for the health physics division and the occupational medicine division and health and safety, devoted to health and safety, studying that, or doing the bioassay analysis for the workers, and we had the lung counting facilities along with the occupational medicine people in the122 building.

(And where were they located in the complex, if you could just describe it briefly?)

OK. They were in the west, at the west end of Central Avenue, right up next to the administration building, building 111. 122 was across the street from 111, and 123 was just across the street on the east side of 122. So they were toward the west end of the plant site.

02:20 (Can you describe what it was like to go there to work every day? Did you feel—I imagine it was very different from the production workers.)

It was. It was much different in that it was pretty much a routine of looking after the protection of the workers, and so we were really a service organization rather than a production. We were providing service to the worker population there, so it was a little different than the production workers. There was a small amount of research associated with health and safety that was being done in those two buildings during that time.

(How did it work when—now, I gather that when workers had been contaminated, they were sometimes brought to—)

Correct.

(—one of the—which building was that?)

There were facilities in building 122 that were facilities set up to be able to bring workers in that had external skin contamination where they could be brought in and washed and showered and what we called "deconning" or decontaminating those individuals. The facility was set up with the capability of monitoring and checking those people for contamination. We also had equipment there, if they did have a surface wound, a cut, or an acid burn, something of this nature, that we could measure the amount of activity and determine whether we needed to scrub further or maybe we needed to excise, take a little bit of the tissue out to remove that radiocontamination so it didn't get in through the lymphatics and the bloodstream. We had the lung counting equipment there as well. We had everything pretty centrally located for taking care of the workers if they did receive contamination, either externally or internally. The occupational medicine group was right there. They could—we as health physicists could work right side-by-side with the physicians in helping them to determine what the best treatment was for those individuals.

04:46 (Now, since you helped, you didn't actually do the treatment yourself, but you worked alongside the medical people?)

Yes, I worked alongside the medical people. Since my doctorate research was dealing with wounds and it was the only study—in fact, there's a national committee that's now coming out with a publication, the National Council on Radiation Protection, they are using my doctoral dissertation research data for this publication. It's the only information on human beings and on animals, the only one that really had much information on wounds, intake of plutonium through wounds. During that, I was also treating the animals that we were studying with a chelating agent which we use on workers if they get plutonium in their bodies. So I worked very closely with the medical people on whether they should come in and use chelation or whether it was advisable not to. In some cases it was the right treatment and in other cases it was just as well if we didn't use it.

(Could you define what chelation, chelating is? Some people wouldn't know.)

OK. "Chelation" comes from a Latin word that means "to claw" or "to grab onto." A chelating agent is one which, if you put it into the bloodstream, like we were doing, it would grab onto the metal ions that are in the blood. So if you had plutonium floating in there or tied up in the chemical matrix of the blood, the chelating agent would grab hold of that plutonium ion and carry it out through the kidneys and excrete the plutonium. It was effective in pulling the plutonium as it went from a wound into the bloodstream going toward the liver and the bones, it would intercept the plutonium and americium and would take them out through the urinary pathway. So a chelating agent is one which is very effective in intercepting and grabbing hold of those molecules and carrying them out through the excretion pathway.

(So you would advise which kinds of wounds you would do this and which you would not?)

Right, the types of situation. Generally it was more dependent on the chemical form of the material, whether it was an oxide or a nitrate or a chloride of plutonium, as to whether it was advisable or not. Whether it was through inhalation or through a cut or through an acid burn, all of these determined whether we would use chelation or not and whether we should go in and try, if it was a wound or an acid burn, what treatment we should try to use to keep it from getting into the body.

08:12 (Getting back to the buildings, I remember in our last talk you went into good detail about the lung counter.)

Yes.

(I was kind of wondering what happened to that?)

That's a good question. It turns out that the lung counter facilities, as we started tearing down those buildings, we had three big steel rooms that I had put in 122 building, and we had an experimental steel room that we put in 123. When we started tearing down 123, which was one of the very first buildings that we tore down at Rocky Flats, when we started tearing that down—I had attended a conference back in Washington DC with seven of the scientists from Russia. As we got into the discussions with the Russian scientists that had been studying the workers at Mayak, outside of Chelyabinsk in the Ural Mountains, which is kind of the equivalent of Rocky Flats, its where the plutonium production was taking place. Many of these workers had received large, large quantities of plutonium in their bodies, in fact so much in some cases that they actually died of radiation sickness.

In talking with these Russian scientists, they said, "You have a lung counter for counting plutonium. We don't have anything like that in Russia." Several of them asked if there was any way they could come visit and see our lung counters and get an idea of how we went about measuring plutonium in the lungs of the workers. These are great scientists, but they just didn't have the equipment that we had developed in the United States.

So when we got ready to tear down the building, I contacted some of the folks back in Washington DC and I said, "This steel that we used in those is pre-World War II, very special steel, which is almost impossible to get your hands on now because it's all gone, basically. It has very low radiation content in the steel. I said, "It's a crime to take that steel and just use it as scrap iron." Which was what they were planning on doing, just scrap-ironing it. You've got 64 tons of steel in one of those rooms, plus lead, tin, and zinc liners on the inside of that.

I said, “Those poor people in Russia don’t have a facility like this.” I said, “Is there any way we can make it possible to ship one of these over there so that they could count the Russian workers, and we could get the information on those people?” Which kind of fills in a gap that we have. We have the real low levels of plutonium that our workers had experienced here, and we had very high levels in animal studies that we’ve done, but in Mayak, those workers kind of fit between those. I said, “The information would be invaluable. Is there any way we can work it out?”

Between all of us, we managed to work out the details, and we shipped one of those big lung counters, those steel rooms, had it refurbished by a fellow down in Oklahoma and then shipped it over on a ship and then by train up to the Ural Mountains. Then they had to put it on a truck during frost time, because the roads are dirt roads and the truck would sink in the mud otherwise. So they had to take it up in the wintertime, and take it by truck from the train rail up to the facility at Mayak, up in the mountains. They are now counting those workers, and they’ve published some papers on the results of that. So one of those steel rooms went to Russia and is being used to this very day on workers over—

(And you know it’s being used.)

Yes. In fact, some of my friends have been over there. I didn’t manage to get over there myself, but some of my friends helped them learn how to run the equipment and set up the equipment for them. David Hicks, who used to work at Rocky Flats and is now out at Livermore, was instrumental in putting all of the equipment together for them.

The three other steel rooms have been shipped up to Idaho Falls, Idaho, for the DOE laboratory accreditation program. They’re going to use at least a couple of those for calibration, for calibrating lung counters throughout the United States for the Department of Energy. And they’re going to save—at least one of those steel rooms is going to be saved back for use at any other facility. If they recreate a new Rocky Flats someplace or something like this, then we still have that steel on hand that we can use to reestablish another lung counter facility.

The equipment that was inside those lung counters, some of that equipment anyway, a great share of it, has been given to Colorado State University. They have been given a grant by Homeland Security to try to set up a facility kind of in the central part of the United States where if a radioactive device was to be detonated or set off, contamination spread, they could have a facility where they could count people for radioactivity up there at Colorado State. So a lot of that equipment is up there now being set up at Colorado State University, and also for training and teaching purposes, for the students.

That’s the history of what’s happened with those lung counters. Those two buildings are completely gone. The ground is all flattened out. They’ve planted grass over those areas. There’s no buildings there any more. That is what’s happened to those lung counters that I talked about last time.

14:55 (Very interesting. Any other thoughts about buildings, about the buildings with respect to the clean-up?)

Let me just say that the clean-up has really been extensive. When you get into the clean-up of the facility there at Rocky Flats, you get into various and sundry problems and issues that had to be dealt with. It wasn’t just the radioactivity. You had the beryllium contamination. You had

chemical contamination from a lot of the chemicals that were very toxic that had to be used in the chemistry processes. Those buildings had to be treated very carefully, handled very carefully. The workers had to be protected.

Most of my work since the last interview has really been oversight of health and safety, making sure that the workers are protected from the chemicals that they might come in contact with that's in the concrete and in the pores of the building materials and the equipment and so forth. They had to go in, take the equipment apart, take the gloveboxes apart, dismantle them and put those into waste containers to ship off. So these folks were right in there disturbing things. There was a lot of shaking and rattling and disturbance of the area. And as a result, it had the tendency to release a lot of that contamination as they were taking bolts loose and got into the nooks and crevices that they were exposing.

(So did protecting them mean having them wear a particular kind of gear, mainly?)

Wearing special gear to make sure that their breathing was protected, setting up engineering controls—in other words, coming up with ways in which, if you were trying to take something apart, setting up a vacuum system to try to suck all that in and keep it from getting loose into the area and creating a big atmosphere of contamination. Trying to contain it as much as possible. We used a lot of fixative materials, where we would spray a kind of sticky substance on and it would keep that contamination controlled against any of the removal contamination, keep it from floating off. We were using all different kinds of techniques. On ventilation ducts and piping and so forth, a lot of times we would drill small holes in there and spray foam material in there that would foam up and then harden and it would encapsulate the material, the contamination. Various techniques that we came up with, engineering techniques to protect the workers.

With beryllium, we're talking about making sure that the levels of contamination that they are breathing is well below the standards. We established standards. Beryllium is one that's really become a big issue in the last ten years.

(And I believe you said before that beryllium was in many of the buildings.)

Many of the buildings. We know at least anywhere from 39 to 43 of the buildings had beryllium at one time or another, at least small quantities. When you got into several of the buildings, like 865 and 444, these were production buildings where we did machining of beryllium and foundry work with beryllium. So there was a very high concentration of beryllium on the equipment that was in those buildings and in the ventilation systems and throughout the buildings. They were very, very contaminated.

We really had to put a great deal of effort into coming up with ways where we could dismantle these buildings, tear them down, get them down low enough so that the concrete and so forth wasn't a hazard to the public. Because a lot of these were taken to landfills, a lot of this material from these buildings was taken to landfills, so it had to be brought down to a level which we felt was safe. I've been involved as chairman of one of the national committees on what are those levels of contamination for beryllium that are acceptable, and how do you get down to that level? How do you sample to make sure you're measuring appropriately?

20:06 (And this would be, on this kind of oversight, it's through the federal government only, or does it pertain to industry?)

It's through the federal government, but because Rocky Flats really is practically a world leader in this area on beryllium, and it is on a lot of the plutonium radiation. So it's through DOE, but we are setting the precedent. We have set the precedent. We have set the bar throughout the Department of Energy plus throughout the nation. And now, even Canada, Australia, Israel, Germany, France, India, all these other countries—and I just was privileged to be at the International Beryllium Conference in Montreal. I was asked to be one of the keynote speakers and deliver a couple of addresses there at the conference. They asked me to speak on how to go about D&D. These other countries—Canada has really taken the issue with beryllium. They've identified the industries, about 2500 industries, that they know where beryllium is associated. Because beryllium now has really become a big issue. We know it causes health problems in certain individuals. About 4.5 percent of the population seems to be hypersensitive to it. There is a genetic predisposition that appears to occur. We found out that those people that are susceptible to it, it doesn't take very much, in many cases. It takes very low levels, microgram quantities, fractions of a microgram per hundred square centimeters per cubic meter of air.

(That was true of some of the workers at Rocky Flats, wasn't it, that didn't even have much exposure?)

Right, yes, even a couple of secretaries that never even went into the areas but were handling some of the paperwork that had beryllium contamination from being in those areas. Some of those people have come down with health problems. This has really become a health issue. It turns out that we now have found out that all the aluminum in the United States, throughout the world, practically, all the aluminum has small trace amounts of beryllium added to it. The auto industry, the airline industries, all these industries that use aluminum—copper, which is used in electronic gear, has 2 percent beryllium alloy added to it for metallurgical purposes.

So if a person is machining them or creating dusts where it is of respirable particle sizes, why, then you have potential problems for individuals. So Rocky Flats has been on the leading edge. We have set the bar. Now OSHA [Occupational Safety and Health Administration] is following a lot of example, and they've asked us to help. They are looking at redoing their standards based on what we have been using and how we've handled it. We handled beryllium at Rocky Flats. We established a program which is really pretty much the same as what we do for radioactivity. Setting step-off pads for the workers. They come up here, they get monitored here, and before they can leave the area they take off their outer clothing. We handle it almost the same way as we would with radioactive materials.

So it's a big issue. Beryllium has become a major issue. You just don't want to take a truck and load up a bunch of building material, rubble, concrete rubble or something like this, and put it out on a highway, running down a highway to a landfill, without knowing that the public is protected, that everybody that's handling it is protected, and that it isn't escaping into the environment and contaminating the environment. So there's a lot to be said.

24:57 (Were you involved at all in the federal compensation that went through Congress?)

Very much so. In fact, I was involved with Dr. David Michaels, who established that program. I've been involved with it from the very inception, and I still am involved with it very deeply. I was just contacted about two weeks ago and asked if would be willing, now that I'm retiring and leaving here—today's my last day at Rocky Flats and with the Department of Energy—they've asked me if I would be willing to be a consultant for the EEOICPA—the Energy employees' compensation program [Energy Employees Occupational Illness Compensation Program Act],

for the oversight advisory committee, the national radiation advisory committee oversight, if I would be willing to serve as consultant with them for reviewing the special exposure cohorts and site profiles and oversight over the dose reconstruction project that's going on under NIOSH [National Institute for Occupational Safety and Health].

I was involved with the legislation that's just come up through Congressman Udall and Senator Allard and Congressmen Beauprez and Salazar, the legislation to make a special exposure cohort of the Rocky Flats population, the petition that was put forward by the steelworkers' union here and then the congressional group from Colorado that has put forth legislation to make a special exposure cohort for Rocky Flats. I was very much involved in all of that.

(Now, would that be for beryllium specifically, or other—?)

It's for everything, but especially for radioactivity under Subpart B—

(Because that wasn't covered under the other—)

—under Subpart B for radioactivity, where individuals—they are doing dose reconstruction for those individuals, going back to see whether they had enough radioactivity in their bodies or were exposed to enough radiation from an external source, whether they received high enough dosages that it may have been a high enough level of probability of causation to cause cancers, the various cancers. There are 22 or 24 cancers that are covered under that section. Under Subpart E, which is a new one that Congress just passed here recently, is for chemical exposures. It includes any chemicals, carbon tetrachloride, trichloroethylene, or any of the other chemicals that might cause health problems, not necessarily cancer, but other health problems. So beryllium is also included in the legislation. It covers radiation, beryllium, and then specifically other chemicals. I've had a big part in all of that, played quite a role in it.

The dose reconstruction, which is going on right now, I play another part, in that back in the 1990s, Roger Falk, who I worked with and went to graduate school with, Roger and I recognized the fact that the neutron doses that workers were receiving back in the early days was not monitored correctly. We found when we did a pilot study in the early '90s that some of those workers had been—they were told that their dosimeters read zeros, and when we went back and found the films in the archives, 90,000 films stored away in the federal center down there, went back and reread those, we found that those workers had actually received in some cases pretty high doses of neutron dose, and even before that, before they even had been measured, in the early days, in the mid-1950s, they didn't even do neutron dosimetry. So there's no measurements on people there.

When they did start measuring it, they chose the wrong people, in some cases, and they didn't put films on all the people they should have. So there is a lot of missing data. So we established a Neutron Dose Reconstruction Project which was carried out here at Rocky Flats. The people that were working that we brought together to work on that project were transferred off-site, since we were closing the site here, to a facility here in the Denver area, where they continued that project. They actually went back and reread all of those 90,000 films—plus where data was missing, they went in and by looking at the gamma doses and various other factors came up with what we feel is pretty accurate dosimetry as to how much dose should be added to those people. That information is being transferred over to NIOSH so that the workers from Rocky Flats will get credited with additional dose—many people will have an additional dose even beyond what their records showed originally.

(And will that be accessible to individual workers, so they can –?)

Yes. In fact, we are notifying them just right now. We just got the approval today from Washington to go ahead and send out letters of notification to each of the workers that were involved—5,317 workers—that were involved in that project, notifying them that most of those people will have additional exposure added to their records, and we will send them how much is being added to each of their records. And then that information is going to be put in each and every one of their radiation exposure record files. Their files are going to be pulled back from the Federal Center down here in Lakewood, and each one of those files will have this additional information added to the file, as an addendum to the file.

(And that will be available to the individuals for them to take to their doctors?)

Absolutely, yes. We are sending copies to all those people that we can find. We're trying to track down every single one of those that we possibly can, or their next of kin. We're trying to track down next of kin on those that are deceased. So that will all be made available to them. They will be sending that to them. Yes.

32:11 (I had heard some criticism with respect to the compensation for beryllium that the monies didn't get to the people very quickly. Is that a bureaucratic problem or—?)

There were some problems in the early going. The Department of Labor was not real familiar. Beryllium was a brand new thing.)

(And they were administrating it.)

Very few doctors even know what you're talking about when you talk about chronic beryllium disease. There are only a few doctors in the country or in the world that know what it is. More and more are learning now. The Department of Labor was given the responsibility to handle that program. They themselves didn't know anything about beryllium. I had to go and sit down with a lot of the people from the Department of Labor and try to educate those people. They were making—like any new program that comes on, errors are made from time to time. There was a learning curve associated with that, and so it did take time, and to get geared up to be able to handle those cases in an expedient way did take some time. There was delay on the part of some of that information, payments, some of those claims.

Some of the claims on the radiation side are still held up today, and that's being held up because the Department of Labor and NIOSH have been holding the Rocky Flats cases until they got this neutron dose reconstruction information that they could add to it. Because a person might not qualify with the information they have in their official record, but now when they get this additional information, now they do qualify. So they've been holding up a lot of claims, several hundreds of claims they've been holding up from Rocky Flats, waiting for this information to get over to them. That information should be transferred maybe yet this week to NIOSH, so that they can go ahead and work those claims through now.

(That must be satisfying to you to be working at this end.)

It is. It's very satisfying, because again, it's trying to help the workers, and that's what my life is dedicated to.

35:00 (Let's see. One of the things that I was hoping we could go back and talk a little bit about that we just touched on a little bit last time was, you mentioned that you at one time had debates with Dr. Carl Johnson and that you were doing some epidemiological studies. We didn't really get into that.

[chuckles] Yeah, back in the days of the activist period, especially in the '70s and early '80s, in that time frame there was a lot of activity, a lot of people—let me try to word this appropriately—there were a lot of people that radiation was a real scare to them, and a lot of people who were misinformed, misled, didn't have information, and sometimes we scientists have a hard time communicating with the lay people. So it's not all their fault. Sometimes it's our fault as well.

[pause] In the 1970s, when this activity really was at a peak, because I had done a lot of public speaking and speaking for civic clubs and schools and various groups, I was asked by the plant to go down and sit down with some of the leaders of the activist groups. We had the Colorado Department of Health as a moderator of that. We were kind of meeting secretively. It was not public knowledge. We were doing it so that we could try to sit down in a civil manner and speak across the table. And they said, "Bistline, would you be willing to go down and sit down and try to communicate?" Because there's a real paradigm between these two groups. Here's the scientific community. Here's the activist community. And each one's talking past the other. Neither one is really communicating. We all have our biases and so forth.

So I agreed to that, and I went down, representing the plant, to some meetings down in the Cherry Creek area. I'd sit down there, and Dr. Ellen Mangione from the state health department and I was moderating these sessions. I'd sit on one side of the table and I'd have a half a dozen activists on the other side, with Ellen kind of keeping the meeting under control. We'd meet about once a month. Part of the time it was once every two weeks.

This went on for a couple of years. I'd go down with a whole armload of materials, because I felt—they felt like I could communicate with these folks. If anybody could, I could probably do as much as anyone to try to communicate. I had the scientific background, the information. I'd walk down with a great big armload of materials under my arm, so that anything I told them I could back up with scientific evidence. I'd go down and discuss with these folks. We'd get into some very heated discussions at times, but we'd try to keep it civil and try to communicate and try to see their side of it as well.

39:08 (Was it usually the same group of people?)

Pretty much the same group.

(So you could form relationships.)

It was a nucleus. We got into a relationship. And as time went by, it became a very, very good relationship, very friendly relationship. To this day a lot of those folks are good friends of mine. I spent many, many hours in these sessions with these folks.

Carl Johnson was asked to come in and speak a couple of times. He and I had some discussions with the activists, who looked to him as pretty much their guiding light. I came in with materials that refuted a lot of what he had done. He really did some gerrymandering of data and so on, and

we got into some pretty interesting conversations. I'd pull out my materials and show where the error was in his methodologies, and it really was an eye-opener to them to see where he had convinced them of things that were not appropriate, that were not right at all, but they didn't have enough scientific knowledge to be able to realize that he was pulling the wool over their eyes many times in some of these areas.

It turns out, when it was all over with, this led up to what became the Colorado Department of Health Rocky Flats study, in which the governor selected a committee of people to serve from around the United States, experts and so on. I was asked to not be directly a part of that because of my association with this plant and the Department of Energy, and so on. But even though I was working on the contractor's side at that time, they asked me to be a consultant to them, to attend all the meetings and be there to help answer questions that came up about Rocky Flats and the epidemiological studies that I had been carrying out with—because in the late '70s, we started doing epidemiological studies with Los Alamos. We were looking at cancer rates of the worker population at Rocky Flats. We were looking at brain cancers and so on. I was co-author on some of these papers. I acted as a consultant to the group but was not a member of the actual group.

(Not considered part of the group.)

And of course that study just ended up here a couple of years ago.

(How did you feel about their work overall?)

I felt like they were quite thorough and I thought it was, for the most part, very, very good. I thought they did a very thorough job. Even to this day, we here at Rocky Flats, we use a lot of the information that they put together. It was well done. It was very thorough. They went back and did stuff that we could never have done ourselves, I don't think, here at the site, because it requires real in-depth study of—going into records, digging through the records in the archives and digging out the inventories of, how many chemicals did we actually have on-site? How much of those chemicals were used on-site? Approximating, estimating how much was used and how much might have gotten put into the environment, and so on. These are very technical questions that required technical expertise from around the United States to answer a lot of these questions.

43:39 (Now, as I understand it, that had to do not with workers at all, it was with people—health for the whole community?)

Right. It was community-based, outside Rocky Flats. How much chemical exposure, radioactive exposure, etc. went outside the borders of Rocky Flats? How much went out, and what were the risk factors to the population outside the plant?

(As you look back on that now, do you feel that this wouldn't have come about if you'd not had that period of time for activists to talk with you and others about—does it seem as though that set the stage for this?)

I think it set the stage. I don't want to take credit for starting that. But I think that it really helped to set the stage to move on to being able to now sit down and bring some of those people into a structured study. It also brought this health issue to the forefront for the funding that was necessary. Because it was very expensive. You're talking about several million dollars a year

that it was costing the taxpayers to do these studies. But I think it helped to set the stage for this to take place. I don't want to take the credit for making it happen. But it did open the door, put the crack in the door for that to start taking place.

45:38 (I would think, though, that you being a person who was working with worker health, as opposed to someone who was in charge of production, that that made a crucial difference in terms of—)

Well, I hope so, Dorothy. I hope it did. I felt like I had good rapport with the workers and do even to this day, I still have a close rapport, a close friendship with a lot of the production workers. I've worked closely with the steelworkers union, who represented the worker force. I've had a good, close relationship with those folks and hopefully have been able to bridge the gap that oftimes exists between management and workers and people in the scientific group and the workers. Yes, I hope so. I hope I've been able to do some beneficial work that way.

(You were mentioning that you had a close relationship with the union. In the clean-up, has that been an issue?)

That has been just absolutely overpowering. Because working together with them and doing clean-up, like when we get into beryllium issues or radiation issues, the workers themselves know they can come to me, if they had a question they could come to me and say, "You know, this isn't right." They felt that freedom to come to me.

At the same time, we could sit down at "lessons learned meetings" or at the meetings—if an incident occurred where we said, "Stop work. We've exceeded the limits for exposure," even though the people had on protective gear and so on, we'd stop the work and say, "OK, let's sit down and take a look at this and see what we need to do to correct things, make things so we don't even take the risk of this."

And the workers themselves many times, many, many times the workers themselves came up with the best ideas as to how they could better do things and more effectively do things in a safe manner and make it a safer operation and at the same time not slow down the process, not slow down the work, but making it safer. They came up with the ideas in many, many of these cases. They recognized where they made the mistake. "Here's where I made a mistake and the material got loose by the way we put it in the bins," or something, "it made a puff" or something. They would come up with the concerns and then come up with the answers to those concerns, how to best proceed forward.

So it's been extremely beneficial to work closely with those workers and give them the credit that they have coming due for recognizing it and not to take those people to task, slap them upside the head or say, "You screwed up, you're fired," but to stop and say, "Where do you think we can improve the situation?" I think it's been extremely beneficial throughout the clean-up operation and D&D. I don't think we'd have made the progress that we have without that.

49:46 (From my limited understanding, many of the workers in the clean-up have not been—they've been contract, not Rocky Flats employees. Has that presented any particular problems, or does it have some advantages?)

It is a disadvantage. It IS a disadvantage. It's an advantage from the standpoint that it's given us extra additional manpower that we didn't have, because a lot of people had left, found other jobs.

They knew it was coming to an end. They were working themselves out of a job, so they had to bring in outside labor. And it was a disadvantage from the standpoint that these folks had never ever worked in these kinds of conditions. A lot of these workers came in and didn't know what a respirator was. They didn't know what protective gear was. They came in without the safety mentality that we required here. And they had come out of an environment, many of these out of just a labor environment, where practices out there were totally different than what we accepted here. You just don't do it that way, that's a dangerous way of doing it. But they'd gotten by with it for years outside here. In our case, with our oversight, sitting in a fishbowl and working with high-risk materials, the highly toxic materials that we had to work with here, you just don't take chances like that.

So it was a disadvantage to hire a lot of these people, because they had no experience. They didn't know what it was like to work in a respirator or even a hood that blocks their vision partially and breathing supplied air and so forth. This was a whole new world to some of these people.

(Were they all union members?)

No, well, these were—they came—yeah, I guess they were, I think most of them were required to be a part of a union, but they were from all the various different trades. They weren't from any one single union. The one thing we did have was that a lot of the workers that had worked here previously did carry on across and we could mix those people in and they could kind of be the leaders within those groups of people and help them learn how to go about doing things appropriately. So the Steelworkers really did help out in helping to train and work side-by-side with these guys that were coming in from outside and didn't have that kind of experience and background.

53:04 (Is there any one or two incidents that stand out in your mind as particularly difficult or surprising?)

[chuckles] I think one that I might mention is the one which really surprised all of us. It was when we were taking down 771 building, which was one of the big production chemistry buildings. We thought everything was going along great. Then all of a sudden we started seeing little trace quantities, just very trace, minuscule quantities of a few atoms coming through in the bioassays of these individuals, in the urinary excretions. We couldn't figure out where it was coming from, why these folks were coming up with this.

We thought we had it narrowed down to a couple of specific incidences that had occurred where the practices weren't real clean and we needed to make some changes. Then lo and behold, we came up with the fact that there were ways in which they were handling the waste, putting it into crates and so forth, that was probably creating an environment that the people that didn't have respiratory protection, it was creating an environment next to those folks and causing some problem. We thought we had everything controlled, and it wasn't as controlled as we thought it was. But it was at such a low level that it wasn't being picked up. We weren't picking it up on our routine monitoring program. It wasn't until we had a couple of small incidences that we started picking up some of these other cases out here that just were outliers. It just didn't make sense to us. So that was one which really was kind of a shock and a surprise to us.

But when you look at what we've done over the past ten years here at Rocky Flats, the progress in tearing down buildings, the enormous amount of radioactive contamination and chemical

contamination that was involved in doing this, and you look at the number of buildings in the entire site, over 800 structures that have been taken down, many of these large, large structures with hundreds of gloveboxes and big tanks of chemicals and radioactivity, the small amount of health risk, health impact that it's had, we have not had any deaths as a result of any of the activity. We've not had serious injuries to speak of. It's really a credit to the workforce.

(Has it been a big worry to you to have the responsibility for the health oversight?)

It's always a worry. When you take on a big, big project like this and you know the levels of contamination that you're working with and trying to find the right mix—if you go down and try to decontaminate so that everything is completely clean, you're putting the worker at more and more risk because it's down to those very low levels. There's a trade-off someplace where you say, "OK, clean it up to this level. Now we'll go ahead and cut this up or we'll take it and dismantle it and just take it and put it into a crate. We're not going to take all of it out. We're just going to go ahead and send it out as contaminated waste." Rather than trying to decon it all the way down to zero, because that puts more people at more risk. It takes more people to do those, when you get down to a certain level, it takes a lot of extra work to get from there down to here. And you're putting people at more and more risk. So there's a fine line that you have to walk with this.

57:57 (In terms of the contaminated waste that's been taken off-site, I think some people wonder, we've gotten rid of it here, but where is it going?)

There's several different locations. The plutonium that could be—the plutonium itself, the material that could continue to be used, was shipped to a couple of different locations here in the United States, DOE facilities. The plutonium waste or residues and so forth that couldn't economically be salvaged were shipped down to the WIPP facility, the Waste Isolation Pilot Plant, down in the salt mines down in southern New Mexico. All of that material is now—we've made our last shipment of that material. What we call low-level waste, though, and mixed wastes, those low-level wastes, part of it has gone to the Nevada test site.

(Excuse me just a minute. I need to change the tape.)

All right.

(Hold that thought.)

59:20 [End of tape A]

[B].

00:00 (This is a continuation of the oral history with Dr. Bob Bistline. Can you pick up where you were?)

Yes. The other waste facilities that we have been using for shipping what we call low-level waste, there are two basic facilities. One is out at the Nevada test site, where they are burying some of this waste in one of the big craters that was created by the nuclear testing back in the '50s and '60s. They're burying it down in the bottom of one of these big craters. Some of the rest of the waste is being shipped to EnviroCare, which is a facility in Utah where low-level waste

has been—an area has been set aside for a low-level waste repository. This is where the low-level and mixed wastes are being sent. There are specific locations around the country.

Back in the old days, we used to ship a lot of our waste up to Idaho. But Idaho is now closed and in fact, they're now digging up, and I get calls quite frequently from Idaho saying, "This is what we're finding in this pit that we're digging up. Can you tell us more about it?" I've been providing some information to those folks in terms of, they have some of the radioactive materials from the 1969 fire, the clean-up of that big fire, up there. Some of the materials are mixed plutonium and beryllium waste and so on. They don't know for sure how to go about handling a situation where they've got radioactive and non-radioactive wastes that are mixed together and so forth. So I get periodic questions from some of these. All of that stuff that was shipped up to Idaho now is being dug back up out of the ground, out of the pits there and being processed, much the same as what we're doing here at Rocky Flats now.

(The places that the waste has gone, do you feel pretty comfortable that these are long-term solutions?)

The ones that they're being shipped to now, yes, I feel pretty comfortable with those. I think they're good facilities. The WIPP facility I think is the best we could possibly come up with. And I think the facilities in Utah and Nevada are just excellent facilities. They're out of the area from which there's possibility of groundwater or anything like this causing problems of leaching of the waste into areas. So for the population, I think the safety of the population is well in hand.

03:22 (You were talking in the last oral history about some, I think, early studies with plutonium exposure. You mentioned Wright Langham and mentioned that the injection of plutonium had been a controversial issue. Would you mind talking more about that whole issue and how it affected you and your work?)

The issue was—one has to kind of put themselves—what was done then was done then. We wouldn't be able to do it today. We wouldn't do it today. But at the time it was felt to be right and done appropriately, and for the most part, it was. Wright Langham was—we had almost no knowledge of plutonium, how it worked in the body, how it was excreted, where it went within the body, and so on. And we had no way of measuring in the body the amount of plutonium that people had from accidents. He had some cases during World War II, the making of the first atomic bombs, he had individuals that had been involved in accidents where they had taken plutonium into their bodies, through inhalation and cuts and so forth, he knew it had gotten into their bodies, but he didn't know how to quantify the amount that they had.

So he did this experiment to try to quantify, saying, "OK, if I inject …"—and this particular group of people, it's well publicized now, publicly, it was a small group of people that were only expected to live for six months to twelve months or so. They had various serious illnesses and had a short life ahead of them. They told them that they were going to be injected—you know, asked them if they would be willing to participate, and they got voluntary consent from all of these individuals and injected very small quantities of plutonium into those individuals and then monitored their urinary excretion with time. And it's the basis upon which we do all of our bioassay to this very day. He only monitored them for a short period of time, for about a year. So he had data that only came out to about a year, and then he extrapolated out, tried to extrapolate along a curve of what he thought this was going to be.

There were about 17 or 18 people that were injected with plutonium at the time. That data, the number of atoms of plutonium excretion each 24 hours, if you go back—here is when the incident occurred, and you come out here and this is a year and a half later, you can go up on a curve and you can pretty well estimate what the amount is that the person had in them by what the level is and the shape of the curve. Is the curve down here or is it up here, based on the amount that they may have taken into their body? So Wright Langham did this experiment, and it's still to this day referred to as the Wright Langham equation for urinary excretion. It's been refined. Many of us have refined it. We found that there were some errors in the estimation out here where he extrapolated them. There were some errors, and it's a little more complex curve than what he first initially came up with, but it's still the basis upon which we use to this very day to estimate how much plutonium is in the body of an individual that's involved in an accident, to this day.

08:01 (I've heard workers and others use the expression "body burden." Could you explain exactly what that means scientifically?)

Let me try to explain it to the best of my ability. In lay terms—"body burden" was an old term that was used up until the late 1980s, about 1989. We referred to it as "body burdens" and "lung burdens." This was what we thought was a safe level that a person could have: 40 nanocuries of plutonium in the bones of an individual. If they didn't have over 40 nanocuries, we felt like there weren't going to be—there wasn't much chance, or any chance, of health effects occurring, cancer occurring. And 16 nanocuries in the lungs, this was the lung burden. It was a quantity that we thought had a safety factor built in.

We said, "OK, based on rats and mice and dog studies and primate studies and so forth, this is a safe level. We didn't see any more cancers in these animals at this level, so we're going to come down to here." And we set a level down here and we'd say, "OK, this is what we're going to call a body burden level. We don't want to exceed that level." We'd try to keep everybody under that level. It's based mainly on various animal studies and extrapolating that to human beings and saying, "OK, this is where we no longer saw cancers occurring in this dog population that had been injected with plutonium, so we'll set a level down here about one-tenth of that. This is what we'll call body burden at a safe level." So it's based basically on animal studies. Does that help?

(Yes. Some of the workers have used the expression as though a body burden is not a good thing to have, there's different degrees.)

There are different degrees. It's what we—the body burden, it's—a lot of workers have difficulty understanding it as well. A lot of times they'll say, "I can work up to this level, but everything's going to break loose if I go over this level." And that isn't the case. It's a number which just kind of arbitrarily but scientifically has been arrived at, and we say we just don't want people to go over that level. But just because you're at 41 doesn't mean that now all of a sudden you're going to get cancer. It's a risk factor. It's probability. It gets into probability of causation.

Actually, when you get right down to it, in all the studies I've done on the workers, the autopsies that I've taken and been involved with and the epidemiological studies looking at the cancer rates at Rocky Flats, doing the follow-up studies of the workers, which I started back in 1980—and I think I fairly thoroughly went through that last time—now adding on the additional years since the last time I spoke with you, we just are not seeing health—I think that level that we established then and now we use CEDE [Committed Effective Dose Equivalent], another terminology—it's a term for the amount of dose that an individual—a lifetime dose that an

individual will get. It can be correlated back to the body burden in a way, but it's really set up on what a lifetime dose will be, an equivalent dose. Looking at this, I think our values that were established even back in those early days were pretty good. Because we've not seen real health effects. We cannot really tie—link an increased cancer incidence. We're not seeing an increased cancer incidence in our population, although it's somewhat small for a good epidemiological study. But still, there's nothing that really comes up and slaps you in the face in terms of cancers. We're just not seeing a high cancer incidence.

Some of those guys that had very high levels of plutonium from those fires back in 1965 and so on, some of those individuals are still alive today, in their 80s, approaching 90 years of age. We've got one individual that died a couple of years ago, he was 86 or 87 years old. Had one of the highest doses of plutonium in his body of all the workers at Rocky Flats. We've got a couple of others that were exposed way back in the 1950s, and both of those guys are still alive. So it's really difficult to say that those standards weren't fairly well selected by the people back in those days, when they established those back in the '40s and '50s. They did a pretty good job, when you get right down to it.

The one that's hit us is the beryllium, which has caused serious health effects in a lot of people. We've got a lot of people—over 130 individuals just at Rocky Flats alone, former Rocky Flats workers, that have chronic beryllium disease, and another 240 or so that are sensitized, their blood tests are coming out sensitized, and now we've got facilities—I'm working with people in Portsmith, Ohio; I'm working with people at Hanford; people at Oak Ridge—the various facilities have asked me to come in and do assessments of their programs. There was an investigation that headquarters asked me to come on an investigation team on an issue up at Hanford on beryllium. Beryllium is the one that has really caught us. It's the one that has really caused a serious problem, and we can't put our heads in the sand. We have to face the music, face the situation that we caused health problems and that's the reason why David Michaels and some of us felt that the right thing was to establish this workers compensation program, to do the right thing by the workers that have been affected by health issues.

15:38 (Did you see David Michaels and other people like yourself as being instrumental in getting the act through Congress? Did it take that push to do it?)

I think it took David Michaels and a bunch of those people back there, Ms. [Hazel] O'Leary and some of the others there in Washington, there were a lot of people that deserve the credit for putting that legislation through. I think it could have been done better. The Rocky Flats workers, in my feeling, got the short end of the stick on it. But they're going back and they're trying to rectify that now in some respects. This special exposure cohort that's being worked on right now, I don't know whether it's going to fly or not, but I think it's the right thing if it can be done, because our workers are the workers that really did hands-on work. Of all the facilities in the entire United States, our guys are the guys that did hands-on work, really had—our population was the one that had the highest number of people that really did have exposure, measurable exposure. We can see it in their urinary excretion. We can see it in their lung counts. We've got several thousand people that we can measure the number of atoms being excreted in their urine. We can measure it. And so these guys are the guys that we really need to give credit to and really deserve to be protected or given—not protected, but given the appropriate health rewards if that can be done.

(How does it feel to you, this is your last day –)

Last day. [chuckles]

(I wanted to thank you for taking time on your last day. How does it feel to come to closure here? It sounds like you're going to move on and not be totally retired, but—.)

Pretty much retired, hopefully. There's a lot of mixed emotion, mixed emotion. It's time. I've put in my years, 39 years here. But by the same token, I don't feel like I've done everything that I could have done. There are a lot of things I would have like to have done for the workers. But I feel real good about what has taken place. What little I've been able to contribute, I feel good about. But I feel like it's—but I feel like its time. The plant is just about closed. I saw it grow. I saw buildings built. And now I've seen them taken back down again. It's time to move on. I'll be 68 this fall. It's time for me to back off and start enjoying my grandkids and my family. A lot of mixed emotion.

19:23 (Do you have any particular thoughts or reflections on resumption of doing the work elsewhere, like at Los Alamos, that was done here, the making of the pits? Do you think this is likely to happen, do you have feelings about it one way or another?)

Unfortunately, I do think that— First of all, I think—and I'm speaking strictly for myself and not for DOE or anybody else.

(Yes.)

Personally, I think it was a mistake to have closed Rocky Flats in the first place. Because I do feel Rocky Flats is going to have to be rebuilt some day. The production levels that other facilities are trying to do right now don't even muster anything. I mean, they can't—the facilities that are trying to build weapons or replace weapons in the weapons system right now can't make enough weapons in a year's time to match what our guys were doing in a week. In fact, we turned out enough weapons in one day's time out here than a lot of these facilities that we now have today— The art has been lost.

Production of nuclear weapons, handling of the plutonium, the chemistry of plutonium was something that you can't write down in a recipe book. There was an art that these guys developed as they worked with this over the years and watched the chemistry process and watched the color changes and so on, to know exactly when it was time to stop the reaction. It's not something that you can pass on by anything other than experience. And that knowledge is lost. I think it's a shame it was lost.

I'm just worried that we haven't seen the end of it, with the Third World countries coming on. As North Korea, as Pakistan and all the other countries that are—Iran and Iraq. Iraq we don't have to worry about now so much, but Iran and some of the other Third World countries—I'm afraid that some day we are going to have to rebuild Rocky Flats. Where it will be, only time will tell.

The problem is that the money that we put into Rocky Flats and then the money we took to tear it back down again; another facility, the equivalent of Rocky Flats, we had a drop in the bucket cost, because the cost of buildings back in those days was down here. Now, to rebuild Rocky Flats, it's going to take billions and billions and billions of dollars to do it, and then they may still not be very successful, not as successful as Rocky Flats ever was. And so I think some day they're probably going to have to replace Rocky Flats, and I don't think they're ever going to be

able to replace it totally to the level that it ever existed now. But it did its job. It was a deterrent. Thank heavens we never had to use any of those weapons that we produced here at Rocky Flats, but at the same time, it was a deterrent and it has impacted the world.

23:26 (Are there other things that we haven't covered, either before or today, that you think would be—you'd want to talk about?)

I think we've covered quite a bit. [chuckles]

(We did. I think we've covered most of the things that I had. I didn't ask you about your own perceptions. There's been so much in the press, and the media in general, about the wildlife refuge, and is it going to be safe? That sort of thing. Could you speak to that issue? First of all, how do you feel about it being a wildlife refuge?)

I think it's great. I think it's a great idea to keep that— There are some very, very unique ecological conditions out there at Rocky Flats. The tall and the short bluestem growing together. It's the only place in the world that we know of where that is occurring and it's naturally occurring. It's such a beautiful ecological area. I think it's great to maintain that and keep it and preserve it to keep it from—because if you were to release this back to landowners or something like this, you know it's going to have development within a few years. There's going to be houses built out there. From a safety standpoint, I don't have a problem with it. The amount of radioactivity that's in the soils, especially now that the DOE is going to preserve that industrial area where there might be some contamination still down, deep down in the soil, but the rest of the area is very, very safe. It's only a very fraction, the radioactivity that's in the soils and out there on the rest of the site are just a mere small minuscule fraction of the radioactivity that's there naturally occurring: uranium, radium, thorium, and so on. That's already in the soils. It's been there for eons of time, for thousands of years. There's thousands of times as much radioactivity naturally occurring as there is from the plutonium that's left behind. So from a health standpoint, there is no health issue. It really isn't an issue.

(Especially if the industrial site—)

Especially if the industrial site is protected. So I really feel that it's the right thing to do: preserve that area, let the wildlife have the run of it, and protect the inner area from anybody coming in there and digging deep down into the soils. The surface is fine. There's no problem on the surface of the industrial area. That's fine. But I wouldn't want to see people going in there and digging a well shaft or digging a big foundation that goes down ten feet deep into some of those areas. I think that would be a mistake.

(How are they going to protect that industrial area?)

It's going to be maintained. I'm not sure whether they're going to have it fenced off. I think the intention is to have it fenced off and kept as a preserved area. DOE will continue to monitor that area. That's part of the turnover that's taking place from the clean-up now, turning it over to the long-term legacy management to monitor and continue to protect that area. And the wildlife people are going to be controlling some of that, too.

27:57 (Do you have any reactions to the—I think there's a bill in the state legislature put forth by the fellow that was on the grand jury, McKinley.)

Oh, yeah.

(Do you have any thoughts about that bill or that kind of legislation?)

I think it's inappropriate. I think it's a scare tactic. It does undue scare of the population and the public. If he only understood that the radioactivity from plutonium is a very small, minuscule quantity of what's out there originally. It doesn't make any sense to go putting placards up that don't mean anything. As a health physicist, measuring background radiation here in Colorado, I can take a sample here and go up Coal Creek Canyon or just move over a few yards over and get differences of readings of gamma radiation, let alone the alpha radiation.

The variability of the amount of radioactivity—if you're afraid of Rocky Flats, the soils of Rocky Flats, especially the soils out—any of that soil, then you better stay out of the mountains. Because I could take you up in Central City up there around the graveyards, the cemetery of Central City, where those flowers are actually mutated. The petals on the flowers are mutated. The Miracles, Dr. and Mrs. Miracle from Michigan State University, studied these back years and years and years ago, several decades back. The flowers have purple blotches on them from the radioactivity in the soil. Naturally occurring thorium—what we call a natural dike, where the crusts of the earth have been pushed up. You take a Geiger counter up there, some of these folks take a Geiger counter up there, they might not stop running till they hit the Kansas border. Because the amount of radioactivity is pretty darn high. I've been up there and done some measurements.

There are a lot of areas like that around here in the Rocky Mountains, where veins of naturally occurring radioactive thorium, uranium, and so forth, with thousands and millions of years of half-life, far longer half-lives than plutonium has, naturally occurring uranium has billions of years of half-life. There just isn't a comparison. And yet people get scared here with this little tiny minuscule quantity, where the radioactivity is a thousand or two thousand times higher in the naturally occurring there on the site than the plutonium.

31:12 (That reminds me, it sounds to me as though from where you started with your early nuclear studies, you then had to move in a sense away from that to beryllium and other chemicals.)

It's been an interesting trip. I started out in—

(Does it seem like you've moved away from that?)

To some extent. It still plays a role. But I've gone from nuclear physics all the way through biological and medical aspects, medical studies, the radiation side of genetic studies, epidemiological studies. Doing pathology, doing autopsies on individuals, moving all the way through and then into beryllium. But at the same time, like the last number of years I've been program manager for DOE, for the occupational medicine, for beryllium, program manager of beryllium and program manager for radiation protection. The radiation side of it has continued to go on. Some of the areas like beryllium have come up to where it takes just about as much of my time. I'm almost better known for my work with beryllium than I am with radiation, even though my doctoral studies were on the translocation dynamics of plutonium and americium and the studies of the health risks. I've diversified a great deal.

(Looking back, I know that you said last time you kind of compared your work to that of a physician. Looking back, do you know why you chose this route rather than becoming a physician, or was it just one of those accidental things?)

Well, I came very close. When I came out of my doctoral research, one of the fellows tried to talk me into either going ahead and getting a degree in occupational medicine or getting a degree in veterinary medicine, one or the other. I came very close to—in fact, my doctor's degree is from the school of veterinary medicine at Colorado State University. My doctor's degree in radiation biology, actually, is under the School of Veterinary Medicine. I took a lot of courses along that line, in physiology and so forth. But I didn't want to put my family through any further—I had three children—my third child was born when I was in graduate school on my Master's program before I even came to Rocky Flats. I had the three kids, and when I was going through my doctoral, I put them through an awful lot. I just didn't want to push it any further. I felt like I needed to—and I didn't want to stay away from Rocky Flats that long, either. I wanted to get back, get back with the workers. I felt a real strong need to get back to working with the workers and trying to do what I could to protect the workers. I had a burning desire to get back here working more directly with the production workers. So I chose not to go ahead or go further at that time.

I feel like we've had some real good medical physicians here. I worked within the medical department. When I came back here, in 1980 they transferred me to the occupational medicine department and I established a group which I called the Health Effects Group. That's the group that grew and took over the research that I was doing on the former radiation worker medical monitoring program and the former beryllium surveillance program and the current beryllium surveillance program.

(All of it.)

All of that I established back in—while I was in the medical department. Actually, when I first went over to the medical department, the very first thing I did was, a couple of us were put in charge of putting together a computer system. I did all the programming, and wrote the program for establishing a computerized medical information system and computerizing all our medical records system at Rocky Flats. I did that in the 1983, 1984, 1985 time frame. I wrote the programs and everything for that while I was doing all these other things. So it's been a varied history. I've had my fingers in a lot of things and a lot of times feel like a jack of all trades and master of none. [laughs] I've been very blessed. The good Lord has really blessed me throughout these years. I really have to give Him credit.

37:36 (So now you're going to retire some but you're going to keep your hand in, it sounds like?)

Well, I might. I haven't made a complete commitment to that. I possibly will do a little bit of consulting. I've been asked to consult some with the employee workers comp program at the national level. Some of the people at headquarters have said, "Bistline, you can't retire without at least agreeing to be willing to do consulting on beryllium." Because that is one area where worldwide, I guess, I've become known as one of the world's experts on beryllium. So there's a lot of pressure to continue to provide some expertise on beryllium and cleaning up facilities, how to go about cleaning up beryllium-contaminated facilities, how to protect workers and so forth. So I may continue to dabble a little bit. But I do want to retire—I'm tired—and do what I enjoy: the family, the grandkids, do a little traveling if at all possible.

(I heard that you were going to retire to a family farm in Kansas where you—?)

My grandparents homesteaded a property outside of Abilene, Kansas, about four miles east of Abilene. I-70 goes right through the middle of the property and splits it in two. They homesteaded that back in the 1880s. We have the old original homestead deed signed by President Benjamin Harrison. A couple of my sisters are having some health problems, and last summer my wife and I were back there talking with the sisters and making arrangements to take over, looking after the farm. While we were there, we found an old historic Victorian mansion in town. I used to march past it back when Eisenhower declared for the presidency, I marched in the parade past that house, when he was there in town, announcing his candidacy for President. I still remember as a high school student marching past there at fair time. And it was for sale. We ended up buying it. I used to drool over that house. So we're going to move back there. I'm going to retire back in the town of Abilene and try to enjoy our latter years of life.

(And you have many grandchildren?)

I've got eight grandchildren at the present time, scattered from one side of the country to the other, from California to a stepson living in Washington DC, two sons in Los Angeles and San Francisco. So they're spread out all over the place. And in between.

(Is there anything else that you would like to say?)

I think we've covered just about everything that I had noted.

(Good.)

That I think that's relevant and important.

(OK, maybe we should stop there.)

Thank you.

41:44 [End of tape B. End of interview.]