## Nevada Test Site Oral History Project University of Nevada, Las Vegas

# Interview with Delbert Barth

December 3, 2004 Henderson, Nevada

Interview Conducted By Mary Palevsky

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#### Produced by:

#### The Nevada Test Site Oral History Project

Departments of History and Sociology University of Nevada, Las Vegas, 89154-5020

> Director and Editor Mary Palevsky

Principal Investigators Robert Futrell, Dept. of Sociology Andrew Kirk, Dept. of History

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[00:00:00] Begin Track 2, Disc 1.

**Mary Palevsky:** Dr. Barth, thank you so much for meeting with me today, and I thought we would start this interview by getting some of your background, if you could state your full name, your date of birth, your place of birth, and something about your family background.

Delbert Barth: My name is Delbert Sylvester Barth. I was actually born in Indiana, even though I grew up in the state of Ohio. My father was on a construction job on the Ohio River, and I was born in Lawrenceburg, Indiana. My father moved around quite a bit, taking construction jobs. Our family was quite poor, but I grew up on a farm in the neighborhood of Upper Sandusky, Ohio. Upper Sandusky. Be sure to use the word "Upper" because Sandusky is on Lake Erie, but Upper Sandusky is at the *upper* end of the Sandusky River, which runs *into* Lake Erie.

*So you were raised there?* 

Yes, I was raised on a farm, and we were quite poor, so we had to essentially grow our own crops and grow our own food. We didn't have enough money to buy that during the early years. I was born in 1925. So we suffered during the economy of the United States at that period, 1925 to '32 or so.

Did you have brothers and sisters?

Due to major problems that my mother had, I was an only child. But I had a sister who died at the age of three from a disease that is now controlled completely with immunizations. And then my mother had a son that was born early and did not survive. And then finally she had a tubal

pregnancy, which things had to be removed, so there was no other possibility. So instead of a family of three or four, they wound up with just one.

And so your dad was a construction worker and—?

Yes, he was a construction worker. He only had an eighth grade education, but he was able to take apart and put together anything like motors. He even managed to build his own tractors by combining the differential of trucks with the front end of cars. So we had a couple of homemade tractors, which I was driving by the age of eleven or so.

But you were on a farm and he did this other work, as well?

Yes. Actually, when we settled down on the farm in Ohio, that was when he stopped doing the other work. And so he was totally involved with that farm. We had about twenty acres, and we had chickens and we had pigs and a couple of milk cows. And we had a very large garden where we grew all of our, or most of our food.

So your dad had an eighth grade education

Yes.

And what was school like for you?

Actually I never had any trouble with school, and I credit my mother for that. Because even though she had only a seventh grade education, before I ever went to school she had taught me the alphabet and had me learning and reading things, which gave me a head start. It seemed like I was always ahead of everybody because of that head start I had going into the first grade.

So you were telling me before we turned on the recorder about your high school years and what you did there helped you get into [United States Military Academy] West Point. Why don't you go over some of that for the record?

[00:05:00] Well, I decided early on that I wanted to go to college, so I took a college curriculum in high school. I took all of the mathematics they had to offer and physics and chemistry. But also I enjoyed sports very much, and I lettered in basketball, baseball, and was the captain of our football team my senior year.

What position did you play in football?

I was the center, and believe it or not, in those days they did not wear the helmets with the nose guards. The first thing that the nose guard did was to hit me in the face and I would wind up with nosebleed almost immediately. It was a very punishing position, but it's an important one in the line. I also in those days played both offense and defense. I was a linebacker on defense. So when you're in high school, do you have an interest in science at that point or—? Very much so. I really enjoyed all of the science and I took everything that I could. Unfortunately I didn't have time to take *all* of the science courses, and I did not take biology. But

I did take physics and chemistry, and in those years we were very interested in preparing people for the war, so a course was established on preflight aeronautics, which I took in high school.

And at the end of that, I was reasonably qualified for a private pilot's license.

So you're a teenager when the war breaks out.

That is correct.

This is a little bit divergent but I'm curious. What was it like in that place in Ohio at that time?

What was the feeling in the community about the war, and what were just sort of your general—?

Actually I had the feeling that everyone in the area was very much for the war. There were no problems at all like we ran into, for example, in Vietnam. Everybody was for the war, and a lot of people went away and fought and many of them did not come back because they were killed in the war, but people accepted this and they were very patriotic.

Now when you're in high school, are you expecting that you will probably be involved in the war, go into the service?

I expected that I would and I applied to go to West Point to get an officer's commission. But when I took the test, a civil service test where the top person got the appointment, I came out second, and the top person accepted the appointment. And so I felt that I would not get to go, being a first alternate appointment, so I immediately enlisted in the Army. And by enlisting in the Army, they gave me a six months' delay. I was eighteen years old at this time. They gave me a six months' delay on reporting to allow me to have one semester of college. And since I was the valedictorian of my graduating class, I had a scholarship at a university in Columbus, Ohio and I had already arranged to attend one semester there before I was called up to the Army.

Which school was that?

It was Capital University in Columbus, Ohio.

But you do end up going to West Point, so how does that happen?

Actually, as it happened, the people who control the number of people that go to West Point decided to enlarge the class at the very last moment. And so to get qualified individuals, they looked at their records of all the first alternates and they picked the ones that were considered to be the best qualified first alternates. And actually I had just left home to go to Capital University.

[00:10:00] I stopped for gasoline in Upper Sandusky, Ohio and my mother called me and said, You just got a letter today. You're supposed to report to West Point on a certain day in July. So I had to turn around and go home. I never did get to Capital University.

*She called you at the gas station?* 

Yes, exactly.

*She knew you were stopping for gas?* 

Yes, she knew.

That's a great story. What did you think when you heard that news?

Oh, I was absolutely delighted because I did want to go to West Point very much. I didn't realize at that time how difficult it was going to be. Because remember this is 1943 and I was going directly from high school at age eighteen, and we had people who were going to West Point who had one year of college, two years of college, three years of college, *four* years of college, and the competition was very, very tough at West Point. I didn't realize that when I went. It wasn't *anything* at all like my high school experience. So I went through some very rough times, particularly the first year at West Point.

What was rough?

Well, the physical harassing that they do for you. It's not as bad now since women attend West Point, but back in 1943 the upperclassmen made it very, very difficult on the plebes, and that was all part of teaching you how to deal with various kinds of problems. I'm probably a better man for having gone through that, but I certainly didn't appreciate it at the time.

Now when you get to be an upperclassman, then just does it become—?

Then you do that to the plebes. The freshmen who are coming in are called plebes. So the upper class has to take roles of responsibility over the plebes and help to teach them, not academics but all of the other things, the tactics and leadership training of that sort.

So how were the academics for you there?

Again, I found that some of the academics were quite difficult. And probably because I had graduated from a very small school and I didn't have a lot of the courses that people did who went to larger schools. For example, I found that it was quite difficult for me to do well in calculus, at least for a while, until I managed to figure out how things were going there. And also

some of the professors at West Point in those days were military officers who really didn't have very much training in the art of teaching. And so I didn't get the same kind of special treatment that I always got in high school, where we had excellent teachers in the small school I went to back in Ohio.

You said the school was small. I'm going to backtrack a little bit. Do you have a sense of what your graduating class size was?

Oh, yes, there were only seventy-four students in my graduating class. And the entire population of Upper Sandusky, Ohio was a little bit over four thousand, probably still is somewhere a little bit over four thousand. It hasn't grown much over the years.

Did you ever wonder if you'd made a mistake going to West Point, or what was your—?

Actually after I graduated from West Point, there was no question in my mind that it was the greatest thing that ever happened to me because it was the foundation for everything else that has happened since that time. And the kind of background that I received at West Point, not just the academics but the leadership training, manager training that you get there, was absolutely wonderful. And I would recommend it to anybody who's eligible to get an appointment. And my [00:15:00] understanding now is, I still stay in touch with the people at West Point, for every opening they're now getting somewhere between ten and fifty applicants, so they can really pick and choose and take the very best, only the very best people to the military academy. And I understand that's the way it is also at the Air Force Academy and at the Naval Academy.

I don't know much about the military academies. Does everybody study the same things?

When I went there, there was one possible choice academically, and that was foreign language which you would take. And I had taken four years of Latin in high school because I really enjoyed Latin and it's the foundation of all the Romance languages. And so I decided that what I

would do is put down German because I wanted to see a different kind of language, so my first choice was German. But unfortunately lots of other people took German. And I put down Portuguese as my second choice, and so I was selected to take Portuguese. But as it turned out, it was my very best subject. I graduated sixth in my class in Portuguese.

That's a great story.

It's true. That is not correct anymore. Now people at West Point can specialize in various programs. You can do engineering, you can do all kinds of different things, so everyone is *not* taking the same curriculum anymore, but that's the way it was back in '43. You had no choices *except* your foreign language, and I didn't get the one I asked for.

Thanks for clarifying that. Now when did you graduate from West Point?

Actually they accelerated the program from four years to three years, so I went in in '43 and I came out in 1946. And the way in which they accelerated the course was to take out many of the long leaves. They really did not lose very much of the academics. They tried to cover everything in three years that they normally covered in four years, so that also made it a little bit more difficult.

Why did they do that?

They wanted to get officers out as soon as possible to get them into World War II to replace the ones who were casualties. And they didn't know that the war was going to end in 1945, it could well have gone on to '46 or '47, and so they wanted to get an extra amount of people into the class and get them graduated as soon as possible.

Am I understanding this correctly that taking the extra and accelerating was part of this need created by World War II?

That is correct. That's why they accelerated, and I had a three-year course. Class of 1947 also had three years. And the class of 1948 was split. Part of them graduated in three years and part graduated in four. And the way in which they decided that was on the age, mostly, of the individuals. So had they done that with my class I would have had to stay for a fourth year. But three years was the correct value for '46 and '47.

Do you remember the end of the war?

Very much so. Yes, I do. Well, the part that I remember the most was at a graduation ceremony, there was an announcement made that we had just invaded Normandy, at the first graduation ceremony that I was at, which was in 1944. And then in 1945 when the war ended in Europe and then later in Japan, I was a cadet at West Point, and it was very greatly celebrated by everyone, the end of the war.

And as someone with a science background, did you have any particular thoughts about the atomic bomb? Was it—?

[00:20:00] Well, when you are getting ready to graduate, you have to select which arm of the Army you want to get your commission in. And of course we have the infantry, we have armor, we have engineers, we have Signal Corps, quartermaster. I decided that what I would like to do was get in the Chemical Corps of the Army. And one of the major reasons was that I was very interested in radiological warfare, chemical warfare, and biological warfare. I wanted to find out more about that, and also the people who came to talk to us about the Chemical Corps indicated that there would be a strong possibility that I would be able to get an advanced degree in one of the subjects. And that's really why I selected the Chemical Corps. And that was, again, a very fortunate occurrence for me because a lot of the things that happened afterwards depended on my

starting off in the Chemical Corps and learning in their basic courses about chemical, biological, and radiological warfare.

Now on a personal note, were your parents still alive when you graduated?

Again, there's a tragedy that I can tell you. At the end of my first year at West Point, after I was going home on leave—after my first year I had a thirty-day leave—and when I met my mother at the train station I asked where my father was and he had died the day before of a heart attack. So I found that out when I went home after my first year at West Point. And he was only forty-one years old at the time. My mother was very happy when I graduated from West Point, and she honored a wish of my dad. He was going to give me a brand new car when I graduated, and she gave me a brand new car when I graduated. And she lived to be seventy-six.

I'm just thinking of where we're going to go next. Why don't you tell me how that works, then, to go into the Chemical Corps?

Well, for my particular class you could select the branch of service you wanted to go into, but when the quota went out for that branch, then nobody else could go into that branch, and you got your pick depending on where you graduated in the class. So the number one person in the class was able to pick anything he wanted, and it kept going down, and finally at the very end all of them went into the infantry because that was the only thing that was left by the time they got down to the lower ranking people in the class. So the first thing we did after graduation was to go to Fort Benning [Georgia] and take a course called Officers' Branch Immaterial. And I think this was a major mistake for the Army to do this because everything that was covered in that class we had already had at West Point in much more detail in our tactical courses there. So what we were doing was essentially going over the same ground again.

Tell me again what that was called.

Officers' Branch Immaterial. Immaterial means it doesn't make any difference what branch you were in. Everybody had to take that course, whether you were infantry, engineers, armor, whatever. And then after that course, you could go for Special Forces or you could become parachute trained. I did not elect to [00:25:00] do any of those things. But after I finished the Officers' Branch Immaterial I was stationed at Army Chemical Center, Maryland and I attended the chemical officers' basic course. And following the chemical officers' basic course I was assigned, let me see, yes, it was at that point after I finished the chemical officers' basic course that I was selected, along with all of the graduates of the class of 1946 that went into the Chemical Corps, we were selected to become specialists in nuclear weapons, and how to employ nuclear weapons and how to defend yourself against nuclear weapons. We were then stationed at Oak Ridge [National Laboratory], Tennessee and became members of the staff of the Health Physics Division there. And we were trainees in that Health Physics Division, and were assigned to different portions, different pieces, of the health physics program there. We would work for a certain period of time in each one of those tasks so we'd learn all about the health physics program. And while I was there at Oak Ridge, I was sent off to a major nuclear weapons test at Enewetak.

While you were at Oak Ridge?

While I was at Oak Ridge. I went from Oak Ridge to Enewetak to participate in Operation Sandstone where there were three nuclear weapons exploded on different islands at Enewetak. Let me ask you this. This is very interesting to me. The bombs are dropped on Hiroshima and Nagasaki, at which point—I sometimes pose my questions as statements and that's what I'm doing now. I'm trying to get my thoughts clear on this. The Army must have to begin to rethink

everything in terms of what having nuclear weapons in the arsenal and in the world means, so this thing that you're involved in must have been brand new at that point.

It was brand new and we were assigned a new what is called an MOS in the Army, military occupational specialty number, and the number that we were assigned was a 7330, and we were the first ones. If I recall, there were seven of my class who went into the Chemical Corps, and we became the first ones. We were being trained in order to be involved with the employment of nuclear weapons against enemies and also how to defend ourselves if any of our enemies had nuclear weapons. So this was the training program that I was involved with, and it started at Oak Ridge, and then I went off to Operation Sandstone to actually see the test, the weapons test. Then I went back to Oak Ridge and subsequently was assigned to the Army Chemical Center and I became the radiological defense officer for the entire base at the Army Chemical Center, for the research and development that was going on. And six months later I was selected to continue as a 7330 specialty nuclear weapons effects, to attend a three-year program which started with one year at the U.S. Naval Postgraduate School. Then in my case I had two years at Ohio State University and graduated from Ohio State University with a master's degree in nuclear physics.

[00:29:46] End Track 2, Disc 1.

[00:00:00] Begin Track 3, Disc 1.

So let's talk a little bit about Sandstone.

All right. What I wanted to do is give you my assignment at Sandstone. I was assistant operations officer for the Radiological Safety Task Force at Operation Sandstone, and so we had to predict, based on the expected yield of these nuclear weapons, what the radiation levels would be at various places on the islands where the explosions were being held, and also possibly off the islands, into the ocean. And following the tests, I stayed around for approximately a month

afterwards and I actually was in charge of conducting a monitoring exercise on the islands to determine the levels of radiation on the islands which resulted from the tests. And the tests were actually in the air, so they were not on the actual island, but there were radiation levels. And I had what is called a duck, which is a kind of truck which can go either in the water or on the land, and we would go to the island and then drive up over the beach and then actually conduct a survey to determine what the levels of radiation were at various places as a result of the tests. So it was a very interesting assignment.

I have a couple of questions about that. The first one is what were your impressions of the tests themselves? Did you see them?

Actually they asked us to turn away when the test was conducted, because if you look at a nuclear test it can damage your eyes rather badly, and we didn't all have very thick glasses, so we just had to turn our backs to the test as the bomb exploded. And then we all turned around and looked at the mushroom clouds that resulted from the explosions. So we were able to watch the mushroom clouds which contained a lot of radiation to see what happened to them as they went up in the air and as they moved away from the location where the tests had been conducted. I don't remember offhand how many tests Sandstone consisted of.

There were three weapons that were exploded at Operation Sandstone. Three.

That's what I thought. And the other question had to do with what was, if anything, your involvement with the science side, the laboratory side, of people interested in similar kinds of questions?

At that point, I was not at all involved with the technical aspects. I was only concerned with the radiological safety aspects because that was my job at that time, and so I knew nothing about the

inner details of the physical construction of atomic weapons. I was only concerned with the operation aspects of the radiological safety program.

And were you close? You said you predicted, and then did you have to verify if your predictions were close, am I understanding that right?

Well, we could only predict in a very general way because there wasn't a lot of experience available at that time in 1948. The only other tests that had been conducted were 1946 in Bikini, and they were different kinds of tests, so the predictions were quite fuzzy. But yes, there were predictions, and ultimately when I conducted the survey I talked about, I developed an overlay of the islands showing the levels of radioactivity at each location where I sampled. And I didn't actually sample the ground. I was only looking at *external* radiation. I was carrying a [00:05:00] meter around which measured gamma radiation, external gamma radiation.

*OK.* Anything else about Sandstone that I should know?

No. It did have an impact on a subsequent assignment that I had, in that the individual who was in charge of my aspect of the radiation safety program was a Navy captain, and that Navy captain was the commander of the U.S. Navy Radiological Defense Laboratory at Hunter's Point in San Francisco, and he subsequently approved my assignment as an Army liaison officer to his facility. So it was because I went to Sandstone and met this captain from the Navy that I actually later on was assigned as liaison officer to the U.S. Navy Radiological Defense Laboratory.

And do you recall his name?

Captain Hinners, H-I-N-N-E-R-S.

First name, do you know?

I'm not certain of his first name, [I believe it was Ralph]. I didn't call him by his first name. In those days, I was a low lieutenant and he was a Navy captain.

Point well taken. You wouldn't even have it to forge. I'll look it up. We can find that. But in the interim, you've gone back to school.

Yes, I went back to Oak Ridge from there, and then I was stationed, as a I said, as a radiation safety officer at the Army Chemical Center in Maryland. I was there only six months when I was selected to attend a three-year course to make me what they were calling in those days an expert in radiation effects. That was the real purpose of the course. And that was when I went to the U.S. Naval Academy [Postgraduate School] for one year and then two years at Ohio State to get a master's in nuclear physics.

Now at some point in this chronology, you're going to have to let me know a personal side, which is when you meet your wife. Is this happening yet at that point?

Oh, that happened a long time ago.

It happened before.

We'll go back. I first met my wife when I was a senior at West Point and she was a model in New York City. And there's a story about that. She was a very beautiful lady. In fact, this is the way she looked right here [indicating photograph on wall].

I was wondering.

And I submitted her picture to be Homecoming Queen, and they threw it out locally because they said, She's a professional model, and I said, So what? She's my girlfriend. But they would not consider her as a possibility. And I met her in the fall of 1945 and we were married in July of 1946.

*So she's with you—well, obviously not—* 

I was dating her while she was a model in New York City, and then I proposed to her and she accepted and we were married on July 10, 1946 in her hometown.

So you've been married almost sixty years.

I'm so sorry. [Pause] So shall we go on or—?

Fifty-eight to be exact.

That's amazing. Yes, to be exact. So obviously not in the Pacific but as you're making these various moves on your assignments, your wife and at some point your family is—

Well, very quickly we had a family. We were married in '46 and in '47 we had a son. And that son was born in my wife's hometown of Washington, Indiana because I was involved with some maneuvers, some training exercise, and she wasn't sure that I would be with her when her time came. So she wanted to go home and I approved of this, so her father and her uncle were

[00:10:00] taking care of her and made sure that she got to the hospital on time. So our son was born in Washington, Indiana in 1947. And incidentally, he just recently within the last year or so died of a heart attack. It was sad. [The other children are Christopher, Deborah, and Diana.]

It's up to you.

OK. What's the next logical place to go? Is there something we need to talk about before the Navy assignment?

Well, no, I don't think so because I got in all of the technical training that I had, as well as the operational training at Oak Ridge. I'm trying to make sure that I have this schedule correctly in my head. Let me think about this for a minute. After I graduated from Ohio State with a master's degree in nuclear physics, my first utilization assignment was to Panama. And I went to Panama and I became the assistant commandant of the Panama Area Damage Control School, which was a chemical, biological, and radiological school for Army, Navy, Marines, Air Force, and civilian people, both officers and enlisted people. It was a three-week course, and I was in charge of that course for my period when I was in Panama. At the completion of that, I was stationed back at

Army Chemical Center to attend the Chemical Officers' Advanced Course. And that is a ninemonths' course, and when we got to the portion of that course dealing with radiation and the effects of radiation, they took me out of the class and made me one of the instructors. So I actually became an instructor in the radiological defense because I had more background than the people that they had there that normally taught that. And so after I graduated from that Chemical Officers' Advanced Course, I then went to San Francisco to this U.S. Navy liaison job.

Well, let me ask you something else that pops into my mind. You've begun teaching at this point.

You're teaching in Panama, courses, and then you're teaching—

And then I taught at the Advanced Course.

Right. And I'm just curious—

While I was teaching at the Advanced Course, we had a guest come in who was a colonel in charge of the chemistry department at West Point. And he heard my lecture, and after he asked me would I be interested in going to West Point as a professor in the chemistry department. And so after my one-year assignment with the Navy, it was because of that that I then went to West Point as a professor there in chemistry, and I was there for four years.

Well, great, you anticipated my question a little bit, but I was curious, when you began teaching, what was your response to it? Was that something that you—?

I discovered that I love teaching, and I really enjoyed it, every minute of it, from the very beginning. And we had only one course in military instructor training at West Point, but I did very well in that course, as well, when I took it at West Point. There's just something about [00:15:00] imparting knowledge to other people that really turns me on, essentially. I enjoy it very much and I work at it very hard to try to get things in terms that people can understand. So what was it like going back to West Point as a professor?

It was absolutely delightful. And again, I can give you an anecdote here. Many people from my class went back at the same time, and usually it's the highest ranking people that they take to come back to the academy to teach. And the quarters are assigned based on your class rank when you graduate. And so when I went back there, all of the quarters that were available on base were assigned to people who ranked me in the class. So I had to live for a while off base, and when a new set of quarters became available, I was a captain at this time, the new set of quarters that became available were for field grade officers, majors and above. But all of the people who ranked me in the class had already moved in so they didn't want to *move* again, so I got these major's and above quarters. And this is a three-story house with something like eight bedrooms, four fireplaces, a basement, and my den was on the third floor and I had a perfect view right out over the Hudson River. And many's the night when I'm studying, I watch the moon come up, reflected in the Hudson River. We had absolutely delightful quarters for four years, just because where I happened to rank in the class.

That's a great story.

It's absolutely true.

I've only seen pictures of West Point, but the pictures, it's quite beautiful.

Oh, it's a lovely place, it really is. And being a professor there is much, much different from being a cadet.

*In what sense?* 

Well, the amount of freedom that you have. You're completely controlled when you're a cadet, but as a professor there, you have the ability to take trips, to take your leave when you plan for it, and also I was doing what I love to do, which is teach.

What year was this that you go back to West Point?

I went back in 1956 to West Point and I taught for four years. I left in '60.

And what were the students like? What was your sense of the students then?

West Point has a program that is different from many universities, in fact from practically every university. They believe in small classes. The largest size class that I ever dealt with was like twelve to sixteen people. But because of that, you have to teach the same course more than once. So you have to prepare your lecture and then give it more than once because you have different sections. And the cadets are adjusted according to their academic records. So when you are in a certain section, you're there with other people who are ranked like you in that particular subject always, that's the case. So we had sections that ran from like Section 1 down to like Section 12, and for some reason or other I wound up usually teaching the upper sections, which I enjoyed very much because they were the brighter ones. And in West Point, each student has to come to class prepared to be tested on the subject matter that day which they have been assigned [00:20:00] as a reading before they come to class. So when they walk through the door, they have to be prepared to be tested on the material that day. But what almost always happens, and this is the way it always happened in my classes, the students would start off by asking questions. They would almost always ask questions about specific problems which had been assigned, and I would always then work out the solution to the problem and explain it and make sure they understood it, and then I'd get another question on another problem, and I'd develop all of the material around these various questions which were asked. So it's a different kind of approach. It's not your straight lecture program. And you're responding to what the students say are their problems and you're trying to explain it. And that's the kind of teaching that I was involved with there for four years. So it's different. Here [at UNLV], for example, in a freshman class, you'll have 120 students in a huge area and you just don't have time to answer all their

questions or be concerned with everybody's problems. You give them a chance to ask questions, but they usually don't ask very many in a very large class. So the way I developed my courses, my teaching here at UNLV, when the students walk in the door I would put on the blackboard an outline of what we were going to talk about that day, and what I was really using is the Army approach to teaching, which is you tell them what you're going to tell them, you tell them, and then you tell them what you told them. And that's just the way I taught all my courses over here at the university. I outlined, here's what we're going to cover today, I would then tell them, and then at the end I would summarize. And if they took careful notes, they had no trouble at all passing, but there would be many people sitting there, you know, not taking any notes at all, half asleep, and so on, but that's a normal freshman class.

And just because I'm not sure I got this the first time through, you're teaching what courses at West Point?

At West Point, I always taught chemistry, only chemistry, and it was sophomore chemistry. They did not offer chemistry as a freshman course at West Point, so it was sophomore chemistry and it was Introductory College Chemistry, it included both inorganic and organic, but it was only an introductory course.

So did you do labs and things?

Oh, yes. In fact, I was the lab officer, so I was responsible for working with the staff to get the labs all set up, and then while they were taking the labs, to go around and help the students that needed help. So yes, there was lab associated with the course.

*Now what causes you not to stay there longer?* 

This is another story. The normal time for staying at West Point as a professor is three years.

You're there three years and then you move out and somebody else comes in. So I was there for

three years. They liked me very much, and so they went to bat for me for a fourth year, with the personnel office of the Chemical Corps. So they agreed and gave me the fourth year. And by the end of the fourth year, it was time for me to go to Command and General Staff School, I now was a major. I had been promoted to major and it was time for me to go to Command and General Staff School. So I applied to go to Command and General Staff School, and the personnel office in the Chemical Corps decided they would get even with me for having my fourth year at West Point. So they *denied* me the ability to go to the long course that I wanted to go to in Fort Leavenworth [Kansas]. And what they said was, We are not going to approve this because this is your last year of eligibility. I think you have to be under thirty-five and I was [00:25:00] thirty-four at the time, and they say this is your last year of eligibility, so we're going to deny this. Well, I later found out that an individual in my Chemical Officers' Advanced class who graduated from that course only because I tutored him—I was number one in that class; I tutored this guy who was at the very end—they sent him to school when I wanted to go, with the fact that he was over age. That's why I left the Chemical Corps. I was very susceptible to an offer from the U.S. Public Health Service just because of that, because in order to reach advanced grades in the Army, you need to go to the Command and General Staff School at Fort Leavenworth. And I wanted to go, and when they wouldn't let me go, I just said goodbye when the opportunity arose.

We've got a few more minutes left on this disc, so let's get the beginning of that story of how that offer comes from Public Health. What was that about? But first, we have to know. You leave West Point and go back—

I leave West Point and I'm assigned to the Office of Chief Chemical Officer, who is a two-star general, and I am a staff person in his office. I'm a major.

Where?

In Washington, D.C., in the Office of the Chief Chemical Officer. And I select a home in Fairfax, Virginia, and I get to talking to an individual over the back fence who happens to be a commander in the U.S. Public Health Service, and he's telling me what his job is and how he's doing this, and I said, Well, who's your boss? And he told me the name of his boss, who was the scientific director at the Naval place where I was liaison officer, and who knew me, and so this guy said, Hey, if you want to join, I'll arrange a meeting, With this scientific director, he's now transferred to Washington and he's working there. And I said, Yes, I'd like to have an appointment with him. And that led to my getting a commission in the U.S. Public Health Service. And so I transferred over as a major and became one step down from a commander. My goodness. I know it so well. They're two broad stripes and one in the middle. Lieutenant commander. And then I subsequently was promoted to captain, and then to rear admiral in the U.S. Public Health Service, with different assignments which we'll talk about later on. But the major reason that I left the Army was because they wouldn't let me go to the Command and General Staff School—they were punishing me for having a fourth year at West Point.

I'm not a military person, so I have really a basic question here about the services. From what you're telling me, you can transfer between services—

You can transfer between services *if* the service that's *gaining* you wants you and approves it.

You can transfer. And in general the losing service will agree to your departing to be transferred to another service, and all of your time and everything goes with you and counts for your retirement, so you don't lose anything.

OK. Now did Public Health, in addition to conserving what you had, give you anything else that was of value to you when you went over?

Well, they offered me three things, any one of which I would have gone for. First and foremost, they offered to keep me in research and development assignments for my entire career in the U.S. Public Health Service, and you can't do this in the Army. You have to have troops and staff and logistics and training and maybe one or two research and development, but you can't stay in [00:30:00] research and development, which is what I wanted to do. The Public Health Service offered to keep me in research and development. They also said that their promotions were faster than they were in the Army. And third, they offered to send me back to school to get my doctor's degree. And they paid off on every single one of those things. So all of this made me attracted to the Public Health Service, and I was very unhappy with the Army for the reason I stated. *Yes.* So when you first moved over, you're being able to stay in Washington, is that—? When I first move over, I was stationed at a research laboratory of the U.S. Public Health Service in Rockville, Maryland. Subsequently that research laboratory was on radiation effects and it was divided in half; half of it stayed with ionizing radiation and the other half went with non-ionizing radiation. The non-ionizing radiation program moved into the Food and Drug Administration [FDA], and the ionizing part moved into the Environmental Protection Agency [EPA]. And I went with the Environmental Protection Agency rather than with the Food and Drug Administration, because I felt that the Environmental Protection Agency had a lot greater chance for not only advancement but also for broadening my spectrum of subjects which I needed to deal with in the research and development program.

This is another really basic question. I don't know this area. The Public Health Service still exists.

Oh, absolutely.

So it didn't become the EPA, but there's a relationship with the EPA that I've never understood. No. Let me explain that. When the EPA was created, there were a lot of U.S. Public Health Service officers. There are no enlisted people in the U.S. Public Health Service; they're all officers. They were delegated to various other services. In fact, in time of war the U.S. Public Health Service, all of their officers are assigned to different components of the military; they are assigned to the Navy, to the Army, and so forth in time of war. But when it's not war, some of them are delegated to other organizational entities, and there were a lot of U.S. Public Health Service officers designated or delegated to the Environmental Protection Agency. This is not true any longer. There are almost no Public Health officers that are now with the Environmental Protection Agency, but in those days there were a lot. So as a result, I was just pulled in to the EPA because of the specific job that I had. I had been delegated to a predecessor agency of the Environmental Protection Agency. It was called Consumer Protection and Environmental Health Services. It disappeared and EPA—it was [President Richard] Nixon, I think, that abolished that and created this new arm.

Yes. I ask, and I'm jumping a little bit ahead because I know from what we—I've talked to people about here in Las Vegas, connected to the test site, that Public Health Service is here and then EPA is here, and I didn't know how that—

Well, right now it's EPA and they have an office out on campus at UNLV [University of Nevada, Las Vegas] but there are, to the best of my knowledge, no U.S. Public Health officers now assigned to EPA. Slowly but surely, they have stopped assigning new people over. They're trying to keep them within their own Public Health Service empire and not lose them off to other organizational entities. So when these people have retired, the Public Health Service people who

were EPA, they didn't replace them with Public Health Service officers. They replaced them with federal civil service people.

[00:35:00] I think my confusion was about the early days of the test site, and you don't have to answer this, I have to do the research on it.

In the early days of the test site, the U.S. Public Health Service had a very solid role in the safety of the offsite residents, and that eventually came over to the Environmental Protection Agency when it was created, but the Public Health Service had it even before, back in the very early days, before there was ever an EPA. That is correct.

Exactly. That's what I'm thinking of. And so then when EPA comes into existence, those kinds of things go under its umbrella?.

Well, it came under the laboratory which is now—and in those days it came under the Office of Research and Development, the operational safety program. And then since that time, the operational safety program for the offsite population, the responsibility was moved from the Office of Research and Development to the Office of Radiation in the EPA. Completely different office. Since then, it has been removed from EPA and they're now contractor employees that are doing offsite safety, and I personally feel that that was a mistake. That's my opinion.

So we've jumped ahead, but that clarifies it because that was a little bit confusing to me.

I understand.

[**00:36:39**] End Track 3, Disc 1.

[00:00:00] Begin Track 2, Disc 2.

You mentioned that you want to go back and say some things about Panama.

Yes. Well, I'd like to backtrack just a little bit to Panama. What I want to recall is the fact that my assignment to Panama was a utilization assignment for a five-year training program to

establish me as a nuclear weapons expert and an expert in the defense program for nuclear weapons. I was requisitioned as such a specialist. And when I arrived there, I discovered that there was a position available on the commanding general's staff for an advisor on radiological defense. And I made my background known to the commanding general's staff and they said, Well, there's no question about your qualifications, but you're the wrong rank. You're only a captain and this position requires a lieutenant colonel. So what they did was assign a lieutenant colonel to the position and he spent a lot of time down talking to me to find out how to carry out these things, and I got no credit whatsoever for what was going on. But as far as I was concerned, I didn't mind because it tied in very nicely to my instruction material in the chemical, biological, and radiological school which I was conducting for people there. But I was also a silent advisor to the commanding general's advisor on radiation protection.

Actually, in order to understand what it means, you need to know how radiation affects the human body. And you need to know a little bit about the details, the technical details, of different kinds of radiation and how those different kinds of radiation affect the human body; you need to worry about specifically external radiation *versus* internal radiation. If the radiation is in food, for example, and you eat the food, that's a different kind of a problem from the fact if the radiation is external gamma radiation, and what you need to know is based on the *levels* of this radiation, what is the risk to human people? And that's the whole thing: knowing the radiation that is present and knowing the levels of the radiation that are present and understanding how it affects people at different dosages. You can then tell the people they have to *move* out of certain areas or they have to wear certain kinds of protective gear or they can't eat food which has been exposed. If they're wounded, for example, you have to beware of radiation which actually gets

into the wound and then can get into the blood system. But all of these things put together is what you need to know in order to develop a radiation protection plan, which is a plan to protect the people to the extent that you can so you won't have casualties as a result of radiation poisoning. And either your military people or their spouses and children or civilians who are close by. So that's a very quick definition of what I mean by radiation protection.

You anticipated one of my questions which was, in your capacity, whether you're looking only at

the military or you're also looking at other populations when you're thinking about this.

Well, it makes a very great deal of difference because different people have different radiation

sensitivities. The most sensitive people are developing embryos in mothers who are going to [00:05:00] give birth. And as an anecdote, I can tell you that this lieutenant colonel in Panama had pregnant women helping in exercises where they were dealing with radiation casualties.

After I explained to him that you should not involve pregnant women in that kind of an exercise because in the real world, if there really is radiation there, you're going to really harm those developing embryos, he changed the policy and from then on, pregnant women were excused from those kinds of exercises. But they wanted volunteers to help if they had somebody that exploded a nuclear bomb down there, and so they went through various exercises where they dealt with, well, how will we deal with this? Radiation protection exercises. And you should not involve pregnant women as volunteers in that kind of a program. You need to protect them to the maximum extent possible.

Now a question about the school being in Panama. The school's in Panama because that's where the Army decides to locate the school?

Well, the reason that the school was there is because there was a major component of the military there. USARCARIB was the United States Army Caribbean, and so it was a very large program.

You had a commanding general and all of his staff and all of the various people assigned down there at the various bases, so probably, there were thousands to tens of thousands of military people that were stationed down there in those days. That was before we turned it back to the Panamanians, who have now given it to the Chinese, so I hear.

Well, we'll talk about that later. So this leads to my real question which is, when the commanding officer is designing these exercises, who are the volunteers in the mock exercises? Are they local people or are they wives of—?

The volunteers were local people. I mean there were a lot of civilians who worked for the military in various capacities, and also there were spouses of the military people that were assigned there, and so those were the kinds of people that they used in the mock exercises. *And how long were you there again?* 

I was there only two years.

So was your family with you there?

Yes, my family was with me, but my wife didn't like it down there and she wanted me to move out, and so I applied for the Advanced Chemical Officers' School and left early. That was a situation where my wife influenced me to move early. I enjoyed my job there very much and I liked Panama, but she was unhappy, so we moved, with approval of the Army.

*I guess so. Anything more about Panama before we—?* 

No, I think that's enough said about the Panama situation. Let me see if we can get back to where we were. I think now we need to talk about the various assignments which I had in the U.S. Public Health Service after I left the Army. Of course, the reason that the U.S. Public Health Service wanted me was because of the training which the Army had given me and never

used. That's the reason the Public Health Service wanted me. And that was one of the reasons that I wanted to go, because I *wanted* to utilize the training that the Army had given me.

So my first assignment in the U.S. Public Health Service was in a research and development program in Rockville, Maryland, and it was in the Division of Radiological Health, so I was involved there only with radiation and trying to do a better job of understanding the effects of radiation on biological systems. And so I was designing a research program there with a technician, and I was just really getting well into the study when I was asked, How would you [00:10:00] like to come out to Las Vegas and head a program there which is a brand new program? You're going to have a budget of something like a total of five million dollars over a five-year program. You'll be able to hire people, you'll be able to control the whole program, design it, and so forth. And I said, where do I sign up? Because what I was doing back in Rockville was very small potatoes compared to what I saw this job to be in Las Vegas.

So I was transferred to Las Vegas and I became the director of what was called the Bioenvironmental Research Program. And our mission of that program was to develop improved models for estimating human exposures from all routes of entry of radiation which has escaped from the test site. That was our job, to develop those models. What we did, we specialized initially on radioiodine 131 [1131] because for most nuclear weapon debris and possible effects on human beings downwind, radioactive iodine seems to be the one that causes the greatest hazard. And what it does, it concentrates in the thyroid gland and it can then cause thyroid cancer or other abnormalities associated with the thyroid gland. And so what we did was to develop an experimental program at the Nevada Test Site to develop data to input into our model. And we built our own farm out there in Area 15 at the Nevada Test Site and we were able to grow our own crops out there. We had our own dairy herd, because the principal route of entry into

humans of radioiodine is from forage to cows to milk to people drinking the milk. So we had to have every piece of that program. So we grew our own crops and we fabricated our own aerosols with radioiodine, released them over our crops out there, and then measured everything. Then fed those crops to our own cows, and then measured what was coming out in the milk, and then the milk was disposed of. It was never consumed by any human because it had radioiodine in it. But that essentially was the way in which we developed our model. And based on that model, then knowing what the yield was of a given shot, a given nuclear shot, knowing the yield, you could determine approximately how much radioiodine would be coming out, and knowing how high the thing went, would be able to tell you by modeling what of the radioiodine went where. And some of it is in the air and goes very long distances, and some gets attached to dust and dirt particles, and some comes down and gets attached to forage grasses which are consumed by cows, and so forth. And so we had to understand what is happening with each aspect of these things. That was the whole program. As I said, we did it over the course of five years. This was from 1963—it was six years, '63 to '69, we developed improved models for estimating exposure to humans. And when accidents occurred, we had airplanes that would sample the cloud to determine how much radiation was there, and then you could apply the models to determine where that radiation was going to go and determine, for example, whether there were certain places where you would have to confiscate the milk and not let anybody drink it. Or you would tell people to stay indoors, don't be outside when a radiation cloud goes over, all of the various protection measures. This is the way we were pointing everything, to do a better job of [00:15:00] protecting people from possible overexposures to radiation, and we concentrated, as I said, in the beginning on iodine 131.

When you first came, I'm trying to think if it's '63 or—

Sixty-three.

But the treaty soon happens that stops atmospheric testing.

That's another anecdote. They were planning a shot, a small shot but it was going to be above ground. We had spent three months designing a very extensive program to sample cows' milk all around in Nevada and in Utah, and to have measuring devices out to measure what is in the air and what is—and we were going to sample forage and sample the ground, and we had worked on this for like three months, and like a week or so before the shot went, they signed a treaty which killed it. So it never happened. So we never got to do that particular study. But I'm just as happy that that's true because it really didn't make a lot of sense to be conducting these high level nuclear tests above ground. But when they were doing that, they really didn't have a good handle on what the hazard *might* be to people. They didn't have a good handle on it because the research and development just had not been done; the data was not available. So they were following the rules the way the rules were set in those days. But as time goes on, almost always with radiation rules, you find that they have to become more strict and more stringent as you understand more and more about the adverse affects that radiation can cause on people.

Well, you're touching on this area of controversy now which goes, as I would see it, back to the basic question of whether it was right to be conducting those tests without sufficient knowledge, but of course scientific knowledge works in such a way that you often don't know what you don't know.

I'd like to respond to that because I feel certain that the reason they rushed into that kind of a testing program was that they wanted to be prepared, first, to use nuclear weapons against any enemy, and second, to be able to defend themselves if any enemy used nuclear weapons. And they wanted to get the information as fast as they could. For example, in the Korean War they

actually were looking at the possibility of using small nuclear weapons, and that's one of the reasons that I was never assigned to Korea. Because people who had special knowledge that would've been needed in Korea if they started using nuclear weapons, and I was one of those, they didn't want us over there until the decision was made as to whether or not they were going to do it. So I went to Panama instead of Korea. Otherwise I would probably have gone to Korea. Well, I have to ask you a couple of questions about this. As a radiation expert at the time, were you aware that this was the case, that there was discussion of those weapons possibly being used?

Yes, I was. I was aware. But at that time, all of those discussions, even the fact that we were considering it, was classified. But I don't think it's classified anymore. We were *considering* the use. We never did it, and it's probably very wise that we never did.

Taking into account that there might be classified issues here, can you give me a sense of how extensive those conversations were, or how much it was in your own mind that it was a possibility, maybe is the best way to phrase it.

Well, let me tell you that it was a controlling factor in the design of weapons that could fire nuclear weapons. I mean if you're going to use nuclear weapons out in the front lines, you need a kind of weapon that somebody can carry on his shoulder and stuff a nuclear shell into it and [00:20:00] shoot it. And so it had an impact on the design program. And that's what the Nevada Test Site was all about. It was the design of various kinds of nuclear weapons: different sizes, different yields, different methods of using the nuclear weapons, whether you're going to explode them underwater, underground, use them to blow up concrete pads, or whatever, all of this went together into the design of the nuclear weapons program. And you have to know what kind of nuclear weapons you're dealing with before you can determine what kind of safety

measures that you might use to protect *yourself* against your *own* weapons. So yes, it had a very solid effect on the detecting program, and on the research and development program to develop more efficient nuclear bombs and smaller ones.

Now back to your work with—this is EPA now that you've come out with. So was part of your job as the—what was your title at this point of that—?

I was Chief of the Bioenvironmental Research Program. I can tell you another anecdote. A guy who didn't like me very much called me the Chief Belch of Burp [chuckling] because bioenvironmental research program [BRP] is pronounced "burp."

That's a good one. So you all came up with the idea of the EPA farm and all these things that—? Well, first, we were given the task to create an improved model for going from the amount of radioiodine in a nuclear explosion debris and human exposure. And to do that, we felt that we needed a farm, so we designed a farm. We needed our own dairy cows, so we had our own dairy cows. There was also a beef herd of cattle that were allowed to go around the test site and we had a sampling program of those to determine what levels of radiation occurred in what tissues at what points in time. So all of it came from the assignment to develop a better model. Then we decided what was needed to do that, and we said, Well, we've got to have our own farm because we have to have a place where, in a controlled area, we can release radioiodine, and we can't do it anyplace where you don't have a completely controlled area. And you have to do it there very carefully and have it approved for safety.

And again for a lay person, how do you do that? You said you had an aerosol—

What we did was to develop procedures for creating our own aerosols and then labeling them with radioactive iodine. And we used very low levels of radioiodine because we didn't want to hurt anybody, including our own people who were involved in the study. So in our labs we had

labs that had the appropriate safety considerations where we could label different sized particles. And one of the major concerns initially was when you have nuclear debris, you have gases, you have extremely fine particles, you have middle-sized particles, you have very large particles, and so we wanted the ability to tailor-make our iodine aerosol to something that was like a gas, something with very fine particles, middle-sized particles, big—and we did all of that. And we released those kinds of aerosols over our own growing forage out at Area 15 at the farm, and then we fed that forage to cows, and then studied the buildup and decay of radioiodine in their milk as a result of what was in the forage.

How did you release it? What was the mechanics of that?

[00:25:00] The mechanics for releasing was almost like a spray. Well, a spray can is the easiest way to describe it. It was *like* that but it wasn't quite that. Because we wanted a line so the cloud would be fairly consistent going across. So we had a physics group, aerosol physics group, that designed the spray things for releasing this over our growing crops out there, and then we had a consultant with the Weather Service who worked with us. This whole program was funded by the Atomic Energy Commission [AEC] and EPA had the money to carry it out, but it was an AEC-funded program to establish better guidelines for safety. So AEC has to be given kudos for supporting that program. So we had a Weather Service guy who worked with us, and when we released this, we had had to have extremely stable weather conditions. And we'd usually get those at night, so we'd have to release the aerosols at night when the weather was very, very calm and you had just a very slight breeze in one direction. Then you would put your spray devices upwind and it would spray and very slowly move across, and then you would sample all the forage to make sure that you got reasonable contamination from the standpoint of not all of it's in one spot and nothing over here, but what we were trying to do was make it very uniform.

And we were able to conduct, I guess, four or five *major* studies, and then they were written up in scientific reports, and those scientific reports ultimately wound up in the library. But that's another story.

I want to know that story in a second.

That's another story.

OK, the reports. Why don't you just tell me now and then I'll go back to my questions.

All right. We had a director who came in here who felt that he needed the space that was being used for a library at EPA for other purposes. He essentially closed down the library, excessed all the materials, offered it to the UNLV library, and they said we don't want it. Now that is absolutely amazing, but that's what happened. Because when I was in charge, I felt that the library was one of the most important functions we had, because that's where we collected all the information and people could come in and *read* these reports and see the results. I have a tremendous background of those reports myself. I couldn't put my hands on all of them right now, but I have them. I never threw *any* of my reports away.

Wow. So do you know where they went?

So far as I know, they may be buried in the basement somewhere or they may have been simply thrown out. I really don't know where they went. And what I'm giving you is hearsay on this. It wouldn't be acceptable as real evidence in a court, but my hearsay was that when all of these reports were offered, that UNLV said we don't want them because we'd have to catalog them and we don't have the staff to do it. And there were many, many reports and there were a lot of *special* reports, obviously, that you *couldn't find in any other library*.

Right. But you have your copies of the reports.

I do.

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Excellent. There's several things I need clarification on here to understand it. How is the release

done? Are there stands?

Actually we put our ejecting devices very close to the ground because we wanted it to come

down on the forage, so we didn't want to put it up high. So I would guess, it was like this, about

this high.

*Maybe, what, two feet?* 

[00:30:00] Yes. And what we wanted was a very slow movement of a uniform aerosol over

growing crops, and then by the time it got to the end of the crops, we wanted most of it to have

been deposited, almost like a fog, on the crops. We didn't want it to go all the way over to the

road and where a lot of people were and so on. So we designed it in such a way, and we had to

wait for the right kind of weather conditions in order to ever have a study. So a lot of times we'd

get all set up to run some night and we wouldn't go. We'd have to postpone it.

OK, that was question number one. Question number two, you mentioned the AEC being sort of

the prime mover on this.

Well, they were the funders, and so they were the ones that we provided the results to.

Do you have any insight into whether or the ways in which any particular policy or politics were

influencing the AEC to do this?

I would have to go off the record to tell you. Yes, I know a lot about it, but I don't want this to be

part of the record.

OK. Shall I pause?

Yes.

[**00:31:18**] End of Track 2, Disc 2.

[00:00:00] Begin Track 3, Disc 2.

So that's five or six years with the EPA here.

Six years. I came here in '63 specifically to run that program and it was completed and I left in '69 and became the director of the research program for the National Air Pollution Control Administration.

Yes. Let's stay a little bit in Las Vegas before we go there. I have a few more questions. How many people did you have working for you with this project here?

Well, at the peak, there were over a hundred people involved with this.

And they are some scientists, I imagine, and some—

Oh, yes, we had all kinds. I mean I had to have people who were dairy farmers who took care of our cows. We needed farmers that would plant the stuff out there and watch it and water it when it needed water and the right amount and so forth. And we had to have technicians, laboratory technicians. And we had to have scientists of all kinds, every kind of description that we could get.

Did you have laboratory facilities right there in Area 15 or in town or—?

Well, we had both places, yes. Both places. Our most extensive laboratories were in town. They were on the campus over at UNLV.

*Oh, they were?* 

Yeah. The whole building used to be ours. The one building which is next to the greenhouse and the farthest west of those EPA buildings, that whole building was ours, the Bioenvironmental Research Program.

These are just things I don't know. EPA has a presence on the UNLV campus back at that point? Yes, it did. Very definitely. When I came out here in '63, I had to go to an office that was across the street from the AEC office over there on Highland Ave; we had the building that we rented

right across the street. And then we got permission to build the buildings which are now on UNLV. I moved from that building then over to this building that I just told you; incidentally, the greenhouse was ours, too. That was so we could grow our own different kinds of forage to look at possibilities, you know, what's the difference between alfalfa and Sudan grass, for example, and so on.

So how was that in your career? Did you enjoy that or what was it?

Oh, absolutely. It's wonderful. How many times in your career do you have a job where they assign you a task, give you a whole bunch of money, and then let you design *who* you need, you go out and locate them and hire them, you develop the facilities that you need, and you do the whole program and you summarize it all in your final report. You don't have that kind of a chance very often in the research and development program. Usually there's always somebody looking over your shoulder and you always have to fight for budget and so on. But this was pretty well set up from the very beginning, and it was supported by the AEC.

Yes. A question about nuclear weapons. As you're out there and you're at the place where they're actually being developed, what are your thoughts about things like the arms race and nuclear weapons and the Cold War?

Let me clarify. Nuclear weapons were not being developed at the test site. They were being developed at Lawrence Livermore [National] lab, at Los Alamos [National Laboratory], and in Albuquerque, New Mexico. We were a *test* site, and there is where the designs that people tried [00:05:00] were actually tested out there. And one of the anecdotes that the Los Alamos people liked to say about Livermore was, Could we use your tower when you get finished with it? Because they did have some duds.

That's a good one.

Well, when you were on the advisory panel, they would always describe the technical nature of the test that was being conducted, and that was a classified briefing where they actually told you just exactly what was being tested and how it was different from other things that had been tested and what they expected from it and so on. If you were on the advisory panel, you always got that briefing, and I did when I was the director here. I served on the advisory panel many times, and for every test I learned exactly what it is they were testing to try to improve that particular nuclear weapon.

Right. I think it was more a—what I'm trying to get at is more of a political question, your own political views on the testing program itself, which of course is connected to the development program, the whole Cold War enterprise, it would've been.

Well, my whole feeling, and from the very beginning, the structure was always national defense. It was being done in the *name* of national defense and in the nature of developing the best possible weapons that we could, and also ways to defend ourselves against the very same weapons. So that was really what we were involved with, and I felt that, you know, weapons of mass destruction in general, I felt that no sensible individual would ever use them, but if people know how to *create* them, you better learn how to defend yourself against them. And so my thrust has always been safety, defense, how do you defend yourself against these kinds of things to the extent that you can? And obviously if you're very close to a nuclear bomb that goes off, forget it. You're gone. You're vaporized. But there are ways that you can defend yourself, and you need to understand what it is you're defending yourself against before you can even develop these defensive measures. So you have to make certain assumptions about what are called threats. What can other people use against you, and how can they use those things, and if they use those things that way, how are you going to defend yourself? Those are the kinds of war

games that you really have to consider and look into. And we're still worried about the very same thing, particularly with regard to chemical and biological warfare.

Well, we're just at noon, and I think what would be a good idea, if there are any other things that are coming to your mind right now about this first Nevada experience, the farm and everything, let's get those now, and then we can wrap it up for today.

Well, I think that, and you're the best judge of this, I tried to explain what the program was and how it came about, who funded it, and how we implemented the program, and the various facilities that we developed in the implementation of that program to develop these better models for predicting what kind of a problem you're going to have before you have it. That's what you always strive for. You want to predict what the problem is going to be before it is there, and then what can you do about it comes next after you have predicted what's going to happen. And that was the whole purpose of our program out there.

And you explained that really well, so I do have a good sense of it, which is great. One question comes to mind as you speak now. Did you go so far as to developing strategies, let's say, if there were to be too much of a release in a certain direction for what you would have proposed for [00:10:00] warning downwind populations? Did your assignment go that far?

We had all of the above that we incorporated, and we developed *recommendations* which came out of the program and were then *transferred* to the offsite monitors. When something occurred and something got out of the ground and we knew that it went over a place where there were dairy cows, for example, the milk became confiscated. It wasn't allowed to be consumed. And we sent out people to measure what were the levels of radioiodine, which was our major concern, in the forage. And warnings were sent out. If we knew that a cloud was going in a certain direction, we told people to stay indoors and close all the windows and everything, in hopes that

that would reduce the exposure, and it would in a real situation. So yes, we made recommendations for how to protect human health and safety. That was the whole purpose of our program, and we wanted to get better models for *predicting* what was going to happen *before* it happened, and then take steps so it never *did* happen.

And so you do have the relationship with the offsite monitoring program.

Oh, yes. Absolutely. We were essentially helping to develop guidelines for the radiation safety monitors.

And once things move underground, then it's venting and things like that that you're concerned about.

When everything went underground back in '63, essentially, what we were trying to do was to look at the situation from the standpoint of *if* this event—

Let me pause it—

[00:12:26] End Track 3, Disc 2.

[00:00:00] Begin Track 4, Disc 2.

Yeah, so you're thinking about venting, then, you were saying, releases.

Always what the whole purpose of the Test Manager's Advisory Panel is to look at the weather conditions and to make certain assumptions about *if* this vents, how high it's going to go, and then what's going to happen to the cloud after it gets to that height? Is it going to be sheared and some go this way and some go this way? And all of that. Those have to be predicted by the weather people, and they have a lot of weather people who work on this, and they actually will present models to the Test Manager's Advisory Panel that here's the situation. If it goes this high, here's where it's going to go. So yes, you

look at all of those possibilities and if it looks like if an event occurs it's going to come towards

Las Vegas, they would never shoot it.

OK. Well, let's wrap it up there for today, then.

OK.

Thank you very much.

[00:01:010] End Track 4, Disc 2.

[End of interview]